DEEPWATER HORIZON OIL SPILL LOUISIANA TRUSTEE IMPLEMENTATION GROUP

DRAFT PHASE 2 RESTORATION PLAN AND ENVIRONMENTAL ASSESSMENT #8.1: EAST ORLEANS LANDBRIDGE RESTORATION PROJECT AND RACCOON ISLAND RESTORATION PROJECT

MAY 18, 2026

NOAA NEPA UIN: EAXX-006-48-1HC-1769789808

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Executive Summary

On April 20, 2010, the *Deepwater Horizon* (DWH) mobile drilling unit exploded, resulting in loss of life and discharge of millions of barrels of oil into the Gulf of America[1] (Gulf) from the BP Exploration and Production, Inc. (BP) Macondo. As an oil pollution incident, the DWH oil spill is subject to the provisions of the Oil Pollution Act of 1990 (OPA; 33 United States Code [U.S.C.] Section [§] 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. Immediately following the DWH oil spill, the DWH Trustee Council[2] initiated an injury assessment pursuant to OPA and associated natural resource damage assessment (NRDA) regulations, which established the nature, degree, and extent of injuries from the DWH incident to both natural resources and the services they provide.

As part of the 2016 DWH legal settlement, BP agreed to pay $8.1 billion in natural resource damages (inclusive of Early Restoration funding) over a 15-year period, and up to an additional $700 million for adaptive management or to address natural resource injuries that may become apparent in the future, for a total of up to $8.8 billion. Following this comprehensive settlement agreement, the *Deepwater Horizon* Natural Resources Trustee Council (DWH Trustees) released the *Deepwater Horizon Oil Spill: Final Programmatic Damage Assessment and Restoration Plan and Final Programmatic Environmental Impact Statement* (Final PDARP/PEIS; DWH Trustees, 2016), outlining the programmatic plan to restore natural resources impacted by the DWH oil spill.

In the Final PDARP/PEIS, the DWH NRDA Trustees established 13 restoration types under five programmatic restoration goals. The Final PDARP/PEIS also established a distributed governance structure that assigned a Trustee Implementation Group (TIG) for eight designated Restoration Areas.

LA TIG Draft Phase 2 Restoration Plan and Environmental Assessment #8.1

In 2022, the Louisiana Trustee Implementation Group[3] (LA TIG) finalized *Restoration Plan and Environmental Assessment #8: Wetlands, Coastal, and Nearshore Habitats* (RP/EA #8), which screened project alternatives at the conceptual design stage based on geographic location, immediacy, and sustainability of project benefits provided for those that could best restore injured wetlands, coastal, and nearshore habitats (WCNH). Through that analysis, the LA TIG narrowed the range of alternatives to a suite of projects, including the East Orleans Landbridge Restoration Project and Raccoon Island Restoration Project. These two projects are proposed as "Phase 2" projects, as the engineering and design (E&D) phase (Phase 1) of the projects were funded through RP/EA #8.

The LA TIG prepared this *Draft Phase 2 Restoration Plan and Environmental Assessment #8.1: East Orleans Landbridge Restoration Project and Raccoon Island Restoration Project* (RP/EA #8.1), which presents OPA

[1] Formerly Gulf of Mexico, revised per Executive Order 14172 "Restoring Names That Honor American Greatness".
[2] The DWH Trustees comprise four federal agencies and Trustees from all five Gulf states: the National Oceanic and Atmospheric Administration (NOAA), U.S. Department of the Interior (DOI), U.S. Department of Agriculture (USDA), U.S. Environmental Protection Agency (USEPA), and the States of Alabama, Florida, Louisiana, Mississippi, and Texas.
[3] The LA TIG comprises five Louisiana state trustee agencies and four federal trustee agencies: the Louisiana Coastal Protection and Restoration Authority (CPRA), Louisiana Department of Environmental Quality (LDEQ), Louisiana Department of Conservation and Energy (C&E), Louisiana Department of Wildlife and Fisheries (LDWF), Louisiana Oil Spill Coordinator's Office (LOSCO), NOAA, DOI, USDA, and USEPA.

NRDA and National Environmental Policy Act of 1969 (NEPA) evaluations for two sets of design alternatives: one set for the East Orleans Landbridge Restoration Project and one set for the Raccoon Island Restoration Project. The LA TIG proposes to allocate $101.2 million to fully implement the East Orleans Landbridge Restoration Project Alternative 4 and approximately $145.5 million to fully implement the Raccoon Island Restoration Project Alternative 3.

The East Orleans Landbridge is located in Orleans Parish, Louisiana, between Lake Pontchartrain and Lake Borgne. This narrow marsh corridor serves as an important protective and hydrologic feature and provides habitat for coastal fish, invertebrates, wildlife, and both resident and migratory birds. The landbridge also supports existing recreational and managed habitat uses and helps attenuate storm surge and waves; its restoration is intended to improve marsh sustainability and maintain its ecological and protective functions, particularly within the Pontchartrain Basin.

Raccoon Island is part of the Isles Dernières barrier island chain along the south-central Louisiana coast in Terrebonne Parish. The island provides important nesting, foraging, and refuge habitat for coastal bird species, supports a variety of estuarine fish and shellfish species at various life stages, and contributes to the region's barrier shoreline system that helps attenuate wave energy and storm impacts. Raccoon Island is actively managed for wildlife habitat by the LDWF, and restoration efforts are intended to stabilize the island's footprint and sustain its ecological and protective functions over time.

This RP/EA #8.1 addresses one of the programmatic goals established in the Final PDARP/PEIS: *Restore and Conserve Habitat*. Under this programmatic goal, this RP/EA #8.1 addresses the restoration type of *Wetlands, Coastal, and Nearshore Habitats*.

The National Oceanic and Atmospheric Administration (NOAA) is the lead federal Trustee for preparing this RP/EA #8.1 pursuant to NEPA (42 U.S.C. § 4336a(a)(1)(A)). The three other federal Trustees of the LA TIG (the U.S. Department of Interior [DOI], the U.S. Department of Agriculture [USDA], and the U.S. Environmental Protection Agency [USEPA]) are acting as cooperating agencies for the purposes of compliance with NEPA in the development of this RP/EA #8.1 (42 U.S.C. § 4336a(a)(3)). Each federal cooperating agency has reviewed the analysis for adequacy in meeting the standards set forth in its own NEPA implementing procedures and intends to adopt the NEPA analysis (42 U.S.C. § 4336a(b)). Adoption of the EA would be completed via signature on the relevant NEPA decision document.

To increase efficiency and reduce redundancy, the Bureau of Ocean Energy Management (BOEM) is participating in the preparation of this RP/EA #8.1 as a cooperating agency for the Raccoon Island Restoration Project. As a result, the dredging component of the Raccoon Island Restoration Project is fully addressed in this integrated plan. When final, BOEM may utilize this NEPA evaluation to inform its decision in authorization of an agreement for dredging of minerals from the Ship Shoal Block 88 Borrow Area.

Public Participation in this RP/EA #8.1

The public is encouraged to review and comment on this draft RP/EA #8.1 during the 30-day comment period, as specified in the public notice published in the Federal and Louisiana registers. Comments may be submitted during the comment period by one of the following methods:

- Via the internet at the following URL: https://parkplanning.nps.gov/LATIGRP8-1
- Via hard copy to: U.S. Fish and Wildlife Service, 341 N. Greeno RD, Suite A, Fairhope, AL 36532
- Via webinar: registration for, and details specific to, the webinar are provided in a web story posted at the following URL: http://www.gulfspillrestoration.noaa.gov/restoration-areas/louisiana.

Submissions must be postmarked no later than 30 days after the release date of the draft RP/EA #8.1. To facilitate public comment, a public review meeting is scheduled via webinar for June 8, 2026, at 12:00 pm central time. After the close of the comment period, the LA TIG will consider all comments received and revise this RP/EA #8.1, as appropriate. A summary of comments received and the TIG's responses, where applicable, will be included in the final RP/EA #8.1. All public comments will be included in their entirety in the administrative record.

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LIST OF ACRONYMS

Abbreviation	Definition
µPa	microPascals
Ac	acre
AGD	Avian Guidance Document
APE	area of potential effects
BA	biological assessment
BICM	Barrier Island Comprehensive Monitoring
BMP	best management practices
BOEM	Bureau of Ocean Energy Management
BP	BP Exploration and Production, Inc.
BSPS	bayside shoreline protection structures
C&E	Louisiana Department of Conservation and Energy
CFR	Code of Federal Regulations
CMFE	constructed marsh fill elevation
CPRA	Coastal Protection and Restoration Authority
CRMS	Coastwide Reference Monitoring System
CWPPRA	Coastal Wetlands Planning, Protection and Restoration Act
cy	cubic yards
CZMP	Coastal Zone Management Program
dB	decibel
DIVER	Data Integration Visualization Exploration and Reporting
DOI	U.S. Department of the Interior
DPC	dredge pipeline corridor
DPS	Distinct Population Segment
DWH	*Deepwater Horizon*
ECD	earthen containment dike
E&D	engineering and design
EEZ	Exclusive Economic Zone
EFH	essential fish habitat
EMU	environmental management units
EO	executive order
ESA	Endangered Species Act
FEMA	Federal Emergency Management Agency
FMC	Fishery Management Council
FMP	fishery management plan

Abbreviation	Definition
ft	feet
FR	Federal Register
Final PDARP/PEIS	*Deepwater Horizon Oil Spill: Final Programmatic Damage Assessment and Restoration Plan and Final Programmatic Environmental Impact Statement*
GEBF	Gulf Environmental Benefit Fund
GFMC	Gulf Fishery Management Counci
GIWW	Gulf Intracoastal Waterway
Gulf	Gulf of America
HAPC	Habitat Areas of Particular Concern
HMS	Highly Migratory Species
HRT	Habitat Reporting Tool
H:V	horizontal to vertical
in	inch
La. Admin. Code	Louisiana Administrative Code
LNM	Local Notice to Mariners
La. Rev. Stat.	Louisiana Revised Statute
LA TIG	Louisiana Trustee Implementation Group
LDEQ	Louisiana Department of Environmental Quality
LDWF	Louisiana Department of Wildlife and Fisheries
LF	linear feet
LOSCO	Louisiana Oil Spill Coordinator's Office
m	meter
MAM	monitoring and adaptive management
MBTA	Migratory Bird Treaty Act
MCA	marsh creation area
mg/L	milligrams per liter
mi	mile
MMPA	Marine Mammal Protection Act
NAAQS	National Ambient Air Quality Standards
NAVD88	North American Vertical Datum of 1988
NEPA	National Environmental Policy Act of 1969
NFWF	National Fish and Wildlife Foundation
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NOI	notice of intent
NRCS	Natural Resources Conservation Service
NRDA	Natural Resource Damage Assessment

Abbreviation	Definition
NTU	nephelometric turbidity unit
OCM	Office of Coastal Management
OCS	Outer Continental Shelf
OPA	Oil Pollution Act of 1990
PBFs	Physical and biological features
PCE	primary constituent elements
ppt	parts per thousand
RESTORE Act	Resources and Ecosystems Sustainability, Tourist Opportunities, and Revived Economies of the Gulf Coast States Act
ROD	Record of Decision
RP/EA	Restoration Plan/Environmental Assessment
SAV	submerged aquatic vegetation
SGCN	species of greatest conservation need
SLR	sea level rise
SOP	standard operating procedure
SPL	sound pressure level
SSB88	Ship Shoal Block 88
TIG	Trustee Implementation Group
TY	target year
U.S.	United States
USACE	U.S. Army Corps of Engineers
U.S.C.	United States Code
USCG	U.S. Coast Guard
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
WCNH	wetlands, coastal, and nearshore habitat
ZOI	zone of influence

1. Introduction

The Louisiana Trustee Implementation Group[4] (LA TIG) prepared this *Draft Phase 2 Restoration Plan and Environmental Assessment #8.1: East Orleans Landbridge Restoration Project and Raccoon Island Restoration Project* (RP/EA #8.1) to partially address injuries to wetlands, coastal, and nearshore habitats (WCNH) as a result of the 2010 *Deepwater Horizon* (DWH) oil spill. This RP/EA was prepared 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, 2016) developed by the *Deepwater Horizon* Natural Resources Trustees (DWH Trustees), its Record of Decision (ROD), the Oil Pollution Act of 1990 (OPA) and associated natural resource damage assessment (NRDA) regulations, and the National Environmental Policy Act of 1969 (NEPA, as amended). This draft RP/EA #8.1 describes the DWH oil spill restoration planning process and presents OPA NRDA and NEPA evaluations for two sets of design alternatives: one set for the East Orleans Landbridge Restoration Project and one set for the Raccoon Island Restoration Project.

This draft RP/EA #8.1 considers design alternatives for the East Orleans Landbridge Restoration Project and identifies Alternative 4 as the Preferred Alternative for construction. This draft RP/EA #8.1 also considers design alternatives for the Raccoon Island Restoration Project and identifies Alternative 3 as the Preferred Alternative for construction. This draft RP/EA #8.1 is consistent with the *Deepwater Horizon Oil Spill Louisiana Trustee Implementation Group Final Restoration Plan and Environmental Assessment #8: Wetlands, Coastal, and Nearshore Habitats* (RP/EA #8), which selected data collection and engineering and design (E&D) efforts for funding. Those E&D efforts resulted in design alternatives for both the East Orleans Landbridge and Raccoon Island restoration projects, which the LA TIG is now evaluating for potential construction funding in this RP/EA #8.1.

The Final PDARP/PEIS and RP/EA #8 are hereby incorporated by reference, and summaries of pertinent information are provided within this RP/EA #8.1 where specific subsections are referenced. Links to online versions of these documents are included with their respective citations in Chapter 8 (DWH Trustees, 2016; LA TIG, 2022).

1.1. Background

The DWH oil spill in 2010 was the largest maritime oil spill in United States (U.S.) history, resulting in the discharge of millions of barrels of oil into the Gulf of America[5] (Gulf). Immediately following the DWH oil spill, the DWH Trustee Council, made up of four federal Trustee agencies (the U.S. Department of the Interior [DOI], U.S. Environmental Protection Agency [USEPA], National Oceanic and Atmospheric Administration [NOAA], and U.S. Department of Agriculture [USDA]) and Trustees from all five Gulf states (Alabama, Florida,

[4] The LA TIG comprises five Louisiana state trustee agencies and four federal trustee agencies: the Louisiana Coastal Protection and Restoration Authority (CPRA), Louisiana Department of Environmental Quality (LDEQ), Louisiana Department of Conservation and Energy (C&E), Louisiana Department of Wildlife and Fisheries (LDWF), Louisiana Oil Spill Coordinator's Office (LOSCO), 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). The DOI Bureau of Ocean Energy Management (BOEM) is a federal cooperating agency for this project.

[5] Formerly Gulf of Mexico, revised per Executive Order 14172 "Restoring Names That Honor American Greatness."

Louisiana, Mississippi, and Texas), initiated an injury assessment pursuant to OPA and associated 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 future NRDA restoration planning.

As part of the DWH settlement, BP Exploration and Production, Inc. (BP) agreed to pay $8.1 billion in natural resource damages (inclusive of Early Restoration funding) over a 15-year period, and up to an additional $700 million for adaptive management or to address natural resource injuries that may become apparent in the future, for a total of up to $8.8 billion. Following this comprehensive settlement agreement on April 4, 2016, the DWH Trustees released the Final PDARP/PEIS, outlining the programmatic plan to restore natural resources impacted by the DWH oil spill. The Final PDARP/PEIS established a distributed governance structure that assigned a Trustee Implementation Group (TIG) for each of the seven Restoration Areas: Regionwide, Open Ocean, and each of the five Gulf states. The LA TIG makes all restoration decisions for the funding allocated to the Louisiana Restoration Area.

As described in the Final PDARP/PEIS, the DWH Trustees determined that the injuries caused by the DWH oil spill affected such a wide array of linked resources over such an enormous area that the effects of the spill must be described as constituting an ecosystem-level injury. Consequently, the DWH Trustees' chosen alternative for programmatic restoration planning employs a comprehensive, integrated ecosystem approach to address the ecosystem-level injury. After detailing the nature, degree, and extent of injuries from the DWH oil spill, the Final PDARP/PEIS describes a comprehensive restoration plan at a programmatic level to guide and direct the ecosystem-level restoration effort, based on five programmatic restoration goals listed below.

- Restore and Conserve Habitat
- Restore Water Quality
- Replenish and Protect Living Coastal and Marine Resources
- Provide and Enhance Recreational Opportunities
- Provide for Monitoring, Adaptive Management, and Administrative Oversight to Support Restoration Implementation

In the Final PDARP/PEIS, the DWH Trustees adopted a portfolio of 13 restoration types to address the diverse suite of injuries caused by the DWH oil spill and advance the Trustees' restoration goals ((DWH Trustees, 2016), Figure 5.4-1). Under each restoration type, the Final PDARP/PEIS identified and analyzed various restoration approaches that would be appropriate to restore injured resources and their lost services. The DWH Consent Decree (USDOJ, 2016) and the Final PDARP/PEIS includes funding allocations to TIGs for certain restoration types, as well as for monitoring, adaptive management, and administrative oversight. In total, these allocations include up to $8.8 billion in natural resource damage claims that will be paid over a 15-year period, with $5 billion allocated to restore resources injured in Louisiana and administered through the LA TIG.

The DWH Trustees' Final PDARP/PEIS detailed a plan to fund and implement restoration projects across the northern Gulf region, thereby providing a comprehensive programmatic restoration strategy to guide and direct ecosystem-level restoration efforts. The Final PDARP/PEIS serves as the programmatic document from which the Regionwide, Open Ocean, and Gulf-state TIGs tier subsequent restoration plans for project design and implementation.

1.2. Oil Pollution Act and National Environmental Policy Act 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. This document was prepared in accordance with the OPA NRDA regulations (15 Code of Federal Regulations [CFR] § 990).

Federal Trustees must comply with NEPA, 42 U.S.C. § 4321 et seq., and agency-specific NEPA implementing regulations and procedures when planning restoration projects. The NEPA analysis associated with this integrated OPA/NEPA document is being prepared in accordance with NEPA as amended. The Final PDARP/PEIS was intended to be used to tier the NEPA analysis in subsequent restoration plans prepared by the TIGs (see Chapter 6 of the Final PDARP/PEIS). A tiered environmental analysis is an analysis that focuses on project-specific issues and summarizes or references (rather than repeats) the broader issues discussed in a programmatic NEPA analysis, in this case, the Final PDARP/PEIS. The NEPA analysis in this RP/EA #8.1 tiers from the Final PDARP/PEIS, where applicable. Additionally, the LA TIG relies on incorporation by reference of existing NEPA analyses, management plans, studies, or other relevant material and adoption of existing NEPA analyses, where applicable, in the analysis of impacts in Chapter 4 and Appendix D of this RP/EA #8.1.

NEPA requires that when a federal agency relies on a programmatic environmental document more than 5 years old, the federal agency must reevaluate the analysis and any underlying assumptions in the programmatic environmental document to ensure the analysis remains valid[6]. The DWH Federal Trustees reviewed the framework of the Final PDARP/PEIS for continued relevance, and in a memorandum dated June 28, 2024,[7] affirmed the continued validity of the Final PDARP/PEIS to the overall program. The federal Trustees will evaluate whether new information or changed circumstances may affect the continued validity of the Final PDARP/PEIS at the project level during the preparation of each tiered RP/EA. Consistent with NEPA, the LA TIG has determined that the analysis in the Final PDARP/PEIS and the underlying assumptions therein, in the context of the alternatives proposed in this RP/EA #8.1, remain valid and that it continues to be applicable as a programmatic evaluation for DWH restoration planning.

NOAA is the lead federal Trustee for preparing this RP/EA #8.1 pursuant to NEPA (42 U.S.C. § 4336(a)(1)(A)). The three other federal Trustees of the LA TIG (DOI, USDA, and USEPA) are acting as cooperating agencies for the purposes of compliance with NEPA in the development of this RP/EA #8.1 (42 U.S.C. § 4336(a)(3)). Each federal cooperating agency has reviewed the analysis for adequacy in meeting the standards set forth in its own NEPA implementing procedures and regulations and intends to adopt the NEPA analysis (42 U.S.C. § 4336a(b)). Adoption of the EA would be completed via signature on the relevant NEPA decision document.

To increase efficiency and reduce redundancy, the Bureau of Ocean Energy Management (BOEM) is participating in the preparation of this RP/EA #8.1 as a cooperating agency for the Raccoon Island Restoration Project. As a result, the dredging component of the Raccoon Island Restoration Project is fully addressed in this integrated plan. BOEM may utilize the NEPA evaluation in the final RP/EA #8.1 to inform its decision in authorization of an agreement for dredging. While Raccoon Island Restoration Project may utilize

[6] This requirement was originally codified in the 2025 revisions to NEPA (42 U.S.C. § 4336a).

[7] The Deepwater Horizon Trustee Analysis and Affirmation for Continued Applicability of the Final PDARP/PEIS can be found at the following URL: https://www.fws.gov/doiddata/dwh-ar-documents/775/DWH-ARZ012870.pdf.

up to 8 million cubic yards (cy), we only anticipate dredging 2.9 million cy from the Ship Shoal Block 88 Borrow Area (SSB88)[8].

1.3. Purpose and Need

The Final PDARP/PEIS (DWH Trustees, 2016) identified a need for comprehensive integrated ecosystem restoration to address extensive and complex injuries to natural resources and their services across the Gulf that occurred as a result of the DWH oil spill, consistent with OPA. Based on this need, the LA TIG has undertaken this restoration planning effort for the purpose of contributing to the compensation for and restoration of natural resources and their services injured, as described in the Final PDARP/PEIS, in the Louisiana Restoration Area. This RP/EA #8.1 is consistent with the Final PDARP/PEIS and falls within the scope of the purpose and need identified therein.

Section 5.3 of the Final PDARP/PEIS identifies and describes five programmatic goals for restoration. These programmatic goals work independently and together to benefit injured resources and services. This RP/EA #8.1 addresses one of these programmatic goals: *Restore and Conserve Habitat*. This goal is intended to benefit injured coastal and nearshore habitats.

The goals of the *Wetlands, Coastal, and Nearshore Habitat* restoration type, outlined in Section 5.5.2.1 of the Final PDARP/EIS, are as follows:

- Restore a variety of interspersed and ecologically connected coastal habitats in each of the five Gulf states to maintain ecosystem diversity, with particular focus on maximizing ecological functions for the range of resources injured by the spill, such as oysters, estuarine-dependent fish species, birds, marine mammals, and nearshore benthic communities.
- Restore for injuries to habitats in the geographic areas where the injuries occurred, while considering approaches that provide resiliency and sustainability.
- While acknowledging the existing distribution of habitats throughout the Gulf[9], restore habitats in appropriate combinations for any given geographic area. Consider design factors, such as connectivity, size, and distance between projects, to address injuries to the associated living coastal and marine resources and restore the ecological functions provided by those habitats.

1.4. Proposed Action

To address the restoration goals and purpose and need for action described in Section 1.3, the LA TIG proposes to implement the LA TIG's preferred alternatives for the East Orleans Landbridge Restoration Project and the Raccoon Island Restoration Project using funds made available through the DWH Consent Decree. The locations of these proposed alternatives are shown in Figure 1-1.

[8] Section 8 of Outer Continental Shelf (OCS) Lands Act (43 U.S.C. § 1337(k)(2)) allows BOEM to negotiate, on a noncompetitive basis, the right to use OCS sand, gravel, or shell resources for shore protection or beach or wetlands restoration projects undertaken by Federal, State, or local agencies, or for use in construction projects funded in whole or in part by or authorized by the Federal Government.

[9] "Gulf of Mexico" is used in the Final PDARP/PEIS, which was released prior to issuance of EO 14172.

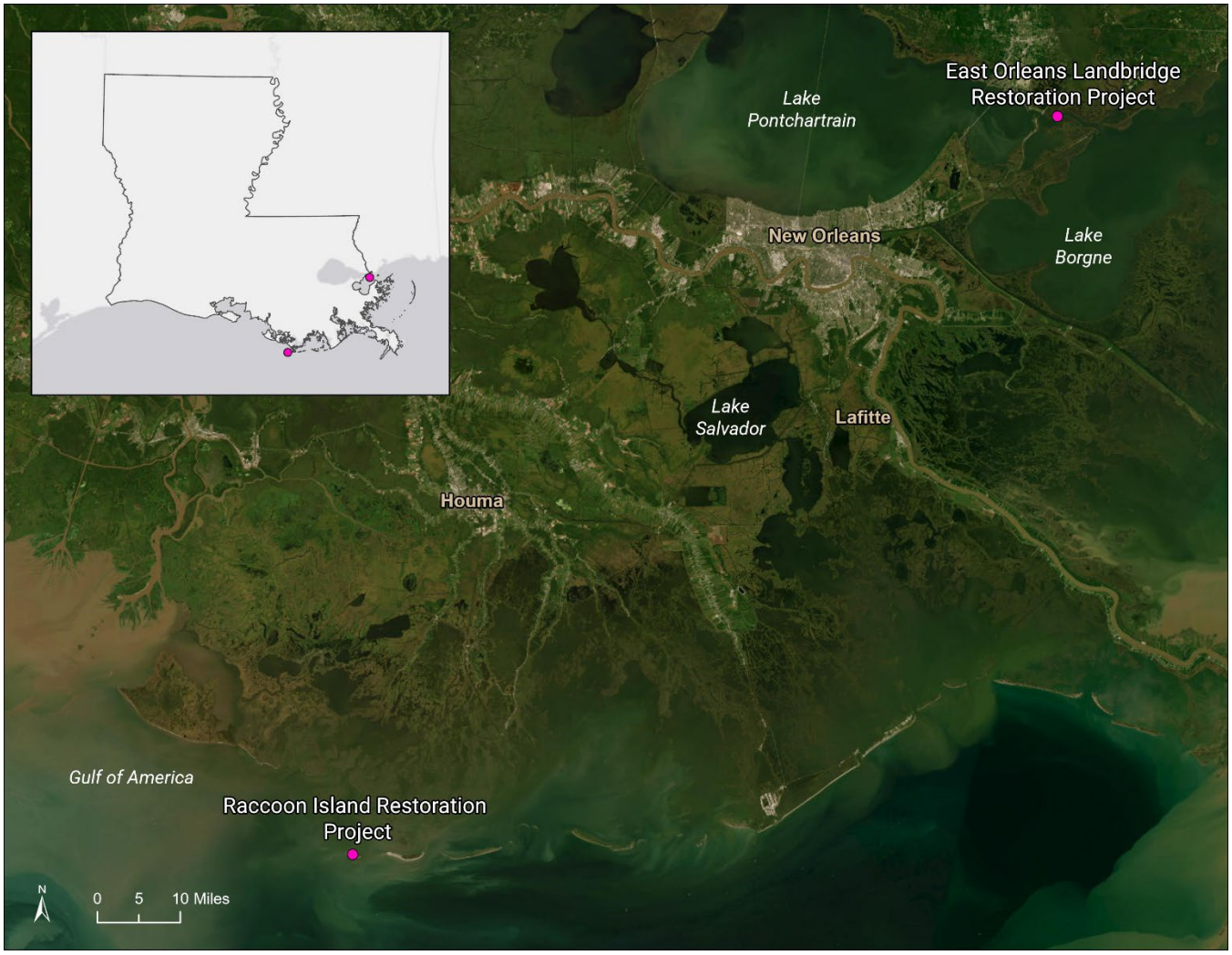

Figure 1-1. RP/EA #8.1 Project Locations.

1.4.1. East Orleans Landbridge Restoration Project Alternative 4

The LA TIG addresses the programmatic restoration goal of *Restore and Conserve Habitat* by proposing the implementation of the East Orleans Landbridge Restoration Project Alternative 4. Alternative 4 would meet the goal of restoring and conserving WCNH by creating approximately 1,320 acres (ac) of marsh habitat and constructing approximately 14,867 linear feet (LF) of shoreline protection along the northwestern edge of the project that runs along the Rigolets. Habitat restoration would be accomplished by dredging and utilization of sediment from a borrow area in Lake St. Catherine. Further details on the design components of Alternative 4 are presented in Section 2.3.1.4.

1.4.2. Raccoon Island Restoration Project Alternative 3

The LA TIG addresses the programmatic restoration goal of *Restore and Conserve Habitat* by proposing the implementation of the Raccoon Island Restoration Project Alternative 3. Alternative 3 would meet the goal of restoring and conserving WCNH by restoring approximately 410 ac of beach, dune, marsh, and marsh mound habitat, raising the crests of the existing Gulfside breakwaters, and constructing 13 bayside shoreline protection structures (BSPS), each approximately 400 feet (ft) long. Habitat restoration would be

accomplished by dredging and utilization of sand resources from a borrow area in Ship Shoal. Further details on the design components of Alternative 3 are presented in Section 2.3.3.3.

1.5. Funding Allocation

The LA TIG proposes to allocate Deepwater Horizon settlement funds under the *Wetlands, Coastal, and Nearshore Habitat* restoration type to implement the restoration projects evaluated in this RP/EA #8.1. Specifically, the LA TIG proposes to allocate $101.2 million to fully implement the East Orleans Landbridge Restoration Project Alternative 4 and approximately $145.5 million to fully implement the Raccoon Island Restoration Project Alternative 3. These proposed allocations, in combination with previously funded projects under the *Wetlands, Coastal, and Nearshore Habitat* restoration type, would reduce the remaining available funding for future *Wetlands, Coastal, and Nearshore Habitat* restoration type projects; however, additional funds would remain available for allocation toward future restoration efforts consistent with PDARP/PEIS goals and priorities. The proposed funding allocations for the projects evaluated in this RP/EA #8.1 are summarized in Table 1-1.

Table 1-1. NRDA Funding Allocations Across Restoration Types for the LA TIG.

PDARP/PEIS PROGRAMMATIC RESTORATION GOAL	RESTORATION TYPE	TOTAL LA TIG SETTLEMENT FUNDS	FUNDS ALLOCATED	FUNDS PROPOSED IN THIS RP/EA #8.1	FUNDS REMAINING
Restore and Conserve Habitat	Wetlands, Coastal, and Nearshore Habitat	$4,268,688,400	$1,977,547,260	$246,700,000	$2,044,441,140
Restore and Conserve Habitat	Habitat Projects on Federally Managed Lands	$50,000,000	$50,000,000	N/A	$0
Replenish and Protect Living Coastal and Marine Resources	Sea Turtles	$10,000,000	$4,000,000	N/A	$6,000,000
Replenish and Protect Living Coastal and Marine Resources	Submerged Aquatic Vegetation	$22,000,000	$22,000,000	N/A	$0

Replenish and Protect Living Coastal and Marine Resources	Marine Mammals	$50,000,000	$4,381,438	N/A	$45,618,462
Replenish and Protect Living Coastal and Marine Resources	Birds	$220,437,300	$178,250,152	N/A	$42,187,148
Replenish and Protect Living Coastal and Marine Resources	Oysters	$40,874,300	$40,780,864	N/A	$93,436
Restore Water Quality	Nutrient Reduction	$20,000,000	$12,421,975	N/A	$7,578,025
Provide & Enhance Recreational Opportunities	Provide & Enhance Recreational Opportunities	$60,000,000	$56,713,646	N/A	$3,286,354
Monitoring & Adaptive Management	N/A	$225,000,000	$80,575,274	N/A	$144,424,726
N/A	**Total:**	**$4,967,000,000**	**$2,426,670,609**	**$246,700,000**	**$2,293,629,391**

1.6. Other Design Alternatives Analyzed in this RP/EA #8.1

In addition to the proposed actions described in Section 1.4, the LA TIG fully analyzed two additional design alternatives for East Orleans Landbridge Restoration and two additional design alternatives for Raccoon Island Restoration under the OPA NRDA regulations. See Sections 2.3.1 and 2.3.3 for detailed descriptions.

1.7. Natural Recovery/No Action Alternative

Under the OPA NRDA regulations, Trustees must consider a natural recovery alternative. Under the Natural Recovery/No Action Alternative, none of the design alternatives would be implemented for the East Orleans Landbridge Restoration Project or the Raccoon Island Restoration Project. In the Final PDARP/PEIS, the DWH Trustees analyzed the Natural Recovery/No Action Alternative programmatically (DWH Trustees, 2016, Section 3.7) and found that it would not meet the purpose and need of restoring lost natural resources and their services. That analysis is incorporated herein, in parts and by reference, and the LA TIG does not further

evaluate natural recovery as a viable alternative under the OPA NRDA regulations. However, pursuant to NEPA, a No Action Alternative is described in Sections 2.3.1.1 and 2.3.3.1 and analyzed in Chapter 4 and Appendix D of this RP/EA #8.1 as a basis for comparison of potential environmental consequences of the design alternatives.

1.8. Coordination with Other Gulf Restoration Programs

As discussed in Section 1.5.6 of the Final PDARP/PEIS and Section 1.7.4 of RP/EA #8, the LA TIG is committed to coordination with other Gulf 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 and within Louisiana.

During the restoration planning process, the LA TIG coordinated with other DWH oil spill and Gulf restoration programs, including the Resources and Ecosystems Sustainability, Tourist Opportunities, and Revived Economies of the Gulf Coast States Act; the National Fish and Wildlife Foundation's Gulf Environmental Benefit Fund; and the Coastal Wetlands Planning, Protection and Restoration Act (CWPPRA) programs. In doing so, the LA TIG 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. Additionally, the LA TIG has coordinated with the project teams for the New Orleans Landbridge Shoreline Stabilization and Marsh Creation (PO-0169) Project and the Raccoon Island Shoreline and Marsh Creation (TE-0048) Project to gain insight into WCNH project design; Best Management Practices (BMPs); and lessons learned from design, construction, and monitoring and to apply those insights to the projects described in this RP/EA.

1.9. Public Involvement

Public input is an integral part of NEPA, OPA, and the DWH oil spill restoration planning effort. The purpose of public review is to facilitate public discussion regarding restoration alternatives, allow the DWH Trustees to solicit and consider public comments, and ensure that the final plans consider relevant issues.

1.9.1. Louisiana's 2023 Comprehensive Master Plan for a Sustainable Coast Public Engagement

Louisiana's 2023 Comprehensive Master Plan for a Sustainable Coast (CPRA, 2023b) is the fourth plan developed by the State of Louisiana to help direct and coordinate local, state, and federal efforts to design and implement large-scale restoration and risk reduction projects. The plan identifies various types of restoration projects, including marsh creation, barrier island maintenance, and shoreline protection. During plan development, CPRA provided opportunities for both in person and online public input; hosted community briefings, community engagement workgroup meetings, conferences, workshops, and informal public meetings; and conducted other outreach efforts. Upon releasing a draft version of the plan, CPRA hosted four official public hearings and received over 200 public comments.

1.9.2. Final PDARP/PEIS Public Engagement

On October 1, 2010, the Trustees published a Notice of Intent (NOI) to Conduct Restoration Planning (75 Federal Register [FR] 60800). Since then, the DWH Trustees have sought restoration project ideas from the

public through a variety of means. In addition, the DWH 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.

1.9.3. LA TIG RP #1 Public Engagement

The LA TIG RP #1 included a range of projects that would be potentially proposed for implementation using DWH NRDA funding from the *Wetlands, Coastal, and Nearshore Habitat* restoration type over the subsequent 15 years. Two of those projects were the East Orleans Landbridge Restoration Project (previously termed New Orleans East Land Bridge Marsh Creation) and the Raccoon Island Restoration Project.

The public comment period for the Draft RP #1 opened on October 20, 2016, and closed on December 9, 2016. During the public comment period, the LA TIG received 255 submissions from private citizens, governmental entities, non-governmental organizations, and others. Several commenters expressed support for the proposed restoration projects. One commenter requested that the discussion of the Raccoon Island project be revised to reflect its beneficial effects on public health and safety related to storm surge and flooding protection, resulting in a change in effect from "neutral" to "beneficial" in the final RP.

1.9.4. LA TIG RP/EA #8 and RP/EA #8.1 Public Engagement

The LA TIG published a Notice of Availability (NOA) of the draft RP/EA #8 in the FR on March 9, 2022 (87 FR 15385) and in the Louisiana State Register on March 20, 2022. The public was encouraged to review and comment on the Draft RP/EA during a 30-day review period.

During the public comment period, the LA TIG received six individual submissions from individuals, non-governmental organizations, and local governments. These comments were received by mail and submitted via a web-based application. Several commenters expressed support for the LA TIG's preferred projects, noting that the projects would reduce storm surge, improve hydrology, and replenish critical habitat. These comments can be found in the administrative record for RP/EA #8. After the comment period closed, the LA TIG considered all comments received and revised RP/EA #8 as appropriate. In the Final RP/EA #8, the LA TIG selected the East Orleans Landbridge Restoration and Raccoon Island Restoration projects for further data collection and E&D efforts.

On December 5, 2025, the LA TIG posted an NOI on the NOAA Gulf Spill Restoration website (at the following URL: hhttps://www.gulfspillrestoration.noaa.gov/2025/12/louisiana-trustees-begin-writing-restoration-plan-raccoon-island-and-east-orleans), informing the public that they were beginning to prepare a Draft Restoration Plan that would evaluate options for restoration of the East Orleans Landbridge and Raccoon Island to partially address injuries to multiple resources caused by the DWH oil spill.

1.9.5. Public Review and Comment Opportunity for RP/EA #8.1

The public is encouraged to review and comment on this draft RP/EA #8.1, made available for public review and comment for 30 days, as specified in the public notice published in the Federal and Louisiana Registers. Repositories with either hard copies available or opportunities for viewing an electronic version can be found in Table 7-1. Comments may be submitted during the comment period by one of the following methods:

- Via the internet at the following URL: https://parkplanning.nps.gov/LATIGRP8-1
- Via hard copy, to: U.S. Fish and Wildlife Service, 341 N. Greeno RD Suite A, Fairhope, AL 36532

- Via webinar: registration for, and details specific to, the webinar are provided in a web story posted at the following URL: http://www.gulfspillrestoration.noaa.gov/restoration-areas/louisiana

Submissions must be postmarked no later than 30 days after the release date of the draft RP/EA #8.1. To facilitate public comment, a public review meeting is scheduled via webinar for June 8, 2026, at 12:00 pm central time. Comments will be summarized in the final RP/EA #8.1, and all public comments will be included in their entirety in the administrative record.

1.10. Next Steps

The LA TIG will accept public comments and host a public webinar to facilitate the public review and comment process. After the close of the public comment period, the LA TIG will consider all input received during the public comment period and finalize this draft RP/EA #8.1, if appropriate. A summary of comments received and the TIG's responses (where applicable) will be included in the final RP/EA #8.1.

Restoration alternatives identified in this RP/EA #8.1 are independent of each other and may be selected independently by the LA TIG. A decision not to select one or more of the alternatives does not affect the LA TIG's selection of any remaining alternatives. Alternatives not proposed as preferred for implementation at this time may be considered in future restoration planning by the LA TIG or by other TIGs.

1.11. Administrative Record

The DWH Trustees opened a publicly available administrative record for the NRDA for the DWH oil spill, including restoration planning activities, concurrently with publication of the 2010 NOI (pursuant to 15 CFR § 990.45). DOI is the federal Trustee that maintains the administrative record, which can be found online at the following URL: http://www.doi.gov/deepwaterhorizon/adminrecord. This administrative record site is also used by the LA TIG for DWH restoration planning.

Information about restoration project implementation is provided to the public through the administrative record and other outreach efforts, including online at the following URL: http://www.gulfspillrestoration.noaa.gov.

1.12. Document Organization

This RP/EA #8.1 is organized into the sections listed below.

- *Chapter 1 Introduction* provides the background and context for this document, background and summary of the DWH settlement, purpose and need for the proposed restoration actions, and a description of past and future public involvement activities related to these actions.
- *Chapter 2 Restoration Planning Process: Alternatives and Screening* presents an overview of the NRDA restoration planning process, the relationship of this RP/EA #8.1 to the RP/EA #8 and the Final PDARP/PEIS, a summary of the injuries addressed by the restoration, and a description of the alternatives identified to address those injuries.
- *Chapter 3 Reasonable Range of Alternatives* provides an OPA analysis of the alternatives and a rationale for selection of the preferred alternatives.
- *Chapter 4 NEPA Analysis* provides a description of the affected environment and an analysis of the environmental consequences of the alternatives.

- *Chapter 5 Compliance with Other Laws and Regulations* presents additional federal laws, regulations, and Executive Orders (EOs) that may be applicable to the proposed projects.
- *Chapter 6 List of Preparers and Agencies Consulted* provides a list of individuals who substantively contributed to the development of this RP/EA #8.1 and agencies consulted.
- *Chapter 7 List of Repositories* includes a list of facilities that received copies of the draft RP/EA #8.1 for review by the public.
- *Chapter 8 Literature Cited* lists the literature referenced in this document.

2. Restoration Planning Process: Alternatives and Screening

This chapter provides a summary of the injuries identified in the Final PDARP/PEIS that are addressed by design alternatives analyzed in this RP/EA #8.1. The alternatives considered are then described, with a summary of the OPA screening process completed by the LA TIG, to arrive at the reasonable range of alternatives.

2.1. Final RP/EA #8

Consistent with the 13 restoration types described in the Final PDARP/PEIS (DWH Trustees, 2016), in the final RP/EA #8, the LA TIG addressed one restoration type: *Wetlands, Coastal, and Nearshore Habitats*. The final RP/EA #8 analyzed a reasonable range of project alternatives anticipated to meet the restoration goals for this restoration type. In addition to the OPA NRDA evaluation standards that were applied, the LA TIG established and applied additional evaluation and selection criteria (LA TIG, 2022).

In the final RP/EA #8, the LA TIG screened project alternatives at the conceptual design stage based on geographic location, immediacy, and sustainability of project benefits provided for those that could best restore injured WCNH. The LA TIG also screened project alternatives at the design stage to restore WCNH. Through that analysis, the LA TIG narrowed the range of alternatives to a suite of projects:

- Bayou Pointe-aux-Chenes Ridge Restoration and Marsh Creation (E&D)
- East Orleans Landbridge Restoration (E&D)
- Raccoon Island Barrier Island Restoration[10] (E&D)
- Bayou Dularge Ridge and Marsh Restoration (construction)
- Bayou La Loutre Ridge Restoration and Marsh Creation Project (construction)
- Lake Lery Marsh Creation and Rim Restoration, Increment 3 (construction)

Of the six project alternatives fully evaluated in RP/EA #8 according to OPA NRDA regulations, the LA TIG selected two projects to undergo E&D and two projects to move to construction:

- East Orleans Landbridge Restoration (E&D)
- Raccoon Island Barrier Island Restoration (E&D)
- Bayou Dularge Ridge and Marsh Restoration (construction)
- Bayou La Loutre Ridge Restoration and Marsh Creation Project (construction)

[10] Since the release of RP/EA #8, the project name has been shortened to Raccoon Island Restoration, including for use in the evaluation presented herein.

The OPA NRDA evaluation for the East Orleans Landbridge Restoration and Raccoon Island Barrier Island Restoration E&D projects can be found in Table 12 in Section 3.6 of the final RP/EA #8 (LA TIG, 2022) and has been incorporated by reference herein.

2.2. Summary of Injuries Addressed in this RP/EA #8.1

Chapter 4 of the Final PDARP/PEIS summarizes the injury assessment, which documents the nature, degree, and extent of injuries from the DWH oil spill to both natural resources and the services they provide. Restoration projects identified in this RP/EA #8.1 are designed to address injuries to resources resulting from the spill. This RP/EA #8.1 proposes design alternatives for the *Wetlands, Coastal, and Nearshore Habitats* restoration type described in the Final PDARP/PEIS. This section summarizes the most relevant information from Chapter 4 of the Final PDARP/PEIS injury assessment and establishes the basis for restoration planning for this restoration type.

The WCNH of the northern Gulf, including beach, marsh, and mangrove habitat, are among the most biologically productive coastal waters in the U.S., providing food, shelter, and nursery grounds for many ecologically and economically important animals that use the Gulf's open waters, including fish, shrimp, shellfish, sea turtles, birds, and mammals. Louisiana experienced the majority of oiled shoreline (approximately 65%) and the vast majority of oiled wetland shorelines (95%) that occurred because of the DWH oil spill. This extensive oiling resulted in reduced aboveground plant biomass and indirectly led to increased rates of shoreline erosion, which were further exacerbated by response activities such as mechanical and manual removal of oil from beach and marsh habitat.

As discussed in the Final PDARP/PEIS, "oiling has been documented to adversely affect coastal wetland vegetation and associated fauna. Oil can wash up at the marsh edge, oiling soil, and coating vegetation. It can also penetrate the marsh through tidal creeks and wash-over events and become stranded in the marsh interior where it can coat plant stems and soil" (DWH Trustees, 2016).

Shoreline oiling results in the loss of marsh vegetation, which "initiate[s] a cascade of trophic-level impacts to bacteria, invertebrates, plankton, and higher-level organisms" (DWH Trustees, 2016). Further, "marsh plants also play an important role in shoreline stabilization, holding and stabilizing soil and sediment, and helping to retain and accumulate soil in the marsh. The marsh serves a role in coastal flood protection by attenuating storm and wave energy" (DWH Trustees, 2016). Therefore, the injuries caused by the DWH oil spill have significantly contributed to the ongoing coastal crisis in Louisiana. The Trustees concluded that some of these losses are permanent, and some injuries, such as marsh edge erosion, can be addressed through the creation of new marsh land (DWH Trustees, 2016).

2.3. Alternatives and OPA NRDA Screening

This RP/EA #8.1 analyzes two sets of design alternatives: one set for the East Orleans Landbridge Restoration Project and one set for the Raccoon Island Restoration Project. Section 2.3.1 describes the alternatives for East Orleans Landbridge Restoration, followed by a summary of the OPA NRDA screening results in Section 2.3.2. Section 2.3.3 describes the alternatives for Raccoon Island Restoration, followed by a summary of the OPA NRDA screening results in Section 2.3.4. The Natural Recovery/No Action Alternative, which is applicable to both projects, is described within each project-specific section (Sections 2.3.1.1 and 2.3.3.1).

The Final PDARP/PEIS provides a structure for TIGs to implement alternatives utilizing a phased approach (Final PDARP/PEIS, Sections 5.3 and 5.3.3). For example, a TIG may propose funding a planning phase

("Phase 1", for example, analyzing for and committing funding for collection/analysis of data critical to the restoration planning process, conducting a planning project or feasibility study, or undertaking E&D work) in a restoration plan, which would allow TIGs to develop alternatives to the extent necessary to consider an implementation phase ("Phase 2") in a subsequent restoration plan. A phased approach can inform restoration implementation and maximize restoration benefits. Under 15 CFR 990.54(c), planning projects are only to be undertaken when, in the judgment of the Trustees, these projects would provide the information at a reasonable cost and in a reasonable timeframe.

2.3.1. East Orleans Landbridge Restoration Project Alternatives

The East Orleans Landbridge Restoration Project is a "Phase 2" project, as the E&D phase (Phase 1) of the project was funded through RP/EA #8. As such, alternative screening herein focuses on the evaluation of different designs for this project rather than screening a pool of potential projects.

The East Orleans Landbridge Restoration Project alternatives include various restoration features focused on the marsh area surrounded by the Rigolets to the north and east, Lake St. Catherine to the west, and the Gulf Intracoastal Waterway to the south (see Figure 2-1). The region experienced direct passes of major hurricanes, including Hurricane Katrina (2005) and Hurricane Zeta (2020), with the storm tracks traversing or closely skirting the East Orleans Landbridge. The marsh is also subject to subsidence, sea level rise (SLR), and wave-induced erosion. This RP/EA #8.1 aims to address habitat loss by analyzing the No Action Alternative along with three restoration alternatives, described in detail in Sections 2.3.1.1 through 2.3.1.4.

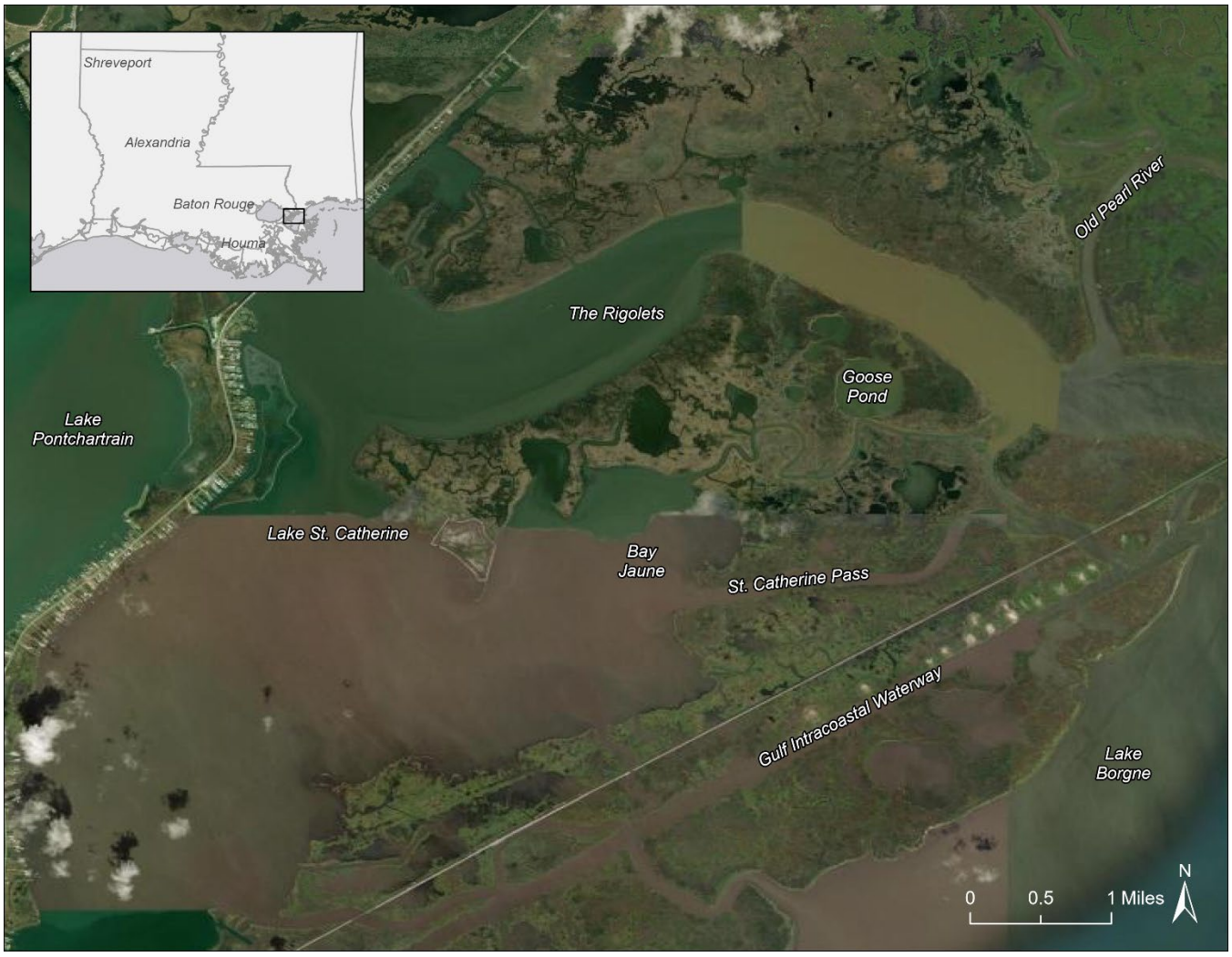

Figure 2-1. East Orleans Landbridge Restoration Project Vicinity.

Data collection and E&D efforts funded by the LA TIG included identification of various potential restoration features, the combination of these features into potential design alternatives, and comparative analysis of the alternatives in terms of performance and impacts. The resulting report, *East Orleans Restoration Project (PO-0191) DRAFT Design Documentation Report* (CPRA, 2025), summarizes this alternative development process and is incorporated by reference. Note that all design specifications (for example, acreage, linear feet) discussed in this document are approximate and would continue to be refined through final E&D.

The following potential restoration features were identified in the PO-191 DRAFT Design Documentation Report:

- Marsh Creation
    - Marsh fill placement to restore and enhance emergent marsh habitat within identified marsh creation areas (MCA), targeting enhancement of degraded intertidal and open-water areas.
    - Construction and use of earthen containment dikes (ECD) to retain placed sediments during marsh creation and allow for controlled dewatering and consolidation.
    - Restoration and enhancement of marsh habitat, and where applicable, partial infilling of interior ponds to improve marsh edge integrity, hydrologic function, and habitat diversity while avoiding excessive pond enlargement.
    - Vegetative plantings along ECDs and within restored marsh areas using appropriate native marsh species to stabilize sediments and support long-term marsh development.
- Shoreline Protection
    - Preparation of shoreline areas for stabilization, including grading and installation of non-woven geotextile fabric, to provide a stable foundation and reduce scour.
    - Placement of marine mattress shoreline protection features along vulnerable marsh edges to reduce wave energy, limit shoreline erosion, and support long-term marsh sustainability.

These potential restoration features were combined to develop three alternatives (hereafter referred to as Alternatives 2 through 4) as summarized in Figure 2-2. All three alternatives involve marsh creation and shoreline protection on the East Orleans Landbridge using compatible sediments dredged from Lake St. Catherine. Marsh creation features include placement of fill within designated restoration areas, use of ECDs to retain sediments, restoration and enhancement of interior pond features, and establishment of native marsh vegetation. Shoreline protection features are intended to stabilize vulnerable marsh edges and reduce erosive forces acting on restored and existing marsh. The alternatives differ primarily in the extent, configuration, and elevation of MCAs, as well as the type and placement of shoreline protection features. These differences influence the overall footprint of restoration, the amount and type of marsh habitat enhanced, and the extent of shoreline stabilization achieved.

In addition to habitat restoration benefits, the East Orleans Landbridge serves an important role in providing storm surge attenuation and wave energy reduction for adjacent interior marshes and surrounding areas. Accordingly, all three alternatives are expected to contribute to improved landscape-scale resilience by enhancing marsh continuity and reducing erosion along the landbridge. Overall, restoration of emergent marsh habitat is anticipated to improve habitat for fish, shellfish, and wildlife that rely on these habitats for foraging and nursery, resulting in increased species abundance and ecosystem productivity over the project life. The three alternatives are described below (Sections 2.3.1.2 – 2.3.1.4). Alternative 1, or the Natural Recovery/No Action Alternative, is described in Section 2.3.1.1.

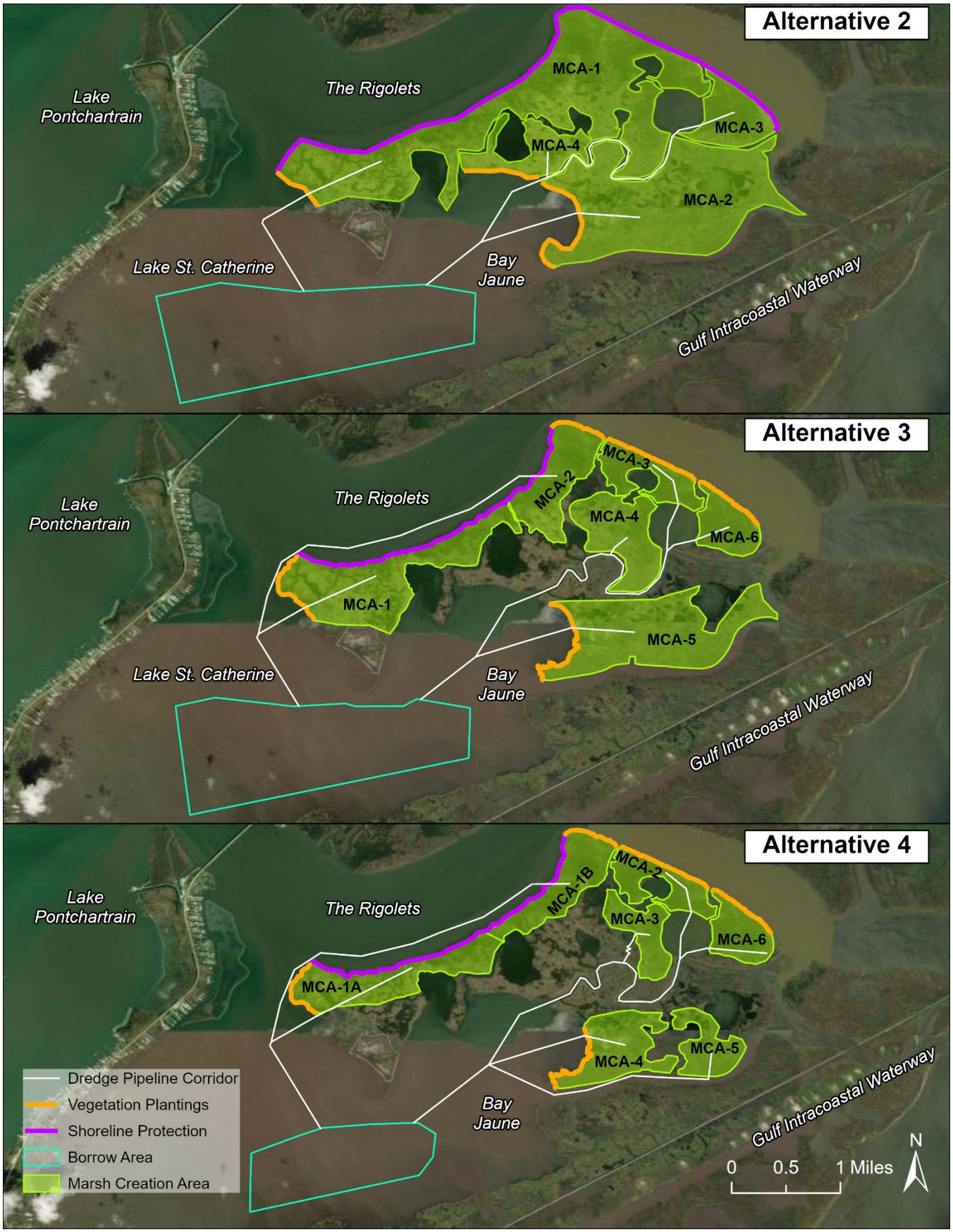

Figure 2-2. Overview of Three Alternatives for the East Orleans Landbridge Restoration Project.

2.3.1.1. Natural Recovery/No Action Alternative (Alternative 1)

Pursuant to the OPA NRDA 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" (15 CFR § 990.53(b)(2)). Under a Natural Recovery / No Action Alternative, no additional restoration would be carried out by the LA TIG at this time to accelerate the recovery of WCNH in the Louisiana Restoration Area 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 SLR and subsidence, the most likely future outcomes are no recovery and further deterioration of habitats and their associated natural resources in and around the East Orleans Landbridge. As demonstrated by an empirical analysis utilizing historical rates of shoreline change, SLR, subsidence, wave action, and post-storm recovery, if no habitat restoration action were taken, the East Orleans Landbridge would potentially experience an average shoreline retreat of about 57 ft between 2023-2033, with an additional 38 ft projected by 2043 (CPRA, 2023a). 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 the natural recovery alternative from further OPA NRDA evaluation in the Final PDARP/PEIS. Based on this determination and incorporating that analysis by reference, the LA TIG does not further evaluate natural recovery as a viable alternative under the OPA NRDA regulations for the East Orleans Landbridge Restoration Project. A No Action Alternative is, however, included in Appendix D of this RP/EA #8.1, pursuant to NEPA, to analyze any negative environmental impacts of not implementing the proposed agency action.

2.3.1.2. Alternative 2: Full Template Restoration

Under Alternative 2 (Figure 2-3), 2,468 ac of marsh habitat would be created, designed for a 20-year project life. The Alternative is divided into four separate MCAs (MCA 1-4).

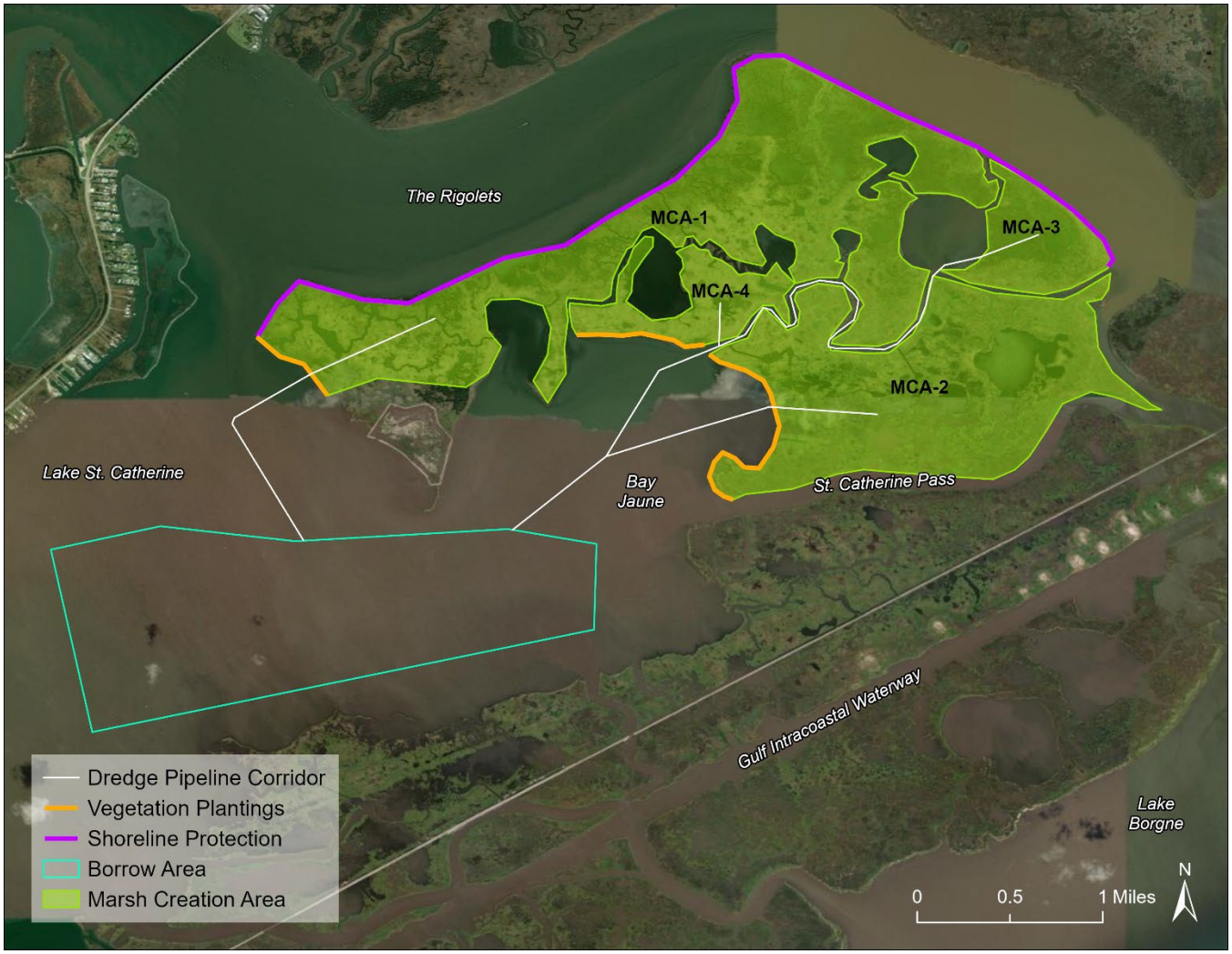

Figure 2-3. East Orleans Landbridge Restoration Project Alternative 2 Features.

To facilitate construction, approximately 149,645 LF of ECD would be built around the MCAs. The ECDs would be constructed with a crown elevation of +3.5 ft North American Vertical Datum of 1988 (NAVD88), slide slopes varying between 4 horizontal to 1 vertical (4H:1V), 5H:1V, and 3H:1V when necessary for softer areas, and a geotextile layer installed at the mudline, providing 500 pounds/ft shear strength. Sheet pile gap closures would be required in areas where the ECD alignments cross minor streams (31-205 LF) or low open-water areas, totaling 27 gap closures at a total of 2,354 LF. These sheet pile sections would be installed to provide structural stability and limit seepage during marsh fill placement. Construction consists of the placement of sheet piles to an approximate depth of -28 ft NAVD88 with a top elevation at +3.5 ft NAVD88. These sheet piles have the potential for 100% removal during operations and maintenance to restore hydrologic connectivity following marsh establishment. Additional ECD gapping of approximately 25% of the non-armored ECDs would be part of operations and maintenance activities to further facilitate development of ecological function no later than three years post-construction.

Approximately 9.0 million cy of marsh fill sediment would be dredged and pumped from the 1,239-ac Lake St. Catherine Borrow Area located up to 6 miles (mi) away. The dredge pipeline corridors (DPC) would extend from the borrow area to the MCAs, with pipelines coming onshore at select locations along the western edges of MCA 1, MCA 2, MCA 3, and MCA 4. Marsh fill would be initially constructed to an elevation of +2.5 ft NAVD88. Final marsh fill elevations may be refined following settlement analyses during the final design phase.

As shown in Figure 2-3, a portion of the project perimeter would include shoreline protection. The ECDs along the northern boundary of the project area, adjacent to the Rigolets, would be reinforced with marine mattresses as a shoreline protection feature. Marine mattresses are a shoreline revetment system made of stitched geogrid panels filled with small-diameter graded limestone. They create a heavy, permeable structure that stabilizes slopes and dissipates wave energy, reducing erosion. For installation, a non-woven geotextile fabric is first placed over the prepared slope, anticipated to be 5H:1V, to prevent soil movement. The mattresses are laid on top of the 5-ft ECD crown width and down the shore-facing slope and filled with limestone. Shoreline protection would consist of approximately 27,544 LF of marine mattresses along the northwestern and northeastern edges of the project adjacent to the Rigolets. The exact location(s) and length of sheet pile removed from the armored shoreline protection feature would be determined in the field (post-construction) in coordination with National Marine Fisheries Service (NMFS).

Figure 2-3 shows that a portion of the project perimeter would include vegetation plantings. Vegetation would be planted along ECD slopes on the western edges of MCA 1, 2, and 4, where the dredge pipelines come onshore from Lake St. Catherine, to support marsh restoration. These vegetation plantings would consist of native species appropriate for brackish marsh conditions and common in the surrounding area, like roseau cane (*Phragmites australis*) and smooth cordgrass (*Sporobolus alterniflorus, previously Spartina alterniflora*) (CPRA, 2025). The vegetation planting would be done along a total ECD length of 12,695 LF.

The estimated total construction cost for Alternative 2 is approximately $152,580,632. Further details on the design components of Alternative 2 are presented in Section 3.5.

2.3.1.3. Alternative 3: Refined Restoration Template with Pond Filling

Under Alternative 3 (Figure 2-4), approximately 1,813 ac of marsh habitat would be created using about 6.7 million cy of dredged material. The Alternative is divided into six MCAs (MCA 1-6). Marsh fill sediment would be dredged from the 1,117-ac Lake St. Catherine Borrow Area and transported via DPC to the MCAs, with pipelines coming onshore along the edges of all MCAs (MCA 1-6). The marsh fill would be placed to a constructed marsh fill elevation (CMFE) consistent with the elevation described for Alternative 2.

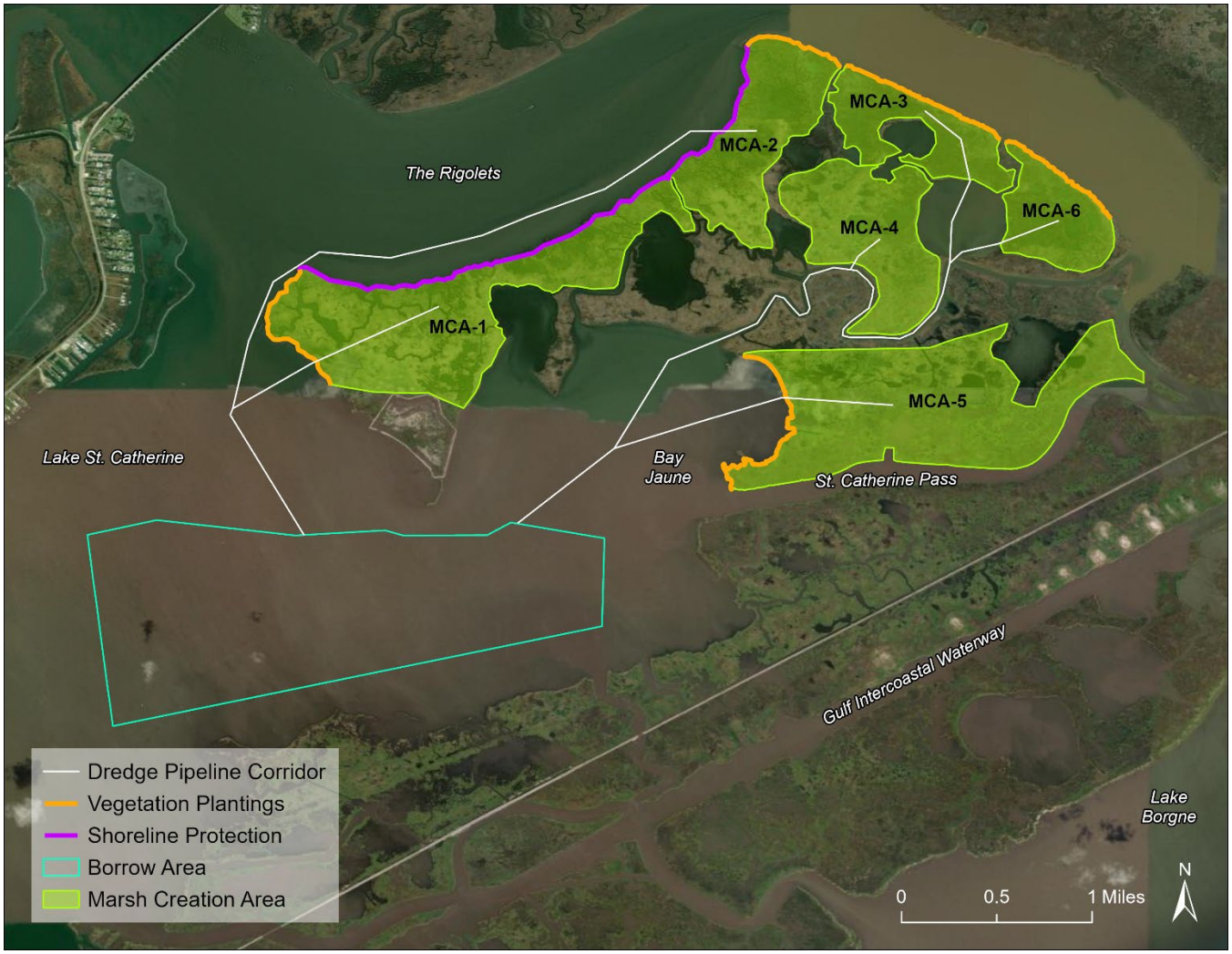

Figure 2-4. Alternative 3 East Orleans Landbridge Restoration Features.

To facilitate construction, approximately 127,628 LF of ECDs would be constructed around the MCAs. MCAs under Alternative 3 would be constructed as described for Alternative 2, with construction methods, marsh fill placement, borrow area use, and design parameters generally consistent, unless otherwise noted below. ECD crown elevations, side slope configurations, and geotextile installation would be the same as those described for Alternative 2, with parameters refined during final design based on site-specific conditions.

Under Alternative 3, 26 sheet pile gap closures totaling 2,048 LF would be installed. While the number and total linear footage of sheet pile installations differ from Alternative 2, installation methods and general design parameters would be generally consistent, providing structural stability and limiting seepage during marsh fill placement.

As shown in Figure 2-4, shoreline protection under Alternative 3 would be reduced relative to Alternative 2. Shoreline protection would include approximately 15,190 LF of marine mattress revetment along the northwestern edge of the project area adjacent to the Rigolets. Shoreline protection features would otherwise be constructed as described for Alternative 2.

Vegetation planting would occur along the ECD slopes on both the western and northeastern portions of the project area, for a total length of approximately 21,947 LF. On the western side of the project area, vegetation planting along the upper-west portion of the ECD would extend slightly farther than under Alternative 2, while planting along the lower-west portion would be substantially shorter. On the northeastern side, vegetation planting would occur in areas where shoreline protection in Alternative 2 was removed under

Alternative 3. Plant species would remain the same as those described for Alternative 2, utilizing brackish marsh species common to the surrounding area.

The estimated total construction cost for Alternative 3 is approximately $109,830,713. Additional details on the design components of Alternative 3 are provided in Section 3.5.

2.3.1.4. Alternative 4: Refined Restoration Template with Pond Avoidance

Under Alternative 4 (Figure 2-5), approximately 1,320 ac of marsh habitat would be created using about 5.0 million cy of dredged material. Like Alternative 3, the design includes six MCAs (MCA 1-MCA 6), and MCA 1 is subdivided into two components (MCA 1A and MCA 1B). Marsh fill sediment would be dredged from a smaller 516-ac Lake St. Catherine Borrow Area and transported via a DPC to the MCAs, with pipelines coming onshore onto the edges of all MCAs. The marsh fill would be placed to a CMFE consistent with the elevation described for Alternative 2.

Figure 2-5. Alternative 4 East Orleans Landbridge Restoration Features.

Alternative 4 differs from Alternative 3 primarily by avoiding pond filling and adjusting marsh creation boundaries to accommodate existing ponds and land leases, thereby maintaining desired open-water areas within the project footprint.

To facilitate construction, approximately 115,335 LF of ECDs would be constructed around the MCAs. MCAs under Alternative 4 would be constructed as described for Alternative 2, with construction methods, marsh fill placement, borrow area use, and design parameters generally consistent, unless otherwise noted below. ECD crown elevations, side slope configurations, and geotextile installation would be the same as those described for Alternative 2, with parameters refined during final design based on site-specific conditions.

Under Alternative 4, 21 sheet pile gap closures totaling 1,240 LF would be installed. While the number and total linear footage of sheet pile installations differ from Alternative 2, installation methods and general design parameters would be generally consistent, providing structural stability and limiting seepage during marsh fill placement.

As shown in Figure 2-5, shoreline protection would consist of approximately 14,867 LF of marine mattress revetment along the northwestern edge of the project area adjacent to the Rigolets. This shoreline protection is consistent in location, but slightly longer than under Alternative 3. Shoreline protection features would otherwise be constructed as described for Alternative 2.

Vegetation planting would occur along the ECD slopes on the western and northeastern portions of the project area in the same general configuration as Alternative 3, but with a slightly reduced extent along the western portions of the project area. Vegetation planting would occur along a total ECD length of approximately 19,768 LF. Plant species would remain the same as those described for Alternative 2, utilizing brackish marsh species common to the surrounding area.

The estimated total construction cost for Alternative 4 is approximately $90,808,462. Additional details on the design components of Alternative 4 are provided in Section 3.5.

2.3.2. OPA NRDA Screening of East Orleans Landbridge Restoration Project Alternatives

When screening potential alternatives to determine the reasonable range of alternatives, the LA TIG evaluated Alternatives 2 through 4 against the following six OPA NRDA regulatory evaluation standards: 1) estimated project cost; 2) the extent to which goals are met for (a) target habitat and (b) habitat supporting targeted living resources; 3) likelihood of success, that is, sustained benefits over time; 4) avoidance of collateral injury and prevention of future injury; 5) the extent to which multiple resources would benefit; and 6) the effect on public health and safety. An overview of the screening evaluation results is provided in Table 2-1.

Table 2-1. OPA NRDA Screening Evaluation of the East Orleans Landbridge Restoration Project Alternatives.

OPA NRDA EVALUATION STANDARDS	EVALUATION
Cost to carry out the alternative	Order of Magnitude Construction Costs, ranging from $60,580-$68,794 per acre across alternatives, were utilized for this screening criteria. On a cost per acre basis, the costs for all three alternatives are reasonable and appropriate according to the LA TIG.

OPA NRDA EVALUATION STANDARDS	EVALUATION
Extent to which the alternative meets the Trustees' goals	All alternatives are consistent with the Final PDARP/PEIS and the RP/EA #8 (specifically, alternatives for the East Orleans Landbridge Restoration Project). This RP/EA #8.1 supports the following programmatic goal: *Restore and Conserve Habitat*. All alternatives would combat habitat loss through marsh restoration that would support habitat restoration and revegetation. These alternatives would restore between 1,320-2,468 ac of emergent wetlands, a habitat injured as a result of the DWH oil spill.
Likelihood of success	All alternatives are technically feasible and utilize proven and established restoration methods which have been implemented successfully for other projects in the region; however, implementation feasibility may vary among them depending on the extent of work in actively managed areas and the level of landowner coordination and access required.
Extent to which the alternative would prevent future injury as a result of the incident and avoid collateral injury as a result of implementing the alternative	All alternatives would utilize sediment from a nearby borrow area to increase marsh elevations to help prevent future conversion to open water. During implementation of any of the three alternatives, BMPs would be employed during in-water and onshore construction, and in-water and onshore activities would be conducted according to any conditions arising from federal consultations and permitting to avoid and minimize potential collateral injury to natural resources. Though impacts on existing habitat are expected within each alternative's constructed footprint, substantially larger net gains in targeted habitat acreage are expected.
Extent to which the project would benefit more than one natural resource and/or service	All alternatives would restore and conserve WCNH while also maximizing ecological functions for a range of resources injured by the DWH oil spill. The project would provide habitat for various ecologically and economically important species, including birds, fish, and crabs.
Effect on public health and safety	LA TIG does not anticipate impacts on public health and safety from implementing any of the alternatives. East Orleans Landbridge is uninhabited and accessible only by boat or air. During construction, all laws and regulations pertaining to worker safety would be followed. All East Orleans Landbridge alternatives would result in long-term benefits to public health and safety through the restoration and expansion of the marsh footprint and protection for the nearby communities.

In summary, the OPA NRDA evaluation demonstrates that the costs of all the alternatives are well documented, reasonable, and appropriate. All the alternatives have a strong nexus to restoration of wetlands and habitats within the East Orleans Landbridge area under the related injury caused by the DWH oil spill and can reasonably be expected to benefit these resources over an extended timeframe. Under the programmatic goal to *Restore and Conserve Habitat*, this RP/EA #8.1 would directly address the *Wetlands, Coastal, and Nearshore Habitats* restoration type. Therefore, the LA TIG chose to carry forward all three design alternatives as the reasonable range.

These criteria were used for the evaluation described in this section, as well as the analysis of the reasonable range of alternatives and identification of a preferred alternative under OPA discussed in Chapter 3.

2.3.3. Raccoon Island Restoration Project Alternatives

The Raccoon Island Restoration Project is a "Phase 2" construction project, as Phase I E&D was funded through RP/EA #8. As such, alternative screening focuses on the nuances between different designs for the same project rather than screening from a pool of potential projects.

The Raccoon Island Restoration Project alternatives include various restoration features focused on Raccoon Island, which is the westernmost island in the Isles Dernières barrier island chain and is bordered by Caillou Bay and Terrebonne Bay to the north and the Gulf to the south (see Figure 2-6). Raccoon Island has been influenced by multiple major hurricane tracks, notably Hurricane Zeta (2020) and Hurricane Ida (2021), both of which passed near the island and contributed to substantial shoreline and habitat changes along the barrier island (Byrnes, 2025; Penland et al., 2003). The island is also subject to subsidence, SLR, and insufficient sediment input. This RP/EA #8.1 aims to address habitat loss by analyzing the No Action Alternative along with three restoration alternatives, described in detail in Sections 2.3.3.1 through 2.3.3.4.

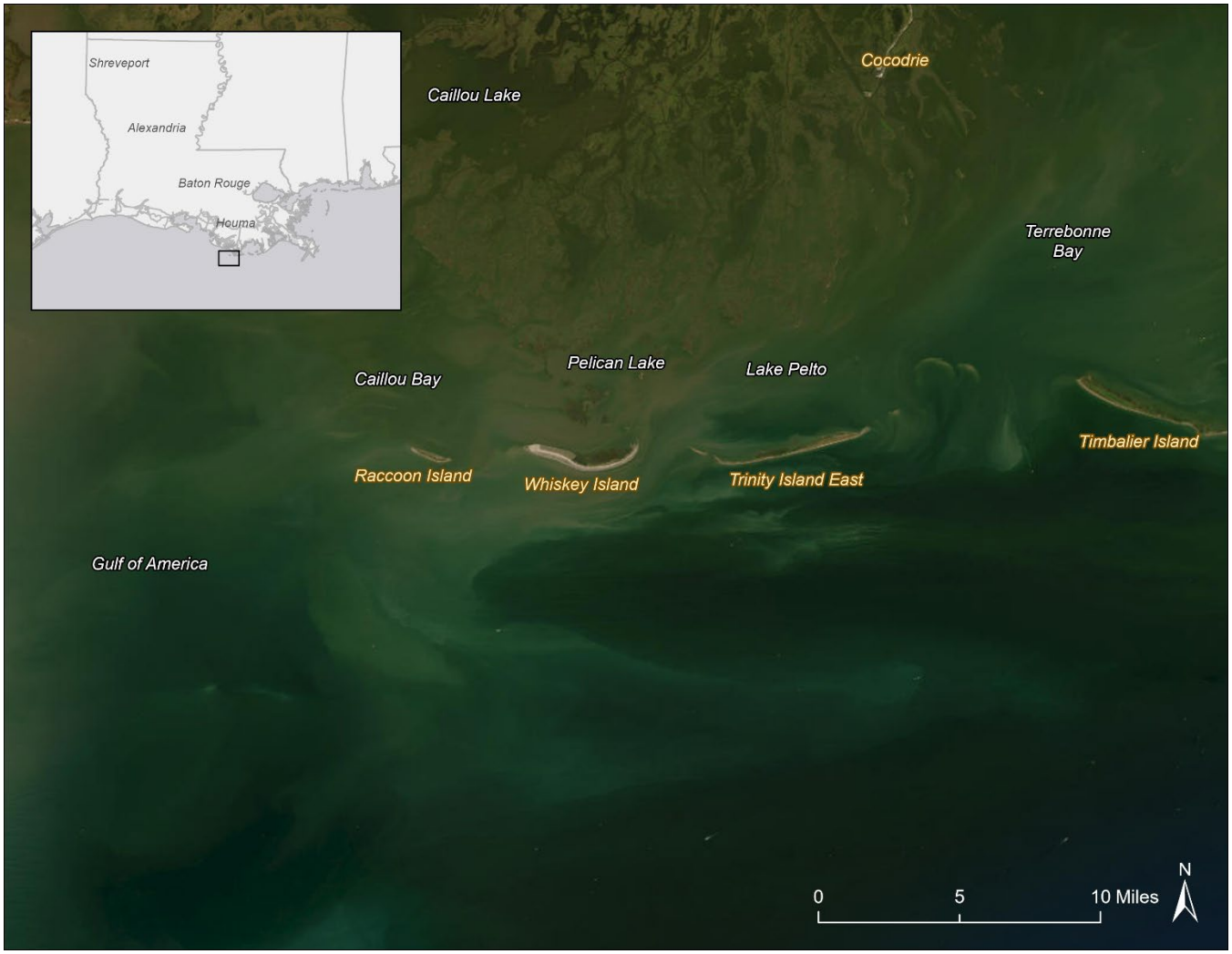

Figure 2-6. Raccoon Island Restoration Project Vicinity.

Data collection and E&D efforts funded by the LA TIG included identification of various potential restoration features, the combination of these features into potential design alternatives, and comparative analysis of the alternatives in terms of performance and impacts. The resulting reports, *Raccoon Island Restoration Project Draft 60% Preliminary Design Report* (Draft 60% Design Report; Baird-Stantec JV, 2026a) and *Raccoon Island Restoration Project Final 60% Preliminary Design Report* (Final 60% Design Report; Baird-Stantec JV, 2026c), summarize this alternative development process and are incorporated by reference. Note that all design specifications (for example, acreage, linear feet) discussed in this document are approximate and would continue to be refined through final E&D.

The following potential restoration features were identified in the Draft and Final 60% Design Reports:

- Island Habitat Restoration
    - Beach and dune fill utilizing compatible sediments placed at varying elevations and widths along the existing shoreline.
    - Marsh platform and marsh mound fill constructed landward of the beach and dune features where degraded, subtidal areas currently exist.
    - Optimization of tidal creek and channel alignment and sinuosity to maintain hydrologic connectivity.

    - Marsh and dune vegetation planting using species appropriate for barrier island conditions.
- Shoreline Protection
    - Gulfside breakwater maintenance and enhancement, including crest elevation increases.
    - Maintenance and enhancement of terminal groin feature.
    - BSPS to reduce marsh edge erosion, including:
        - Low-elevation rock rubble-mound living shoreline structures with oyster cultch.
        - Traditional trapezoidal segmented rock breakwaters.

These potential restoration features were combined to develop three alternatives for the Raccoon Island Restoration Project (hereafter referred to as Alternatives 2, 3, and 6), as summarized in Table 2-2 and shown in Figure 2-7. Each alternative includes beach, dune, marsh platform, and marsh mound restoration on Raccoon Island using compatible sediments dredged from SSB88 Borrow Area (Figure 2-8). The alternatives differ primarily in the inclusion and configuration of BSPS, which influence marsh edge stability, habitat composition, and long-term project performance.

During project development, the design team evaluated a broader suite of restoration concepts and configurations before refining the set of alternatives advanced for detailed analysis in this RP/EA. Early design work considered multiple borrow area options (nearby Raccoon Point shoal and offshore Ship Shoal), variations in beach and marsh layout, differing types and extents of shoreline protection features, and alternative implementation strategies such as planned renourishment events to sustain island performance over the design life. These concepts were iteratively assessed based on engineering feasibility, sediment compatibility, anticipated ecological performance, constructability, and cost considerations. This process resulted in the refinement of the broader design suite into Alternatives 2, 3, and 6 for full evaluation in this RP/EA. Additional information on the range of alternatives considered and the screening process is provided in the *Raccoon Island Final Design Criteria Technical Report* and subsequent Draft and Final 60% Design Reports (Baird-Stantec JV, 2024, 2026a, 2026c).

Collectively, the alternatives are intended to stabilize the island, restore critical barrier island habitats, and enhance ecological function over a 20-year project life. The restoration of the beach, dune, marsh, and mounds is expected to improve bird nesting, as well as habitat for fish and shellfish that rely on marsh habitats for foraging and nursery. The three alternatives are described below (Sections 2.3.3.2 – 2.3.3.4). Alternative 1, or the Natural Recovery/No Action Alternative, is described in Section 2.3.3.1.

Table 2-2. Raccoon Island Restoration Project Alternatives and Associated Restoration Features.

RESTORATION FEATURES	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 6
Beach/dune and marsh/mound restoration	X	X	X
Marsh and dune planting	X	X	X
Tidal creek and channel optimization	X	X	X
Gulfside shoreline protection maintenance	X	X	X

RESTORATION FEATURES	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 6
BSPS – rock rubble-mound living shoreline	N/A	X	N/A
BSPS – traditional trapezoidal segmented breakwater	N/A	X	X
Maintenance and enhancement of terminal groin	X	X	X

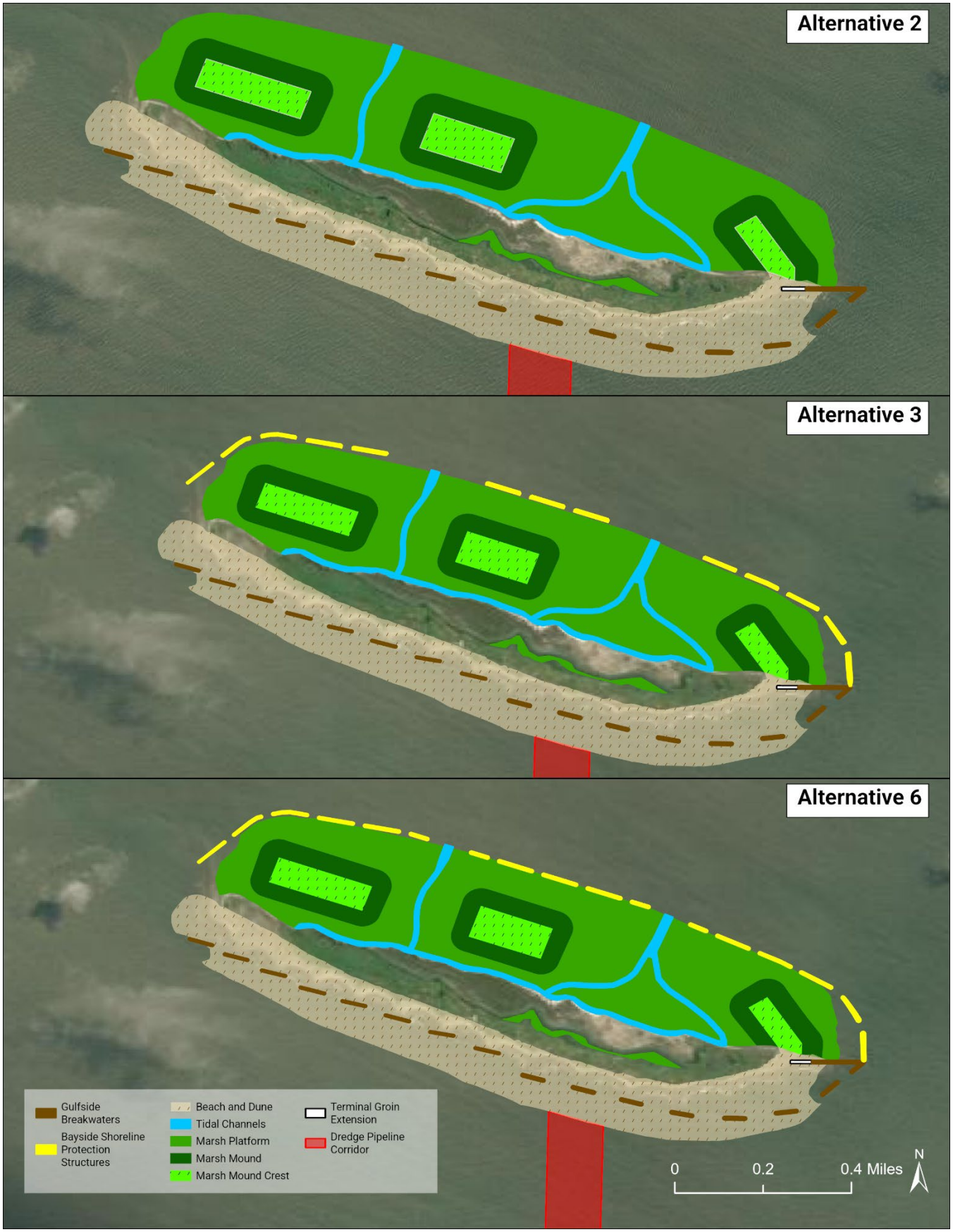

Figure 2-7. Overview of Three Alternatives for the Raccoon Island Restoration Project.

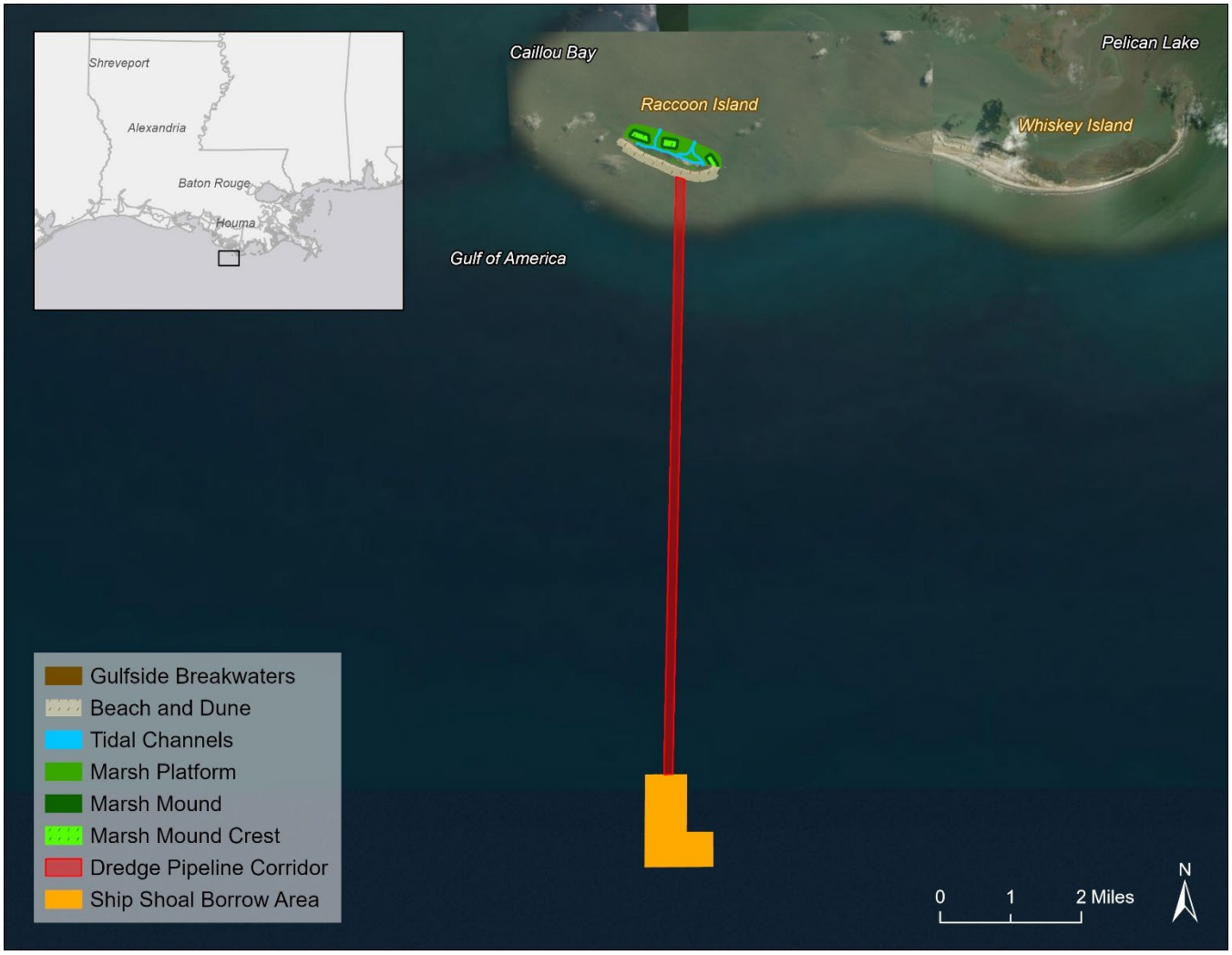

Figure 2-8. Raccoon Island Restoration Project DPC and Ship Shoal Borrow Area.

2.3.3.1. Natural Recovery/No Action Alternative (Alternative 1)

Pursuant to the OPA NRDA 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" (15 CFR § 990.53(b)(2)). Under a Natural Recovery/No Action Alternative, no additional restoration would be carried out by the LA TIG at this time to accelerate the recovery of WCNH in the Louisiana Restoration Area 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 SLR, subsidence, and storm-driven erosion, the most likely future outcomes under a No Action Alternative scenario are continued deterioration of habitats and associated natural resources in and around Raccoon Island. Long-term numerical modeling of existing conditions indicates that, over a 20-year period, storm processes would continue to drive shoreline retreat, overwash, and loss of island elevation, with localized breaching and erosion of the existing spit and marsh features (Baird-Stantec JV, 2026b). Model simulations calibrated to historical storm impacts (e.g., Hurricane Ike) reproduced island breaching and spit loss under existing conditions, demonstrating that storm events can rapidly reduce island elevation and continuity. Over the 20-year simulation period, the No Action Alternative shows progressive reduction in supratidal and intertidal habitat areas and continued fragmentation of the island platform. These changes

increase hydraulic connectivity between the Gulf and back-barrier waters and reduce the island's ability to function as a barrier shoreline. If recovery were to occur naturally, the modeling indicates that it would not occur within the 20-year analysis period and that erosion and fragmentation would likely continue, meaning that any natural recovery would be slow and uncertain relative 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 the natural recovery alternative from further OPA NRDA evaluation in the Final PDARP/PEIS. Based on this determination and incorporating that analysis by reference, the LA TIG does not further evaluate natural recovery as a viable alternative under the OPA NRDA regulations for Raccoon Island Restoration. A No Action Alternative is, however, included in Appendix D of this RP/EA #8.1, pursuant to NEPA, to analyze any negative environmental impacts of not implementing the proposed agency action.

2.3.3.2. Alternative 2

Under Alternative 2 (Figure 2-9), approximately 401 ac of beach, dune, marsh, and marsh mound habitat would be restored along with optimization of tidal creeks and channels and maintenance of existing Gulfside shoreline protection, designed for a 20-year project life.

Alternative 2 would include the construction of approximately 99 ac of beach and dune habitat along the Gulf-facing shoreline of Raccoon Island. The dune feature would be constructed with a crest elevation of +8.0 ft NAVD88 and a crest width of approximately 200 ft, consistent with elevations shown to support barrier island stability and avian nesting habitat. Beach and dune slopes and transitions would be graded to blend with existing conditions and to promote sediment retention and long-term habitat sustainability. Vegetation planting and hay bales would be incorporated to stabilize dune features and support habitat development. Hay bale placement would tentatively occur on the north side of the dune crest and would be followed by vegetative plantings.

Approximately 302 ac of barrier island marsh platform would be constructed landward of the beach and dune features. The marsh platform would be graded to slope from approximately +2.0 ft NAVD88 along the southern edge to +1.2 ft NAVD88 along the interior marsh edge, then transition down to existing grades at a slope of approximately 1V:50H. These elevations were selected to support marsh vegetation establishment while maintaining hydrologic connectivity and providing suitable habitat for avian and aquatic species.

Three marsh mounds would be constructed within the marsh platform footprint to provide additional topographic diversity and refuge habitat. This would include elevations suitable for nesting, roosting, and foraging by coastal bird species of conservation concern, such as the brown pelican (*Pelecanus occidentalis*). In addition, the project would support foraging and wintering habitat for federally threatened piping plover (*Charadrius melodus*) and the federally listed rufa red knot (*Calidris canutus rufa*). These species rely on higher-elevation intertidal and supratidal habitats that have become increasingly limited in coastal Louisiana. Each marsh mound would have a crest elevation of approximately +6.0 ft NAVD88, with side slopes of 1V:50H transitioning to the surrounding marsh platform. Hay bales would also be incorporated as a temporary sediment control measure to stabilize newly placed material on marsh mounds, reducing wind-driven sediment transport and promoting retention of fill until vegetation becomes established.

Tidal creek and channel features would be incorporated to maintain connectivity between the bay, constructed marsh platform, and back-barrier environments; they would also ensure hydrologic connectivity to existing mangrove-dominated wetlands on Raccoon Island, which provide important bird nesting habitat. A tidal channel would be maintained between the northern edge of the existing island and the southern edge

of the marsh fill, with additional tidal channels extending across the marsh platform to support hydrologic exchange and habitat function.

Modeling suggests that storm-induced waves would exceed Roland and Douglas thresholds along the Alternative 2 bayside shoreline, leaving an unvegetated and potentially scarped shoreline (Baird-Stantec JV, 2026a). Under these conditions, wave energy would limit the establishment of emergent vegetation at the marsh edge and promote a steeper shoreline profile over time. In contrast, alternatives that include BSPS are expected to attenuate wave transmission and support the development of a more gradual, vegetated marsh edge. Such gently sloping, vegetated shorelines provide higher-quality habitat for fishes, invertebrates, and birds by increasing edge complexity, improving refuge and foraging opportunities, and enhancing connectivity between marsh and open water habitats. This difference in shoreline morphology and associated ecological function is an important consideration in comparing alternatives.

Marsh planting would occur throughout the constructed marsh platform and marsh mounds using species appropriate for barrier island marsh conditions. Plant species selection, densities, and planting methods would be consistent with those used in similar restoration projects within the Isles Dernières barrier island chain and would support long-term habitat sustainability.

As part of Alternative 2, the crests of the existing Gulfside breakwaters along the Gulf-facing shoreline of Raccoon Island would be raised by approximately one armor stone (approximately 3 ft) to maintain shoreline protection and reduce wave energy impacts on the restored beach and dune features. Maintenance and enhancement of the existing terminal groin on the eastern side of the island would also be included. The terminal groin would be extended approximately 300 ft west with a crest elevation of approximately +6.0 ft NAVD88 to help retain sediment within the restored shoreline system and support the long-term stability of the beach and dune features. No additional shoreline structures would be constructed under Alternative 2.

Construction of the beach, dune, marsh platform, and marsh mounds under Alternative 2 would require approximately 2.9 million cy of fill material. Sediment would be dredged from the SSB88 Borrow Area, located approximately 8.6 mi south of Raccoon Island in the Gulf. Sediment would be transported from the borrow area to Raccoon Island via hydraulic dredging and pipeline conveyance. Conveyance corridors would extend from the borrow area to the project site, with the pipeline resting on the seafloor and repositioned as needed during construction.

Temporary access channels would be dredged to provide construction access for equipment and personnel. Access channels would have a minimum width of approximately 80 ft and a minimum depth of -7.0 ft NAVD88. Two potential access channels (Option 1 and Option 2) are identified along the northeastern portion of Raccoon Island, extending from the -7.0-ft NAVD88 contour to the shoreline to provide barge access to beach, dune, and marsh construction areas. Option 1 represents the easternmost option and Option 2 represents the western option. Only one of these access channel options would be constructed, with the contractor selecting the final prior to construction. In addition, an equipment access channel and dredge pipeline corridor would extend from the gulf-facing shoreline into the interior project footprint to support material conveyance and construction access. Temporary flotation access areas and associated dredge spoil placement areas would be constructed adjacent to the selected northeast access channel to facilitate equipment and material transport during construction. Temporary access channels would be used for the duration of construction and backfilled upon project completion.

The estimated total construction cost for Alternative 2 is approximately $81,500,000. Additional details on the design components of Alternative 2 are provided in Section 3.6.

Figure 2-9. Raccoon Island Restoration Project Alternative 2 Features (including two potential northeastern floatation access channel options [Option 1 – eastern; Option 2 – western]).

2.3.3.3. Alternative 3

Under Alternative 3 (Figure 2-10), approximately 410 ac of beach, dune, marsh, and marsh mound habitat would be restored on Raccoon Island, designed for a 20-year project life. Alternative 3 includes the same beach, dune, marsh platform, marsh mound, tidal channel, and Gulfside shoreline protection features as described for Alternative 2, including sediment dredging from the SSB88 Borrow Area. Alternative 3 has the addition of bayside living shoreline structures to enhance marsh edge stability and habitat function.

Beach and dune restoration under Alternative 3 would be constructed as described for Alternative 2, including approximately 102 ac of beach and dune habitat with a dune crest elevation of +8.0 ft NAVD88 and a crest width of approximately 200 ft. Marsh platform grading, marsh mound construction, and tidal channel configurations would also be constructed as described for Alternative 2, with design elevations, slopes, hay bale placements, and planting approaches generally consistent. Marsh planting and mound planting under Alternative 3 would be conducted as described for Alternative 2, using species appropriate for barrier island marsh conditions. As part of Alternative 3, the crests of the existing Gulfside breakwaters would be raised consistent with Alternative 2 and maintenance and enhancement of the terminal groin would also occur as described for Alternative 2.

Alternative 3 differs from Alternative 2 by the inclusion of 13 BSPS constructed along the toe of the marsh platform to reduce erosion along the marsh edge. These BSPS would consist of two structural types: 1) low-elevation living shoreline breakwaters and 2) conventional trapezoidal breakwaters (Type B), which include two design variants (Type B-1 and Type B-2) placed at the western and eastern ends of the island, respectively. Nine of the BSPS would consist of low-elevation breakwaters with a crest width of approximately 6.0 ft and a crest elevation of +1.2 ft NAVD88. Each BSPS segment would range in length from 400-450 ft long, with spacing ranging from 120-640 ft apart, and positioned in line with the marsh toe fill, approximately 250 ft bayward of +1.2 ft NAVD88 marsh contour.

For the nine low-elevation breakwaters, a 15-ft-wide oyster cultch platform would be constructed in the lee of each BSPS segment at an elevation of approximately +0.4 ft NAVD88. The inclusion of oyster cultch and low-elevation breakwaters is intended to provide marsh edge protection while creating hard-bottom habitat that supports fish and invertebrates. These living shoreline features are designed to function similarly to naturally occurring oyster reefs fringing marsh edges, creating habitat mosaics that support increased fisheries productivity while maintaining hydrologic exchange.

The remaining four BSPS (two located near the western end of the island [Type B-1] and two near the eastern end [Type B-2]) would consist of traditional trapezoidal rubble-mound breakwaters (Type B) with a crest elevation of approximately +4.0 ft NAVD88 and a crest width of approximately 6.0 ft. Type B-1 structures, located in shallower water, include an approximately 8-ft-wide berm at approximately 0.0 ft NAVD88 with a toe elevation of approximately -2.0 ft NAVD88, while Type B-2 structures, located in deeper water, include a 6-ft-wide berm at approximately -2.0 ft NAVD88 and a larger overall cross-section to accommodate water depths ranging from approximately -5 to -8 ft NAVD88. Modeling suggests these 13 BSPS would attenuate storm-induced wave energy to an extent where emergent marsh would survive along the shoreline behind the breakwaters (Baird-Stantec JV, 2026c). Flooded emergent marsh provides a productive habitat type important for fish and shellfish foraging and nursery.

Dredging under Alternative 3 would be conducted as described for Alternative 2, with no variation in borrow area, dredging methods, or estimated fill volumes. Temporary access channels would be required to facilitate the construction of the BSPS. In addition to the access channels described for Alternative 2, Alternative 3 may include one or more flotation access channels and associated temporary dredge spoil placement areas to facilitate installation of the BSPS. These flotation access channels would generally be located along the bayside shoreline adjacent to the BSPS construction areas and would provide access for construction equipment and materials. All temporary access channels would be used for the duration of construction and backfilled upon project completion.

The estimated total construction cost for Alternative 3 is approximately $102,900,000. Additional details on the design components of Alternative 3 are provided in Section 3.6.

Figure 2-10. Raccoon Island Restoration Project Alternative 3 Features (including two potential northeastern floatation access channel options [Option 1 – eastern; Option 2 – western]).

2.3.3.4. Alternative 6

Under Alternative 6 (Figure 2-11), approximately 412 ac of beach, dune, marsh, and marsh mound habitat would be restored on Raccoon Island, designed for a 20-year project life. Alternative 6 includes the same beach, dune, marsh platform, marsh mound, tidal channel, and Gulfside shoreline protection features as described for Alternative 2, including sediment dredging from the SSB88 Borrow Area. Alternative 6 has the addition of BSPS to enhance marsh edge stability.

Beach and dune restoration under Alternative 6 would be constructed as described for Alternative 2, including approximately 102 ac of beach and dune habitat with a dune crest elevation of +8.0 ft NAVD88 and a crest width of approximately 200 ft. Marsh platform grading, marsh mound construction, and tidal channel configurations would also be constructed as described for Alternative 2, with design elevations, slopes, hay bale placements, and planting approaches generally consistent. Marsh planting and mound planting under Alternative 6 would be conducted as described for Alternative 2, using species appropriate for barrier island marsh conditions. As part of Alternative 6, the crests of the existing Gulfside breakwaters would be raised consistent with Alternative 2. Like Alternative 3, Alternative 6 would include maintenance and enhancement of the terminal groin on the eastern side of the island.

Alternative 6 differs from Alternative 3 in the number, type, and configuration of BSPS. Under Alternative 6, BSPS would consist of 17 traditional segmented rock breakwaters constructed along the bayside edge of the marsh platform. These segmented breakwaters would have a crest elevation of approximately +4.0 ft NAVD88 and would include a 6-ft-wide berm at approximately 0.0 ft NAVD88 as part of and contiguous with the bayside slope of the structure. BSPS would include a combination of segments that range from 250-440 ft long, with spacing ranging from 110-510 ft apart, and positioned in line with the marsh toe fill, approximately 250 ft bayward of the +1.2 ft NAVD88 marsh contour. Modeling suggests these structures would attenuate storm-induced wave energy to an extent where emergent marsh would survive along the shoreline behind the breakwaters. Flooded emergent marsh provides a productive habitat type important for fish and shellfish foraging and nursery.

Unlike Alternative 3, Alternative 6 would not include oyster cultch or low-elevation living shoreline features. As a result, Alternative 6 would provide less subaqueous hard-bottom habitat for fish and shellfish than Alternative 3, while offering marginally higher structural shoreline protection along the bayside marsh edge.

Dredging under Alternative 6 would proceed as described for Alternative 2, with no variation in the dredging plan. Temporary access and flotation channels required to facilitate construction of the BSPS under Alternative 6 would be the same as those described for Alternative 3. All temporary access channels would be used for the duration of construction and backfilled upon project completion.

The estimated total construction cost for Alternative 6 is approximately $115,700,000. Additional details on the design components of Alternative 6 are provided in Section 3.6.

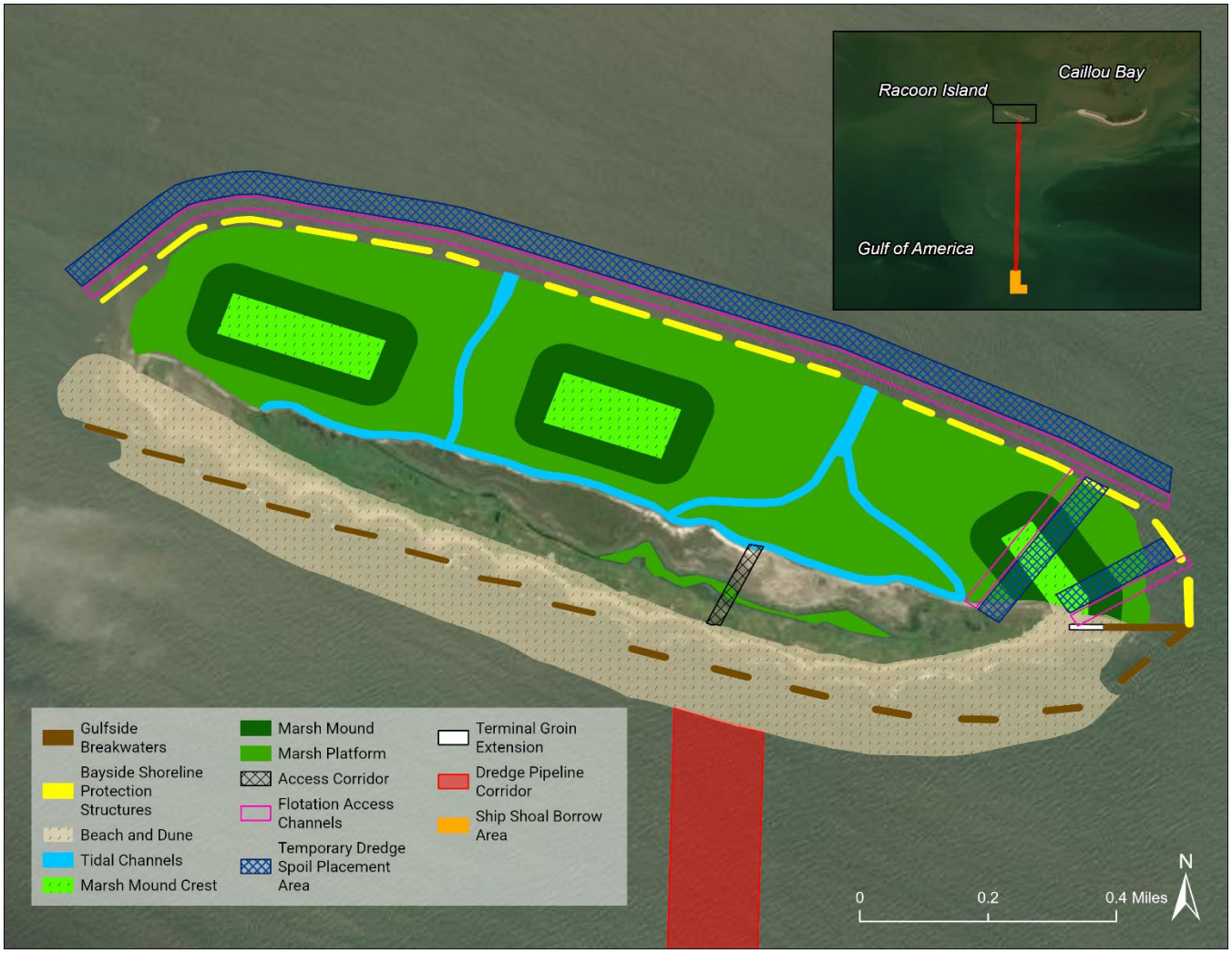

Figure 2-11. Raccoon Island Restoration Project Alternative 6 Features (including two potential northeastern floatation access channel options [Option 1 – eastern; Option 2 – western]).

2.3.4. OPA NRDA Screening of Raccoon Island Restoration Project Alternatives

When screening potential alternatives to determine the reasonable range of alternatives, the LA TIG evaluated Alternatives 2, 3, and 6 against the following six OPA NRDA regulatory evaluation standards: 1) estimated project cost; 2) the extent to which goals are met for (a) target habitat and (b) habitat supporting targeted living resources; 3) likelihood of success, that is, sustained benefits over time; 4) avoidance of collateral injury and prevention of future injury; 5) the extent to which multiple resources would benefit; and 6) the effect on public health and safety. An overview of the screening evaluation results is provided in Table 2-3.

Table 2-3. OPA NRDA Screening Evaluation of the Raccoon Island Restoration Project Alternatives.

OPA NRDA EVALUATION STANDARDS	EVALUATION
Cost to carry out the alternative	Order of Magnitude Construction Costs, ranging from $203,242-$280,825 per acre across alternatives due to their differing features, were utilized for this screening criteria. On a cost per acre basis, the costs for all three alternatives are reasonable and appropriate according to the LA TIG.
Extent to which the alternative meets the Trustees' goals	All alternatives are consistent with the Final PDARP/PEIS and RP/EA #8 (specifically, alternatives for the Raccoon Island Barrier Island Restoration Project). This RP/EA #8.1 supports the following programmatic goal: *Restore and Conserve Habitat*. All alternatives would benefit injured WCNH. All alternatives would benefit injured resources in and around Raccoon Island.
Likelihood of success	All alternatives are likely to succeed because they are technically feasible and utilize proven and established restoration methods which have been implemented successfully for other projects in the region. Using model calculations, sustained gains in habitat acreage were predicted for all alternatives throughout the 20-year analysis period.
Extent to which the alternative would prevent future injury as a result of the incident and avoid collateral injury as a result of implementing the alternative	All alternatives would utilize the same sediment source (i.e., Ship Shoal) to increase beach, dune, and marsh elevations to help prevent future conversion to open water. During implementation of any of the three alternatives, BMPs would be employed during in-water and onshore construction, and in-water and onshore activities would be conducted according to any conditions arising from federal consultations and permitting to avoid and minimize potential collateral injury to natural resources. Though impacts on existing habitat are expected within each alternative's constructed footprint, substantially larger net gains in targeted habitat acreage are expected.
Extent to which the project would benefit more than one natural resource and/or service	All alternatives would provide suitable nesting habitat for birds, while restoring beach, dune, mound, and marsh habitat within the Raccoon Island project area. These habitats are of a kind and type injured by the DWH oil spill. Creation of marsh and living shoreline habitat would also increase productivity of fish and shellfish that rely upon these habitats at various times during their life cycles.

OPA NRDA EVALUATION STANDARDS	EVALUATION
Effect on public health and safety	The LA TIG does not anticipate impacts on public health and safety from implementing any of the alternatives. Raccoon Island is uninhabited, remote, and accessible only by boat or air. During construction, all laws and regulations pertaining to worker safety would be followed. All Raccoon Island alternatives would result in long-term benefits to public health and safety through the restoration and expansion of the island footprint and barrier island protection for the mainland.

In summary, the OPA NRDA screening evaluation demonstrates that the costs of all alternatives are well documented, reasonable, and appropriate. All alternatives have a strong nexus to restoration of beach, dune, and wetlands on Raccoon Island under the related injury caused by the DWH oil spill and can reasonably be expected to benefit these resources over an extended timeframe. Under the programmatic goal to *Restore and Conserve Habitat*, this RP/EA #8.1 would directly address the *Wetlands, Coastal, and Nearshore Habitats* restoration type. Therefore, the LA TIG chose to carry forward all three design alternatives as the reasonable range.

These criteria were used for the screening evaluation described in this section, as well as the analysis of the reasonable range of alternatives and identification of a preferred alternative under OPA discussed in Chapter 3.

3. Reasonable Range of Alternatives

The reasonable range of alternatives for the East Orleans Landbridge Restoration Project consists of three restoration alternatives, Alternatives 2-4. These alternatives comprise different configurations of marsh creation and shoreline protection on the East Orleans Landbridge. For more detailed descriptions of each of the alternatives, see Section 2.3.1.

The reasonable range of alternatives for the Raccoon Island Restoration Project consists of three restoration alternatives, Alternatives 2, 3, and 6, as described in the Draft and Final 60% Design Reports (Baird-Stantec JV, 2026a, 2026c). These alternatives comprise configurations of beach, dune, mound, and marsh fill and repair and maintenance of existing Gulfside rock structures on Raccoon Island. Some of the alternatives also include construction of traditional segmented rock breakwaters and rock-rubble mound living shoreline structures (Alternative 3) or only traditional segmented breakwaters (Alternative 6) on the bayside of Raccoon Island. Additionally, Alternatives 3 and 6 include an extension of a terminal groin on the east side of the island. For more detailed descriptions of each of the alternatives, see Section 2.3.3.

In this chapter, the LA TIG presents a thorough and comprehensive analysis to uniformly and objectively assess the respective alternatives for East Orleans Landbridge and Raccoon Island restoration using the OPA NRDA evaluation standards to select their preferred alternatives.

3.1. Summary of OPA NRDA Evaluation Standards

According to the OPA NRDA regulations, Trustees are responsible for identifying a reasonable range of alternatives (15 CFR § 990.53(a)(2)) that can be evaluated according to the OPA NRDA evaluation standards (15 CFR § 990.54). Based on the evaluation of the standards listed below, and after incorporating any other screening criteria identified by Trustees, Trustees identify the preferred alternative(s). If Trustees conclude that two or more alternatives are equally preferable, the OPA NRDA regulations provide that the most cost-effective alternative must be chosen (15 CFR § 990.54(b)).

Chapter 2 describes the screening and identification of a reasonable range of alternatives for evaluation under OPA. Chapter 3 describes the Trustees' evaluation of the reasonable range of alternatives to identify preferred restoration alternatives based on, at a minimum, the following standards found in 15 CFR § 990.54(a):

- The cost to carry out the alternative (Cost-effectiveness).
- The extent to which each alternative is expected to meet the Trustees' goals and objectives in returning the injured natural resources and services to baseline and/or compensating for interim losses (Goals and objectives).
- The likelihood of success of each alternative (Feasibility).
- The extent to which each alternative would prevent future injury resulting from the incident and avoid collateral injury resulting from implementing the alternative (Avoid collateral injury).
- The extent to which each alternative benefits more than one natural resource and/or service (Benefits).
- The effect of each alternative on public health and safety (Health and safety).

3.2. Monitoring Requirements

When developing a restoration plan under the OPA NRDA regulations, Trustees establish restoration objectives that are specific to the natural resources that were injured (15 CFR § 990.55(b)(2)). These objectives should clearly specify the desired project outcome and the performance criteria by which successful restoration under OPA would be determined, including criteria that would necessitate corrective actions (15 CFR § 990.55(b)(2)). Should a corrective action become necessary from unanticipated conditions, the Implementing Trustee would evaluate the corrective action for consistency with the OPA NRDA and NEPA analyses conducted in this RP/EA #8.1 in accordance with Section 9.5.2 of the Trustee Council's Standard Operating Procedures (SOPs). Regulatory requirements for the monitoring component of a restoration plan are further described in 15 CFR § 990.55(b)(3). The DWH Trustees identified Monitoring, Adaptive Management, and Administrative Oversight as one of the programmatic Restoration Goals in the Final PDARP/PEIS. As described in Chapter 5, Appendix E of the Final PDARP/PEIS, the Trustees committed to a MAM framework that incorporates best available science into planning and design of each alternative, identifies and reduces key uncertainties, tracks and evaluates progress towards Restoration Goals, and determines the need for corrective actions (DWH Trustees, 2021). The MAM framework provides a flexible, science-based approach to implement and monitor restoration.

The LA TIG developed draft MAM plans for each of the preferred alternatives identified in this RP/EA #8.1 (Appendix A and Appendix B). These MAM plans outline the monitoring needed to evaluate each alternative's progress toward meeting project-specific objectives, appropriate corrective actions, and adaptive management where applicable. The plans included in Appendices A and B are consistent with the requirements and guidelines set forth in the Final PDARP/PEIS (DWH Trustees, 2016), the Trustee Council's SOPs (DWH Trustees, 2021), and the Trustees' MAM Manual (DWH Trustees, 2024). The MAM plans are intended to be updated as needed to reflect changing conditions and to incorporate new information as it becomes available. For example, if initial data analysis indicates that the sampling design for the alternative is inadequate, or if any uncertainties are resolved or new uncertainties are identified during implementation and monitoring of the alternative, the plan may be revised. Updates to MAM plans and any additional details concerning the status of monitoring activities will be made publicly available through the Data Integration Visualization Exploration and Reporting (DIVER) website.

3.3. Estimated Project Costs

The cost provided for each restoration alternative is the estimated cost to implement the specific restoration project. Cost estimates incorporate contingencies and reflect the most current planning and information available to the LA TIG at the time of completing this RP/EA #8.1. Estimated costs reflect all costs associated with implementing each alternative, potentially including but not limited to planning, construction or implementation, and contingency. Should budgets change prior to or during project implementation, Implementing Trustees would seek TIG approval for updated budgets.

3.4. Best Management Practices

As part of the environmental compliance process, consulting agencies provide guidance on BMPs and project design criteria. DWH Trustees incorporate appropriate BMPs into planning and design to avoid or minimize impacts on natural resources, including protected and listed species and their habitats. BMPs are identified in required permits, consultations, or environmental reviews, including those described in Appendix 6.A of the Final PDARP/PEIS (DWH Trustees, 2016). BMPs that each project would implement are described

within each project's environmental analysis in Appendix D. Through consultation with regulatory agencies, additional BMPs may be identified for implementation and would be noted in compliance documentation.

3.5. OPA NRDA Evaluation of the Reasonable Range of East Orleans Landbridge Restoration Project Alternatives

Sections 3.5.1 through 3.5.3 provide an evaluation of each of the alternatives in the reasonable range against the OPA NRDA standards. Section 3.5.4 provides a summary of how these evaluations informed the selection of a preferred alternative.

As designed, the East Orleans Landbridge Restoration Project's marsh platform feature would be expected to remain within the optimal inundation range for brackish marsh (10-65%; CPRA, 2017) for the duration of the 20-year project life. Shoreline protection features would reduce erosion along exposed MCA edges, and vegetative plantings would stabilize ECDs used to contain marsh fill. In addition to these design performance considerations, evaluation of the East Orleans Landbridge Restoration Project alternatives also accounts for implementation factors such as the relative ease of land acquisition, compatibility with existing land uses and access patterns, and the sensitivity of shorelines and habitats targeted for restoration, all of which influence the practicability and long-term sustainability of each alternative.

An "order of magnitude" construction cost, which is a high-level estimate of how much a project would likely cost to construct, was assessed for each alternative and used in the evaluation of the reasonable range of alternatives. These estimates include costs such as mobilization and demobilization of construction and support equipment; construction materials; construction personnel, lodging, and transportation; sediment pipeline delivery, installation, and removal; construction and removal or modification of ECDs; shoreline protection installation; vegetation plantings; and administration and inspection. Additional details regarding the development of these cost estimates are available in the *East Orleans Restoration Project DRAFT Design Documentation Report* (CPRA, 2025). The costs associated with proposed MAM are not included in the construction costs utilized to compare the alternatives, as the cost of MAM would not differ substantially between alternatives.

3.5.1. Alternative 2: Full Template Restoration

Table 3-1. OPA NRDA Evaluation of Alternative 2.

OPA NRDA STANDARDS	EVALUATION SUMMARY
Cost-Effectiveness	The estimated order of magnitude construction cost for Alternative 2 is $152,580,632 ($61,824 per acre) to place approximately 9.0 million cy of sediment, which is considered reasonable and appropriate on a cost per acre basis.

OPA NRDA STANDARDS	EVALUATION SUMMARY
Goals and Objectives	Overall, Alternative 2 would help advance goals identified by the Trustees for the *Wetlands, Coastal, and Nearshore Habitats* restoration type under the *Restore and Conserve Habitat* goal. This project would include restoring intertidal wetland elevations, restoring native coastal wetland vegetation, and providing habitat for fish, invertebrates, and resident and migratory birds. This project would restore up to 2,468 ac of wetland complex, a habitat type that was injured as a result of the DWH oil spill.
Likelihood of Success	Alternative 2 is technically feasible and utilizes proven and established restoration methods, which have been implemented successfully for other projects in the region. However, this Alternative includes marsh creation configurations that would extend into interior portions of the East Orleans Landbridge that are actively managed for recreational and land-use purposes. As a result, this Alternative would likely face challenges related to landowner coordination and securing necessary access or land rights. These challenges could reduce the overall likelihood of successful implementation compared to alternatives that better align with existing land uses.
Avoidance of Collateral Injury	Alternative 2 would utilize sediment from a nearby borrow area to increase marsh elevations to help prevent future conversion to open water. During implementation of Alternative 2, BMPs, conservation measures, and design modifications to avoid and minimize impacts would be employed. Activities would be conducted according to any conditions arising from federal consultations and permitting to avoid and minimize potential collateral injury to natural resources.
Benefits	Under Alternative 2, approximately 2,468 ac of marsh habitat would be created. Placement of the shoreline protection marine mattresses would also protect and enhance marsh habitat. This Alternative would result in the filling of approximately 208 ac of existing interior ponds, representing the greatest extent of pond conversion among the alternatives. While some loss of open-water habitat would occur, the overall increase in marsh habitat is anticipated to provide net ecological benefits. This Alternative is expected to benefit multiple natural resources by creating additional habitat for different groups of living coastal and marine resources.
Public Health and Safety	The LA TIG does not anticipate impacts on public health and safety from implementing Alternative 2. The East Orleans Landbridge is uninhabited, remote, and accessible only by boat or air. During construction, all laws and regulations pertaining to worker safety would be followed. Alternative 2 would result in long-term benefits to public health and safety through the restoration of marshes, which can benefit the public's safety by improving water quality and buffering storm surges.

3.5.2. Alternative 3: Refined Restoration Template with Pond Filling

Table 3-2. OPA NRDA Evaluation of Alternative 3.

OPA NRDA STANDARDS	EVALUATION SUMMARY
Cost-Effectiveness	The estimated order of magnitude construction cost for Alternative 3 is $109,830,713 ($60,580 per acre) to place approximately 6.7 million cy of sediment, which is a lower cost per acre compared to Alternative 2 and is considered reasonable and appropriate on a cost per acre basis.
Goals and Objectives	Overall, Alternative 3 would help advance goals identified by the Trustees for the *Wetlands, Coastal, and Nearshore Habitats* restoration type under the *Restore and Conserve Habitat* goal. This project would include restoring intertidal wetland elevations, restoring native coastal wetland vegetation, and providing habitat for fish, invertebrates, and resident and migratory birds. This project would restore up to 1,813 ac of wetland complex, a habitat type that was injured as a result of the DWH oil spill.
Likelihood of Success	Alternative 3 is technically feasible and utilizes proven and established restoration methods, which have been implemented successfully for other projects in the region. However, this Alternative includes marsh creation configurations that would extend into interior portions of the East Orleans Landbridge that are actively managed for recreational and land-use purposes. This Alternative incorporates design refinements intended to reduce conflicts with actively managed interior areas of the East Orleans Landbridge, which may improve coordination with landowners relative to Alternative 2. However, this Alternative would likely still face challenges related to landowner coordination and securing necessary access or land rights. These challenges could reduce the overall likelihood of successful implementation compared to alternatives that better align with existing land uses.
Avoidance of Collateral Injury	Alternative 3 would utilize sediment from a nearby borrow area to increase marsh elevations to help prevent future conversion to open water. During implementation of Alternative 3, BMPs, conservation measures, and design modifications to avoid and minimize impacts would be employed. Activities would be conducted according to any conditions arising from federal consultations and permitting to avoid and minimize potential collateral injury to natural resources.
Benefits	Under Alternative 3, approximately 1,813 ac of marsh habitat would be created, a lower total acreage compared to Alternative 2. Placement of the shoreline protection marine mattresses would also protect and enhance marsh habitat. Approximately 111 ac of natural ponds would be filled under this Alternative, which is less than Alternative 2. As a result, this Alternative represents a balance between marsh creation benefits and the partial preservation of interior open-water habitat. Alternative 3 is expected to benefit multiple natural resources by creating additional habitat for different groups of living coastal and marine resources.

OPA NRDA STANDARDS	EVALUATION SUMMARY
Public Health and Safety	The LA TIG does not anticipate impacts on public health and safety from implementing Alternative 3. The East Orleans Landbridge is uninhabited, remote, and accessible only by boat or air. During construction, all laws and regulations pertaining to worker safety would be followed. Alternative 3 would result in long-term benefits to public health and safety through the restoration of marshes, which can benefit the public's safety by improving water quality and buffering storm surges.

3.5.3. Alternative 4: Refined Restoration Template with Pond Avoidance

Table 3-3. OPA NRDA Evaluation of Alternative 4.

OPA NRDA STANDARDS	EVALUATION SUMMARY
Cost-Effectiveness	The estimated order of magnitude construction cost for Alternative 4 is $90,808,462 ($68,794 per acre) to place approximately 5.0 million cy of sediment, which is considered reasonable and appropriate on a cost per acre basis.
Goals and Objectives	Overall, Alternative 4 would help advance goals identified by the Trustees for the *Wetlands, Coastal, and Nearshore Habitats* restoration type under the *Restore and Conserve Habitat* goal. This project would include restoring intertidal wetland elevations, restoring native coastal wetland vegetation, and providing habitat for fish, invertebrates, and resident and migratory birds. This project would restore up to 1,320 ac of wetland complex, a habitat type that was injured as a result of the DWH oil spill.
Likelihood of Success	Alternative 4 is likely to succeed because it is technically feasible and utilizes proven and established restoration methods, which have been implemented successfully for other projects in the region. In addition, settlement analyses conducted using standard CPRA marsh creation design methodologies (CPRA, 2017, 2025) indicate that constructed marsh elevations under this Alternative are expected to remain within the optimal inundation range for brackish marsh communities throughout the anticipated 20-year project life, supporting sustained marsh function and habitat value. These projected long-term performance characteristics, combined with improved compatibility with landowner considerations and reduced pond filling relative to Alternatives 2 and 3, indicate that Alternative 4 has a higher overall likelihood of successful implementation.

OPA NRDA STANDARDS	EVALUATION SUMMARY
Avoidance of Collateral Injury	Alternative 4 would utilize sediment from a nearby borrow area to increase marsh elevations to help prevent future conversion to open water. During implementation of Alternative 4, BMPs, conservation measures, and design modifications to avoid and minimize impacts would be employed. Activities would be conducted according to any conditions arising from federal consultations and permitting to avoid and minimize potential collateral injury to natural resources.
Benefits	Under Alternative 4, approximately 1,320 ac of marsh habitat would be created, a lower total acreage compared to Alternative 3. Placement of the shoreline protection marine mattresses would also protect and enhance marsh habitat. Approximately 56 ac of natural ponds would be filled under this Alternative, which is less than Alternative 3. By reducing pond filling, this Alternative minimizes potential disadvantages associated with the loss of existing open-water habitat and reduces the potential for collateral injury to pond-dependent resources. Alternative 4 is expected to benefit multiple natural resources by creating additional habitat for different groups of living coastal and marine resources.
Public Health and Safety	The LA TIG does not anticipate impacts on public health and safety from implementing Alternative 4. The East Orleans Landbridge is uninhabited, remote, and accessible only by boat or air. During construction, all laws and regulations pertaining to worker safety would be followed. Alternative 4 would result in long-term benefits to public health and safety through the restoration of marshes, which can benefit the public's safety by improving water quality and buffering storm surges.

3.5.4. East Orleans Landbridge Restoration Project Preferred Alternative and Summary Rationale

The LA TIG applied the OPA NRDA evaluation standards to the reasonable range of alternatives to identify a Preferred Alternative for the East Orleans Landbridge Restoration Project. Based on the results of this analysis (presented in Sections 3.5.1 through 3.5.3 and summarized in Table 3-4 below) and informed by the NEPA analysis presented in Appendix D, the LA TIG has determined that Alternative 4 (Refined Restoration Template with Pond Avoidance) is the Preferred Alternative for this project.

The LA TIG identified Alternative 4 as the Preferred Alternative over Alternatives 2 and 3 because it best balances marsh restoration and shoreline protection objectives with landowner considerations, constructability constraints, and long-term project sustainability. While other alternatives would restore a greater total acreage of marsh habitat, Alternative 4 was determined to be the most practicable and implementable alternative within the project area.

During project development, landowner coordination played a significant role in refining the reasonable range of alternatives. Input from landowners indicated that certain interior areas of the East Orleans Landbridge are actively managed and provide important recreational and land-use functions, including

existing waterfowl habitat. As a result, larger-scale marsh creation configurations that would substantially alter interior portions of the landbridge were determined to be infeasible from an implementation standpoint.

Alternative 4 was configured to avoid these managed areas while still targeting locations experiencing the greatest marsh loss and shoreline erosion. By focusing restoration and shoreline protection in areas of highest need, the Preferred Alternative minimizes impacts to existing interior habitats and land uses while maintaining the project's core restoration objectives.

Although Alternative 4 would result in a smaller total area of marsh creation compared to other alternatives (Table 3-4), it concentrates restoration efforts along the most vulnerable shorelines and marsh edges. Shoreline protection features under the Preferred Alternative are limited to areas exhibiting the highest erosion rates, which is expected to improve the effectiveness of these features in stabilizing marsh edges and retaining marsh fill over time. This targeted approach is anticipated to reduce unnecessary disturbance to relatively stable areas of the landbridge while providing focused protection where erosion pressures are greatest.

Table 3-4. Estimated Project Features and Construction Costs for the East Orleans Landbridge Restoration Project Alternatives.

Notes: Alternative 1 represents the No Action Alternative and is not included. Alternatives 2-4 include marsh creation, shoreline protection, and vegetation planting.

ALTERNATIVE	MARSH HABITAT (AC)	SHORELINE PROTECTION (LF)	VEGETATION PLANTING (LF)	CONSTRUCTION COST (TOTAL)	COST (PER AC)
2	2,468	27,544	12,695	$152,580,632	$61,824
3	1,813	15,190	21,947	$109,830,713	$60,580
4	1,320	14,867	19,768	$90,808,462	$68,794

Alternative 4 was also evaluated with consideration of long-term marsh performance over the anticipated 20-year project life. Consistent with CPRA marsh creation design guidelines, optimal marsh conditions for brackish marsh communities are generally associated with an inundation range of approximately 10-65% (CPRA, 2017). Settlement behavior and projected marsh elevations were evaluated using standard CPRA design methodologies to assess post-construction performance through time. Based on these projections, marsh elevations associated with the Preferred Alternative are anticipated to remain within the optimal inundation range from shortly after construction through the project design life, supporting sustained marsh function and habitat value over the long term.

While Alternative 4 does not maximize initial marsh acreage, its more focused footprint and reduced borrow area are expected to improve construction efficiency and reduce potential impacts associated with sediment placement. Due to its reduced restoration footprint, Alternative 4 has the lowest total construction cost among the evaluated alternatives (Table 3-4), while still providing meaningful marsh restoration and targeted shoreline protection in areas of greatest need. When long-term performance, constructability, and landowner constraints are considered together, the Preferred Alternative represents a balanced and implementable restoration approach.

Table 3-5. Summary of OPA NRDA Evaluation of the East Orleans Landbridge Restoration Project Alternatives.

OPA NRDA STANDARDS	EVALUATION SUMMARY
Cost-Effectiveness	With estimated order of magnitude construction costs of approximately $152.6 million for Alternative 2 ($61,824 per acre), $109.8 million for Alternative 3 ($60,580 per acre), and $90.8 million for Alternative 4 ($68,794 per acre), all three alternatives fall within a reasonable cost range for marsh creation projects in coastal Louisiana. Alternative 2 would restore the greatest acreage but at the highest total cost and footprint. Alternative 3 provides the lowest cost per acre while still restoring a substantial marsh area. Alternative 4 has the lowest total project cost but a higher cost per acre due to its smaller footprint; however, its reduced construction footprint and improved implementation feasibility may enhance overall cost-effectiveness when likelihood of success is considered.
Goals and Objectives	All alternatives would advance Trustee goals for the *Wetlands, Coastal, and Nearshore Habitats* restoration type by restoring intertidal marsh elevations, re-establishing native vegetation, and providing habitat for fish, invertebrates, and migratory birds. Alternative 2 maximizes acreage restored; Alternative 3 balances marsh creation with preservation of interior open-water features; and Alternative 4 prioritizes restoration in areas most compatible with existing land uses and long-term marsh sustainability.
Likelihood of Success	All alternatives are technically feasible and rely on established marsh creation methods; however, implementation feasibility varies. Alternative 2 may face challenges due to its larger footprint in actively managed interior areas of the landbridge, which could complicate landowner coordination and access. Alternative 3 reduces some of these concerns through design refinements but may still encounter coordination challenges. Alternative 4 avoids most of the interior managed areas and is supported by settlement analyses indicating marsh elevations are likely to remain within optimal inundation ranges over the 20-year design life, suggesting the highest likelihood of successful implementation among the alternatives.
Avoidance of Collateral Injury	All alternatives would use nearby sediment sources to increase marsh elevations to help prevent future conversion to open water and would incorporate BMPs, conservation measures, and permit-driven conditions to minimize impacts to existing resources. Alternatives differ primarily in the extent of interior pond filling, with Alternative 2 filling the most ponds and Alternative 4 filling the fewest, thereby reducing potential impacts to existing open-water habitat and associated resources.

OPA NRDA STANDARDS	EVALUATION SUMMARY
Benefits	All alternatives would provide substantial ecological benefits by restoring marsh habitat and improving conditions for coastal fish, invertebrates, and bird species. Alternative 2 provides the largest increase in marsh acreage but results in the greatest conversion of existing interior ponds. Alternative 3 provides a balance between marsh creation and preservation of some interior aquatic habitats. Alternative 4 restores a smaller area but targets locations most likely to sustain marsh conditions over time, which may enhance long-term ecological benefits relative to its footprint.
Public Health and Safety	The East Orleans Landbridge is remote and uninhabited, and no adverse public health or safety impacts are anticipated during construction or operation of any alternative. All alternatives would follow applicable safety regulations during construction. Over the long term, restoration of marsh habitats is expected to provide public benefits by improving water quality, supporting fisheries resources, and enhancing storm-surge buffering capacity.

3.6. OPA NRDA Evaluation of the Reasonable Range of Raccoon Island Restoration Project Alternatives

Sections 3.6.1 through 3.6.3 provide an evaluation of each of the alternatives in the reasonable range against the OPA NRDA standards. Section 3.6.4 provides a summary of how these evaluations informed the selection of a Preferred Alternative.

Projected future habitat conditions discussed in this section and Appendix D were informed by numerical modeling conducted to evaluate the relative performance of the Raccoon Island Restoration Project alternatives over a 20-year project life. An integrated coastal process modeling framework was developed using coupled wave, hydrodynamic, sediment transport, and morphodynamic models to simulate island response under future-with-project and future-without-project conditions (Baird-Stantec JV, 2026b). The modeling approach accounted for historical shoreline change, wave climate, water levels, consolidation, subsidence, and storm-driven processes and was calibrated using observed island response to past storm events and long-term erosion trends. Model results were used comparatively to evaluate the relative performance of the alternatives, rather than to predict exact future conditions.

All Raccoon Island restoration alternatives include beach, dune, marsh platform, and marsh mound restoration intended to stabilize the island and restore barrier island habitat. They each incorporate sinuous tidal creek and channel networks designed to maintain hydrologic connectivity and create low-energy aquatic habitat within the marsh platform, which can enhance foraging and refuge opportunities for fishes and invertebrates that rely on marsh-edge and shallow-water environments. The alternatives differ primarily in the inclusion and configuration of BSPS, which influence marsh edge stability, sediment retention, and long-term habitat persistence. In particular, Alternatives 3 and 6 incorporate BSPS that reduce wave energy along the constructed marsh edge, creating areas of reduced wave action and calm waters that promote the establishment of emergent marsh and fledgling loafing. While modeling indicates that both Alternatives 3 and 6 would achieve the objectives of reduced wave energy, there are differences in how the structures themselves would serve as habitat for marine species. These differences in the BSPS are explained below.

Differences among the alternatives are also reflected in modeled habitat extent and distribution over time, which were evaluated using both geomorphic and avian-oriented habitat classification approaches.

An "order of magnitude" construction cost was also considered as part of the evaluation of the reasonable range of alternatives. These high-level cost estimates were used to support comparative evaluation among alternatives and include major construction-related cost components. Costs associated with administration, oversight, and MAM activities were not included in the comparative cost evaluation, as these activities are not expected to differ substantially among alternatives.

3.6.1. Alternative 2

Table 3-6. OPA NRDA Evaluation of Alternative 2.

OPA NRDA STANDARDS	EVALUATION SUMMARY
Cost-Effectiveness	The estimated order of magnitude construction cost for Alternative 2 is $81,500,000 ($203,242 per acre) to place approximately 2.9 million cy of sediment, which is considered reasonable and appropriate on a cost per acre basis.
Goals and Objectives	Overall, Alternative 2 would help advance goals identified by the Trustees for the *Wetlands, Coastal, and Nearshore Habitats* restoration type under the *Restore and Conserve Habitat* goal. This project would include restoring beach, dune, marsh, and marsh mound habitat, and providing habitat for fish, invertebrates, and resident and migratory birds. This project would restore up to 401 ac of barrier island, a habitat type that was injured as a result of the DWH oil spill.
Likelihood of Success	Alternative 2 is likely to succeed because it is technically feasible and utilizes proven and established restoration methods, which have been implemented successfully for other projects in the region. As further evidence of the likelihood of success, model calculations predict that Alternative 2 would lead to sustained gains in habitat acreages. Over a 20-year analysis period, Alternative 2 is expected to retain approximately 350 ac of existing and constructed habitat.
Avoidance of Collateral Injury	During implementation of Alternative 2, BMPs would be employed, and activities would be conducted according to any conditions arising from federal consultations and permitting to avoid and minimize potential collateral injury to natural resources. The island restoration features of Alternative 2 would utilize sediment from Ship Shoal to increase beach, dune, marsh, and marsh mound elevations. This restoration would help reduce the likelihood of future breaching, limit sediment loss from the island platform, and help prevent future conversion to open water and loss of coastal habitats. In areas where fill material is placed, Alternative 2 is expected to impact approximately 131 ac of existing habitat comprising beach (13 ac), dune (5 ac), Gulfside intertidal (23 ac), and marsh (90 ac) Avian Guidance Document (AGD) classification types (Baird-Stantec JV, 2026a). However, impacts on existing habitat would be offset by substantially larger gains in targeted habitat expected for Alternative 2.

OPA NRDA STANDARDS	EVALUATION SUMMARY
Benefits	Alternative 2 would create approximately 99 ac of beach and dune habitat along with approximately 302 ac of marsh habitat, including important bird nesting habitats. Vegetation plantings would also be incorporated to stabilize restored dune and marsh areas and support the establishment of native coastal plant communities. In total, Alternative 2 would construct approximately 401 ac of habitat. In addition, Alternative 2 would include raising the crests of existing Gulfside breakwaters and expansion of the terminal groin to help maintain shoreline protection, reduce wave energy impacts on restored habitats, and support the long-term stability of the restored beach and dune system. This Alternative is expected to benefit multiple natural resources by creating additional habitat for different groups of living coastal and marine resources, as well as bird nesting habitat.
Public Health and Safety	The LA TIG does not anticipate impacts on public health and safety from implementing Alternative 2. Raccoon Island is uninhabited, remote, and accessible only by boat or air. During construction, all laws and regulations pertaining to worker safety would be followed. Alternative 2 would result in long-term benefits to public health and safety through the restoration of the island footprint and barrier island protection for the mainland.

3.6.2. Alternative 3

Table 3-7. OPA NRDA Evaluation of Alternative 3.

OPA NRDA STANDARDS	EVALUATION SUMMARY
Cost-Effectiveness	The estimated order of magnitude construction cost for Alternative 3 is $102,900,000 ($250,976 per acre) to place approximately 2.9 million cy of sediment, which is considered reasonable and appropriate on a cost per acre basis but represents a higher cost per acre compared to Alternative 2.
Goals and Objectives	Overall, Alternative 3 would help advance goals identified by the Trustees for the *Wetlands, Coastal, and Nearshore Habitats* restoration type under the *Restore and Conserve Habitat* goal. This project would include restoring beach, dune, marsh, and marsh mound habitat, and providing habitat for fish, invertebrates, and resident and migratory birds. This project would restore up to 410 ac of barrier island, a habitat type that was injured as a result of the DWH oil spill.
Likelihood of Success	Alternative 3 is likely to succeed because it is technically feasible and utilizes proven and established restoration methods, which have been implemented successfully for other projects in the region. As further evidence of the likelihood of success, model calculations predict that Alternative 3 would lead to sustained gains in habitat acreages. Over a 20-year analysis period, Alternative 3 is expected to retain approximately 364 ac of existing and constructed habitat.

OPA NRDA STANDARDS	EVALUATION SUMMARY
Avoidance of Collateral Injury	During implementation of Alternative 3, BMPs would be employed, and activities would be conducted according to any conditions arising from federal consultations and permitting to avoid and minimize potential collateral injury to natural resources. The island restoration features of Alternative 3 would utilize sediment from Ship Shoal to increase beach, dune, marsh, and marsh mound elevations. This restoration would help reduce the likelihood of future breaching, limit sediment loss from the island platform, and help prevent future conversion to open water and loss of coastal habitats. In areas where fill material is placed, Alternative 3 is expected to impact approximately 131 ac of existing habitat comprising beach (13 ac), dune (5 ac), Gulfside intertidal (23 ac), and marsh (90 ac) AGD classification types (Baird-Stantec JV, 2026c). However, impacts on existing habitat would be offset by substantially larger gains in targeted habitat expected for Alternative 3.
Benefits	Alternative 3 would create approximately 102 ac of beach and dune habitat along with approximately 308 ac of marsh habitat, including important bird nesting habitats. Vegetation plantings would also be incorporated to stabilize restored dune and marsh areas and support the establishment of native coastal plant communities. In total, Alternative 3 would construct approximately 410 ac of habitat. Alternative 3 would include raising the crests of existing Gulfside breakwaters and expansion of the terminal groin to help maintain shoreline protection, reduce wave energy impacts on restored beach and dune habitats, and support the long-term stability of the restored island shoreline. In addition, Alternative 3 includes nine BSPS designed as rubble-mound living shoreline features and four traditional breakwaters totaling approximately 5,240 LF. Together, these structures would attenuate wave energy along the bayside shoreline, reducing erosion pressures on restored marsh edge and allowing the establishment of emergent marsh edge habitat, an important nursery and forage habitat for coastal fish and shellfish. This would also create an area of calm waters where fledgling birds could loaf. The rubble-mound living shoreline features would provide intertidal reefs, suited for settlement by oysters and other encrusting organisms. In addition to structural habitat for reef organisms, these reefs would provide a source of forage for animals utilizing the created marsh-reef habitat complex. Estuarine habitats that include a mosaic of reef and marsh edge habitats are thought to yield higher fisheries productivity. This Alternative is expected to benefit multiple natural resources by creating additional habitat for different groups of living coastal and marine resources, as well as 410 ac of bird habitat.
Public Health and Safety	The LA TIG does not anticipate impacts on public health and safety from implementing Alternative 3. Raccoon Island is uninhabited, remote, and accessible only by boat or air. During construction, all laws and regulations pertaining to worker safety would be followed. Alternative 3 would result in long-term benefits to public health and safety through the restoration and expansion of the island footprint and barrier island protection for the mainland.

3.6.3. Alternative 6

Table 3-8. OPA NRDA Evaluation of Alternative 6.

OPA NRDA STANDARDS	EVALUATION SUMMARY
Cost-Effectiveness	The estimated order of magnitude construction cost for Alternative 6 is $115,700,000 ($280,825 per acre) to place approximately 2.9 million cy of sediment, which is considered reasonable and appropriate on a cost per acre basis, but represents a higher cost per acre than Alternatives 2 and 3.
Goals and Objectives	Overall, Alternative 6 would help advance goals identified by the Trustees for the *Wetlands, Coastal, and Nearshore Habitats* restoration type under the *Restore and Conserve Habitat* goal. This project would include restoring beach, dune, marsh, and marsh mound habitat, and providing habitat for fish, invertebrates, and resident and migratory birds. This project would restore up to 412 ac of barrier island, a habitat type that was injured as a result of the DWH oil spill.
Likelihood of Success	Alternative 6 is likely to succeed because it is technically feasible and utilizes proven and established restoration methods, which have been implemented successfully for other projects in the region. As further evidence of the likelihood of success, model calculations predict that Alternative 6 would lead to sustained gains in habitat acreages. Over a 20-year analysis period, Alternative 6 is expected to retain approximately 369 ac of existing and constructed habitat.
Avoidance of Collateral Injury	During implementation of Alternative 6, BMPs would be employed, and activities would be conducted according to any conditions arising from federal consultations and permitting to avoid and minimize potential collateral injury to natural resources. The island restoration features of Alternative 6 would utilize sediment from Ship Shoal to increase beach, dune, marsh, and marsh mound elevations. This restoration would help reduce the likelihood of future breaching, limit sediment loss from the island platform, and help prevent future conversion to open water and loss of bird nesting habitat. In areas where fill material is placed, Alternative 6 is expected to impact approximately 131 ac of existing habitat comprising beach (13 ac), dune (5 ac), Gulfside intertidal (23 ac), and marsh (90 ac) AGD classification types (Baird-Stantec JV, 2026a). However, impacts on existing habitat would be offset by substantially larger gains in targeted habitat expected for Alternative 6.

OPA NRDA STANDARDS	EVALUATION SUMMARY
Benefits	Alternative 6 would create approximately 102 ac of beach and dune habitat along with approximately 310 ac of marsh habitat, including important bird nesting habitats. Vegetation plantings would also be incorporated to stabilize restored dune and marsh areas and support the establishment of native coastal plant communities. In total, Alternative 6 would construct approximately 412 ac of habitat. Alternative 6 would include raising the crests of existing Gulfside breakwaters and expansion of the terminal groin to help maintain shoreline protection, reduce wave energy impacts on restored beach and dune habitats, and support the long-term stability of the restored island shoreline. In addition, Alternative 6 includes 17 BSPS designed as traditional segmented breakwaters totaling approximately 6,590 LF. These structures are intended to attenuate wave energy and reduce erosion along restored marsh edge, allowing the establishment of emergent marsh edge habitat, which is an important nursery and forage habitat for coastal fish and shellfish. This would also create an area of calm waters where fledgling birds could loaf. This Alternative is expected to benefit multiple natural resources by creating additional habitat for different groups of living coastal and marine resources, including approximately 412 ac of bird nesting habitat.
Public Health and Safety	The LA TIG does not anticipate impacts on public health and safety from implementing Alternative 6. Raccoon Island is uninhabited, remote, and accessible only by boat or air. During construction, all laws and regulations pertaining to worker safety would be followed. Alternative 6 would result in long-term benefits to public health and safety through the restoration and expansion of the island footprint and barrier island protection for the mainland.

3.6.4. Raccoon Island Restoration Project Preferred Alternative and Summary Rationale

The LA TIG applied the OPA NRDA evaluation standards to the reasonable range of alternatives to identify a Preferred Alternative for the Raccoon Island Restoration Project. Based on the results of this analysis (presented in Sections 3.6.1 through 3.6.3 and summarized in Table 3-9 below) and informed by the NEPA analysis presented in Appendix D, the LA TIG has determined that Alternative 3 is the Preferred Alternative.

The LA TIG identified Alternative 3 as preferred over Alternatives 2 and 6 because it best balances habitat restoration benefits, shoreline protection function, project resiliency, and cost-effectiveness, while supporting the long-term sustainability of restored habitat on Raccoon Island.

All evaluated alternatives would restore similar total acreages of beach/dune and mound/marsh habitat at initial construction (Table 3-9). Alternative 3 would construct approximately 410 ac of total habitat, compared to 401 ac under Alternative 2 and 412 ac under Alternative 6. While these differences in initial constructed habitat are minor, the alternatives differ more substantially in the type and extent of shoreline protection features incorporated into their designs.

Unlike Alternative 2, which does not include BSPS, Alternative 3 includes bayside breakwaters designed with rubble-mound living shoreline and traditional breakwater features. Modeling indicates the structures would attenuate wave energy along the bayside shoreline and reduce erosion pressures, allowing the establishment of an emergent marsh edge. Emergent marsh edge is known to be highly important habitat for fish and shellfish nursery and forage. Moreover, these BSPS would provide an area of calm waters that would serve

as loafing habitat for fledgling birds born in the nearby nesting habitats. In contrast to Alternative 6, Alternative 3 includes fewer structures and a shorter total length of BSPS. Alternative 3 also incorporates nine rubble mound living shoreline structures, whereas only traditional segmented breakwaters are proposed in Alternative 6 (Table 3-9). The incorporation of rubble-mound living shoreline breakwaters under Alternative 3 was determined to provide intertidal and subtidal reef habitat that would be suited for settlement by oysters and other encrusting, reef building organisms. These reefs would provide structural habitats for young reef associated species, including spotted seatrout (*Cynoscion nebulosus*), gray snapper (*Lutjanus griseus*), lane snapper (*Lutjanus synagris*), and stone crabs (*Menippe adina*) while also providing an area for forage for organisms that utilize the constructed marsh habitat. The reefs and constructed habitats would provide a habitat mosaic that is thought to increase fisheries and ecosystem productivity. This habitat mosaic is well-aligned with the *Wetlands, Coastal, and Nearshore Habitats* restoration type under the *Restore and Conserve Habitat* goal, which calls for the restoration of complexes of different habitats to maintain ecosystem diversity and maximize ecological function.

Table 3-9. Estimated Project Features and Construction Costs for the Raccoon Island Restoration Project Alternatives.

Notes: Alternative 1 represents the No Action Alternative and is not included. Alternatives 2, 3, and 6 include AGD habitat classification results. In addition to variation in number and total length of BSPS segments, construction material varies between Alternative 3 and 6.

ALTERNATIVE	BEACH/ DUNE/ GULFSIDE INTERTIDAL HABITAT (AC)	MOUND/ MARSH HABITAT (AC)	TOTAL HABITAT (AC)	NUMBER OF BSPS (TOTAL LF)	CONSTRUCTION COST (TOTAL)	CONSTRUCTION COST (PER AC)
2	99	302	401	0 (0)	$81,500,00	$203,242
3	102	308	410	13 (5,240)	$102,900,000	$250,976
6	102	310	412	17 (6590)	$115,700,000	$280,825

Over the 20-year analysis period, all alternatives are projected to retain a high percentage of restored habitat. AGD bird nesting habitat retention is estimated at approximately 87% under Alternative 2, 88% under Alternative 3, and 90% under Alternative 6 (Table 3-10). Given the relatively small differences in projected long-term habitat retention among the alternatives, these results indicate that each alternative would provide sustained avian habitat benefits through time.

Table 3-10. AGD Habitat (Existing and Constructed) Retained on Raccoon Island Over Time.

ALTERNATIVE	TARGET YEAR-1 TOTAL AGD HABITAT (AC)	TARGET YEAR-20 TOTAL AGD HABITAT (AC)	HABITAT AREA RETAINED (%)
2	401	350	87%
3	410	364	89%
6	412	369	90%

While Alternative 6 shows a slightly higher projected habitat retention percentage at year 20 compared to Alternatives 2 and 3, these incremental gains are achieved at substantially greater construction cost. Alternative 6 represents the highest-cost option evaluated, with an estimated total cost of approximately $115.7 million, compared to approximately $102.9 million for Alternative 3 and $81.5 million for Alternative 2 (Table 3-9). When considered alongside the relatively similar long-term habitat outcomes, the additional cost associated with Alternative 6 was not determined to result in a commensurate increase in ecological benefit. Relative to Alternative 3, there is a decrease in ecological benefits because the Alternative 6 BSPS are not optimized to create reef habitat.

Alternative 3 was therefore identified as the Preferred Alternative because it provides enhanced shoreline protection relative to Alternative 2 through the inclusion of bayside breakwaters and creates reef habitat, while avoiding the higher costs and more traditional structural approach associated with Alternative 6. By incorporating rubble-mound living shoreline features, Alternative 3 is expected to improve island resiliency, increase ecosystem productivity, support retention of restored bird nesting habitat, and contribute to the long-term stability of Raccoon Island in a cost-effective and ecologically beneficial manner.

Table 3-11. Summary of OPA NRDA Evaluation of Raccoon Island Restoration Project Alternatives.

OPA NRDA STANDARDS	EVALUATION SUMMARY
Cost-Effectiveness	With estimated order of magnitude construction costs of approximately $81.5 million for Alternative 2 ($203,242 per acre), $102.9 million for Alternative 3 ($250,976 per acre), and $115.7 million for Alternative 6 ($280,825 per acre), all alternatives fall within a reasonable cost range for barrier island restoration in coastal Louisiana. Alternative 2 provides the lowest total cost and lowest cost per acre but lacks BSPS that improve long-term shoreline stability. Alternative 3 has a higher cost per acre but incorporates living shoreline structures that enhance ecological function and project resiliency. Alternative 6 has the highest total and per-acre cost due to the greater extent of shoreline protection structures, though it provides similar habitat outcomes to Alternative 3. When both habitat function and long-term performance are considered, Alternative 3 represents a balanced and cost-effective approach.
Goals and Objectives	All alternatives would advance Trustee goals for the *Wetlands, Coastal, and Nearshore Habitats* restoration type by restoring beach, dune, marsh, and marsh mound habitat, improving island stability, and providing habitat for fish, invertebrates, and resident and migratory birds. Alternatives differ primarily in the type and extent of bayside shoreline protection incorporated. Alternative 2 focuses on habitat construction without additional bayside protection; Alternative 3 integrates living shoreline and breakwater features to improve habitat complexity and shoreline resilience; and Alternative 6 relies on more extensive traditional breakwaters to provide shoreline protection.

OPA NRDA STANDARDS	EVALUATION SUMMARY
Likelihood of Success	All alternatives are technically feasible and rely on proven barrier island restoration methods. Modeling results indicate that each alternative would retain a high percentage of restored habitat over the 20-year analysis period; however, alternatives differ in their ability to support long-term shoreline stability and ecological function. Alternative 2 lacks bayside shoreline protection and may be more susceptible to marsh-edge erosion. Alternatives 3 and 6 include shoreline protection features that reduce wave energy and improve marsh edge persistence. Alternative 3 combines shoreline protection with living shoreline elements that provide additional ecological benefits while maintaining moderate structural complexity, indicating a strong likelihood of successful implementation and long-term habitat performance.
Avoidance of Collateral Injury	All alternatives would employ BMPs, conservation measures, and permit conditions to minimize potential impacts to existing natural resources. Placement of fill would temporarily affect existing habitat types, but impacts are expected to be offset by substantial gains in restored barrier island habitat. Elevation increases associated with restoration features are expected to reduce breaching risk, limit sediment loss, and help prevent long-term conversion of island habitat to open water. Differences among alternatives relate primarily to shoreline protection configuration rather than direct collateral impacts.
Benefits	All alternatives would restore more than 400 ac of barrier island habitat with associated vegetation plantings to support dune stabilization and marsh establishment and provide important nesting, foraging, and refuge habitat for coastal birds, fishes, and invertebrates. All alternatives would also include raising the crests of existing Gulfside breakwaters and expansion of the terminal groin to help maintain shoreline protection, reduce wave energy impacts on restored beach and dune habitats, and support the long-term stability of the island shoreline. Alternatives 3 and 6 would provide additional benefits by incorporating BSPS that attenuate wave energy, promote marsh edge stability, and create areas of calm water that support bird loafing and juvenile fish habitat. Alternative 3 uniquely includes rubble-mound living shoreline features that create intertidal reef habitat suitable for oysters and other reef organisms, producing a marsh-reef habitat mosaic associated with higher fisheries productivity and ecosystem function. These additional ecological benefits distinguish Alternative 3 from Alternatives 2 and 6.
Public Health and Safety	Raccoon Island is remote and uninhabited, and no adverse public health or safety impacts are anticipated during construction or operation of any alternative. All alternatives would follow applicable safety regulations during construction. Over the long term, restoration of the barrier island under any alternative would enhance its persistence and buffering capacity, helping reduce wave energy and storm impacts in adjacent waters and providing regional public safety benefits.

4. NEPA Analysis

4.1. Overview of NEPA Approach

The NEPA analysis presented in this document comparatively evaluates the environmental effects of the alternatives under consideration, including effects on physical, biological, and socioeconomic resources. This integrated OPA/NEPA document is being prepared under NEPA as amended. The NEPA conclusions presented herein are informed by the NEPA Supporting Documentation Report in Appendix D.

The NEPA analysis describes anticipated adverse and beneficial impacts of the preferred and non-preferred alternatives. Together, these constitute the reasonable range of alternatives for this RP/EA #8.1. A No Action Alternative relative to each project is also analyzed. See Section 2.3 for full details on each alternative. The NEPA Supporting Documentation Report provided in Appendix D is consistent with the Final PDARP/PEIS, which is incorporated by reference, and tiers where applicable. Appendix D is organized by (D.2) analyzing physical, biological, and socioeconomic resources for impacts across all alternatives, (D.3) presenting a summary of the environmental consequences of each of the alternatives, and (D.4) consideration of reasonably foreseeable environmental impacts.

The NEPA Supporting Documentation Report provided in Appendix D and the conclusions provided in this chapter address direct, indirect, and reasonably foreseeable environmental effects[11]. For purposes of this document, impacts are assessed in accordance with the approach taken in Chapter 6 of the Final PDARP/PEIS. In this document, the terms "impacts," "effects," and "consequences" are used interchangeably. Direct impacts are caused by the action and occur at the same time and place as the action. Indirect impacts are caused by the action and occur later in time or farther removed in distance, but are still reasonably foreseeable.

The guidelines for NEPA impact determinations in Table 6.3.2 of the Final PDARP/PEIS, as described below and in more detail in Appendix C, were used to assess the magnitude of impacts. 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 (for example, local, statewide) and their duration (for example, whether they are short-term or long-term impacts). An impact lasting for a finite period and of short duration relative to the proposed restoration project and the environmental resource is considered short term. In general, the impacts of construction and associated activities undertaken to implement a restoration project are expected to be short term, and the impacts that persist beyond construction are expected to be

[11] The analysis herein tiers from the programmatic PDARP/PEIS and the structure of analysis is consistent with Section 102 of NEPA (requiring environmental documents to include discussion of reasonably foreseeable environmental effects). The analysis included in Draft RP/EA 8.1 acknowledges NOAA's recent NEPA guidance regarding consideration of effects. This guidance recommends the following criteria be considered in the effects analysis as appropriate to the specific action:
(1) Both short- and long-term effects
(2) Both beneficial and adverse effects
(3) Effects on public health and safety
(4) Economic effects
(5) Effects on the quality of life of the American people

long term. However, these can be defined differently depending on the resource being analyzed, as detailed in Appendix C.

Intensity refers to the severity of an impact and could include the timing of the action (for example, more intense impacts would occur during wildlife breeding/rearing). Intensity is also described in terms of whether the impact would be beneficial or adverse. Impacts are characterized as minor, moderate, or major, and short term or long term and are generally defined as follows:

- Minor: Minor impacts are generally those that might be detectable but, in their context, may nonetheless not be measurable because any changes they cause are so slight as to be impossible to define.
- Moderate: Moderate impacts are those that are more detectable and, typically, more quantifiable or measurable than minor impacts.
- Major: Major impacts are those that, in their context and due to their severity, have the potential to meet the thresholds for significance set forth in Table 6.3.2 of the Final PDARP/PEIS and, thus, warrant heightened attention and examination for potential benefit of mitigation.

A beneficial impact is one that creates a positive outcome in the manmade or natural environment. Because restoration conducted is intended to result in significant, major benefits to injured resources, evaluation of the intensity of the benefits to resource categories is not described. For resource areas where there is no expected effect from project activities, a "no impact" conclusion is made. "Adverse" is used in this document only to describe the federal Trustees' evaluation under NEPA. That term is defined and applied differently in consultations conducted pursuant to the Endangered Species Act (ESA) and other protected resource statutes. Accordingly, in the protected resources sections, there may be adverse impacts identified under NEPA; however, this does not necessarily mean that an action would be likely to "adversely affect" the same species because that term is defined and applied under protected resources statutes.

4.2. Consistency with the Final PDARP/PEIS

The NEPA analysis in this RP/EA #8.1 tiers from the Final PDARP/PEIS, where applicable. To ensure compliance with NEPA (42 U.S.C. § 4336b) in the preparation of this RP/EA #8.1, the DWH Federal Trustees reevaluated the Final PDARP/PEIS analysis and its underlying assumptions and confirm its continued validity. Specifically, the federal Trustees compared their assessment of each project's anticipated impacts on each resource analyzed with the impact intensity definitions (short- or long-term, minor, moderate, or major) found in Table 6.3-2 of the Final PDARP/PEIS (and in this RP/EA #8.1 as Appendix C), the impacts that the Final PDARP/PEIS forecasted for preliminary phases of restoration planning (Section 6.4.14, DWH Trustees, 2016), and the restoration approaches and techniques to protect and conserve WCNH (Section 6.4.1, DWH Trustees 2016) proposed in this RP/EA #8.1 (for example, creating and restoring marshes, barrier islands, and beaches, aquatic habitat, nesting and foraging habitat).

The DWH Trustees for the LA TIG find that the resource impacts as forecasted in the Final PDARP/PEIS are consistent with the impacts anticipated from the projects analyzed in this RP/EA #8.1, and thus, the LA TIG affirms the applicability of the Final PDARP/PEIS' NEPA analysis to this RP/EA #8.1. Additional analyses regarding the specific activities proposed in this RP/EA #8.1 are below and in the NEPA Supporting Documentation Report (see Appendix D).

The Final PDARP/PEIS found that the Restoration Approaches relevant to the projects proposed in this RP/EA #8.1 would be likely to cause the following environmental consequences:

4.2.1. Physical Resources

Depending on the project type, there could be short-term, minor to major, adverse impacts and long-term benefits to geology, substrates, hydrology, water quality, air quality, and noise during project implementation. Short-term, minor impacts on geology and substrates along with hydrology and water quality may occur as a result of construction. However, many short-term, adverse impacts would be prevented or minimized by implementing BMPs. Long-term, minor, adverse impacts on existing substrates could occur as dredged material is placed, but there would also be long-term benefits to geology and substrates from the increased storm resilience.

4.2.2. Biological Resources

Depending on the techniques implemented, short-term, minor to moderate, adverse impacts and long-term benefits to biological resources may be anticipated during project implementation. For example, long-term moderate, adverse impacts may occur due to final placement of sediment in the footprint where existing habitats would be covered by additional sediment. However, these effects would be localized and offset by long-term benefits associated with restoration of coastal habitats. Restoration of marsh, beach, dune, and barrier island habitats would increase the availability and sustainability of habitat for coastal fish, invertebrates, birds, and other wildlife, and would improve ecological function by stabilizing shorelines and supporting habitat connectivity within the coastal landscape.

4.2.3. Socioeconomic Resources

Project activities could result in minor, short-term, adverse economic impacts and long-term economic benefits related to restoration efforts. For example, adverse impacts on tourism and recreation resulting from reduced fishing opportunities in the vicinity of construction would be expected to be short-term and minor to moderate. Over the long term, these projects could provide wildlife enthusiasts with increased wildlife viewing opportunities. Long-term benefits for the public are anticipated as a result of these restoration approaches. Construction activities could also result in temporary access restrictions or localized navigation limitations associated with vessel traffic and work zones during dredging and sediment placement; however, these conditions would be short-term and managed through coordination, safety notifications, and marked work areas.

4.3. Summary of Environmental Consequences for the Restoration Plan Alternatives

4.3.1. East Orleans Landbridge Restoration Alternatives

The detailed analysis of environmental consequences for each East Orleans Landbridge Restoration Alternative in this RP/EA #8.1 is presented in the NEPA Supporting Documentation Report in Appendix D. Table 4-1 below summarizes the direct and indirect impacts of each restoration alternative and the No Action Alternative. Overall, the environmental analysis demonstrates that implementation of the restoration alternatives would result primarily in short-term, minor to moderate impacts during construction, with some localized, long-term, moderate, adverse impacts where sediment is placed. The project would also have substantial long-term environmental benefits associated with restoration of marsh habitat and improved landbridge stability.

In general, implementation of the restoration alternatives would result in short-term, minor to moderate, adverse impacts on physical resources during construction. These impacts would include temporary disturbances to geology and substrates from dredging and fill placement, localized increases in turbidity and suspended sediments affecting hydrology and water quality, and temporary increases in air emissions and noise associated with construction equipment and vessel activity. Some localized and long-term, minor changes to physical resources would occur due to permanent placement of restoration materials and alterations to existing marsh elevations and hydrologic patterns. However, all alternatives would provide long-term, beneficial effects on physical resources by improving marsh elevation and persistence, reducing erosion, supporting sediment retention, and enhancing the stability and resilience of the East Orleans Landbridge.

Biological resources would experience short-term, minor to moderate, adverse impacts during construction resulting from temporary disturbance to marsh and open-water habitats, vegetation, and substrates; displacement or avoidance behavior by birds and other wildlife; and disturbance to aquatic fauna due to turbidity, noise, and vessel activity. Some localized, long-term changes to habitat composition would occur where marsh creation converts existing shallow-water areas to emergent marsh habitat; however, the alternatives would provide substantial, long-term benefits to biological resources through increases in marsh extent and elevation, improved habitat quality and connectivity, enhanced shoreline stability, and reduced susceptibility to future habitat loss. These benefits would improve habitat availability and resilience for fish, invertebrates, birds, and other wildlife using the landbridge and adjacent waters.

Socioeconomic, recreational, and visual resources would experience primarily short-term, minor, adverse impacts during construction due to temporary vessel activity, access limitations, and construction presence. Following construction, all alternatives would provide long-term, beneficial effects by improving marsh habitat that supports fisheries productivity, enhancing wildlife resources, and contributing to the maintenance of the landbridge's ecological and protective functions. Restoration of the landbridge would also contribute to regional coastal resilience and resource management objectives, supporting both ecological and community benefits.

Adverse impacts associated with implementation of the alternatives would be minimized through the use of BMPs, avoidance and minimization measures, and other mitigation developed during permitting, consultation, and environmental review processes. These measures include protected species construction conditions, spill prevention measures, and coordination with resource agencies. See Table 5-1 in section 5.4 for the environmental compliance status of each alternative.

Table 4-1. Summary of the Direct and Indirect Impacts of the Reasonable Range of East Orleans Landbridge Restoration Project Alternatives.

RESOURCE	ALTERNATIVE 1 (NO ACTION)	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 4 (PREFERRED ALTERNATIVE)
Geology and Substrates	Long-term, major, adverse impacts from continued erosion, land loss, and inundation.	Short-term and long-term, minor to moderate, adverse impacts from localized soil disturbances during and after construction. Long-term, beneficial impacts from restoration of the marsh footprint, higher elevation, and reduced erosion.	Short-term and long-term, minor to moderate, adverse impacts from localized soil disturbances during and after construction. Long-term, beneficial impacts from restoration of the marsh footprint, higher elevation, and reduced erosion.	Short-term and long-term, minor to moderate, adverse impacts from localized soil disturbances during and after construction. Long-term, beneficial impacts from restoration of the marsh footprint, higher elevation, and reduced erosion.
Hydrology and Water Quality	Long-term, moderate, adverse impacts from continued land loss, inundation, and increased salinities.	Short-term, minor to moderate, adverse impacts from increases in suspended sediment and turbidity and changes in dissolved oxygen, nutrients, temperature, and salinity during construction. Long-term, beneficial impacts from reduced erosion, reduced turbidity, growth of filter feeders, and increased marsh longevity after restoration implementation.	Short-term, minor to moderate, adverse impacts from increases in suspended sediment and turbidity and changes in dissolved oxygen, nutrients, temperature, and salinity during construction. Long-term, beneficial impacts from reduced erosion, reduced turbidity, growth of filter feeders, and increased marsh longevity after restoration implementation.	Short-term, minor to moderate, adverse impacts from increases in suspended sediment and turbidity and changes in dissolved oxygen, nutrients, temperature, and salinity during construction. Long-term, beneficial impacts from reduced erosion, reduced turbidity, growth of filter feeders, and increased marsh longevity after restoration implementation.

RESOURCE	ALTERNATIVE 1 (NO ACTION)	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 4 (PREFERRED ALTERNATIVE)
Air Quality	No effect from No Action	Short-term, minor, adverse impacts from equipment dust and exhaust and combustion emissions during construction. Long-term, beneficial impacts from an increase in marsh vegetation after restoration implementation.	Short-term, minor, adverse impacts from equipment dust and exhaust and combustion emissions during construction. Long-term, beneficial impacts from an increase in marsh vegetation after restoration implementation.	Short-term, minor, adverse impacts from equipment dust and exhaust and combustion emissions during construction. Long-term, beneficial impacts from an increase in marsh vegetation after restoration implementation.
Noise	No effect from No Action	Short-term, minor, adverse impacts from operation of vessels, equipment, and earthwork activities during construction. No effect after restoration implementation.	Short-term, minor, adverse impacts from operation of vessels, equipment, and earthwork activities during construction. No effect after restoration implementation.	Short-term, minor, adverse impacts from operation of vessels, equipment, and earthwork activities during construction. No effect after restoration implementation.
Habitats	Long-term, major, adverse impacts from continued land and habitat loss.	Short-term and long-term, minor to moderate, adverse impacts from vegetation and habitat disturbance during and after construction. Long-term, beneficial impacts from the increase in total marsh habitat and reduction in susceptibility to habitat loss after restoration implementation.	Short-term and long-term, minor to moderate, adverse impacts from vegetation and habitat disturbance during and after construction. Long-term, beneficial impacts from the increase in total marsh habitat and reduction in susceptibility to habitat loss after restoration implementation.	Short-term and long-term, minor to moderate, adverse impacts from vegetation and habitat disturbance during and after construction. Long-term, beneficial impacts from the increase in total marsh habitat and reduction in susceptibility to habitat loss after restoration implementation.

RESOURCE	ALTERNATIVE 1 (NO ACTION)	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 4 (PREFERRED ALTERNATIVE)
Wildlife Species	Long-term, moderate to major, adverse impacts from continued coastal processes, shoreline change, and erosion contributing to habitat loss over time.	Short-term, moderate, adverse impacts from displacement and disturbance due to habitat disturbance, noise, lighting, workers, and equipment during construction. Long-term, beneficial impacts from increase in available habitat for nesting, foraging, and loafing after restoration implementation.	Short-term, moderate, adverse impacts from displacement and disturbance due to habitat disturbance, noise, lighting, workers, and equipment during construction. Long-term, beneficial impacts from increase in available habitat for nesting, foraging, and loafing after restoration implementation.	Short-term, moderate, adverse impacts from displacement and disturbance due to habitat disturbance, noise, lighting, workers, and equipment during construction. Long-term, beneficial impacts from increase in available habitat for nesting, foraging, and loafing after restoration implementation.
Marine and Estuarine Aquatic Fauna, Essential Fish Habitat, and Managed Fish Species	Long-term, major, adverse impacts from continued coastal processes, shoreline change, and erosion contributing to habitat loss over time.	Short-term to long-term, minor to moderate, adverse impacts from displacement and disturbance due to habitat disturbance, noise, vessels, and equipment, and changes in water quality during and after construction. Long-term, beneficial impacts from increase in available high-quality aquatic habitat and increase in marsh longevity after restoration implementation.	Short-term to long-term, minor to moderate, adverse impacts from displacement and disturbance due to habitat disturbance, noise, vessels, and equipment, and changes in water quality during and after construction. Long-term, beneficial impacts from increase in available high-quality aquatic habitat and increase in marsh longevity after restoration implementation.	Short-term to long-term, minor to moderate, adverse impacts from displacement and disturbance due to habitat disturbance, noise, vessels, and equipment, and changes in water quality during and after construction. Long-term, beneficial impacts from increase in available high-quality aquatic habitat and increase in marsh longevity after restoration implementation.

RESOURCE	ALTERNATIVE 1 (NO ACTION)	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 4 (PREFERRED ALTERNATIVE)
Protected Species (Threatened and Endangered)	Long-term, major, adverse impacts from continued coastal processes, shoreline change, and erosion contributing to habitat loss over time.	Short-term to long-term, minor, adverse impacts from displacement and disturbance due to habitat disturbance, noise, vessels, and equipment during and after construction. Long-term, beneficial impacts from increase in available high-quality habitat and increase in marsh longevity after restoration implementation.	Short-term to long-term, minor, adverse impacts from displacement and disturbance due to habitat disturbance, noise, vessels, and equipment during and after construction. Long-term, beneficial impacts from increase in available high-quality habitat and increase in marsh longevity after restoration implementation.	Short-term to long-term, minor, adverse impacts from displacement and disturbance due to habitat disturbance, noise, vessels, and equipment during and after construction. Long-term, beneficial impacts from increase in available high-quality habitat and increase in marsh longevity after restoration implementation.
Protected Species (Marine Mammals)	Long-term, minor to moderate, adverse impacts from continued coastal processes, shoreline change, and erosion contributing to habitat loss over time and less high-quality foraging habitat.	Short-term to long-term, minor, adverse impacts from disturbance due to noise, workers, vessels, and equipment and entrapment during and after construction. Long-term, beneficial impacts from increase in available high-quality habitat and increase in marsh longevity after restoration implementation.	Short-term to long-term, minor, adverse impacts from disturbance due to noise, workers, vessels, and equipment and entrapment during and after construction. Long-term, beneficial impacts from increase in available high-quality habitat and increase in marsh longevity after restoration implementation.	Short-term to long-term, minor, adverse impacts from disturbance due to noise, workers, vessels, and equipment and entrapment during and after construction. Long-term, beneficial impacts from increase in available high-quality habitat and increase in marsh longevity after restoration implementation.

RESOURCE	ALTERNATIVE 1 (NO ACTION)	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 4 (PREFERRED ALTERNATIVE)
Socioeconomics	Long-term, minor, adverse impacts from continued degradation and loss of natural resources.	Short-term, beneficial impacts from construction spending and workforce hiring during construction. Long-term, beneficial impacts from increased recreational and commercial activity and buffering of coastal communities from flooding after restoration implementation.	Short-term, beneficial impacts from construction spending and workforce hiring during construction. Long-term, beneficial impacts from increased recreational and commercial activity and buffering of coastal communities from flooding after restoration implementation.	Short-term, beneficial impacts from construction spending and workforce hiring during construction. Long-term, beneficial impacts from increased recreational and commercial activity and buffering of coastal communities from flooding after restoration implementation.
Cultural Resources	No effect from No Action	No effect due to no cultural resources in the area.	No effect due to no cultural resources in the area.	No effect due to no cultural resources in the area.
Infrastructure	No effect from No Action	No effect on infrastructure in the area during construction.	No effect on infrastructure in the area during construction.	No effect on infrastructure in the area during construction.
Land and Marine Management	No effect from No Action	Short-term, minor, adverse impacts from temporary restricted access during construction. Long-term beneficial impacts by meeting Coastal Zone Management Program (CZMP) goals and objectives of conservation of natural resources and erosion control.	Short-term, minor, adverse impacts from temporary restricted access during construction. Long-term beneficial impacts by meeting CZMP goals and objectives of conservation of natural resources and erosion control.	Short-term, minor, adverse impacts from temporary restricted access during construction. Long-term beneficial impacts by meeting CZMP goals and objectives of conservation of natural resources and erosion control

RESOURCE	ALTERNATIVE 1 (NO ACTION)	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 4 (PREFERRED ALTERNATIVE)
Tourism and Recreational Use	Long-term, minor, adverse impacts from continued habitat degradation and loss.	Short-term, minor, adverse impacts from the presence of construction equipment and personnel, temporary disturbance of fish and wildlife habitat, and the increase in vessel traffic during construction. Long-term, beneficial impacts from improved habitat for fish and wildlife species and stabilization of the marsh after restoration implementation.	Short-term, minor, adverse impacts from the presence of construction equipment and personnel, temporary disturbance of fish and wildlife habitat, and the increase in vessel traffic during construction. Long-term, beneficial impacts from improved habitat for fish and wildlife species and stabilization of the marsh after restoration implementation.	Short-term, minor, adverse impacts from the presence of construction equipment and personnel, temporary disturbance of fish and wildlife habitat, and the increase in vessel traffic during construction. Long-term, beneficial impacts from improved habitat for fish and wildlife species and stabilization of the marsh after restoration implementation.
Aesthetics and Visual Resources	Long-term, minor, adverse impacts from continued habitat degradation and loss.	Short-term, minor, adverse impacts from the presence of construction equipment and personnel and the increase in vessel traffic during construction. Long-term, beneficial impacts from improved habitat for birds and other species after restoration implementation.	Short-term, minor, adverse impacts from the presence of construction equipment and personnel and the increase in vessel traffic during construction. Long-term, beneficial impacts from improved habitat for birds and other species after restoration implementation.	Short-term, minor, adverse impacts from the presence of construction equipment and personnel and the increase in vessel traffic during construction. Long-term, beneficial impacts from improved habitat for birds and other species after restoration implementation.

RESOURCE	ALTERNATIVE 1 (NO ACTION)	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 4 (PREFERRED ALTERNATIVE)
Public Health and Safety	Long-term, minor, adverse impacts from continued coastal erosion and land loss increasing the risk of flooding, wave action, saltwater intrusion, storm surge, and tidal current further inland.	No effect during construction. Long-term, beneficial impacts from increase in marsh longevity and storm risk reduction for coastal communities after restoration implementation.	No effect during construction. Long-term, beneficial impacts from increase in marsh longevity and storm risk reduction for coastal communities after restoration implementation.	No effect during construction. Long-term, beneficial impacts from increase in marsh longevity and storm risk reduction for coastal communities after restoration implementation.
Fisheries and Aquaculture	Long-term, minor, adverse impacts from continued degradation and loss of high-quality fish habitat.	Short-term, minor, adverse impacts from temporary decline in fish and mobile aquatic species from disturbance (or avoidance) during construction. Long-term, beneficial impacts from increase in total quantity of available habitat after restoration implementation.	Short-term, minor, adverse impacts from temporary decline in fish and mobile aquatic species from disturbance (or avoidance) during construction. Long-term, beneficial impacts from increase in total quantity of available habitat after restoration implementation.	Short-term, minor, adverse impacts from temporary decline in fish and mobile aquatic species from disturbance (or avoidance) during construction. Long-term, beneficial impacts from increase in total quantity of available habitat after restoration implementation.
Marine Transportation	No effect from No Action	Short-term, minor, adverse impacts from temporary diversion of marine traffic during construction. No effect after restoration implementation.	Short-term, minor, adverse impacts from temporary diversion of marine traffic during construction. No effect after restoration implementation.	Short-term, minor, adverse impacts from temporary diversion of marine traffic during construction. No effect after restoration implementation.

4.3.2. Raccoon Island Restoration Project Alternatives

The detailed analysis of environmental consequences for each Raccoon Island Restoration Project alternative in this RP/EA #8.1 is presented in the NEPA Supporting Documentation Report in Appendix D. Table 4-2 below summarizes the direct and indirect impacts of each restoration alternative and the No Action Alternative. Overall, the environmental analysis demonstrates that implementation of the alternatives would result primarily in short-term and long-term, minor to moderate, adverse impacts as well as substantial, long-term environmental benefits associated with restoration of the barrier island system.

In general, implementation of restoration alternatives would result in short-term and long-term, minor to moderate, adverse impacts on physical resources during and after construction. These impacts would include temporary disturbances to geology and substrates from dredging and fill placement, localized increases in turbidity and suspended sediments affecting hydrology and water quality, and temporary increases in air emissions and noise associated with construction equipment and vessel activity. Some localized and long-term, minor effects on physical resources may occur due to permanent placement of restoration materials and shoreline protection structures; however, all restoration alternatives would provide long-term, beneficial effects on physical resources by reducing erosion, improving shoreline stability, increasing elevation and sediment retention, supporting marsh vegetation development, and enhancing the overall longevity and resilience of Raccoon Island.

Biological resources would experience short-term and long-term, minor to moderate, adverse impacts during and after construction, resulting from temporary disturbance to habitats, vegetation, and substrates; displacement or avoidance behavior by birds and other wildlife; and disturbance to marine and estuarine aquatic fauna due to dredging, sediment placement, noise, turbidity, and vessel activity. Some localized, long-term changes to habitat composition would occur where restoration features alter existing conditions or convert aquatic areas to supratidal or vegetated habitats; however, the alternatives would provide substantial, long-term benefits to biological resources through increases in beach, dune, marsh, and intertidal habitat; improved habitat elevation and stability; enhanced shoreline protection; and reduced susceptibility to future habitat loss. These benefits would improve habitat availability and resilience for birds, wildlife, aquatic fauna, and protected species using the barrier island and adjacent waters.

Socioeconomic, recreational, and visual resources would experience primarily short-term, minor, adverse impacts during construction due to temporary vessel activity, access limitations, and the presence of construction equipment. Following construction, all alternatives would provide long-term, beneficial effects by improving fisheries habitat, supporting wildlife resources, enhancing coastal resilience, and maintaining the ecological and recreational value of the island and surrounding waters. The project would also contribute to regional storm-risk reduction and coastal resource management objectives.

Adverse impacts associated with implementation of the restoration alternatives would be prevented or minimized through the use of BMPs, avoidance and minimization measures, and other mitigation developed during permitting, consultation, and environmental review processes. These measures include protected species construction conditions, spill prevention measures, and coordination with resource agencies. See Table 5-1 in Chapter 5 for the environmental compliance status of each alternative.

Table 4-2. Summary of the Direct and Indirect Impacts of the Reasonable Range of Raccoon Island Restoration Project Alternatives.

RESOURCE	ALTERNATIVE 1 (NO ACTION)	ALTERNATIVE 2	ALTERNATIVE 3 (PREFERRED ALTERNATIVE)	ALTERNATIVE 6
Geology and Substrates	Long-term, major, adverse impacts from continued erosion, land loss, and inundation.	Short-term and long-term, minor to moderate, adverse impacts from localized soil disturbances during and after construction. Long-term, beneficial impacts from restoration of the island's footprint, higher elevation, and reduced erosion.	Short-term and long-term, minor to moderate, adverse impacts from localized soil disturbances during and after construction. Long-term, beneficial impacts from restoration of the island's footprint, higher elevation, and reduced erosion.	Short-term and long-term, minor to moderate, adverse impacts from localized soil disturbances during and after construction. Long-term, beneficial impacts from restoration of the island's footprint, higher elevation, and reduced erosion.
Hydrology and Water Quality	Long-term, moderate, adverse impacts from continued land loss, inundation, and increased salinities.	Short-term, minor to moderate, adverse impacts from increases in suspended sediment and turbidity and changes in dissolved oxygen, nutrients, temperature, and salinity during construction. Long-term, minor to moderate, adverse impacts from decreased dissolved oxygen at the SSB88 Borrow Area and increased avian fecal matter and long-term, beneficial impacts from reduced erosion, reduced turbidity, growth of filter feeders, and increased island longevity after restoration implementation.	Short-term, minor to moderate, adverse impacts from increases in suspended sediment and turbidity and changes in dissolved oxygen, nutrients, temperature, and salinity during construction. Long-term, minor to moderate, adverse impacts from decreased dissolved oxygen at the SSB88 Borrow Area and increased avian fecal matter and long-term, beneficial impacts from reduced erosion, reduced turbidity, growth of filter feeders, and increased island longevity after restoration implementation.	Short-term, minor to moderate, adverse impacts from increases in suspended sediment and turbidity and changes in dissolved oxygen, nutrients, temperature, and salinity during construction. Long-term, minor to moderate, adverse impacts from decreased dissolved oxygen at the SSB88 Borrow Area and increased avian fecal matter and long-term, beneficial impacts from reduced erosion, reduced turbidity, growth of filter feeders, and increased island longevity after restoration implementation.

RESOURCE	ALTERNATIVE 1 (NO ACTION)	ALTERNATIVE 2	ALTERNATIVE 3 (PREFERRED ALTERNATIVE)	ALTERNATIVE 6
Air Quality	No effect from No Action	Short-term, minor, adverse impacts from equipment dust and exhaust and combustion emissions during construction. Long-term, beneficial impacts from an increase in marsh vegetation after restoration implementation.	Short-term, minor, adverse impacts from equipment dust and exhaust and combustion emissions during construction. Long-term, beneficial impacts from an increase in marsh vegetation after restoration implementation.	Short-term, minor, adverse impacts from equipment dust and exhaust and combustion emissions during construction. Long-term, beneficial impacts from an increase in marsh vegetation after restoration implementation.
Noise	No effect from No Action	Short-term, minor, adverse impacts from operation of vessels, equipment, and earthwork activities during construction. No effect after restoration implementation.	Short-term, minor, adverse impacts from operation of vessels, equipment, and earthwork activities during construction. No effect after restoration implementation.	Short-term, minor, adverse impacts from operation of vessels, equipment, and earthwork activities during construction. No effect after restoration implementation.
Habitats	Long-term, major, adverse impacts from continued land and habitat loss.	Short-term and long-term, minor to moderate, adverse impacts on aquatic and terrestrial habitats from vegetation disturbance, borrow area sediment removal, and habitat alteration during and after construction. Long-term, beneficial impacts from the increase in total available barrier island habitat and reduction in susceptibility to habitat loss after restoration implementation.	Short-term and long-term, minor to moderate, adverse impacts on aquatic and terrestrial habitats from vegetation disturbance, borrow area sediment removal, and habitat alteration during and after construction. Long-term, beneficial impacts from the increase in total available barrier island habitat and reduction in susceptibility to habitat loss after restoration implementation.	Short-term and long-term, minor to moderate, adverse on aquatic and terrestrial habitats from vegetation disturbance, borrow area sediment removal, and habitat alteration during and after construction. Long-term, beneficial impacts from the increase in total available barrier island habitat and reduction in susceptibility to habitat loss after restoration implementation.

RESOURCE	ALTERNATIVE 1 (NO ACTION)	ALTERNATIVE 2	ALTERNATIVE 3 (PREFERRED ALTERNATIVE)	ALTERNATIVE 6
Wildlife Species	Long-term, moderate to major, adverse impacts from continued coastal processes, overwash, and erosion contributing to habitat loss over time.	Short-term, moderate, adverse impacts from displacement and disturbance due to habitat disturbance, noise, lighting, workers and equipment during construction. Long-term, beneficial impacts from increase in available habitat for nesting, foraging, and loafing after restoration implementation.	Short-term, moderate, adverse impacts from displacement and disturbance due to habitat disturbance, noise, lighting, workers and equipment during construction. Long-term, beneficial impacts from increase in available habitat for nesting, foraging, and loafing after restoration implementation.	Short-term, moderate, adverse impacts from displacement and disturbance due to habitat disturbance, noise, lighting, workers and equipment during construction. Long-term, beneficial impacts from increase in available habitat for nesting, foraging, and loafing after restoration implementation.
Marine and Estuarine Aquatic Fauna, Essential Fish Habitat, and Managed Fish Species	Long-term, major, adverse impacts from continued coastal processes, overwash, and erosion contributing to habitat loss over time.	Short-term to long-term, minor to moderate, adverse impacts from displacement and disturbance due to habitat disturbance, noise, vessels, and equipment, and changes in water quality during and after construction. Long-term, beneficial impacts from increase in available high-quality aquatic habitat and increase in island longevity after restoration implementation.	Short-term to long-term, minor to moderate, adverse impacts from displacement and disturbance due to habitat disturbance, noise, vessels, and equipment, and changes in water quality during and after construction. Long-term, beneficial impacts from increase in available high-quality aquatic habitat and increase in island longevity after restoration implementation.	Short-term to long-term, minor to moderate, adverse impacts from displacement and disturbance due to habitat disturbance, noise, vessels, and equipment, and changes in water quality during and after construction. Long-term, beneficial impacts from increase in available high-quality aquatic habitat and increase in island longevity after restoration implementation.

RESOURCE	ALTERNATIVE 1 (NO ACTION)	ALTERNATIVE 2	ALTERNATIVE 3 (PREFERRED ALTERNATIVE)	ALTERNATIVE 6
Protected Species (Threatened and Endangered)	Long-term, major, adverse impacts from continued coastal processes, overwash, and erosion contributing to habitat loss over time.	Short-term to long-term, minor to moderate, adverse impacts from displacement and disturbance due to habitat disturbance, noise, vessels, and equipment during and after construction. Long-term, beneficial impacts from increase in available high-quality habitat and increase in island longevity after restoration implementation.	Short-term to long-term, minor to moderate, adverse impacts from displacement and disturbance due to habitat disturbance, noise, vessels and equipment, during and after construction. Long-term, beneficial impacts from increase in available high-quality habitat and increase in island longevity after restoration implementation.	Short-term to long-term, minor to moderate, adverse impacts from displacement and disturbance due to habitat disturbance, noise, vessels and equipment, during and after construction. Long-term, beneficial impacts from increase in available high-quality habitat and increase in island longevity after restoration implementation.
Protected Species (Marine Mammals)	Long-term, minor to moderate, adverse impacts from continued coastal processes, overwash, and erosion contributing to habitat loss over time and less high-quality foraging habitat.	Short-term to long-term, minor, adverse impacts from disturbance due to noise, workers, vessels, and equipment and entrapment during and after construction. Long-term, beneficial impacts from increase in available high-quality habitat and increase in island longevity after restoration implementation.	Short-term to long-term, minor, adverse impacts from disturbance due to noise, workers, vessels, and equipment and entrapment during and after construction. Long-term, beneficial impacts from increase in available high-quality habitat and increase in island longevity after restoration implementation.	Short-term to long-term, minor, adverse impacts from disturbance due to noise, workers, vessels, and equipment and entrapment during and after construction. Long-term, beneficial impacts from increase in available high-quality habitat and increase in island longevity after restoration implementation.

RESOURCE	ALTERNATIVE 1 (NO ACTION)	ALTERNATIVE 2	ALTERNATIVE 3 (PREFERRED ALTERNATIVE)	ALTERNATIVE 6
Socioeconomics	Long-term, minor adverse impacts from continued degradation and loss of natural resources.	Short-term, beneficial impacts from construction spending and workforce hiring during construction. Long-term, beneficial impacts from increased recreational and commercial activity and buffering of coastal communities from flooding after restoration implementation.	Short-term, beneficial impacts from construction spending and workforce hiring during construction. Long-term, beneficial impacts from increased recreational and commercial activity and buffering of coastal communities from flooding after restoration implementation.	Short-term, beneficial impacts from construction spending and workforce hiring during construction. Long-term, beneficial impacts from increased recreational and commercial activity and buffering of coastal communities from flooding after restoration implementation.
Cultural Resources	No effect from No Action	No effect due to no cultural resources being located in the area.	No effect due to no cultural resources being located in the area.	No effect due to no cultural resources being located in the area.
Infrastructure	No effect from No Action	No effect on infrastructure in the area during construction. Long-term, beneficial impacts from increased protection of offshore infrastructure due to stabilization of the island after restoration implementation.	No effect on infrastructure in the area during construction. Long-term, beneficial impacts from increased protection of offshore infrastructure due to stabilization of the island after restoration implementation.	No effect on infrastructure in the area during construction. Long-term, beneficial impacts from increased protection of offshore infrastructure due to stabilization of the island after restoration implementation.

RESOURCE	ALTERNATIVE 1 (NO ACTION)	ALTERNATIVE 2	ALTERNATIVE 3 (PREFERRED ALTERNATIVE)	ALTERNATIVE 6
Land and Marine Management	Long-term, minor to moderate, adverse impacts relative to effects inconsistent with state, parish, and refuge management objectives for habitat conservation, fisheries support, and coastal resilience.	Short-term, minor, adverse impacts from temporary restricted access during construction. Long-term, beneficial impacts by meeting CZMP and Terrebonne Parish's local coastal management goals of shoreline stabilization, habitat restoration, and coastal resilience.	Short-term, minor, adverse impacts from temporary restricted access during construction. Long-term, beneficial impacts by meeting CZMP and Terrebonne Parish's local coastal management goals of shoreline stabilization, habitat restoration, and coastal resilience.	Short-term, minor, adverse impacts from temporary restricted access during construction. Long-term, beneficial impacts by meeting CZMP and Terrebonne Parish's local coastal management goals of shoreline stabilization, habitat restoration, and coastal resilience.
Tourism and Recreational Use	Long-term, minor to moderate, adverse impacts from continued habitat degradation and loss.	Short-term, minor, adverse impacts from the presence of construction equipment and personnel, temporary disturbance of fish and wildlife habitat, and the increase in vessel traffic during construction. Long-term, beneficial impacts from improved habitat for fish and wildlife species and stabilization of the island after restoration implementation.	Short-term, minor, adverse impacts from the presence of construction equipment and personnel, temporary disturbance of fish and wildlife habitat, and the increase in vessel traffic during construction. Long-term, beneficial impacts from improved habitat for fish and wildlife species and stabilization of the island after restoration implementation.	Short-term, minor, adverse impacts from the presence of construction equipment and personnel, temporary disturbance of fish and wildlife habitat, and the increase in vessel traffic during construction. Long-term, beneficial impacts from improved habitat for fish and wildlife species and stabilization of the island after restoration implementation.

RESOURCE	ALTERNATIVE 1 (NO ACTION)	ALTERNATIVE 2	ALTERNATIVE 3 (PREFERRED ALTERNATIVE)	ALTERNATIVE 6
Aesthetics and Visual Resources	Long-term, minor, adverse impacts from continued habitat degradation and loss.	Short-term, minor, adverse impacts from the presence of construction equipment and personnel, and the increase in vessel traffic during construction. Long-term, beneficial impacts from improved habitat for birds and other species after restoration implementation.	Short-term, minor, adverse impacts from the presence of construction equipment and personnel, and the increase in vessel traffic during construction. Long-term, beneficial impacts from improved habitat for birds and other species after restoration implementation.	Short-term, minor, adverse impacts from the presence of construction equipment and personnel, and the increase in vessel traffic during construction. Long-term, beneficial impacts from improved habitat for birds and other species after restoration implementation.
Public Health and Safety	Long-term, minor, adverse, impacts from continued coastal erosion and land loss increasing the risk of flooding, wave action, saltwater intrusion, storm surge, and tidal current further inland.	No effect during construction. Long-term, beneficial impacts from increase in island longevity and storm risk reduction for coastal communities after restoration implementation.	No effect during construction. Long-term, beneficial impacts from increase in island longevity and storm risk reduction for coastal communities after restoration implementation.	No effect during construction. Long-term, beneficial impacts from increase in island longevity and storm risk reduction for coastal communities after restoration implementation.
Fisheries and Aquaculture	Long-term, minor, adverse impacts from continued degradation and loss of high-quality fish habitat.	Short-term, minor, adverse impacts from temporary decline in fish and mobile aquatic species from disturbance (or avoidance) during construction. Long-term, beneficial impacts from increase in total quantity of available habitat after restoration implementation.	Short-term, minor, adverse impacts from temporary decline in fish and mobile aquatic species from disturbance (or avoidance) during construction. Long-term, beneficial impacts from increase in total quantity of available habitat after restoration implementation.	Short-term, minor, adverse impacts from temporary decline in fish and mobile aquatic species from disturbance (or avoidance) during construction. Long-term, beneficial impacts from increase in total quantity of available habitat after restoration implementation.

RESOURCE	ALTERNATIVE 1 (NO ACTION)	ALTERNATIVE 2	ALTERNATIVE 3 (PREFERRED ALTERNATIVE)	ALTERNATIVE 6
Marine Transportation	No effect from No Action	Short-term, minor, adverse impacts from temporary diversion of marine traffic during construction. No effect after restoration implementation.	Short-term, minor, adverse impacts from temporary diversion of marine traffic during construction. No effect after restoration implementation.	Short-term, minor, adverse impacts from temporary diversion of marine traffic during construction. No effect after restoration implementation.

5. Compliance with Other Laws and Regulations

In addition to the requirements of OPA and NEPA, other laws may apply to the preferred alternatives in this RP/EA #8.1. The LA TIG ensures compliance with applicable laws or EOs, including those listed below. For Raccoon Island, BOEM will issue an agreement under the Outer Continental Shelf Lands Act for offshore dredging. Mitigation measures in that agreement will be followed by the implementing Trustee. Details on each of these laws or EOs can be found in Chapter 6 of the Final PDARP/PEIS. 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 EOs. That material is incorporated by reference here.

5.1. Federal Laws

Additional federal laws, regulations, and EOs 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 of 1976, as amended (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.)
- Migratory Bird Treaty Act (16 U.S.C. § 703 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 (16 U.S.C. § 1431 et seq. and 33 U.S.C. § 1401 et seq.)
- Estuary Protection Act (16 U.S.C. §§ 1221–1226)
- Archaeological Resource Protection Act (16 U.S.C. §§ 470aa–470mm)
- National Marine Sanctuaries Act (16 U.S.C. § 1431 et seq.)
- Farmland Protection Policy Act (7 U.S.C. §§ 4201–4209)
- Outer Continental Shelf Lands Act (43 U.S.C. § 1331 et seq.)
- EO 11988: Floodplain Management (May 24, 1977), as amended
- EO 11990: Protection of Wetlands (May 24, 1977), as amended

- EO 12962: Recreational Fisheries (June 7, 1995), as amended
- EO 13007: Indian Sacred Sites
- EO 13045: Protection of Children from Environmental Health Risks and Safety Risks (Apr. 23, 1997), as amended
- EO 13112: Safeguarding the Nation from the Impacts of Invasive Species (Feb. 3, 1999), as amended
- EO 13175: Consultation and Coordination with Indian Tribal Governments (Nov. 6, 2000)
- EO 13186: Responsibilities of Federal Agencies to Protect Migratory Birds (Jan. 10, 2001)
- EO 14154: Unleashing American Energy (Jan. 20, 2025)
- EO 14172: Restoring Names That Honor American Greatness (Feb. 9, 2025)
- EO 14224: Designating English as the Official Language of the United States (March 1, 2025)

5.2. State and Local Laws

The LA TIG would confirm compliance with all applicable state and local laws and other applicable federal laws and regulations relevant to the State of Louisiana. An unexclusive list of potential additional laws and regulations are listed below:

- Archeological Finds on State Lands (Louisiana Revised Statutes [La. Rev. Stat.] 41:1605)
- 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)
- Louisiana Scenic Rivers Program (La. Rev. Stat. 56:1856)

5.3. Summary and Next Steps

The LA TIG would ensure compliance reviews and/or approvals under all applicable state and local laws and other applicable federal laws and regulations that are relevant to any selected alternatives are complete before implementation. Implementing Trustees are required to implement alternative-specific mitigation measures, including BMPs, that are identified in this RP/EA #8.1 and in the completed consultations/permits and biological evaluation forms. Implementing Trustees would 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 5-1 reflects the status of the LA TIG's regulatory compliance progress as of May 15, 2026.

Table 5-1. Current Status of Federal Regulatory Compliance for Preferred Alternatives.

REGULATORY REQUIREMENTS	RACCOON ISLAND RESTORATION PROJECT ALTERNATIVE 3 STATUS	EAST ORLEANS LANDBRIDGE RESTORATION PROJECT ALTERNATIVE 4 STATUS
Bald and Golden Eagle Protection Act	In Progress	In Progress
Coastal Barrier Resources Act	Raccoon Island is classified as CBRS System Unit S06 (Isles Dernieres); consultation not required (restoration/conservation use allowable)	Not Applicable
Coastal Zone Management Act	In Progress	In Progress
ESA Section 7 (NMFS)	In Progress	In Progress
ESA Section 7 (U.S. Fish and Wildlife Service [USFWS])	In Progress	In Progress
Essential Fish Habitat (NMFS)	In Progress	In Progress
Marine Mammal Protection Act (NMFS)	In Progress	In Progress
Marine Mammal Protection Act (USFWS)	In Progress	In Progress
Migratory Bird Treaty Act	In Progress	In Progress
Section 404 of Clean Water Act / Section 10 of Rivers and Harbors Act (U.S. Army Corps of Engineers)	In Progress	In Progress
Section 106 of the National Historic Preservation Act	In Progress	In Progress
Outer Continental Shelf Lands Act (BOEM)	In Progress	Not Applicable

5.4. Draft Certification of NEPA Page Limit and Deadline

NOAA has considered the factors mandated by NEPA and, pending public comment, this draft EA (i.e., the EA content within this integrated OPA NEPA RP/EA) represents NOAA's good-faith effort to prioritize documentation of the most important considerations required by the statute within the congressionally mandated page limits; this prioritization reflects NOAA's expert judgment; and any considerations addressed briefly or left unaddressed were, in NOAA's judgment, comparatively not of a substantive nature that meaningfully informed the consideration of environmental effects and the resulting decisions on how to proceed. This draft EA also represents NOAA's good-faith effort to fulfill NEPA's requirements within the congressionally mandated timeline. Once this EA is finalized, this effort will be substantially complete. At

that time, NMFS will have thoroughly considered the factors mandated by NEPA and in NOAA's judgment, the analysis contained in final EA will be adequate to inform and reasonably explain NOAA's final decision regarding the proposed action.

6. List of Preparers and Agencies Consulted

Table 6-1. List of Preparers and Agencies Consulted.

AGENCY/FIRM	NAME	POSITION
Royal	Kirk Rhinehart	Principal
Royal	Mandy Green	Senior Scientist
Royal	Patrick Williams	Senior Scientist
Royal	Caitlin Vines	Project Manager
Royal	Leland Moss	Project Scientist
Royal	Denise Poveda	Staff Scientist
Royal	Katie Percy	Project Scientist
Royal	Alaina Grace	Project Scientist
CPRA	Renee Bennett	Project Manager
LDWF	Jon Wiebe	Restoration Program Manager
NOAA	David Reeves	Marine Habitat Resource Specialist
NOAA	Mel Landry	Marine Habitat Resource Specialist
NOAA	Ramona Schreiber	Marine Habitat Resource Specialist
NOAA	Christina Fellas	Marine Habitat Resource Specialist
NOAA	Craig Gothreaux	Fishery Biologist
NOAA	Gabrielle Armin	Science Policy Fellow

AGENCY/FIRM	NAME	POSITION
DOI	Amy Mathis	DWH Restoration Planner
DOI	Michael Barron	Wildlife Biologist – Compliance Coordinator
USEPA	Doug Jacobson	Louisiana TIG Representative
USEPA	Alexandra LaBouff	Environmental Scientist
USEPA	Tim Landers	Life Scientist

7. List of Repositories

Table 7-1. List of Repositories.

LIBRARY	ADDRESS	CITY	ZIP CODE
St. Tammany Parish Library	310 W. 21st Avenue	Covington	70433
New Orleans Public Library, Louisiana Division	219 Loyola Avenue	New Orleans	70112
St. Bernard Parish Library	2600 Palmisano Boulevard	Chalmette	70043
Plaquemines Parish Library	8442 Highway 23	Belle Chasse	70037
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
Terrebonne Parish Library	151 Library Drive	Houma	70360
Martha Sowell Utley Memorial Library	314 St. Mary Street	Thibodaux	70301
South Lafourche Public Library	16241 E. Main Street	Cut Off	70345
East Baton Rouge Parish Library	7711 Goodwood Boulevard	Baton Rouge	70806
Alex P. Allain Library	206 Iberia Street	Franklin	70538
St. Martin Parish Library	201 Porter Street	St. Martinville	70582
Iberia Parish Library	445 E. Main Street	New Iberia	70560
Vermilion Parish Library	405 E. St. Victor Street	Abbeville	70510
LSU AgCenter	1105 West Port Street	Abbeville	70510

LIBRARY	ADDRESS	CITY	ZIP CODE
Calcasieu Parish Public Library Central Branch	301 W. Claude Street	Lake Charles	70605

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Appendix A. East Orleans Landbridge Restoration Monitoring and Adaptive Management Plan

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A.1 Introduction

The Deepwater Horizon (DWH) Louisiana Trustee Implementation Group (LA TIG)[12] has developed this draft Monitoring and Adaptive Management Plan (MAM Plan) for the East Orleans Landbridge Restoration Project (PO-0191; the project), to be included by way of an appendix in the *Louisiana Trustee Implementation Group Draft Phase 2 Restoration Plan and Environmental Assessment #8.1: East Orleans Landbridge Restoration and Raccoon Island Restoration*. The project represents one of 6 projects selected by the Louisiana Trustee Implementation Group Final Restoration Plan and Environmental Assessment #8: Wetland, coastal, and nearshore habitats (Louisiana TIG, 2022). If selected for implementation, construction and monitoring and adaptive management activities would be funded from the LA TIG's DWH Natural Resource Damage Assessment (NRDA) settlement funding allocations. This MAM Plan was developed in accordance with Version 2.1 of the *Monitoring and Adaptive Management Procedures and Guidelines Manual* (DWH NRDA Trustees, 2024; MAM Manual).

There are three primary purposes for MAM plans:

1. Identify and document how restoration managers will measure and track progress toward achieving restoration goals and objectives;
2. Prior to implementation, increase the likelihood of success by identifying potential corrective actions that could be undertaken if the project does not proceed as expected; and
3. Capture lessons learned or new information acquired that can be incorporated into future project selection, design, and implementation.

Accordingly, and in compliance with 15 Code of Federal Regulations [CFR] § 990.55(b)(1)(vii), this MAM Plan identifies monitoring activities that will be conducted to document restoration effectiveness, including performance criteria for determining restoration success or need for interim corrective action. Where applicable, this MAM Plan identifies key sources of uncertainty and incorporates monitoring data and decision points that address these uncertainties to ensure that restoration objectives are met and project benefits are maximized. It also establishes a decision-making process for making adjustments where needed.

The MAM Plan is a living document and may be updated as needed to reflect changing conditions and/or new information. Any future revisions to the MAM Plan will be made available through the Restoration Portal (at the following URL: https://www.diver.orr.noaa.gov/web/guest/home) and accessible through the DWH NRDA Trustees' website (at the following URL: https://www.gulfspillrestoration.noaa.gov/).

A.1.1 Project Overview

The East Orleans Landbridge Project is located in Orleans Parish within the Pontchartrain Hydrologic Basin located between Lake Pontchartrain and Lake Borgne (Figure A- 1) in Louisiana. The

[12] The LA TIG includes the following members: Louisiana State Trustees include the Louisiana Coastal Protection and Restoration Authority (CPRA); Louisiana Department of Environmental Quality (LDEQ); Louisiana Department of Wildlife and Fisheries (LDWF); Louisiana Department of Conservation and Entergy (LDCE); and Louisiana Oil Spill Coordinator's Office (LOSCO). Federal Trustees include Department of Interior (DOI); the National Oceanic and Atmospheric Administration (NOAA), United States Environmental Protection Agency (USEPA), and United States Department of Agriculture (USDA).

approximate coordinates of the center of the project area are X = 818,354 and Y = 3,340,785 (North American Datum of 1983 Universal Transverse Mercator (UTM) Zone 15 North). The project's selected alternative for construction features six (6) marsh creation cells totaling approximately 1,320 acres of degraded intertidal marsh, approximately 116,365 linear feet of earthen containment dikes and approximately 1,030 linear feet of training dikes separating two cells in marsh creation cell number 1, approximately twenty-one (21) gap closures, and reinforcing approximately 15,000 linear feet of weakened shoreline along The Rigolets. The borrow area is located in the southwest portion of Lake St. Catherine. The constructed marsh fill elevation is a maximum of +2.5 feet [(NAVD88), Figure A- 2]. This elevation was chosen in order to maximize the time that the marsh elevation is located in the intertidal range. Upon completion of the project, suitable native herbaceous vegetation is expected to naturally become established within the first few years. However, vegetative plantings on the marsh platform may occur if natural succession does not occur as anticipated. This project is currently in the engineering and design phase and a 95% Design Report is being drafted.

Figure A- 1. East Orleans Landbridge Restoration project location in Orleans Parishes, Louisiana

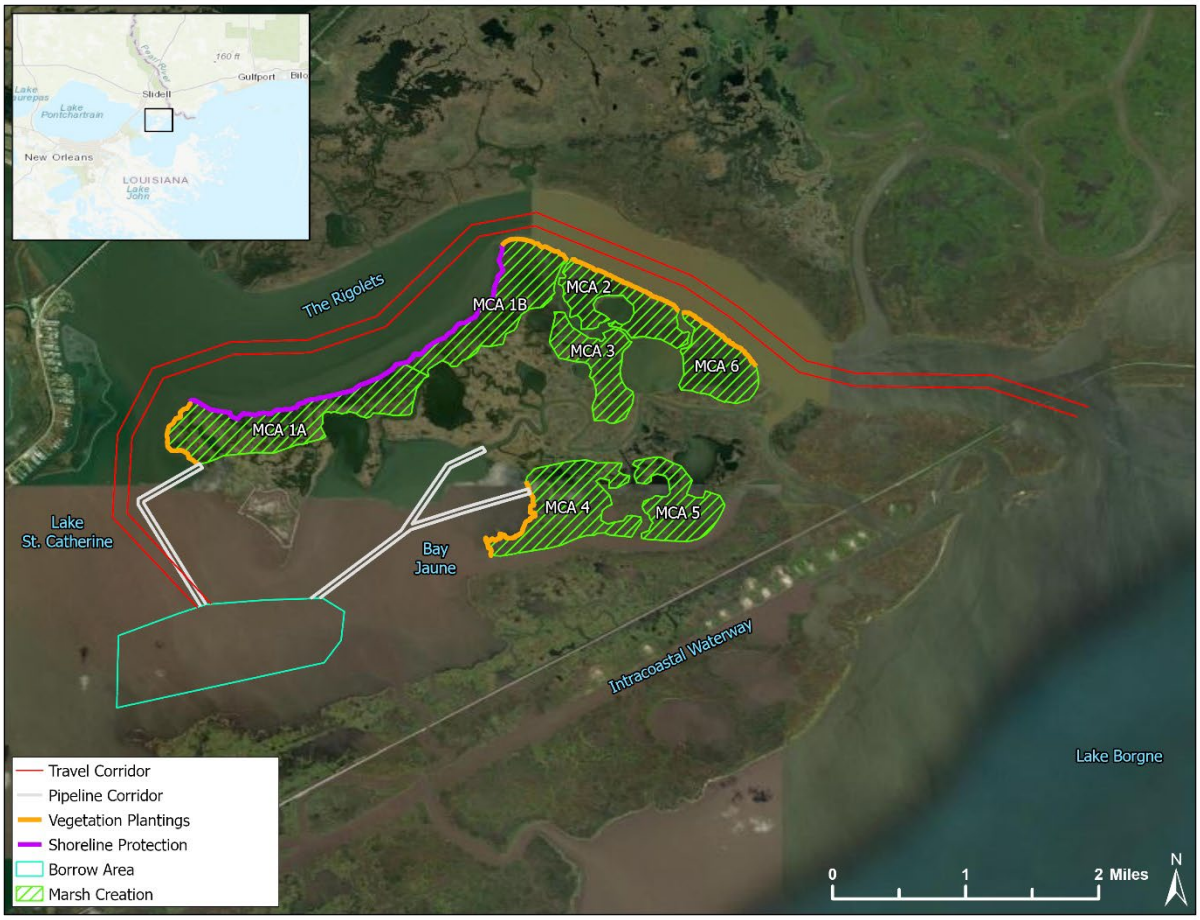

Figure A-2. Proposed Restoration Design for East Orleans Landbridge Restoration

The project is being implemented as restoration for the DWH oil spill NRDA, consistent with the *Deepwater Horizon Oil Spill: Final Programmatic Damage Assessment and Restoration Plan and Final Programmatic Environmental Impact Statement* (DWH Trustees, 2016), the *Louisiana Trustee Implementation Group Monitoring and Adaptive Management Strategy* (LA TIG, 2021).

Per the nested framework set out in the Final PDARP/PEIS to guide and direct restoration efforts, the project is characterized by the selection of programmatic goals, restoration types, restoration approaches, and restoration techniques listed below. The implementing state Trustee for the project is the Louisiana Coastal Protection and Restoration Authority (CPRA) and the lead federal Trustee is the U.S. Department of the Commerce, National Oceanic and Atmospheric Administration (NOAA).

- **Programmatic Goals:** Restore and conserve habitat
- **Restoration Types:** Wetlands, coastal, and nearshore habitats
- **Restoration Approaches:** Create, restore, and enhance coastal wetlands
- **Restoration Techniques:** Create or enhance coastal wetlands through placement of dredged material
- **Restoration Plan:** Louisiana Trustee Implementation Group Draft Phase 2 Restoration Plan and Environmental Assessment #8.1: East Orleans Landbridge Restoration and Raccoon Island Restoration

A.1.1.1 Restoration Type Goals and Project Restoration Objectives

The goal for this Project is to create and restore wetlands, coastal and nearshore habitats in the Louisiana Restoration Area specifically in the area known as the East Orleans Landbridge area within the Pontchartrain Basin. This area has been degraded due to eustatic sea-level rise, high subsidence rates, diminished sediment re-nourishment, and extreme storm events. In restoring these coastal habitats, the Trustees envision that the Project will compensate, in part, for wetlands, coastal and nearshore habitat losses associated with the DWH oil spill.

A.1.2 Restoration Type Goals

As summarized in the PDARP/PEIS, Chapter 5, the restoration goals for injuries to coastal habitats are as follows:

- Restore a variety of interspersed and ecologically connected coastal habitats in each of the five Gulf states to maintain ecosystem diversity, with particular focus on maximizing ecological functions for the range of resources injured by the spill.
- Restore for injuries to habitats in the geographic areas where the injuries occurred, while considering approaches that provide resiliency and sustainability.
- Restore habitats in appropriate combinations for any given geographic area.

A.1.3 Project Restoration Objectives

To help meet the restoration goals for injuries to coastal habitats, the project restoration objective is to create approximately 1,320 acres of marsh habitat in the East Orleans Landbridge area of the Pontchartrain Basin, which has been degraded due to sea-level rise, high subsidence rates, diminished sediment supply, and extreme storm events. The degree to which this restoration objective is met will be evaluated via measurements of the following parameters:

Parameter #1: Area (acres) of marsh creation

Parameter #2: Elevation of marsh creation areas

Parameter #3: Vegetation percent cover (by taxon)

Parameter #4: Invasive Species Cover of marsh

Specific, measurable performance criteria are defined for monitoring parameters associated with each of the restoration objectives in Section 3.2.

These parameters will be monitored according to the monitoring schedule summarized in Section 4. During the final design process, project team members will have the opportunity to refine design parameters as additional information becomes available. Performance criteria will be identified/implemented to determine restoration success or the need for corrective action in accordance with 15 CFR § 990.55(b)(1)(vii).

A.2 Conceptual Framework

The East Orleans Landbridge Project is located in Orleans Parish, Louisiana between U.S. Highway 90 and Lake Borgne. It is adjacent to the south and west bank of The Rigolets which is a channel that connects Lake Pontchartrain and Lake Borgne. These marshes were formed as part of the St. Bernard Delta Lobe of the Mississippi River when it was active roughly 4,600 to 1,000 years before present. Once the St. Bernard Delta Lobe was abandoned for the Lafourche Delta Lobe, freshwater and sediment inputs were removed. In more recent times, shoreline erosion and impacts from tropical activity are the primary reasons for marsh loss along with subsidence and sea-level rise.

A.2.1 Potential Sources of Uncertainty

Potential uncertainties are defined as those that may affect the ability to achieve stated project restoration objective(s). Although the likelihood of project success is evaluated under the Oil Pollution Act regulations (15 CFR § 990.54(a)(3)), uncertainties may exist regarding how to best implement projects to achieve the greatest benefits for the injured resources. These uncertainties may arise from an incomplete understanding of the current conceptual setting; from unknown conditions in the future; or from project elements that do not perform as anticipated (e.g., sediment compaction or vegetation success). Potential uncertainties associated with this project are listed in Table A- 1. Monitoring activities can be selected and implemented to inform these uncertainties and to select appropriate corrective actions in the event that the project is not meeting its performance criteria. Section 3 summarizes project monitoring protocols and describes how this information will be used to inform adaptive management and address uncertainties.

Table A- 1 Sources of Project Uncertainty and Potential Impacts

UNCERTAINTY	POTENTIAL IMPACT
Sea level rise and subsidence	Increased flooding of the marsh platform would reduce the growth and cover of herbaceous plant species and potentially increase the coverage of submerged aquatic species or increase the open-water area.
Sediment compaction	Unpredicted compaction may lower the elevation of the marsh platform causing it to become subtidal earlier in the project life.
Vegetation colonization and establishment	Lack of planting success / vegetation establishment would limit or delay the creation of desired habitat.
Herbivory	Young, tender plants, either through natural succession or vegetative plantings, are desired by some species as a source of food. Herbivory may cause the increase of planting efforts by requiring devices to reduce plant consumption. Also, would delay the establishment of vegetation and habitat creation.
Contractor completing the Project on-time	Contractor's inability to complete the project within the designated time frame would delay resource restoration and require allocation of additional resources for project completion.

UNCERTAINTY	POTENTIAL IMPACT
Project design criteria achieved	If elevations are not achieved and sustained to project design specifications, targets for habitats may not be attained, and would be more susceptible to undesirable habitats such as open water or scrub-shrub.
Impacts of extreme weather events such as hurricanes, storms, and droughts	Storm events before or after project construction could result in existing or created marsh loss.

A.3 Adaptive Management

Monitoring information collected at the project-level can also inform adaptive management. Adaptive management is 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 Figure A- 2).

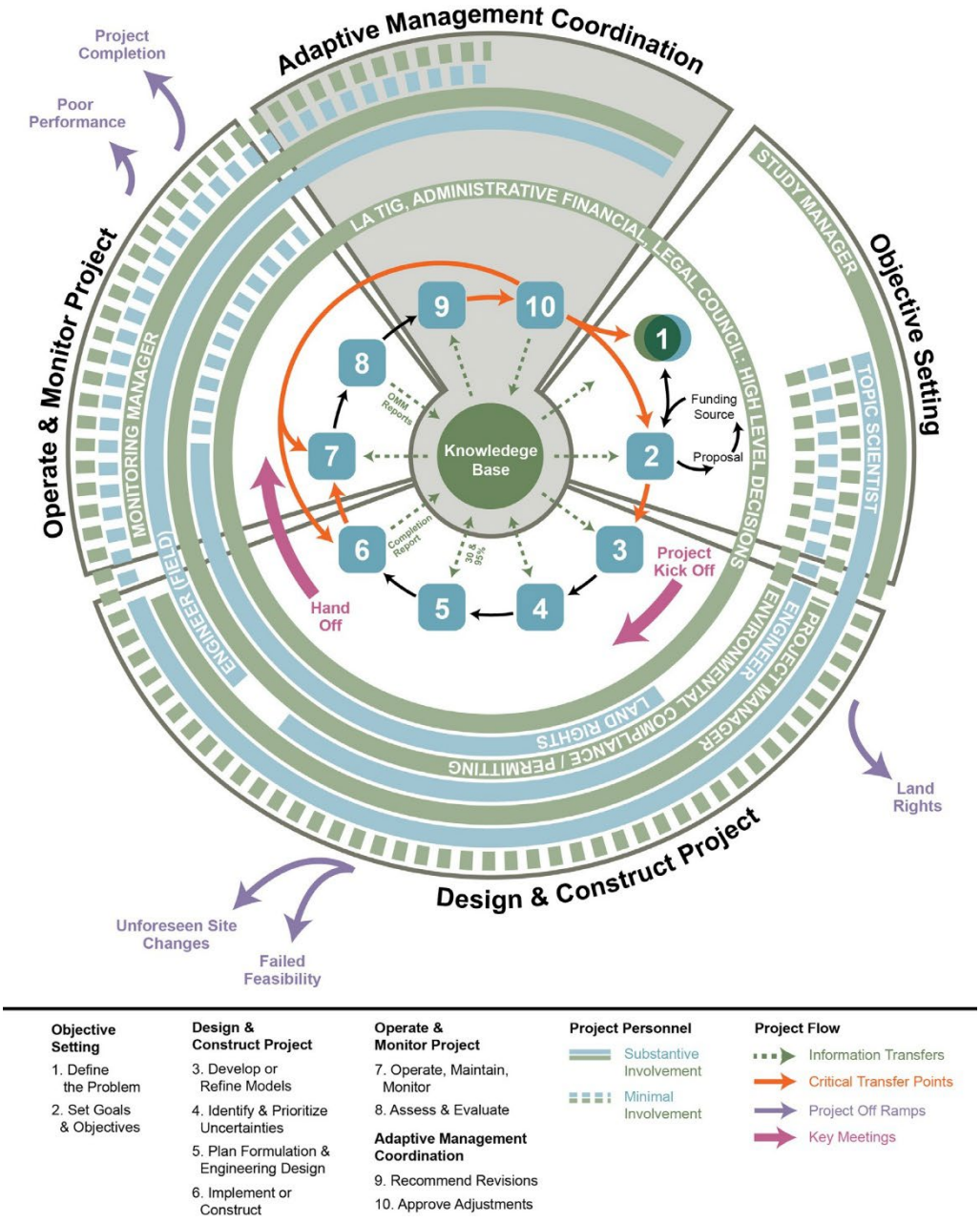

Figure A- 3 LA TIG Adaptive Management Cycle (Source: The Water Institute of the Gulf, 2020)

- Objective-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. For the East Orleans Landbridge Restoration Project (PO-0191), the goal setting phase is already complete – the problem of marsh loss has been defined through the PDARP/PEIS as well as through Louisiana's Coastal Master Plan (2017) process, and the goals and objectives of restoration are as described in the restoration plan that accompanies this MAM Plan.
- Design and Construct Phase: Project advances through select steps, including model development or refinement, identification and prioritization of uncertainties, plan formulation, engineering, design, and project construction. For this project, the elements of a preliminary design have already been described within the restoration plan, incorporating available data.
- Operate and Monitor Phase: Project's operations, maintenance, and monitoring plans are developed, and project assessment and evaluation criteria are identified. Note that for this and other habitat creation projects, the opportunities for adaptive management post-

construction may in some cases be limited. For example, if the marsh habitat does not achieve the proper elevation post-settlement, supplying additional dredge fill to increase elevation is generally cost-prohibitive. However, supplemental vegetative plantings can be used to improve vegetative cover if proper elevation is not achieved.

- 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

Where gaps in scientific understanding exist, project information collected (see Section 3.1, Project Monitoring) and evaluated (see Section 5, Evaluation) may be used to reduce key uncertainties and/or other analyses that inform the selection, design, and optimization of future restoration projects.

A.4 Project Monitoring, Performance Criteria, and Potential Correction Actions

A.4.1 Project Monitoring

This MAM Plan was developed to identify methods for evaluating and documenting project performance, key uncertainties, and potential corrective actions, if needed, for the first 5 years following the project's construction. For each of the identified monitoring parameters, information is provided on the intended purpose (e.g., to monitor progress toward meeting one or more of the restoration objectives, support adaptive management of the project, etc.), monitoring methods, timing and frequency, duration, sample size, and sites. Monitoring these parameters will enable the LA TIG to track progress toward performance criteria targets and will inform the need for corrective actions (see Section 3.2, Performance Criteria and Potential Corrective Action).

The MAM Manual recommends project-level monitoring be conducted at reference or control sites. The CPRA currently maintains a monitoring program that provides ecological data and research to support the planning, design, construction, evaluation, and adaptive management of Louisiana's wetland restoration projects (Folse et al, 2023). The Coastwide Reference Monitoring System (CRMS) at the following URL: (https://www.lacoast.gov/crms/ Home.aspx) was developed and implemented to improve the effectiveness in evaluating individual restoration projects, as well as the combined effects of multiple projects, by providing a network of reference sites where data are collected on a regular basis (Steyer et al., 2003; Folse et al., 2023). There is one (1) CRMS-Wetlands station that is within the project footprint, marsh creation area 6. To the extent possible, the monitoring methods used for the project will be consistent with the methods described in Folse et al. (2023).

Though additional measures may be implemented to more fully characterize the project's effectiveness, the LA TIG propose the continued implementation of the following proven and established monitoring methodologies to monitor project success:

Parameter #1, Area (acres) of marsh creation

Purpose: To determine how many acres met the marsh platform elevation at the end of construction criteria per the engineering and design requirements and how many acres of

supratidal, intertidal, and subtidal marsh habitat developed/exist at years (YRs) 3 and 5 post-construction (design report, in draft).

4. Method: Using geo-rectified aerial imagery, land water maps will be generated using methodology described in Chapter 10. Imagery of Folse et al. (2023).
5. Timing, Frequency, and Duration: Aerial imagery will be acquired post-construction/as-built to represent year (YR) 0; YRs 3 and 5 post-construction will occur during the Fall of the respective years.
6. Sample Size: Aerial imagery will be acquired for the entire project area and some surrounding areas
7. Sites: Slightly larger than the project area

Parameter #2, Elevation of marsh areas

Purpose: To determine that the average elevation is achieved per the design specifications for construction and to verify the elevation of the sediment is as expected per the design curves in the final design report at YRs 3 and 5 post-construction.

8. Method: LiDAR topography and/or Real-Time Kinematic Global Positioning System (RTK GPS) topographic surveys.
9. Timing, Frequency, and Duration: Surveys will be conducted during construction (before and after sediment placement) and at YRs 0, 3, and 5 post-construction.
10. Sample Size: Construction surveys will be conducted on transects spaced every 250 feet apart or as specified in the construction documents. YR 0 would utilize LiDAR depending on vegetative cover and the consolidation of sediments. RTK transects would be spaced 500 feet at YRs 0 and 5 and 1,000 feet at YR 3. Elevation points would be collected approximately every 50 feet along the transect, transects would be the same for YRs 0 and 5 and every other for YR 3.
11. Sites: Slightly larger than the project area.

Parameter #3, Vegetation percent cover (by taxon)

Purpose: To determine the vegetation cover in the project area over time.

12. Method: Ocular estimates of percent cover of each species identified, height measurements of the dominant species, and percent cover of the carpet, herbaceous, shrub, and tree layers, if present, within a 2 meter by 2 meter plot (Folse et al., 2023) randomly placed along the transect lines that were established throughout the project area.
13. Timing, Frequency, and Duration: YRs 3 and 5; sampling will occur between mid-August and mid-November with the target being September/October.
14. Sample Size: Number of plots per transect and number of transects to sample are TBD depending on other monitoring activities and budget availability.
15. Sites: Project area; CRMS sites and restoration projects having similar habitats will be used as references.

Parameter #4, Invasive Species Cover

Purpose: To determine invasive species percent cover in the marsh.

16. Method: Visual taxonomic identification of plants, resolved at the species level or using species groupings during vegetation surveys (Parameter #3).
17. Timing, Frequency, and Duration: YRs 3 and 5; sampling will occur between mid-August and mid-November with the target being September/October.
18. Sample Size: Number of plots per transect and number of transects to sample are TBD depending on other monitoring activities and budget availability.
19. Sites: Project area; CRMS sites and restoration projects having similar habitats will be used as references.

A.5 Performance Criteria and Potential Corrective Actions

In this section, the LA 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.

Information gathered through monitoring allows for corrective actions to be made to achieve desired outcomes. Table 2 identifies performance criteria, 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 all encompassing; rather, it represents 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 operations and maintenance (O&M) plan. The decision of whether a corrective action should be implemented for the project should 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. Corrective action may not be taken in all cases based on such considerations. The knowledge gained from this process could also inform future restoration decisions such as the selection, design, and implementation of similar projects.

Table A- 2. List of Project Monitoring Parameters, Performance Criteria, and Potential Corrective Actions

MONITORING PARAMETER	FINAL PERFORMANCE CRITERIA USED TO DETERMINE PROJECT SUCCESS	POTENTIAL CORRECTIVE ACTION(S)
Area (acres) of marsh creation	Using pre-construction, as-built, and YR 5 aerial imagery, a land-water analysis will be performed. The annual rate of land loss will be calculated between as-built and YR5 and extrapolated to YR 20. The amount of acres anticipated at YR 5 will be greater than the amount of acres pre-construction.	Planting of appropriate species and/or addition of sediments
Elevation of marsh areas	(A) The target elevation stated in the Final 95% Design Report at the time of construction. (B) The target elevation stated on the settlement curves in the Final 95% Design Report for post-construction year 5.	
Vegetation percent cover	Average live vegetative cover is equal to or greater than 85% at Year 5[a].	Perform planting of preferred herbaceous species
Invasive Species Cover*	Average live cover of invasive species is not greater than 25% a Year 5.	Mechanical removal or herbicide application

[a] Average live vegetative cover was calculated at CRMS3784 using 2021 – 2025 data.

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A.6 Monitoring Schedule

The project monitoring schedule Table 3 is separated by monitoring activities. Pre-execution monitoring will occur before project execution, if applicable. Execution of monitoring will occur when the project has been fully executed as planned, although this timeframe may vary for different parameters. Performance monitoring will occur in the years following initial project execution (years 1 - 5).

Table A- 3. Monitoring Schedule

MONITORING PARAMETERS	YR0[1]	YR1[1]	YR2[1]	YR3[1]	YR4[1]	YR5[1]
Vegetation Survey	N/A	N/A	N/A	X	N/A	X
Elevation Survey	N/A	N/A	X	N/A	N/A	X
Aerial Imagery	X	O	O	X	O	X
Land Water Analysis	X	N/A	N/A	X	N/A	X

Note: X's denote data acquisitions. O's denote optional data acquisitions.

[1] Years of data collection may change based on the availability of funds and/or the ability to leverage data collection efforts conducted outside of this project.

A.7 Evaluation

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

As part of the larger decision-making context, the evaluation of monitoring data from individual projects could also be compiled and assessed at the level of restoration type and restoration area, 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 the identification of critical uncertainties.

The results of these analyses 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., hurricanes)?
- Were any of the uncertainties identified prior to project implementation resolved?
- Were any new uncertainties identified?

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

Parameter #1: Area (acres) of marsh creation

Analysis: As-built (YR 0) aerial imagery and elevation data sets collected for the project will be used to determine the spatial extent of that which was constructed and if it met the construction requirements. Aerial imagery, elevation, and/or vegetation data sets collected in YRs 3 and 5 will be analyzed to determine

marsh habitat development and evolution. Aerial imagery will be analyzed for land – water composition. Vegetation data will be used to determine habitat types and species composition of the land portion of the project. Elevation data will be used to determine the average depth of water and the average elevation of the land/marsh habitat.

Parameter #2: Elevation of marsh areas

Analysis: The project's Final Design Report will establish the desired elevation for each the marsh creation areas in order for appropriate herbaceous species to colonize and create marsh habitat. Data will be analyzed for the average elevation in each marsh creation area. Other mapping products such as triangular irregular network models could be generated in Geographic Information System (GIS) software packages along with digital elevation model (DEM) to show the elevation across the project area. Over time, differences amongst the individual models would show elevation changes.

The constructed target elevations for marsh will be determined using the methodology(ies) in CPRA's Marsh Creation Design Guidelines (2017). These elevations use various data sources such as water elevation, sea-level rise, and subsidence. At YRs 3 and 5, data will be analyzed using the same methods and updated data (current water elevations and habitat elevations) to determine if the habitat is within the optimal marsh inundation ranges for habitat development. The same water level gauges used in the Final Design Report will be used for YRs 3 and 5, if still active.

The average elevation will be determined using YRs 3 and 5 data sets to determine if these elevations are as predicted in the project settlement curves that will be published in the Final Design Report.

Parameter #3: Vegetation percent cover

Analysis: General descriptive statistical analyses may include, but are not limited to, averages/means of the overall total cover by herbaceous species and/or shrubs (marsh); percent cover of species; and/or average height of dominant species. After each data collection effort, all collected and analyzed data will be evaluated to determine existing habitat type. After multiple data collection efforts, comparisons between each time period will be assessed to determine the evolution of the habitat. Data from CRMS sites in the vicinity, within the basin, and coast-wide of similar habitats may be analyzed for comparative performance purposes. Data from other marsh creation projects using borrow material from lakes and bays and in the same habitat type across Louisiana will be examined for performance comparisons.

Parameter #4: Invasive Species Cover

Analysis: Data sets will be examined for invasive species. If invasive species are identified with the data set, the average percent cover will be calculated.

A.8 Data Management

A.8.1 Data Deliverables

Shapefiles, Imagery, and Elevational Data: LA TIG representatives will receive copies of all data generated (e.g., survey tracks, survey photographs that coincide with those tracks, GIS files, Keyhole Markup Zipped files, associated metadata and data files) in association with the scheduled sampling events.

Vegetation Surveys: LA TIG representatives will receive an individual summary report for each of the scheduled sampling events. Reports will include all data collected and analyses performed as well as all associated metadata.

A.8.2 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 hard copy datasheets and notebooks and photographs will be retained by the implementing Trustee.

Relevant project data that are handwritten on hard copy 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 Federal Geographic Data Committee (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, quality assurance/quality control [QA/QC] procedures, and other information about data such as meaning, relationships to other data, origin, usage, and format—can reference different documents)

A.8.3 Data Review and Clearance

Data will be reviewed for QA/QC in accordance with the MAM Manual (DWH Trustees, 2024), and errors in transcription will be corrected. Implementing Trustees will verify and validate 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 identified errors are addressed, data are considered to be 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, co-implementing Trustees shall confirm with one another that the package is approved for submission.

A.8.4 Data Storage and Accessibility

Once data have been cleared, they will be submitted to the designated Amazon Web Service (AWS) server which can be accessed through 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.

A.8.5 Data Sharing

Data will be made publicly available in accordance with the Federal Open Data Policy through the designated AWS server, which can be accessed through DIVER Explorer Interface within 1 year of when the data collection occurred.

A.9 Reporting

Based on the anticipated project monitoring schedule (Section 4), associated reporting will be submitted in years 4 and 6. Reports have been scheduled for the year after major data collection efforts with the intention that results will be available to determine whether performance criteria that have been established in Table 4 have been met. If performance criteria have not been met, then potential corrective actions will be identified.

A.10 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 work groups. The CPRA is the implementing Trustee for the project. The U.S. Department of the Commerce will be the lead federal agency for conducting the environmental evaluation and compliance review for implementation. Additional Trustees, and/or their designees, will be responsible for collection and transmission of QA/QCed data to CPRA for incorporation into annual DIVER reporting and periodic synthesis reporting. The participating Trustees' roles include:

CPRA (Implementing Trustee):

- Coordinating with the project partner(s) to ensure data collection and report composition are completed.
- Ensuring the project partner performs O&M activities as required.
- Providing project progress information to the LA and Open Ocean TIGs.

A.11 Monitoring and Adaptive Management Budget

The overall budget for the project monitoring and adaptive management is $1,090,000, and includes aerial imagery acquisition and land water analysis, vegetation surveys, elevation surveys, oversight of monitoring activities, monitoring data synthesis and reporting costs.

A.12 References

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A.13 MAM Plan Revision History

Table A- 4. MAM Plan Revision History

OLD VERSION #	REVISION DATE	CHANGES MADE	REASON FOR CHANGE	NEW VERSION #
-	-	-	-	-

Appendix B. Raccoon Island Restoration Monitoring and Adaptive Management Plan

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B.1 Introduction

The Deepwater Horizon (DWH) Louisiana Trustee Implementation Group (LA TIG) developed this monitoring and adaptive management (MAM) plan for the Raccoon Island Restoration Project, which represents one project selected from within the draft *Restoration Plan and Environmental Assessment #8.1: Wetlands, Coastal, and Nearshore Habitats (RP/EA #8.1)*. Construction and MAM activities for this project will be funded by the LA TIG's DWH Natural Resource Damage Assessment (NRDA) settlement funding allocations. The primary objective of this selected project, the Raccoon Island Restoration Project, is to create and restore approximately 413 acres of Raccoon Island habitats, including 176 acres of back-barrier marsh and 85 acres of beach and dune. The purpose of this MAM plan is to identify monitoring activities that will be conducted for 10 years following construction to evaluate and document restoration effectiveness. Effectiveness may be measured by various performance criteria posed in this document and may be strengthened by identified corrective actions if certain performance criteria are not met (15 Code of Federal Regulations [CFR] 990.55 (b)(1)(vii)). This MAM plan identifies sources of uncertainty encompassing environmental changes, as well as construction or monitoring logistics and decision points that address these uncertainties to reach project objectives and maximize project benefits. Additionally, it establishes a decision-making process for incorporating adjustments where needed. In general, MAM plans increase the likelihood of successful project implementation by identifying restoration goals and planning for corrective actions that may need to be taken if a particular goal is not achieved as expected. These documents allow for managers to capture the lessons learned from an implemented restoration project, informing future project selection, design, and implementation.

This MAM Plan was developed according to the Monitoring and Adaptive Management Procedures and Guidelines Manual (DWH NRDA Trustees, 2024; MAM Manual) and is considered a living document. It may be updated as needed to reflect changing conditions, new information, and/or developments in technology. Any future revisions to the MAM Plan will be made available through the Restoration Portal (https://www.diver.orr.noaa.gov/web/guest/home) and accessible through the DWH NRDA Trustees' website (https://www.gulfspillrestoration.noaa.gov/).

B.1.1 Project Overview

B.1.1.1 Barrier Islands

Barrier islands form when sediment is deposited consistently by wave action in nearshore marine environments. These dynamic deposits provide routes for longshore sediment transport, often shift landward, and are ubiquitous to the northern Gulf of America (hereafter termed the Gulf) (Penland et al., 1988). Situated close to shore, barrier islands serve as transitional habitats between the open ocean and coastal wetlands, dampening storm and wave energy. This protection offers refuge for many species in the salty marshes surrounding barrier islands as well as on their beaches and dunes. In LA waters, barrier islands provide highly productive habitats for shrub and ground-nesting birds, breeding and non-breeding shorebirds, secretive marshbirds, and migrant neotropical species (termed "birds" hereafter). Additionally, the marshes formed behind the barrier islands, termed back-barrier marsh, offer shelter, nursery, and foraging habitat for many commercially, recreationally, and ecologically important nekton species. Historically, these islands have supported biodiverse

ecosystems which offer a wealth of associated ecosystem services to LA but have been changing in recent years due to anthropogenic and environmental pressures.

B.1.1.2 DWH Injuries and Previous Barrier Island Restoration

After the 2010 Deepwater Horizon (DWH) incident, LA coasts and wildlife were impacted by persistent heavy oiling leading to injured bird and nekton species and the degradation of many transitional habitats, including barrier islands. Under Oil Pollution Act regulations, Trustees conducted a comprehensive injury assessment and found significant, direct effects of oiling to LA wildlife. Across the Gulf states, large-scale and pervasive injuries of at least 93 bird species and their critical habitats were documented (DWH Trustees 2016; Section 4.7.5, Wallace & Ritter, 2015). Bird injuries included direct and indirect mortalities as well as lost future reproduction. Of note, access restrictions within expansive oiled coastal marshes and island bird colonies, habitats which maintain significant bird concentrations, limited Trustees' ability to more fully characterize the extent of the true avian injury (DWH Trustees 2017). Similarly, nekton species, such as shrimp and red drum (Sciaenops ocellatus), suffered from reduced growth, reduced egg-hatch success, and mortality. In general, secondary production declined by an estimated 50-95 percent across studied nekton and benthic species (i.e. amphipods, periwinkles, brown and white shrimp, southern flounder (Paralichthys lethostigma), and red drum) in nearshore environments (DWH Trustees 2016; Section 4.6.4, Powers & Scyphers, 2015, Zengel et al., 2015, Blancher et al., 2015). Additionally, the spill occurred in a period of high productivity in the Gulf and large oil slicks were estimated to kill 2 to 5 trillion fish larvae in the water column. The direct oiling of these resources (i.e. birds and nekton) coincided with the indirect impact of degradation to their respective habitats. Oiling of the LA coast degraded many nearshore marine environments including salt marshes and mangrove stands. LA salt marshes experienced reductions in above ground biomass and live plant cover ranging from 11 to 53 percent over 350-721 miles. Within these marshes, the marsh edge suffered the most serious injuries (Hester et al 2015, Powers & Scyphers 2015). The productive marsh edge protects juvenile nekton from predators while foraging, providing important nursery habitat. Mangrove stands in LA were significantly reduced and had visible, diminished physiological health (DWH Trustees 2016; Section 4.6.10, Willis et al., 2015). These stands offer important nesting habitat for birds, along with other impacted vegetation.

These injuries, along with environmental pressures such as sea level rise, subsidence, tropical storms, and cold fronts, threaten the geomorphologic and ecological integrity of barrier islands off the LA coast. LA transitional habitats are losing land at high rates (CPRA, 2023) and thus have been targeted areas for restoration in LA. Previously, the LA TIG has implemented restoration projects at other barrier islands and the Coastal Protection and Restoration Authority of LA (CPRA) has established a Barrier Island Comprehensive Monitoring Program (BICM). These ongoing efforts aim to restore natural resources and services and monitor the geomorphic and ecologic statuses of LA barrier islands.

B.1.2 Raccoon Island

One such island which was injured by the DWH oil spill and remains vulnerable to environmental pressures is Raccoon Island. This barrier island off the LA coast in Terrebonne Parish is situated on the western end of the Isles Dernières island chain (29.051°N, 90.925°W) and is the terminus for

westward, longshore sediment transport. Raccoon Island is a transitional habitat between the Gulf to the south and Caillou Bay to the north.

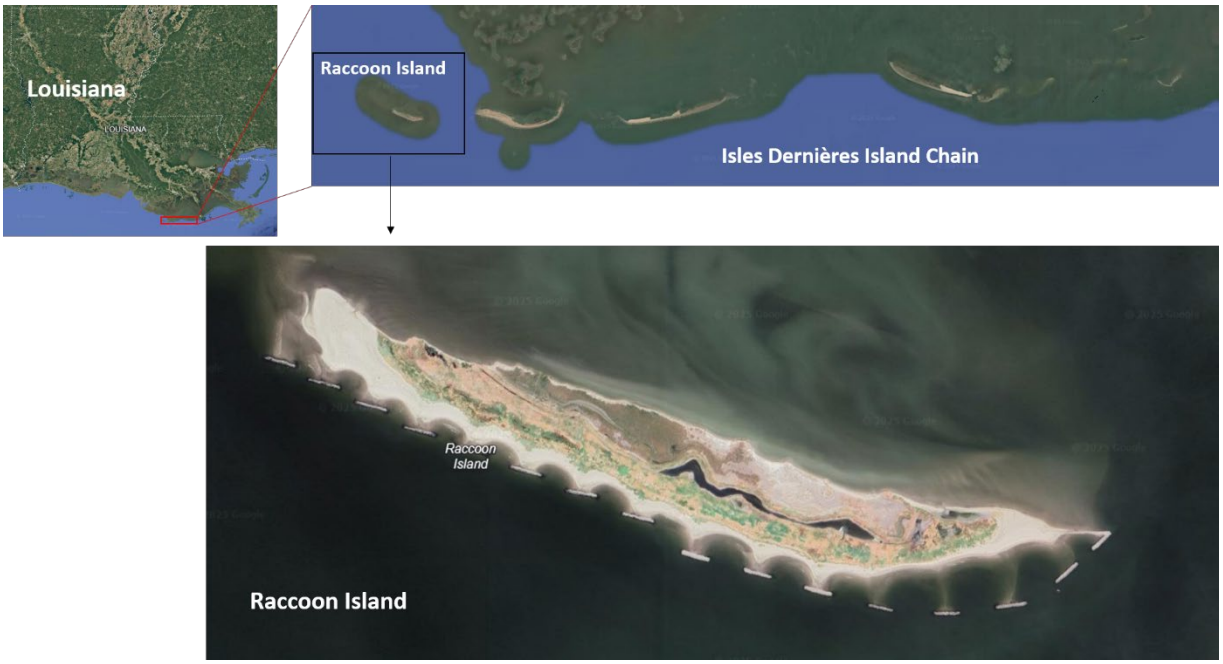

Figure B- 1. Map of Raccoon Island within the Isles Dernières island chain off the coast of Louisiana

Several habitat types are associated with Raccoon Island including salt marshes, beaches, and dunes which may be vegetated with mangrove stands, scrub/shrubs, and grasses. On the islands, this vegetation offers essential habitat for birds and currently supports one of the most productive rookeries of Brown Pelican (*Pelecanus occidentalis*) in LA. Additionally, Raccoon Island serves as critical habitats for both wintering non-breeding shorebirds as well as offering key resting and feeding locations for neotropical migrants. North of Raccoon Island, back-barrier marsh acts as nursery habitat for transient nekton species and spawning habitat for the recreationally important fish, red drum. These marsh areas also offer habitat for nekton which feed, forage, and evade predation during various life stages. These natural resources provide recreational opportunities such as fishing and birdwatching as well as support commercial fisheries (e.g. shrimp and blue crab). Raccoon Island also protects northern marsh shorelines which support natural resources economically and ecologically important to the state. Similar to other LA barrier islands, many of Raccoon Island's natural resources and ecosystem services were injured after the DWH spill. Thus, the LA TIG has approved the implementation, construction, and monitoring of the Raccoon Island Restoration Project.

B.1.3 Restoration Plan Design and Implications

Previous restorative actions including nourishment, armoring, and planting have occurred on Raccoon Island through projects like TE-29 (available at the following URL): (https://www.lacoast.gov/reports/gpfs/TE-29.pdf) and TE-48 (available at the following URL): (https://www.lacoast.gov/reports/gpfs/TE-48.pdf) sponsored by the Natural Resources Conservation Service and CPRA. These projects added segmented breakwaters starting on the eastern end of the island (TE-29) and extending west (TE-48) along the gulf-facing side. The second

effort (TE-48) also included construction of a retention dike along the northern shore to create a back bay enclosure that was filled with sediment and planted, forming back-barrier marsh. Later, more breakwaters were installed, and a 58-acre back-barrier marsh was created. Yet, Raccoon Island was still projected to become subaqueous by 2050 (USACE, 2010) without further restoration efforts. Thus, the LA TIG allocated funds to further Raccoon Island restoration in attempts to restore its ecological and geomorphic functions.

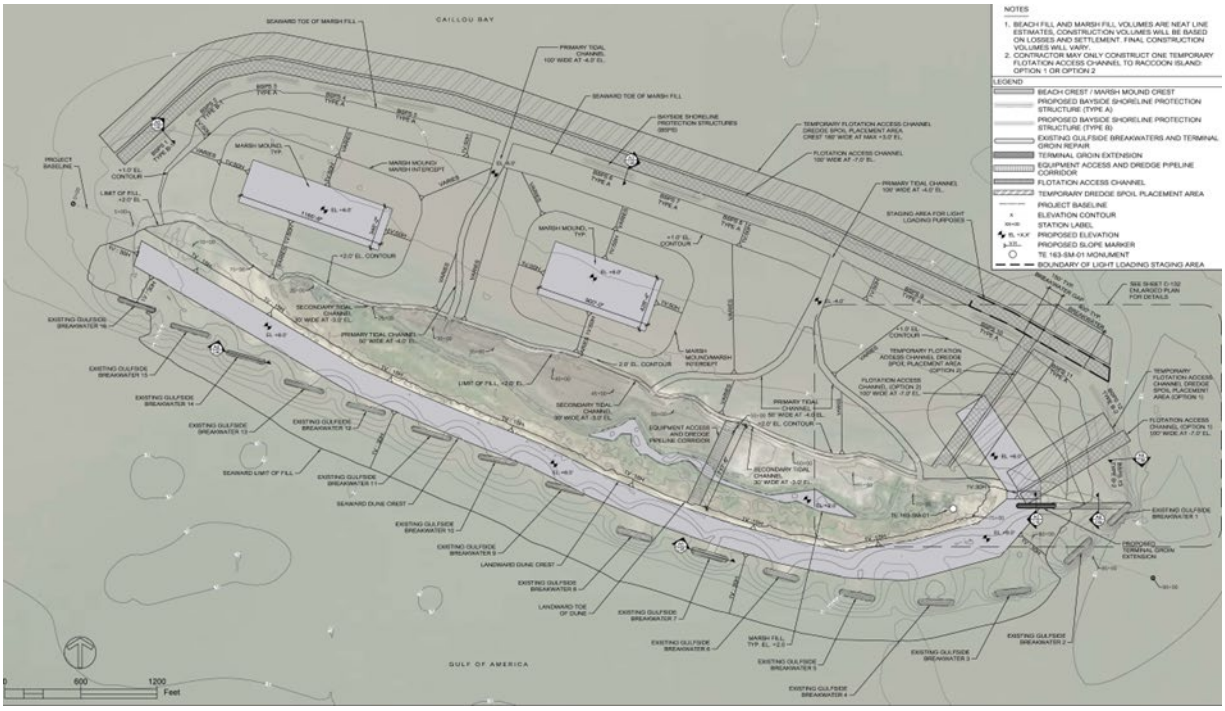

Figure B- 2. Preferred Design Alternative for the Raccoon Island Restoration Project. Major design features include beach and dune nourishment and creation of back-barrier marsh mounds (light grey areas), sinuous tidal channels, repairing gulfside breakwate

The Raccoon Island Restoration Project (Figure B- 2) will create and restore a total of approximately 413 acres of barrier island. This acreage includes approximately 176 acres of back-barrier marsh and 85 acres of beach and dune. Sediment will be utilized from Ship Shoal Block 88 (available at the following URL): (BOEM Data Center-Block Polygons) borrow area and placed on the beach and dune habitats (1.34 MCY of fill) and the back-barrier marsh platform (1.58 MCY of fill). Beach and dune nourishment, along with plantings, will provide more habitat for shrub and ground-nesting birds. Contrary to previous projects, the back-barrier marsh platform has a sloped edge where the constructed mound elevation peaks at +6.0 feet NAVD88 and then tapers down to +1.2 feet NAVD88, before taking a 1V:50H slope to existing grade. Within the back-barrier marsh area, 3 sinuous tidal channels will be constructed to provide connectivity through the marsh and to the barrier island with the surrounding waters. Along with repairing existing gulfside breakwater structures, seventeen (17) new bayside shoreline protection structures will be constructed along the perimeter of the marsh filled area (Figure B- 2). Contrary to traditional breakwaters, these structures will have lower elevation (+1.2 feet NAVD88) and include a layer of oyster cultch on the marsh-side, creating a low-crested living shoreline structure. We expect the lower elevation to be balanced by greater surface area, leading to similar effectiveness in dampening bayside wave action. Each of these constructed

marsh features (i.e. tidal channels, low-crested living shoreline structures) were designed to create desirable habitat for the nekton, promoting secondary production of important fisheries species.

The Raccoon Island Restoration Plan falls into these restoration categories outlined in the final Programmatic Damage Assessment and Restoration Plan/ Programmatic Environmental Impact Statement (PDARP/PEIS):

- **Programmatic Goals:** Restore and Conserve Habitat; Replenish and Protect Living Coastal and Marine Resources
- **Restoration Types:** Wetlands, Coastal, and Nearshore Habitat (WCNH)
- **Restoration Approaches:** 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; Plant vegetation on dunes and back-barrier marsh
- **Trustee Implementation Group:** LA TIG
- **Restoration Plans:** *Restoration Plan and Environmental Assessment #8: Wetlands, Coastal, and Nearshore Habitats (RP/EA #8); RP/EA #8.1*

Overall, the Raccoon Island Restoration Project will create diverse habitat for LA natural resources which were injured by the DWH spill and are further threatened by environmental stressors. The capacity to support productive rookeries and fisheries on the island should increase, leading to enhanced ecological function of a key coastal habitat.

B.2 Restoration Type Goals and Project Restoration Objectives

As mentioned above, the overall DWH programmatic goals of the Raccoon Island Restoration Project are to *Restore and Conserve Habitat* and to *Replenish and Protect Living Coastal and Marine Resources*. Within each of these programmatic goals are various Restoration Types. Here, we are primarily focused on the WCNH Restoration Type. Within the PDARP, the Trustees indicated that restoration for WCNH should achieve multiple ecosystem benefits and contribute to an integrated, connected food web. These benefits include improving habitat for key wildlife that were injured in the spill that rely on WCNH. Aligning with these goals, the Raccoon Island Restoration Project aims to support the restoration of injured nekton and birds and thus this MAM Plan includes actions to monitor the effectiveness of the restoration in supporting these species.

B.2.1 Restoration Type Goals

Our restoration activities aim to create and restore approximately 413 acres of WCNH, including 176 acres of back-barrier marsh and 85 acres of beach and dune. This creation and enhancement will also support the protection and replenishing of living coastal and marine resources such as birds and nekton that directly use this habitat. Within the WCNH Restoration Type are the following associated Restoration Type goals:

- Restore a variety of interspersed and ecologically connected coastal habitats in each of the five gulf states to maintain ecosystem diversity, with particular focus on maximizing ecological functions for the range of resources injured by the spill, such as oysters,

estuarine-dependent fish species, birds, marine mammals, and nearshore benthic communities
- Restore for injuries to habitats in the geographic areas where the injuries occurred, while considering approaches that provide resiliency and sustainability
- While acknowledging the existing distribution of habitats throughout the Gulf, restore habitats in appropriate combinations for any given geographic area. Consider design factors such as connectivity, size, and distance between projects, to address injuries to the associated living coastal and marine resources and restore the ecological functions provided by those habitats

Birds and nekton are not specified as Resource Types for the Raccoon Island Restoration Project yet will be indirectly restored through improvement of key habitat. Identified in the Bird Resource Type restoration, this project will achieve goals of 1) Restoring or protecting habitats on which injured birds rely and 2) Restoring injured birds by species where actions would provide the greatest benefits within the geographic ranges that include the Gulf. Although not classified as their own Resource Type in the PDARP, estuarine-dependent nekton were designated as important species injured by the spill and the Trustees planned to account for their injuries using a three-pronged approach. One of these strategies restores important coastal and nearshore habitat under the WCNH Restoration Type as an indirect, ecosystem-level approach to restore for injuries to nekton.

B.2.2 Project Restoration Objectives

As previously stated, this project will deposit dredged sediment from the Ship Shoal borrow area to create and/or restore approximately 413 acres of habitat. The primary purposes of this restoration project identified in the initial draft RP/EA #8 were to:

1. Restore Raccoon Island system geomorphologic integrity and support natural geomorphic processes
2. Restore the Raccoon Island system ecological function
3. Support the natural processes of the barrier systems
4. Prevent island breaching
5. Support the diversity of habitats including providing more areas suitable for nesting, loafing, and foraging for birds and productive marsh habitat for fish that maintains ecological connectivity on the island

The RP/EA #8 proposed several restoration techniques in order to execute these primary purposes of the project. First, the project will create and enhance beach, dune, supratidal, intertidal, and subtidal habitats through seawards and landward sand fill placement and shoreline protection. Further, herbaceous and woody vegetation planting will be included to promote productive bird habitats. As a result, approximately 176 acres of back-barrier marsh and 85 acres of beach and dune habitat will be created, while some remaining acreage of existing emergent habitat will be restored. From these initial restoration plan purposes and techniques, we developed specific project objectives and parameters for this MAM Plan (also see Table 2.1):

Objective 1: Restore Raccoon Island system geomorphologic integrity and support geomorphic processes

- Parameter 1.1: Area (acres) of barrier island habitats created
- Parameter 1.2: Elevation of beach/dune and marsh areas

- Parameter 1.3: Shoreline position
- Parameter 1.4: Bathymetry around island (context)
- Parameter 1.5: Breakwater monitoring
- Parameter 1.6: Vegetation percent cover (by taxon)
- Parameter 1.7: Vegetation species composition

Objective 2: Restore and create more areas suitable for bird nesting, loafing, and foraging

- Parameter 2.1: Area of potential nesting habitat
- Parameter 2.2: Shrub and Ground Nesting Bird Nest abundance
- Parameter 2.3: Non-breeding bird abundance

Objective 3: Create and support productive marsh habitat for fish and water column invertebrates that maintains ecological connectivity to the island

- Parameter 3.1: Water levels (context)
- Parameter 3.2: Presence of target nekton
- Parameter 3.3: Species richness and diversity (context)
- Parameter 3.4: CPUE of target nekton

Specific, measurable performance criteria and potential corrective actions can be found in Section 2.1, These parameters will be monitored according to the Monitoring Schedule found in Section 2.2. During the final design process, project team members will have the opportunity to refine design parameters as additional information becomes available. Performance criteria will be identified/implemented to determine restoration success or the need for corrective action in accordance with 15 CFR § 990.55(b)(1)(vii).

B.3 Conceptual Setting

Raccoon Island, similar to other barrier islands (Figure B- 3) situated in the Gulf, is a uniquely dynamic coastal and marine habitat. This constantly shifting landform offers protection for back-barrier marsh fisheries from strong oceanic physical processes such as tropical storms, longshore currents, and general wave and tidal energy, promoting secondary productivity for ecologically and economically relevant species. Not only this, but the dune and beach habitats of Raccoon Island have historically been among the most productive avian nesting areas in the northern Gulf and a key site for neotropical migrant species. In recent years, Raccoon Island has experienced severe land loss and shoreline recession threatening many species due to a combination of natural (e.g., subsidence, changes to sediment supply) and anthropogenic factors (i.e. DWH oil spill). To restore this important ecosystem and associated natural resources and services, the Raccoon Island Restoration Project has been proposed.

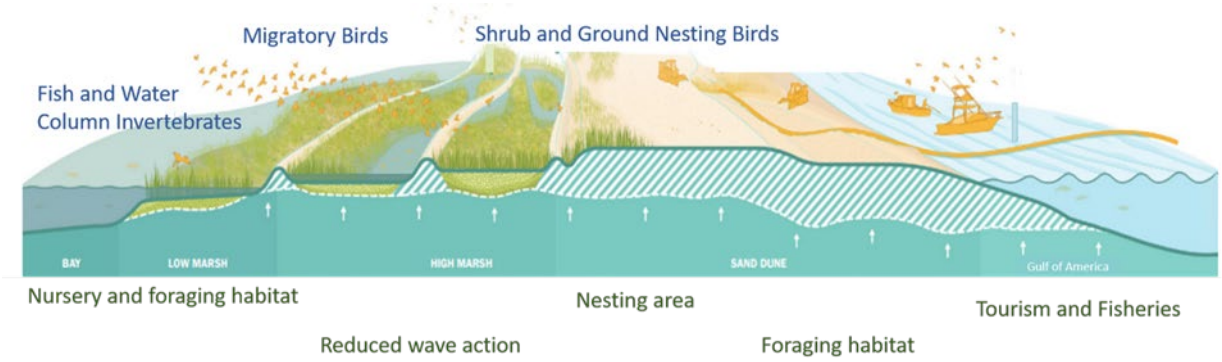

Figure B- 3. Barrier Island habitat types (white text), natural resources served (blue text), and services (green text) they provide. Figure adapted from CPRA Coastal Master Plan 2023

For the Raccoon Island Restoration Project, the main actions include adding fill to beach/dune and marsh habitats and placement of breakwaters and hay bales to restore the barrier island geomorphic processes and ecological function. Through this project, there will also be vegetation and predation control to improve the probability of success of nesting birds in the project area. These combined actions are designed to build habitat and influence productivity but may have propagating ecological consequences. Beach and dune enhancements will provide more area for essential nesting, foraging, and loafing habitat for birds which rely on Gulf barrier islands. This area currently supports one of the largest Brown Pelican rookeries in the northern Gulf, a species which suffered significant injuries from the DWH oil spill. With added area and vegetation and predation management, this rookery may continue to thrive and grow, helping to recover from those injuries. Similarly, adding fill and vegetation to the back-barrier marsh will increase habitat for nekton species across life stages. These nekton species use edges of the marsh platform, particularly vegetated edges, to forage and hide from predators (e.g. birds and larger fishes). Marsh habitats such as these also offer nursery habitat for marine species and are protected by the barrier island. Thus, creating habitat for nekton species is expected to increase secondary productivity of key recreational and commercial species. Besides nekton and bird abundance and diversity, created marsh may increase nutrient cycling and contribute to water quality changes. Further, the vegetation control will aid in further erosion of the island habitats. Overall, the implementation of the Raccoon Island Restoration Project focuses on creating and restoring habitat, encouraging ecological succession and cascading ecosystem benefits.

B.4 Potential Sources of Uncertainty

Potential uncertainties (Table B- 1) affect the project's ability to achieve stated restoration objectives. Monitoring activities may be selected and implemented to inform these uncertainties and select appropriate corrective actions in the event the project is not meeting its performance criteria.

Table B- 1. Potential uncertainties and their impact to the project grouped by broader issues

BROADER ISSUE	SPECIFIC UNCERTAINTY	POTENTIAL IMPACT
Building/ Construction Logistics and Design Considerations	Contractor completing the project on time	An inability to complete the project on time would delay resource restoration and may require allocation of additional funding/resources for project completion
Building/ Construction Logistics and Design Considerations	Project design criteria achieved	Targets for habitats and species may not be attained and would be more susceptible to wind/wave erosion
Building/ Construction Logistics and Design Considerations	Marsh Platform Settlement	The extent of marsh platform settlement will affect the amount of habitat available to different species. If the platform settles too much, important nesting and forging habitat for birds may be lost. Conversely, if it does not settle enough, nekton habitat and connectivity to the mangrove stands may be compromised.
Building/ Construction Logistics and Design Considerations	Functionality of Tidal Creeks	Constructed tidal creeks were designed to maintain the existing (and future) mangrove stands on the project's interior. Lack of flushing or connectivity to the mangrove stands may lead to vegetation mortality and decreased cover, diminishing nesting habitat for birds and nursery habitat for nekton.
Monitoring Logistics	Accessibility of island	Over the lifetime of the project, the accessibility of the island may change, and thus sampling plans should remain flexible to obtain necessary monitoring data in a reasonable and safe manner.
Monitoring Logistics	Expense and level of effort	Once monitoring efforts begin, it may become clear that there is low accessibility of the island and high levels of effort to monitor specific parameters. This could lead to increased expenses to compensate those monitoring for the extra time accrued.
Monitoring Logistics	Availability of other bird nesting sites along the LA coast	There are several restoration activities that are taking place across coastal LA and the northern Gulf Coast. Many of these projects could provide habitat for nesting birds. This additional amount and diversity of potentially high-quality habitat could lower the number of nesting birds on Raccoon 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.

BROADER ISSUE	SPECIFIC UNCERTAINTY	POTENTIAL IMPACT
Oceanographic Processes	Hurricanes, tropical storms, strong wave action, longshore currents	Storm events before or after project construction could result in sediment or elevation loss and damage to breakwaters. Unexpectedly high frequency of overwash, nest site flooding, wave action on the back-barrier shoreline, and similar disturbance events have been shown to cause mortality in avian age classes (adults, juveniles, young of the year) as well as loss of critical nesting and brooding habitats.
Oceanographic Processes	Changes in sediment transport	Increased sediment compaction would reduce the elevation making the dune, beach, and marsh more susceptible to increased water levels. Uncertainty in sediment dynamics would result in poor predictions of barrier island evolution, including predictions of elevation and habitat area, which can jeopardize project success.
Oceanographic Processes	Breakwater erosional hotspots	With time, the constructed breakwaters around the island may obstruct natural sediment transport processes and could in turn, change the bathymetry around the island which could lead to erosion of restored habitats, impacting project success. Not only this, but this erosion could also undermine the breakwaters themselves.
Oceanographic Processes	Sea-level rise, subsidence	Sea level rise uncertainty could result in poor predictions of geomorphic and ecological responses. Increased water levels would expose beaches and dunes to more wave action, potentially removing sediment, lowering elevation, and reducing shoreline protection afforded by restored habitat. Increased water level would increase the depth and duration of flooding in marsh habitat, causing plant stress and habitat deterioration, subsidence, and potential loss.
Barrier Island Ecosystem succession and dynamics	Vegetation colonization and establishment	Lack of planting success / vegetation establishment would limit or delay the creation of desired habitat, increasing wind and wave-driven sediment loss and limiting creation of preferred nesting habitat for target bird species and nursery and foraging habitat for fish.
Barrier Island Ecosystem succession and dynamics	Oyster recruitment and reef establishment	Storms may move the oyster cultch/reefs. Additionally, sand may cover the reefs intermittently impacting oyster recruitment and potentially limiting habitat for nekton species.

BROADER ISSUE	SPECIFIC UNCERTAINTY	POTENTIAL IMPACT
Barrier Island Ecosystem succession and dynamics	Invasive Species	Colonization by invasive plant species could reduce nesting habitat and would therefore not support proposed project objectives. Potential options to address this uncertainty include, but are not limited to, use of chemical, mechanical, or other removal techniques
Barrier Island Ecosystem succession and dynamics	Nest predators	Mammalian predators (e.g., nutria, raccoons, rats) have been shown to be highly detrimental to nesting success and hatchling/fledgling survival and may be present as nuisance species on Raccoon Island. Potential options to address this uncertainty include, but are not limited to, predator monitoring, predator removal/reduction methods, and/or colony fencing to reduce/eliminate access by nuisance mammals.
Barrier Island Ecosystem succession and dynamics	Anthropogenic disturbance	Anthropogenic disturbance has been shown to significantly impact nesting success and hatchling/fledgling survival via limiting parental attendance. Potential options to address this uncertainty include, but are not limited to, signage indicating restricted distance to colonies at certain times of the year, law enforcement, or other methods.
Barrier Island Ecosystem succession and dynamics	Pests or disease	Avian disease has the potential to harm birds and cause nesting failure. Potential options to address this uncertainty include, but are not limited to, creation or enhancement of habitat across other locations to reduce bird densities and thereby prevalence of disease presence and frequency. For plant diseases, pests, and/or fungal infections, spraying of appropriate insecticides or fungicides may be necessary.

B.5 Project-Level Decisions: Performance Criteria and Potential Corrective Actions

This MAM Plan identifies methods to document the project's performance for the first 10 years following construction. Here, we outline key performance criteria, context variables, and potential corrective actions associated with our established objectives and parameters. For each of our defined parameters, we classify parameters as performance or context and address the intended purpose, monitoring method, timing and frequency of monitoring, sample size, and duration of monitoring. For each parameter, the site location will be centered on Raccoon Island. If there is a specified area of the barrier island where monitoring will be focused, we also list the sites where

monitoring should be conducted. Monitoring these parameters will enable the TIG to track progress towards performance criteria, inform the need for potential corrective actions or adjustments to various monitoring approaches, and evaluate restoration success.

Given the lack of unrestored barrier islands to serve as controls, other barrier island restoration projects may serve as useful comparison to Raccoon Island Restoration Project at various stages of project life. The CPRA currently maintains BICM, a program which provides data and research to support the planning, design, construction, evaluation, and adaptive management of LA's barrier/sandy shoreline restoration projects through the Barrier Island System Management program (Kindinger et al., 2013; Enwright et al., 2020). As data is available, these can be used to compare the restoration progress of Raccoon to other barrier island restoration projects. Additionally, the Coastwide Reference Monitoring System (CRMS) (available at the following URL): (https://www.lacoast.gov/crms/ Home.aspx) was developed and implemented to improve the effectiveness in evaluating individual restoration projects, as well as the combined effects of multiple projects, by providing a network of reference sites where data are collected on a regular basis (Steyer et al., 2003; Folse et al., 2023). The Avian Data Monitoring Portal will also provide valuable data from other barrier islands and similar habitat to compare with monitoring from this project. Lastly, the Louisiana Department of Wildlife and Fisheries (LDWF) manages the Fisheries-Independent Monitoring Program (FIMP), collecting valuable coastal wetland, oyster, nekton, and prey resource data for nearshore habitats and resources targeted for NRDA restoration (Louisiana Fisheries-Independent Monitoring Program). Raccoon Island monitoring data may be compared to nearby sites of the CRMS and FIMP programs where applicable to address ecological connectivity or use as reference data for target nekton species.

B.6 Project Monitoring

The LA TIG proposes the continued implementation of the following (see Table B- 2) proven and established monitoring methodologies to monitor project success. However, the LA TIG remains open to emerging technological and scientific advancements to enhance project monitoring as they become available. Gained knowledge from project monitoring efforts will be used to determine whether the project may be considered successful or if potential corrective actions are needed. Monitoring and corrective actions enable the project to achieve desired outcomes. In (Table 2), we also identify performance criteria and potential corrective actions that may be taken if certain performance criteria are not met. Previously identified uncertainties, previously unknown conditions, and unanticipated consequences or environmental drivers may affect project success. These potential corrective actions aim to account for such consequences which may not be accounted for in the original design of the restoration project. The LA TIG's decision to implement corrective actions will fall within the larger adaptive decision-making framework.

Table B- 2. Project objectives, purpose (i.e. performance or contextual), proposed methods of monitoring, performance criteria and potential corrective actions.
Notes: The objectives in the table below include:

- *Objective 1 (1.1 – 1.7): Restore Raccoon Island system geomorphologic integrity and support geomorphic processes*
- *Objective 2 (2.1 – 2.3): Restore and create more areas suitable for bird nesting, loafing, and foraging*
- *Objective 3 (3.1 – 3.4): Create and support productive marsh habitat for fish and water column invertebrates that maintains ecological connectivity to the island*

PAREMETER	PURPOSE	METHODS	METRIC & DATA OUTPUT	TIMING, FREQUENCY, AND DURATION OF DATA COLLECTION	SAMPLE SIZE AND SITES	PERFORMANCE CRITERIA	POTENTIAL CORRECTIVE ACTIONS
1.1: Area (acres) of barrier island habitats created	**Performance:** To determine the number of acres for each habitat type and overall project area over time	Using geo-rectified aerial imagery, habitat maps will be generated using an object-based classification approach in the Trimble eCognition software or equivalent. Habitat acreage will be evaluated using the same methods and classification scheme as used for the BICM program (Enwright et al., 2020), allowing integration and comparison of multiple datasets if needed. As available, real-time kinematic (RTK) global positioning system (GPS) data and light detection and ranging (LiDAR) elevation data. This can be done by drone-based methods. Parameters 1.1-1.5 can all rely on data from combined drone-based lidar and single beam bathymetry	Survey tracks, survey photography, GIS raster files, KMZ files, JPG map and area [acres] of total barrier island habitat created and area [acres] of each habitat type	Aerial imagery will be acquired post-construction in the fall of Years 1, 3, 5, 10	High-resolution, near-vertical aerial imagery acquired for the entirety of Raccoon Island	The total created area (marsh, beach/dune) is equal to or greater than 413 acres (or final approved construction design	Planting of appropriate species; addition/use of hay bales
1.2: Elevation of beach/ dune and marsh areas	**Performance:** To evaluate whether target habitat elevations are achieved according to design criteria and to track elevation of habitats over time	LiDAR topography and/or RTK GPS topographic/bathymetric survey data collected as part of project monitoring. Settlement and overwash monitoring plates are included in construction plans but will not be relied on as measures of performance success. Additional data collected by BICM surveys (outside of this project), if available, may also be used to supplement the dataset.	Elevation at set points (ft NAVD88)	Data will be collected by the construction team at Year 0 (as-built) and then collected by the MAM team in Years 3, 5, and 10	If RTK is used, transects across Raccoon Island should follow methods outlined in the construction documents that occurred in the as-built survey.	There will be at least 194 acres of habitat above +2.0 ft NAVD88 10 years post-construction (or acreage described final approved construction design)	Addition of hay bales
1.3: Shoreline position	**Performance:** To delineate shoreline position and determine changes to island extents	Derivation from RTK GPS topographic/ bathymetric survey data, and/or LiDAR topography collected as part of project monitoring. Any of several reasonable options for assessing shoreline position may be used or combined depending on available budget (e.g., Terrano et al., 2016), including digitization and use of aerial imagery following the BICM program methods (Enwright et al., 2020).	JPG map, GIS raster files of delineated land:water, proportion [%] and area [acres] of land and water	Aerial imagery collected in Years 1, 3, 5, and 10 may be used here as well as any RTK or LiDAR collected in Years 3, 5, and 10 by Objective 1.1 and Objective 1.2.	High-resolution, near-vertical aerial imagery acquired for the entirety of Raccoon Island	Change in shoreline position should not exceed 16.6 ft per year (Byrnes et al., 2018)	Enhanced monitoring to detect and inform potential repair of island breaches. Enhanced monitoring could include the deployment of a wave attenuation sensor array to understand energy transmission through the project area.
1.4: Bathymetry around island	**Context:** To determine the extent of erosion and changes to bathymetry off the island due to placement of breakwaters	Single-beam bathymetry or side-scan bathymetry may be used to assess bathymetry around the island as well as through constructed tidal creeks. Any reasonable option for assessing island bathymetry may be used or combined based on available budget and following existing BICM program methods (if applicable).	Contour elevation profiles surrounding the island (m/ft)	Occurring in Years 1, 3, 5, and 10 aligning with sampling for Objective 3.	High resolution surrounding the island including through tidal creeks	N/A	N/A

PAREMETER	PURPOSE	METHODS	METRIC & DATA OUTPUT	TIMING, FREQUENCY, AND DURATION OF DATA COLLECTION	SAMPLE SIZE AND SITES	PERFORMANCE CRITERIA	POTENTIAL CORRECTIVE ACTIONS
1.5: Breakwater monitoring	**Performance:** Ensure breakwaters do not have excessive scouring, have not failed, and do not require repair	Ocular monitoring and drone-based elevation surveys (LiDAR may be an acceptable method here). Ocular monitoring to be conducted by NOAA and CPRA before major monitoring events to identify any issues that require action or further investigation.	Indication of no sign of failure or failed. Example of failure types include circular slip failure and loss of armor stone, dislodged by waves. Circular slip failure is a localized, visible failure in which the structure may be 1-2 feet lower than the adjacent. There may also be gradual settlement and subsidence, which should not be considered a failure unless the settlement rates are higher than those predicted (by settlement curves) in engineering and design.	Occurring in Years 1, 3, 5, and 10 aligning before sampling for Objective 3.	All breakwater structures surrounding Raccoon Island	Breakwaters have no signs of failure including circular slip failure, loss of armor stone, or higher than expected subsidence rate. In a loss of armor stone, 3% loss of material is considered a failure. In the engineering and design report, the expected subsidence rate for the existing structures was between 0.5 and 1 inches. For the bayside protection structures, and appropriate range of settlement was 2-6 inches. If these settlement rates are exceeded, that will be considered a failure. Identified failures during visual inspections or the large monitoring events may trigger a corrective action.	Perform surveys (i.e. side scan sonar, RTK) to evaluate extent of damage and inform a potential repair. Repair failed breakwater(s) according to the Operations and Maintenance Plan outlined in Supplemental Material, Attachment 1.
1.6: Vegetation percent cover (by taxon)	**Performance:** To delineate the vegetation cover in the various habitats within the project area over time	Year 1: Survival count for existing mangrove stands and planted areas Following Years: Ocular estimates of percent cover of each species identified, height measurements of the dominant species, and percent cover of the carpet, herbaceous, shrub, and tree layers, if present, within a 2 meter by 2 meter plot (Folse et al., 2023) randomly placed along the transect lines that were established throughout the project area (Hester and Willis, 2015).	Percent cover and height of identified vegetation species	Occurring in late summer of early fall for Years 1, 3, 5, and 10 aligning with nekton sampling for Objective 3.	Year 1: Surveying limited to existing mangrove stands and planted areas Following years: 5 transects across Raccoon Island with 9 stations on each transect: 3 dune, 2 swale, and 4 marsh stations	At Year 5 and 10 the constructed habitats below will have the follow percent vegetation cover: Dune: at least 30% in planted areas Marsh: 70% for Year 10 Mounds: at least 30%	Perform supplemental planting of preferred vegetation in areas suited for plantings, eradicate unwanted vegetation
1.7: Vegetation species composition	**Performance:** To characterize the vegetation species composition in the various habitats in the project area over time.	Visual taxonomic identification of plants, resolved at the species level or using species groupings during vegetation surveys	Taxonomic designation	Occurring in late summer or early fall for Years 1, 3, 5, and 10 aligning with nekton sampling for Objective 3.		Species composition will be comparable to what was observed prior to project implementation and/or for nearby islands at the time of the most recent BICM survey.	Perform supplemental planting of preferred vegetation, eradicate unwanted vegetation

PAREMETER	PURPOSE	METHODS	METRIC & DATA OUTPUT	TIMING, FREQUENCY, AND DURATION OF DATA COLLECTION	SAMPLE SIZE AND SITES	PERFORMANCE CRITERIA	POTENTIAL CORRECTIVE ACTIONS
2.1: Area of potential nesting habitat	**Performance:** To determine the effectives of the project in increasing habitat by nesting birds	Data collected for habitat area and elevation will be used to categorize and measure habitat available for use by nesting birds	Survey tracks, survey photography, GIS raster files, KMZ files, JPG map and area [acres] of total nesting habitat created	Aerial imagery collected in Years 1, 3, 5, and 10 occurring in May/June	High-resolution, near-vertical aerial imagery acquired for the entirety of Raccoon Island	The total created nesting habitat (beach/dune) for birds is greater or equal to 85 acres (or final approved construction design) at year 10.	Planting of appropriate species
2.2: Shrub and Ground Nesting Bird Nest abundance	**Performance:** To determine the effectiveness of the project in increasing habitat use by nesting colonial birds.	Photographic counting (i.e., "dotting") of high-resolution aerial digital photography will be used to estimate numbers of nests for Shrub and Ground-Nesting Bird species (Ford, 2010).	Survey photography, GIS raster files, JPG map that illustrates dotted nests	Aerial imagery collected in Years 1, 3, and 5 occurring in May/June	The entire project area will be photographed, and associated images will be analyzed for nests produced by species or guild	Year 1: Brown Pelicans as high as 1450 nests; gulls as high as 2350 nests; wading birds as high as 0 nests; terns and skimmers as high as 16000 nests. Year 3: Brown Pelicans as high as 2900 nests; gulls as high as 4700 nests; wading birds as high as 100 nests; terns and skimmers as high as 16000 nests. Year 5: Brown Pelicans as high as 4300 nests; gulls as high as 7100 nests; wading birds as high as 230 nests; terns and skimmers as high as 16000 nests.	No corrective action envisioned at Year 1 as the habitat is evolving for optimal bird use. If unforeseen situations arise, adaptive management may be utilized. Years 2,4,6: Brown Pelican and wading birds-Additional preferred vegetative plantings; eradicate unwanted vegetation; placement of additional hay bales Terns and skimmers-eradicate unwanted vegetation; supplement limestone or expose bare ground through mechanical methods prior to nesting season. Predator control may be implemented as needed using established methods.

PAREMETER	PURPOSE	METHODS	METRIC & DATA OUTPUT	TIMING, FREQUENCY, AND DURATION OF DATA COLLECTION	SAMPLE SIZE AND SITES	PERFORMANCE CRITERIA	POTENTIAL CORRECTIVE ACTIONS
2.3: Non-breeding bird abundance	**Performance:** To determine the effectiveness of the project in maintaining foraging habitat for use by non-breeding birds, including red knot and piping plover	Data collection will use the pedestrian survey protocols	Abundance by species of non-breeding birds	Field surveys to be conducted in fall/winter in years 1, 3, 5, 7, and 10.	Crews will survey the entire island during a single day.	Year 1: As high as 5 focal shorebirds Year 3: As high as 10 focal shorebirds Year 5: As high as 19 focal shorebirds Year 7: As high as 24 focal shorebirds Year 10 As high as 38 focal shorebirds	Performance metric will be developed utilizing historic survey data for Raccoon Island collected 2013-2025 by USGS and LDWF
3.1: Water levels and water quality	**Context:** Used to evaluate the depth, water connectivity, and tidal influence on the marsh platform	Tidal signal, salinity, water temperature, and dissolved oxygen (DO) measured using continuously-recording data loggers. Elevation and water level data will be used to model inundation of the back-barrier marsh	Water level (ft), DO, temperature, salinity	Continuous data collection to occur over a minimum 72 hr period coinciding with nekton and vegetation monitoring in late summer/ early fall. May explore semi-permanent deployment solution for longer water level measuring.	One logger for each metric will be placed in 3 locations within the interior of the constructed back-barrier marsh and at 1 unvegetated reference location adjacent to the created marsh platform	N/A	N/A
3.2: Presence of target nekton	**Performance:** Understand which nekton species are using the created marsh habitat and assess the biological connectivity between the island, marsh platform, and open marine waters	Any reasonable method which allows for characterizing species of nekton within a fixed area. Some examples include, but are not limited to, using a fyke net, hand-pulled sled, light-weight throw traps, or ditch/lift nets.	Presence/ absence per habitat type across all catches per monitoring year and target species. Presence of target species will be examined from catch data.	Sampling to occur in late summer/ early fall to coincide with peak vegetation productivity related to vegetation surveys.	3-5 replicate samples per selected gear type collected at a minimum of 3 locations/ habitats across the back barrier marsh	Brown shrimp, white shrimp, other shrimps, blue crab, and killifish are present in habitat types sampled	Identify potential cause: Accessibility, comparison to abundance at reference sites. Evaluate monitoring protocols and substitute sampling gear types or methods

PAREMETER	PURPOSE	METHODS	METRIC & DATA OUTPUT	TIMING, FREQUENCY, AND DURATION OF DATA COLLECTION	SAMPLE SIZE AND SITES	PERFORMANCE CRITERIA	POTENTIAL CORRECTIVE ACTIONS
3.3: Species richness and diversity	**Context:** Assess biological connectivity and calculate the species richness and diversity of nekton species within the project area over time	Any reasonable method which allows for characterizing species of nekton within a fixed area. Some examples include, but are not limited to, using a fyke net, hand-pulled sled, lightweight throw traps, or ditch/lift nets.	Shannon-Weiner Diversity, richness, multivariate similarity across all catches per monitoring year. Species richness and Shannon Diversity examined from catch data	Sampling to occur in late summer/ early fall to coincide with peak vegetation productivity related to vegetation surveys.	3-5 replicate samples per selected gear type collected at a minimum of 3 locations/ habitats across the back barrier marsh	N/A	N/A
3.4: Condition and CPUE of target nekton	**Performance:** Provide an estimate of marsh habitat contributions to enhanced nekton productivity and connectivity to various barrier island habitats.	Any reasonable method which allows for characterizing species of nekton within a fixed area. Some examples include, but are not limited to, using a fyke net, hand-pulled sled, light-weight throw traps, or ditch nets.	Relative abundance (CPUE) and condition of target taxa can be examined from catch data. Length: weight data collected for a subset of individuals can be used to assess condition of target taxa at the project area (Froese 2006).	Sampling to occur in late summer/ early fall to coincide with peak vegetation productivity related to vegetation surveys.	3-5 replicate samples per selected gear type collected at a minimum of 3 locations/ habitats across the back barrier marsh. Reference stations may be established in accordance with LDWF FIMP	Brown shrimp, white shrimp, other shrimps, blue crab, and killifish are present in habitat types sampled	Identify potential cause: Accessibility, comparison to abundance at reference sites. Evaluate monitoring protocols and substitute sampling gear types or methods

B.7 Monitoring Schedule

The project monitoring schedule presented (Table B- 3) is separated by monitoring activities. Execution of monitoring will occur when the project has been fully executed as planned, although this timeframe may vary for different parameters. Performance monitoring will occur in the years following initial project execution (years 1 - 10). The table below (Table B- 3) proposes data collection periods which we aim to conduct 4 times over the course of the 10-year monitoring period. Yet, the specific years of these monitoring activities is subject to change and will remain flexible at this point. Monitoring activities in Year 0 will be completed by the construction team during the "as-built" surveys, indicated with a "*" in the table below and thus are not included in the MAM budget. Those activities are not the responsibility of the LA TIG, but the data collected will be considered in the monitoring and adaptive management of the Raccoon Island Restoration Project. In the first year, vegetation surveys will be limited to existing mangrove stands and areas that were planted. These surveys will be slightly different than the subsequent years as they should be a survival count rather than the extensive sampling plan outlined for the following years. Breakwaters will first be visually inspected by NOAA and CPRA before the monitoring team begins the large monitoring events in Years 1, 3, 5, and 10, as documented in the Operations and Maintenance Plan in the Supplemental Material (Attachment 1). The visual inspections may occur in other years to investigate the integrity of these shoreline protection structures after a large storm event.

Table B- 3. Schedule of monitoring activities following initial project execution (years 0-10)

Note: [2]Monitoring Timeframe for Each Parameter

Monitoring Parameters	0[2]	1[2]	2[2]	3[2]	4[2]	5[2]	6[2]	7[2]	8[2]	9[2]	10[2]
Aerial Imagery Acquisition	X*	X		X		X					X
Island Vegetation Survey		X		X		X					X
Elevation Survey	X*			X		X					X
Habitat Mapping		X		X		X					X
Bathymetry and breakwaters	X*			X		X					X
Shrub and Ground-Nesting Bird Nest Survey		X		X		X					
Non-Breeding Bird Survey		X		X		X		X			X

Monitoring Parameters	0[2]	1[2]	2[2]	3[2]	4[2]	5[2]	6[2]	7[2]	8[2]	9[2]	10[2]
Nekton Sampling		X		X		X					X

B.8 Adaptive Management

Monitoring information collected at this project-level will inform the adaptive management of the Raccoon Island Restoration Project. Adaptive management is an iterative, structured decision-making process that combines monitoring and evaluation of monitoring actions to manage natural resources facing uncertainty (Pastorok et al., 1997; Williams & Brown, 2014). Within the context of DWH NRDA, adaptive management includes implementing corrective actions to projects misaligned with set performance criteria, making continual adjustments to projects that require ongoing decision-making, and informing the selection, design, and implementation of restoration projects. Within the adaptive management framework developed by the LA TIG (Figure B- 4), there are four main phases to a representative management cycle including the goal setting, development and execution, monitoring and performance, and adaptive management coordination phases.

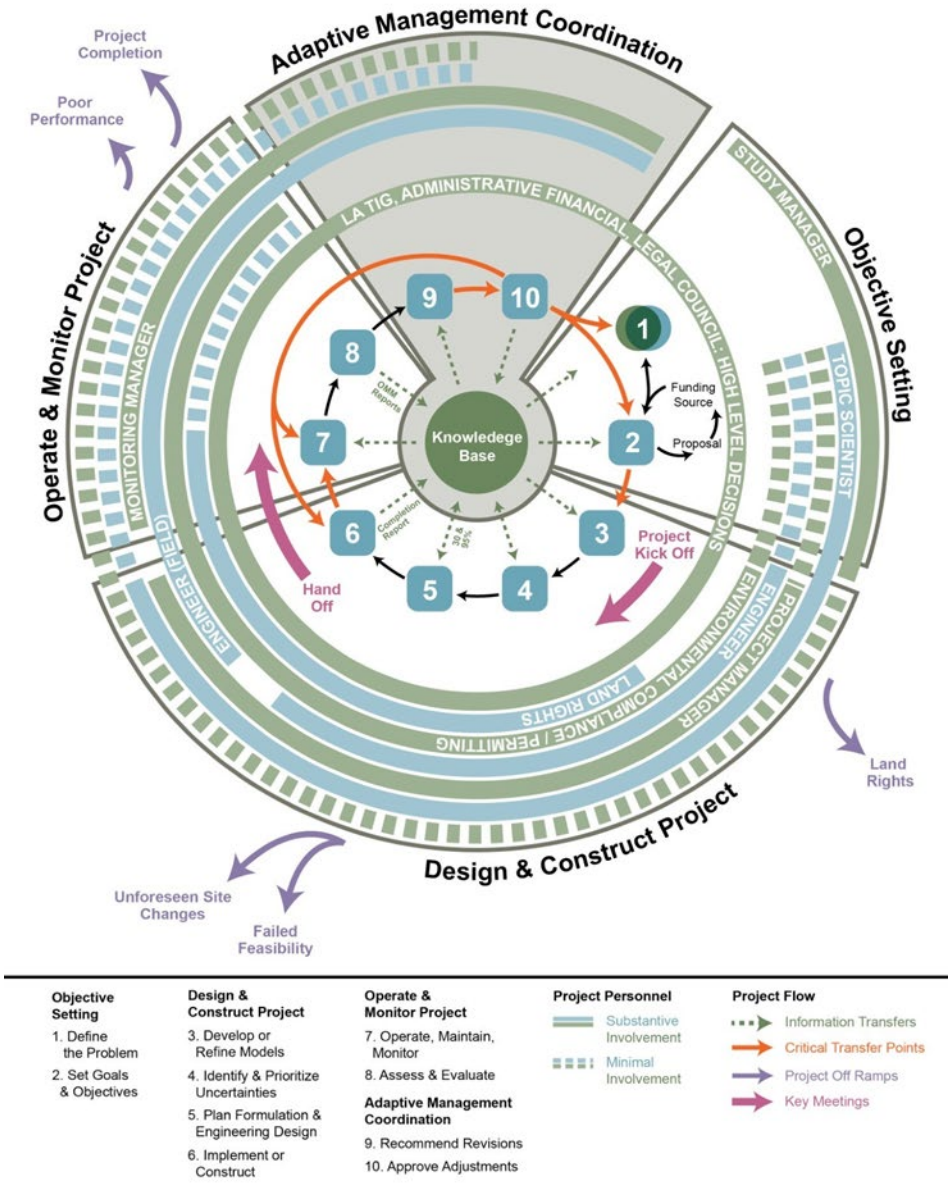

Figure B- 4. LA TIG Adaptive Management Cycle (Source: The Water Institute of the Gulf (2020))

Where gaps in scientific understanding exist, project information collected (see Section 3.1, Project Monitoring) and evaluated (see Section 5, Evaluation) may be used to reduce key uncertainties and/or other analyses that inform the selection, design, and optimization of future restoration projects. The above objectives and parameters listed in Table B- 1 will inform managers if a corrective action needs to be initiated or if the monitoring approaches need to be adjusted. Our monitoring of key parameters could be iterative as well where certain criteria may trigger more detailed, local monitoring. For example, if the less-resolved spatial monitoring captures the loss of breakwater elevation, then we can adapt our monitoring plan where we increase the detail of monitoring in that area to better understand the cause of loss of elevation at this particular breakwater. We will also use performance criteria in this particular case (i.e. evaluating conditions of the breakwaters) to inform the Operations and Maintenance outlined in Section 10. Supplemental Material, Attachment 1. Monitoring methodologies may also be revisited if the desired parameters are not well captured. Here, we may begin nekton sampling with one sampling technology and observe that some target species are consistently elusive. If that is detected in our catch data, we would

then switch sampling gear types to accommodate those species. For the Raccoon Island Restoration Project, adaptive management is especially necessary as some project components have many unknowns associated with them. The breakwaters in the design plan pose questions about maintenance, displacement, and changes to island geomorphology. Adding oyster reef habitat to the breakwater structures is not common practice and thus may come with new questions. These features alone will require adaptive management over the lifespan of the project. Additionally, our monitoring approach may change based on available technology. This monitoring plan spans 10 years post-construction and throughout the lifetime of the project, there may be certain advances in technology and scientific understanding, and thus the MAM Plan will be revisited if key uncertainties or parameters may be evaluated in a new manner.

B.9 Evaluation

To determine if the project implementation has been successful in meeting restoration objectives, it is necessary to evaluate the data collected during monitoring efforts. This evaluation can also suggest when corrective actions are necessary and may help to resolve any uncertainties that arise. The results of these analyses should be used to answer the following questions:

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

B.9.1 Proposed Analysis Methods

Below in (Table B- 4), we list proposed analysis methods but may be revised or updated dependent on which monitoring data are collected.

Table B- 4. Proposed analyses for project parameters, both performance and context included

OBJECTIVE	PARAMETER	PROPOSED ANALYSIS
Objective 1: Restore Raccoon Island system geomorphologic integrity and support geomorphic processes	Parameter 1.1: Area (acres) of barrier island habitats created	Aerial imagery will be used to perform a habitat classification analysis using the protocol set forth by the BICM program. The BICM detailed classification scheme methodology is consistent with the recommendations in the Guidance for Coastal Ecosystem Restoration and Monitoring to Create or Improve Bird-Nesting Habitat (LA TIG, 2023). The current habitat mapping procedure uses any available elevation data to assist in the classification of some habitats. Using multiple time periods, changes in quantity and type of habitat will be evaluated.

OBJECTIVE	PARAMETER	PROPOSED ANALYSIS
Objective 1: Restore Raccoon Island system geomorphologic integrity and support geomorphic processes	Parameter 1.2: Elevation of beach/dune and marsh areas	The project's construction documents will establish the desired target elevations of constructed marsh, beach, and dune habitat areas. Data will be processed to create digital elevation models (DEMs) to determine the average elevation within each habitat classified during the habitat mapping effort. Results may be compared to other barrier island restoration projects based on data availability. Elevation models generated to show the elevation across the project area and island can also be used to determine elevation changes as well as changes in volume of sediment, allowing change trends to be developed and compared to pre-project trends
Objective 1: Restore Raccoon Island system geomorphologic integrity and support geomorphic processes	Parameter 1.3: Shoreline position	Shoreline position can be delineated from aerial imagery, RTK GPS data, and/or LiDAR topography. It has not been determined yet which method(s) will be used. Any of several reasonable options for assessing shoreline position may be used or combined depending on available budget (e.g., Terrano et al., 2016), including digitization and use of aerial imagery following the BICM program methods (Enwright et al., 2020). Change rates will be calculated from sampled time periods and may be compared to other data sets for islands in the vicinity of the project, as well as compared with regional and coastwide trends. These data sets are provided through the BICM program or other literature.
Objective 1: Restore Raccoon Island system geomorphologic integrity and support geomorphic processes	Parameter 1.4: Bathymetry around island (context)	General descriptive analyses, contour maps of barrier island, possible forecasting of changing bathymetry over time
Objective 1: Restore Raccoon Island system geomorphologic integrity and support geomorphic processes	Parameter 1.6: Vegetation percent cover (by taxon) Parameter 1.7: Vegetation species composition	General descriptive statistical analyses may include, but are not limited to, averages/means of the overall total cover by herbaceous species and/or shrubs (marsh); percent cover of species; and/or average height of dominant/species. After each collection effort, the data will be analyzed and evaluated. In conjunction with the habitat mapping, the vegetation data will provide on the ground verification of the habitat mapping effort and provide insight into the species composition, percent cover, and elevation of those delineated habitats. After multiple collection efforts, comparisons between time periods will be assessed to determine changes

OBJECTIVE	PARAMETER	PROPOSED ANALYSIS
Objective 2: Restore and create more areas suitable for bird nesting, loafing, and foraging	Parameter 2.1: Area of potential nesting habitat	See Parameter 1.1
Objective 2: Restore and create more areas suitable for bird nesting, loafing, and foraging	Parameter 2.2: Shrub and Ground-Nesting Bird Nests Parameter 2.3: Non-breeding bird abundance	Aerial photographs will be analyzed using accepted methods. Images inspected for clarity, location within the colony, and extent of colony coverage. Nests and birds marked on images manually. Ground surveys and associated environmental data will use standard descriptive statistics to further characterize available foraging and loafing habitats.
Objective 3: Create and support productive marsh habitat for fish and water column invertebrates that maintains ecological connectivity to the island	Parameter 3.1: Water levels (context)	Water level depth, salinity, inundation across monitoring years with possible forecasting of inundation and water levels post-monitoring
Objective 3: Create and support productive marsh habitat for fish and water column invertebrates that maintains ecological connectivity to the island	Parameter 3.2: Presence of target nekton Parameter 3.3: Species richness and diversity (context) Parameter 3.4: CPUE of target nekton	Presence/absence and standard suite of statistics for nekton across monitoring years. Inclusion of other nekton species, especially YOY red drum and spotted sea trout may be included for context.

B.9.2 Learning Goals

The Raccoon Island Restoration Project design incorporates comparable features to previous barrier island restoration projects as well as new design principles for this type of restoration. Therefore, comparing across barrier island restoration projects may provide insights into some key questions:

- Have the sloped marsh features and creeks performed as expected? How does the habitat compare to previous barrier island restoration projects?
- How often is the platform flooding due to the sloped design features?

- Are the existing mangrove stands receiving sufficient tidal influence?
- Do oyster reefs on the project side of the protection structures offer habitat for fish over the life of the project?

B.10 Data Management

B.10.1 Deliverables

Shapefiles, Imagery, Elevation Data: LA TIG representatives will receive copies of all data generated (e.g., survey tracks, survey photographs that coincide with those tracks, GIS files, KMZ files, associated metadata and data files) in association with the scheduled sampling events.

Vegetation Surveys: LA TIG representatives will receive an individual summary report for each of the scheduled sampling events. Reports will include all data collected and analyses performed as well as all associated metadata.

Bird Surveys: LA TIG representatives will receive copies of all data generated (e.g., survey tracks, survey photographs that coincide with those tracks, GIS files, KMZ files, associated metadata) in association with the scheduled sampling events. All associated data, including a data management plan, will be maintained within the Avian Data Monitoring Portal.

Nekton Surveys: LA TIG representatives will receive an individual summary report for each of the scheduled sampling events. Reports will include all data collected (including boat survey tracks) and analyses performed as well as all associated metadata.

B.10.2 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 hard copy datasheets and notebooks and photographs will be retained by the implementing Trustee.

Relevant project data that are handwritten on hard copy 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 Raccoon Island Habitat Restoration Project MAM Plan 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 Federal Geographic Data Committee /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, quality assurance/quality control [QA/QC] procedures, and other information about data such as meaning, relationships to other data, origin, usage, and format—can reference different documents)

B.10.3 Data Review and Clearance

A Quality Assurance Project Plan (QAPP) will be required by the LA TIG prior to Project implementation. This QAPP will outline the appropriate quality assurance/quality control (QA/QC) process in accordance with the

data management section of the MAM Manual (DWH NRDA Trustees, 2024). The data management plan developed for this Project will adhere to NOAA's established data standards and meet the LA TIG requirements of the QAPP.0

B.10.4 Data Storage and Accessibility

Data collected for this MAM plan will be stored in the DIVER Restoration Portal. Data will be submitted as soon as possible, but no more than one year from when the data were collected. Data storage and accessibility will be consistent with the guidelines in Section 3.1.3 of the MAM Manual (DWH NRDA Trustees, 2024).

B.10.5 Data Sharing

The LA TIG will ensure that data sharing follows standards and protocols set forth in the Open Data Policy (DWH Trustees, 2016; Section 10.6.6). No data release can occur if it is contrary to federal or state laws (DWH Trustees, 2016; Section 10.6.4). The DWH NRDA Trustees will provide notification to the LA TIG *Restoration Plan and Environmental Assessment #8: Wetlands, Coastal, and Nearshore Habitats (RP/EA #8, RP/EA #8.1)* work group when new data and information packages have been uploaded to DIVER (DWH Trustees, 2016). All data related to Objective 2 will be maintained within the Avian Data Monitoring Portal, which will be referenced within DIVER for the Raccoon Island Restoration Project. In the event of a public records request related to Project data and information that are not already publicly available, the Trustee to whom the request is addressed will provide notice to the other LA TIG Trustees prior to releasing any Project data that are the subject of the request.

As noted in Sections 7.0 and 8.0, the Project's data will be stored in the DIVER Restoration Portal. These data will be shared with the public by publishing the data to the Trustee Council website (DWH Trustees, 2016; Section 10.6.6). For further instructions on this process, see the DIVER Restoration Portal User Manual at (available on the following URL); https://www.diver.orr.noaa.gov/. Some of the data collected may be protected from public disclosure under federal and state law (e.g., personally identifiable information under the Privacy Act) and therefore will not be publicly distributed.

B.11 Reporting

Reports will be scheduled for the year following major data collection efforts so the results may be evaluated to determine whether or not performance criteria have been met and if corrective actions need to be taken. Therefore, associated reported will occur in years 2,6 and 11. The first report, occurring in Year 2, should be a high-level synthesis of the first year of data collection. This report should focus on observed construction issues that warrant corrective actions and any data collection issues encountered in the first monitoring event. Subsequent annual reports should include the following details:

- Summary data/synthesized data for all efforts during the year
- Graphics and associated interpretations of the data
- Comparisons of pre- and post-project conditions if applicable
- Any uncertainties with management actions
- Potential data collection issues
- Any triggers for corrective actions

- Issues to be resolved to improve data collection or cooperation in getting quality data and/or issues associated with data loss or inability to collect data for a time period

In the annual reporting, an executive summary and discussion of the synthesized data should be written for a target audience of ecosystem managers/decision-makers, commercial stakeholders, and the public. In doing so, the data should be connected back to the broader implications and importance of the restoration work. Before releasing the reports to the public, a communications plan should be made in conjunction with the implementing Trustees to ensure we are reaching our target audience.

B.11.1 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 work groups. The National Oceanic and Atmospheric Administration (NOAA) is the implementing Trustee for the project. NOAA will also be the lead federal agency for conducting the environmental evaluation and compliance review for implementation. Additional Trustees, and/or their designees, will be responsible for collection and transmission of QA/QCed data to NOAA and the LA TIG for incorporation into annual DIVER reporting and periodic synthesis reporting. The participating Trustees' roles include:

NOAA (Implementing Trustee):

- Coordinating with the project partners to ensure data collection and report composition are completed
- Ensuring the project partners perform Operations and Maintenance activities as required
- Providing progress information to the LA TIG
- Carrying out MAM and sampling activities for Objectives 1 and 3

LDWF:

- Carrying out MAM and sampling activities for Objective 2
- Providing data collection results to the implementing Trustee
- Coordinating with the implementing Trustee to ensure reporting needs are met

CPRA:

- Coordinating with the implementing Trustee to ensure reporting needs are met

B.12 References

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B.13 MAM Plan Revision History

B.14 Supplemental Information

Attachment 1: Operation, Maintenance, and Rehabilitation Plan

Project Description, Purpose, and Location

See above sections for more details regarding the project description, purpose and location of the Raccoon Island Restoration Project. This Operations and Management Plan will be focused on vegetative plantings, the traditional breakwaters facing the Gulf, and the bayside shoreline protection structures facing Caillou Bay on the northside of the island. The prospective operations and maintenance for shoreline protection structures include regular inspection and potential repair. Additionally, vegetative plantings and addition of hay bales are outlined here that will be used as adaptive management corrective actions (as described in Table B- 2) associated with Objective 2 in the MAM Plan. This plan will support adaptive management of Raccoon Island to ensure habitat features constructed to enhance bird or nekton habitat are well-maintained.

Construction Completion

Will be updated accordingly throughout the construction process.

Project Permits

Will be updated as the project progresses.

Items Requiring Operation, Maintenance, and Rehabilitation

The following completed, structural components may require operation, maintenance, repair, and/or rehabilitation throughout the first ten years of the twenty-year life of the project. These actions will be triggered if a performance criterion identified in Table B- 2 fails to be met. For the shoreline protection structures failures include loss of armor stone, high subsidence rates, or circular slip failures. Prior to large monitoring events, inspections (detailed below) will be performed by NOAA and CPRA. If these ocular inspections identify any failures, corrective actions may be triggered. These failures may have varying degrees of maintenance requirements outlined in the table below (Table B- 5).

Table B- 5. Types of shoreline protection feature failure outlined in MAM Plan Section 2.1. Project Monitoring with a general description, and potential required maintenance actions.

TYPE OF FAILURE IN SHORELINE PROTECTION STRUCTURES	DESCRIPTION	REQUIRED MAINTENANCE
Loss of Armor Stone	Strong wave action may dislodge armor stone. To be considered a failure, there would be a loss of 3% of material in the structure. Stone should be large enough to remain in place	Replacing lost armor stone

TYPE OF FAILURE IN SHORELINE PROTECTION STRUCTURES	DESCRIPTION	REQUIRED MAINTENANCE
Subsidence	Structures lose elevation over time but may not be visually noticeable. Loss in elevation is expected to be greater immediately following construction, slowing over time. For the existing breakwaters, an appropriate settlement range is 0.5 to 1 inch, while the range is 2 to 6 inches for the bayside protection structures. If subsidence rates are higher, action may be required.	Raising the crest of structures
Circular Slip Failure	Visible, localized failure occurring quickly. Structure would be 1-2 feet lower than the adjacent.	Rebuilding entire shoreline protection structure

- **Gulfside Breakwater:** 16 existing gulf-facing breakwater structures will be lifted by a single armor stone in this project. After the structures are initially repaired, breakwaters 1-8 (eastern most breakwater moving to the center of the island) will be at +6.0 feet NAVD88 and breakwaters 9-16 (center moving westward) will be situated at +5.0 feet NAVD88. The crest length of each breakwater varies ranging from 198 to 284 feet while crest width must be 10 feet with a side slope of approximately 2H:1V. These structures will be inspected throughout the monitoring period and repaired should they fail.

- **Bayside Shoreline Protection Structures-Type A:** These structures differ from traditional breakwaters as they are low-crested and include a low intertidal reef structure immediately behind the breakwater, closer to the island. The breakwater elevation will be +1.2 feet NAVD88 while the intertidal reef elevation will be +0.4 feet NAVD88. The breakwater component will be a trapezoidal design with 3H:1V side slopes and have a crest width of 6 feet. These structures will also be inspected regularly for failure. They are expected to settle over time and may eventually require a lift towards the end of the monitoring period.
- **Bayside Shoreline Protection Structures- Type B:** These bayside protection structures are situated on either end of Raccoon Island and potentially face the highest wave exposure and associated wave energy. Therefore, these structures have slightly higher crests, +4.0 feet NAVD88, and will not have a constructed reef behind the breakwater structure. Similar to the other bayside shoreline protection structures, the crest width will be 6 feet. Due to the exposure to high wave action, these structures may require more frequent inspection, especially after large storm events, to ensure they have not failed.
- **Vegetative Plantings:** The Project's Design includes two phases of vegetative plantings. Phase I occurs during and immediately following construction. The dunes will be planted with approximately 28,575 smooth cordgrass (*Spartina alterniflora*), 56,018 saltmeadow cordgrass (*Spartina patens*), 172,511 salt grass (*Distichlis spicata*), 16,905 bitter panicum (*Panicum amarum var. amarum*), and 4,226 sea oats (*Uniola paniculata*). Phase II of vegetative plantings will occur 1 year after construction. Marsh mounds may be planted with native scrub and shrub species (groundsel trees (*Baccharis halimifolia*), matrimony vines (*Lycium carolinianum*), and marsh elder plants (*Iva frutescens*)). Additionally, up to 25% of the native grass species planted on the dune and marsh during Phase I plantings may be re-planted for Phase II. These grasses include sea oats (*Uniola paniculata*), bitter panicum (*Panicum amarum var. amarum*), and salt grass plants (*Distichlis spicata*). Based on the performance of past projects at Whiskey Island, we expect a Phase III planting to replant previously planted areas and to help jump-start parts of the marsh platform that have become suitable for smooth cord grasses. Phase III plantings would be informed by and occur after the year-3 monitoring.

Inspections

The purpose of the inspections is to visually inspect and evaluate the conditions of the project features listed above to determine whether or not any maintenance needs to be performed. NOAA and CPRA will conduct inspections prior to large monitoring events conducted in Years 1, 3, 5, and 10. A brief inspection report outlining observations will be drafted by NOAA. It should include a description of the condition of the traditional breakwaters on the southside of the island and the bayside shoreline protection on the northside of Raccoon Island, as well as ocular assessments of the beach, dune, marsh mound, marsh platform, and tidal creek features. It could also include date and time of inspection, personnel observing the structures, weather condition, and water levels. Describing the condition of the shoreline protection structures is essential to adaptively managing this large-scale restoration project. As noted in Section 2.1. Project Monitoring, an observed failure of the breakwater includes circular slip failure, loss of armor stone, or a subsidence rate higher than estimated performance curves. These failures will trigger a corrective action in which maintenance should be performed. In case of severe storms, additional inspections in years without monitoring may be required to assess the potential damage.

Operation and Maintenance Budget

The projected cost for Operations, Maintenance, and Rehabilitation includes costs associated with breakwater inspections, vegetative plantings, breakwater maintenance contracting, and administrative oversight by the Implementing Trustee.

Attachment 2: Bird Colony Aerial Photography Protocol (RG Ford and The Water Institute of the Gulf)

High resolution, low altitude, oblique aerial photographic surveys will be used to census waterbird colonies along the Louisiana shoreline based on previous colony photographic surveys (2010 to 2013, 2015, 2018, and 2021) following the DWH oil spill. The list of colonies visited will be informed based on the most recent survey. 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 and 200-300 mm telephoto lenses will be used to acquire photographs. Aircraft waypoints and time will be recorded automatically at 5 second or shorter 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 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 750-1,000 ft Above (mean) Sea Level (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 determine they are not obtaining photographs of adequate quality or if birds appear to be responding to the presence of the aircraft.

A high altitude (1,500 to 3,000 ft ASL) overview photographic survey will also be implemented using an accepted method (Colibri; method in development). Use of a gyroscopically stabilized fixed camera mount will result in an image that is taken at a near-perpendicular aspect relative to the ground. Further, GPS location of each photograph will be recorded to metadata using a commercial GPS receiver affixed to the camera.

All photograph files (JPGs) will be downloaded daily to an external backup device. Flash memory cards from the cameras will be labeled and stored when they are full. Photographs of each individual colony will be inspected for clarity, location within the colony, and extent of colony coverage. If better photographs are required for a particular colony and if survey logistics allow, a colony may be visited a second time during a survey session.

Attachment 3: Bird Quantification (i.e., Dotting) Protocol (RG Ford and The Water Institute of the Gulf)

For most species, photographs from May surveys will represent peak breeding numbers and will be selected for future 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 high altitude overview photographs will be inspected for clarity, location within the colony, and extent of colony coverage. Those best suited will be post processed using established georeferencing methods and mosaicked into a high resolution base mapping resource (Chapman and Wieczorek, 2022). Representative low altitude aerial photographs will then be georeferenced using the high resolution, high altitude mosaic as an orientating layer thereby resulting in a singular imagery resource (a mosaic of high resolution photos for a given colony location) that is capable of supporting future analyses (i.e., nest dotting, characterizing bird / habit relationships, habitat evaluations, etc.).

Nest dotting analyses encompass the manual marking (dotting) of nests and birds (Ford, 2010) within the mosaic of high resolution, low altitude, oblique aerial photographs; an ArcGIS-based platform. Upon completion, all dotting results are automatically displayed within a designated point count window. By design, the template standardizes both the feature domain and symbology of species and bird/nest delineations. Although the primary objective will be to determine number of nests, individual birds and chicks of each species will be counted in each photograph.

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)
- 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).

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

Manual nest dotting analyses are implemented and maintained within an ArcGIS-based platform. Tally of designated nest categories and related metadata are manually tabulated within 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) 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).
- 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.

Data Summary Report

For each sampling event, the contractor will complete a data summary report, which 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
- Contractor observations that may provide the LA TIG with insight into current and future avian restoration projects and/or adaptive management strategies

The contractor will provide designated LA TIG representatives with an individual, georegistered digital mapping product (i.e., photo mosaic) that clearly identifies counting sub

Appendix C. Guidelines for NEPA Impact Determinations

C- 1. Guidelines for NEPA Impact Determination on Physical, Biological, and Socioeconomic Resources.

RESOURCE	IMPACT DURATION	MINOR IMPACT INTENSITY DEFINITIONS	MODERATE IMPACT INTENSITY DEFINITIONS	MAJOR IMPACT INTENSITY DEFINITIONS
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 connectivity could occur; however, wetland function could not be affected, and natural restoration could occur if left alone.	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 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.	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.
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 USEPA 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 USEPA 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 USEPA'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.

RESOURCE	IMPACT DURATION	MINOR IMPACT INTENSITY DEFINITIONS	MODERATE IMPACT INTENSITY DEFINITIONS	MAJOR IMPACT INTENSITY DEFINITIONS
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 rangewide 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 displace native species populations and distributions.	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 native species population and distributions.	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 affect rangewide 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.
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 rangewide 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, their habitats, 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 rangewide 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 temporary and localized and these species could not displace native species populations and distributions.	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. 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 could be readily apparent and could substantially change marine and estuarine species populations over a widescale 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 broad and permanent changes to native species populations and distributions.

RESOURCE	IMPACT DURATION	MINOR IMPACT INTENSITY DEFINITIONS	MODERATE IMPACT INTENSITY DEFINITIONS	MAJOR IMPACT INTENSITY DEFINITIONS
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.
Socioeconomics	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.
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.

RESOURCE	IMPACT DURATION	MINOR IMPACT INTENSITY DEFINITIONS	MODERATE IMPACT INTENSITY DEFINITIONS	MAJOR IMPACT INTENSITY DEFINITIONS
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. 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.	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. 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.	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. 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.

RESOURCE	IMPACT DURATION	MINOR IMPACT INTENSITY DEFINITIONS	MODERATE IMPACT INTENSITY DEFINITIONS	MAJOR IMPACT INTENSITY DEFINITIONS
Public Health and Safety, Including Flood and Shoreline Protection	Short-term: During construction period. Long-term: Over the life of the project or longer.	Actions could not result in 1) soil, ground water, and/or surface water contamination; 2) exposure of 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.	Project construction and operation could result in 1) exposure, mobilization and/or migration of existing 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.	Actions could result in 1) soil, ground water, and/or surface water contamination at levels exceeding 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 D. National Environmental Policy Act East Orleans Landbridge Restoration Project and Raccoon Island Restoration Project Supporting Documentation Report

D.1 Introduction

This Appendix contains the National Environmental Policy Act (NEPA) supporting documentation that informs the NEPA analysis presented in Chapter 4. This Appendix presents the detailed analysis of impacts associated with the East Orleans Landbridge Restoration alternatives and Raccoon Island Restoration alternatives on physical, biological, and socioeconomic resources within this Louisiana Trustee Implementation Group (LA TIG) Phase 2 Restoration Plan and Environmental Assessment #8.1: East Orleans Landbridge Restoration and Raccoon Island Restoration (RP/EA #8.1).

D.2 Resources Analyzed in Detail: East Orleans Landbridge Restoration

The following sections describe the affected environment by resource category[13] followed by the environmental consequences of each East Orleans Landbridge Restoration Alternative. For purposes of this document, the proposed action is considered implementation of the Preferred Alternative, Alternative 4. Two non-preferred Alternatives (2 and 3) and a No Action Alternative (Alternative 1) are also analyzed. See Chapter 2 for full details on each Alternative.

The No Action Alternative (Alternative 1) is analyzed first as a basis for comparison of potential environmental consequences of the action alternatives, followed by action alternatives (Alternative 2, 3, and 4). As noted in Chapter 2, all project design specifications (for example, acreage, linear feet [LF], etc.) discussed in this document are approximate and would continue to be refined through final Engineering and Design (E&D); however, the environmental consequences would not be expected to diverge from what is analyzed in this RP/EA #8.1.

D.2.1 Physical Resources

This section discusses resources of the natural and physical environment including geology, soils, topography, hydrology, water quality, noise, and air quality.

[13] Tiering from the Deepwater Horizon Oil Spill: Final Programmatic Damage Assessment and Restoration Plan and Final Programmatic Environmental Impact Statement (PDARP/PEIS), the resource categories evaluated in this RP/EA #8.1 are organized in the same structure (i.e., physical, biological, and socioeconomic resources). The National Oceanic and Atmospheric Administration's (NOAA) updated NEPA procedures note the need to consider the effects of the project on the quality of life of the American people. In this document, those effects are captured under the following subheadings: cultural resources, infrastructure, land and marine management, tourism and recreation, aesthetics and visual resources, fisheries and aquaculture, and marine transportation.

D.2.1.1 Geology and Substrates

D.2.1.1.1 AFFECTED ENVIRONMENT

The project area is a brackish coastal marsh generally situated between Lake Pontchartrain to the west and Lake Borgne to the south. This area is within the Lower Pontchartrain subbasin, which was formed from two Mississippi River deltaic processes: the St. Bernard Delta Lobe and the modern delta known as Plaquemines/Balize (Penland et al., 2002). Sedimentation in this area has declined since the Mississippi River naturally abandoned the St. Bernard Delta Lobe approximately 2,000 years ago. Levee construction along the Mississippi River halted freshwater input into the Lower Pontchartrain subbasin. Construction of the Mississippi River Gulf Outlet canal, oil and gas canals, and natural processes, such as sea level rise (SLR) and subsidence, have resulted in coastal erosion and saltwater intrusion within the basin. Coastal marshes, such as those present in the project area, act as a buffer to reduce the effects of wave action, saltwater intrusion, storm surge, and tidal currents on associated estuaries and wetlands.

Surface soils in the project area have been classified by U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) as primarily Clovelly muck with 0 to 0.2 percent slopes (USDA NRCS, 2025). These soils have moderately thick herbaceous organic material over very fluid clayey alluvium that is very poorly drained and classified as having negligible runoff, which is typical of continuously flooded tidal areas and coastal marshes.

Recent geotechnical investigations, with exploration depths ranging between 20 and 40 feet (ft) below the ground surface, primarily encountered very soft peat or organic clay within the first 2-10 ft followed by very soft to soft clay and silty clay (sometimes with a 1-4 ft layer of silty sand) down to about 20 ft, followed by medium to very stiff Pleistocene Age soil to the depth of exploration (GeoEngineers, Inc., 2022). One soil boring on the northeastern side of project area in marsh creation area (MCA) 1 showed soft clay throughout the 40-ft boring with no stiffer Pleistocene Age soils. This is consistent with the USDA NRCS surface soil data. The geology of the borrow area is predominantly very soft to soft clay; stiffer Pleistocene Age soil may be encountered 12 ft or more below the mudline (GeoEngineers, Inc., 2022).

D.2.1.1.2 ENVIRONMENTAL CONSEQUENCES

D.2.1.1.2.1 Alternative 1 – No Action

Under the No Action Alternative, the project would not be implemented. There would be no adverse impacts in the short term as geology and substrate conditions would remain the same as existing conditions. In the long term, the lack of sediment input combined with continued subsidence and SLR, as described above, would contribute to continued shoreline erosion, accelerated land loss, and increased inundation of East Orleans Landbridge marshes, which would leave the area more vulnerable to fragmentation and land loss during storm events. Continued land loss could lead to conversion of the marsh into open water. Therefore, under the No Action Alternative, impacts on geology and substrates would be long term, major, and adverse.

D.2.1.1.2.2 Alternative 2

Alternative 2 involves placing fill material within the MCAs to restore marsh elevation, placing marine mattresses along the shoreline of the Rigolets to protect the restored marsh, and planting vegetation on the earthen containment dikes (ECD) that line the shoreline of the Rigolets and Bay Jaune. Dredged material would be deposited over the existing organic, clay soil, resulting in predominantly clay surface soils. After fill placement, marsh vegetation in the MCAs would be allowed to recolonize naturally. Vegetation would help stabilize soils and reduce soil loss due to erosion in the long term. Therefore, this revegetation would have a long-term, beneficial impact on substrates.

Short-term, minor to moderate, adverse impacts to terrestrial substrates would be expected during construction, such as localized soil disturbances from construction of ECDs and localized soil disturbances and compaction from sediment placement and use of land-based equipment during site preparation and restoration implementation. Short-term, minor to moderate, adverse impacts to aquatic substrates would also be expected from the use of marine equipment during site preparation and excavation activities at the borrow area (Table D- 1). The scale of these terrestrial and aquatic impacts would be slightly greater for Alternative 2 than for other alternatives due to the larger footprint, the greater quantity of fill material, and the longer construction duration.

Table D- 1. Total Estimated Sediment Excavation Volumes.

ALTERNATIVE	EXCAVATION VOLUME (CUBIC YARDS)
Alternative 1 – No Action	0
Alternative 2	8,956,403
Alternative 3	6,705,699
Alternative 4 - Preferred	5,011,680

Long-term, moderate, adverse impacts on aquatic substrates would result from dredging activities that would remove material from the borrow area. More than 8.9 million cubic yards (cy) of material would be dredged from the borrow area (Coastal Protection and Restoration Authority [CPRA], 2025c). While this removal of substrate would last longer than the duration of project construction, it would likely not result in a permanent impact due to slumping and redistribution of sediment within Lake St. Catherine and the larger Pontchartrain Basin.

The anticipated method for mining the borrow area and conveying it to the placement sites would be a hydraulic cutterhead dredge with booster pumps. The in-water construction activities would result in localized disturbances on aquatic substrates, constituting short-term, minor, adverse impacts. There would be anticipated short-term, minor to moderate, adverse impacts on soils along the nearshore conveyance corridor resulting from ground disturbance from placement of material and dredge outfall pipe as well as from the earthwork required for site preparation and construction activities. The sediment pipeline installed within the conveyance corridors and pump-out areas would not require excavation for pipeline installation, as the sediment pipelines would be placed below the waterline (subline), on dry land or firm bottom (shoreline), or floating behind the dredge (pontoon line). There could be short-term and minor adverse impacts on the waterbottom from strumming of the pipeline; however, these impacts would be minor and would not be expected to lead to scouring because the project could anchor or ballast the pipelines (for example implementing weighted coatings, weighted collars, or weighted mats) to reduce their movement if needed. There would be short-term and minor, adverse impacts from the dredging of temporary access channels to provide construction access to East Orleans Landbridge for equipment and personnel; the channels would be refilled with side-cast material at the end of construction.

Alternative 2 would create approximately 2,468 acres (ac) of marsh on the East Orleans Landbridge and install 27,544 LF of shoreline protection. While placement of large quantities of fill material on and adjacent to the marsh would cause short-term, minor to moderate, adverse impacts on the existing substrates, this fill material placement and associated vegetation plantings would help stabilize terrestrial soils and reduce erosion in the long term by restoring and increasing soil surface, resulting in an overall long-term, beneficial impact on substrates, contributing to the restoration of geomorphologic and ecologic form and function. There would also be long-term, beneficial impacts to the marsh from installation of shoreline protection, which would protect the substrate and geology of the shoreline.

Overall, Alternative 2 would result in short-term and long-term, minor to moderate, adverse impacts on geology and terrestrial and aquatic substrates during construction activities and long-term, beneficial impacts on geology and substrates from restoration of the marsh footprint, higher elevation, and reduced erosion.

D.2.1.1.2.3 Alternative 3

Similar to Alternative 2, short-term and long-term, minor to moderate, adverse impacts on terrestrial and aquatic substrates would be expected during construction of Alternative 3, but the impacts would be less than those in Alternative 2 because construction activities would cover a smaller area and for a shorter duration.

Alternative 3 would create and restore approximately 1,813 ac of marsh habitat and install 15,190 LF of shoreline protection. Fill material type would be the same as in Alternative 2 and would help stabilize soils and reduce erosion in the long term by restoring and increasing soil surface. Long-term, beneficial impacts would be similar to those described for Alternative 2. Like Alternative 2, there would be also long-term, beneficial impacts to the shoreline from the installation of shoreline protection features, which would protect the substrate and geology, though the scale of impacts would be reduced due to the reduction in length of shoreline protection.

D.2.1.1.2.4 Alternative 4 (Preferred Alternative)

Similar to Alternative 2, short-term and long-term, minor to moderate, adverse impacts on terrestrial and aquatic substrates would be expected during construction of the Preferred Alternative, but the impacts would be less than those in Alternative 2 because construction activities would cover a smaller area and for a shorter duration.

The Preferred Alternative would create and restore approximately 1,320 ac of marsh habitat and install 14,867 LF of shoreline protection. Fill material type would be the same as in Alternative 2 and would help stabilize soils and reduce erosion in the long term by restoring and increasing soil surface. Long-term, beneficial impacts would be similar to those described for Alternative 2. Like Alternative 2, there would be also long-term, beneficial impacts to the shoreline from the installation of shoreline protection features, which would protect the substrate and geology, though the scale of impacts would be reduced due to the reduction in length of shoreline protection.

D.2.1.2 Hydrology and Water Quality

D.2.1.2.1 AFFECTED ENVIRONMENT

The entire Pontchartrain Basin is approximately 1,700,000 ac, with 483,390 ac of wetlands (Coastal Wetlands Planning, Protection and Restoration Act [CWPPRA], n.d.). Freshwater inputs into the basin are heavily impeded by the Mississippi River levees (CWPPRA, n.d.). The project area is in Orleans Parish and is bounded by the Rigolets on the north and east, Lake St. Catherine and Bay Jaune on the west, and St. Catherine Pass on the south.

Based on the 2024 Louisiana Water Quality Inventory Integrated Report (Louisiana Department of Environmental Quality [LDEQ], 2024), the proposed project area is in the coastal zone boundary and the Rigolets (subsegment LA041701_00) and Lake St. Catherine (LA041704_00) subsegments. The subsegments are listed as fully supporting the designated use for secondary contact recreation and fish and wildlife propagation. The Rigolets subsegment is listed as not supporting primary contact recreation. The cause of water quality impairment for primary contact recreation is enterococcus, the source of which is unknown.

Mean tide levels near the project area (Coastwide Reference Monitoring System [CRMS] site 3784) are +0.8 ft North American Vertical Datum of 1988 (NAVD88) Geoid 12B with mean low water at +0.2 ft and mean high water at +1.3 ft (CPRA, 2025c). Water depths vary within the project area. Within larger ponds (e.g., Goose Pond), water depths generally do not exceed -5.0 ft NAVD88 (T. Baker Smith, 2022). Depths within Counterfeit Pass and St. Catherine Pass exceed -15.0 ft NAVD88 in some locations (T. Baker Smith, 2022). These ponds and passes are outside of but adjacent to some portions of the MCAs. Water depths in the Lake St. Catherine Borrow Area generally do not exceed -5.0 ft NAVD88 (T. Baker Smith, 2022).

Salinity levels within Lake St. Catherine and the Rigolets are indicative of brackish surface water. Water quality measurements were collected in 2023 from a location approximately 7,600 ft southwest of the borrow area in Lake St. Catherine. These samples revealed salinity concentrations in Lake St. Catherine ranging from 0.2 to 14.2 parts per thousand (ppt) (LDEQ, 2023). The nearest CRMS station to the project area (CRMS 3784) recorded salinities between 0.2 and 32.2 ppt between 2008 and 2025 (CPRA, 2025a). Dissolved oxygen concentrations in Lake St. Catherine from 2001 to 2023 ranged from 4.9 to 11.7 milligrams per liter (mg/L), which exceed estuarine water quality standards of 4 mg/L (LDEQ, 2011, 2023). Turbidity levels in Lake St. Catherine, which range in depth from 1.8 to 34.9 nephelometric turbidity units (NTU) between 2010 and 2023, are well below the maximum guideline level for estuarine lakes, as defined by LDEQ water quality standards, of 50.0 NTU (LDEQ, 2011, 2023).

The project area is located within the Federal Emergency Management Agency (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 (FEMA, 2016). Base flood elevations of the 1-percent-annual-chance flood range from +16.0 to +17.0 ft NAVD88 (FEMA, 2016).

D.2.1.2.2 ENVIRONMENTAL CONSEQUENCES

D.2.1.2.2.1 Alternative 1 – No Action

Under the No Action Alternative, the project would not be implemented and the short-term and long-term, minor to moderate, adverse impacts on water quality and hydrology associated with construction of the action alternatives would not occur. However, over the long-term, sea level rise and subsidence would continue making East Orleans Landbridge marshes more susceptible to inundation and loss. Overall, the No Action Alternative would have a long-term, moderate, adverse impact on the ongoing hydrology and water quality trends in the project area.

D.2.1.2.2.2 Alternative 2

In the short term, sediment disturbance during dredge and fill operations that would occur during construction would result in localized and temporary increases in suspended sediment concentrations and turbidity in the work areas, representing a short-term, minor, adverse impact on water quality. These impacts are expected to be slightly greater under Alternative 2 than the other action alternatives because of the larger construction area and longer construction period but would still be considered short term and minor. These dredge and fill operations during the construction period could also result in minor changes in dissolved oxygen, nutrients, temperature, and salinity in the immediate vicinity of sediment disturbance. However, these impacts would be temporary, limited to periods of active dredging, and are expected to dissipate rapidly after the construction period.

The use of different types of marine equipment, land-based equipment, and transportation equipment during construction could result in short-term, minor to moderate, adverse impacts on water quality due to potential fuel leaks or vehicle fluid leaks. The severity of the impact would depend upon the quantity and type of material released. Construction debris would be disposed of properly, and construction would comply with applicable permit conditions, including any requirements for the protection of water quality. Best

management practices (BMPs), including vehicle maintenance and implementation of measures in a Spill Prevention, Response, and Reporting Plan, would be implemented to minimize the potential for spills and leaks of hazardous materials. These construction BMPs, in addition to other avoidance and mitigation measures as required by state and federal regulatory agencies, would minimize hydrology and water quality impacts.

Once constructed, the project would provide long-term, beneficial impacts on water quality due to the presence of the shoreline protection features and vegetation plantings on the ECDs. These shoreline protection features and plantings would be expected to reduce turbidity from potential marsh erosion. The shoreline protection features could also serve as habitat for filter feeders such as barnacles growing over time that would improve water quality. Alternative 2 would also create areas of marsh and sediments that could support natural physical, chemical, and biological processes that improve water quality via nutrient exchange (O'Donnell et al., 2018). The project would also provide long-term, beneficial impacts on hydrology by increasing marsh longevity.

Overall, the Preferred Alternative would result in short-term, minor to moderate, adverse impacts on hydrology and water quality during construction activities; long-term, beneficial impacts on water quality from reduced erosion, reduced turbidity, and potential growth of filter feeders on the shoreline protection features; and long-term, beneficial impacts on hydrology through increased marsh longevity.

D.2.1.2.2.3 Alternative 3

Similar to Alternative 2, short-term, minor to moderate, adverse impacts on hydrology and water quality would be expected during construction of Alternative 3, but the impacts would be less than those in Alternative 2 because construction activities would cover a smaller area and for a shorter duration.

After construction is complete, impacts would be similar to those described for Alternative 2 resulting in long-term, beneficial impacts on water quality from reduced erosion, reduced turbidity, and potential growth of filter feeders on the shoreline protection features and long-term, beneficial impacts on hydrology through increased marsh longevity.

D.2.1.2.2.4 Alternative 4 (Preferred Alternative)

Similar to Alternative 2, short-term, minor to moderate, adverse impacts on hydrology and water quality would be expected during construction of the Preferred Alternative, but the impacts would be less than those in Alternative 2 because construction activities would cover a smaller area and for a shorter duration.

After construction is complete, impacts would be similar to those described for Alternative 2 resulting in long-term, beneficial impacts on water quality from reduced erosion, reduced turbidity, and potential growth of filter feeders on the shoreline protection features and long-term, beneficial impacts on hydrology through increased marsh longevity.

D.2.1.3 Air Quality

D.2.1.3.1 AFFECTED ENVIRONMENT

In accordance with the Clean Air Act of 1970 (as amended), the U.S. Environmental Protection Agency (USEPA) developed the National Ambient Air Quality Standards (NAAQS) that list six atmospheric criteria pollutants considered harmful to public health: carbon monoxide, lead, nitrogen dioxide, ozone, particulate matter, and sulfur dioxide. The primary NAAQS are established to protect public health; secondary standards also provide protection against decreased visibility and damage to animals, crops, vegetation, and buildings. LDEQ is responsible for regulating and ensuring compliance with the Clean Air Act in Louisiana. For compliance purposes, geographic areas within the United States (U.S.) are classified as either in attainment,

unclassifiable, 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. A designation of unclassifiable applies to geographic areas which cannot be classified due to lack of available information. In nonattainment areas, USEPA requires states to develop and/or revise a state implementation plan to ensure the standards would be attained. The project would be located in Orleans Parish, Louisiana. USEPA has determined that Orleans Parish is in attainment status for all NAAQS (USEPA, 2026).

The project area is uninhabited and only accessible by water or air. As a result, existing air pollution sources are limited to boat, helicopter, and seaplane traffic, and pollutants that are transported by winds to the project area. The closest major sources of air pollution occur along the New Orleans urban-industrial corridor, and the closest point is 15 miles (mi) southwest of the project area (USEPA, 2024). The primary sources of air pollution in the project area include transient sources, such as exhaust from boats, and other modes of marine transportation.

D.2.1.3.2 ENVIRONMENTAL CONSEQUENCES

D.2.1.3.2.1 Alternative 1 – No Action

Under the No Action Alternative, the project would not be implemented and the short-term, minor, adverse air quality impacts associated with implementation of the action alternatives would not occur. However, any long-term benefits (including any potential air quality benefits associated with marsh creation) would also not occur. Overall, the No Action Alternative would have no measurable effect on air quality.

D.2.1.3.2.2 Alternative 2

Impacts would occur during construction of Alternative 2 due to the dust and exhaust from equipment and earthwork activities, such as grading, bulldozing, dredging, excavating, and welding. Additional impacts would also arise from combustion emissions due to an increase in vessel use to deliver equipment, materials, and construction workers to the project area, as well as quarters barges to house workers. The estimated construction duration for Alternative 2 is the longest of all the action alternatives; therefore, the activities causing air impacts would last longer than for the other action alternatives.

These localized, temporary activities are not likely to increase any of the six criteria pollutant levels above the NAAQS. Although Alternative 2 would place the greatest overall volume of fill material (8,956,403 cy) compared to the other action alternatives, fugitive dust emissions are expected to be minor. Fugitive dust control and capture techniques on construction equipment, such as baghouse filters, scrubbers, or electrostatic precipitators, may also be implemented to further limit particulate emissions, where feasible, during construction activities. Combustion emissions from construction equipment, including on-road and off-road engines, would be mitigated by only using and operating engines in accordance with all state and federal emission and performance laws and standards. After construction, an increase in marsh vegetation could potentially provide a long-term benefit to the air quality for the area (USEPA, 2025).

Overall, the duration of construction for Alternative 2 would be similar to but slightly greater than each of the other action alternatives described below, and the type and quantity of construction equipment would be similar. Therefore, the short-term, minor, adverse impacts on air quality would be greatest for this alternative when compared with the other action alternatives.

D.2.1.3.2.3 Alternative 3

Alternative 3 would require a similar type and quantity of construction equipment when compared with Alternative 2, described above. Overall, impacts are expected to be short-term, minor, and adverse. The general impacts described above for Alternative 2 capture the impacts anticipated for implementation of

Alternative 3, although impacts would be less than those under Alternative 2 given the smaller area and shorter duration for construction.

D.2.1.3.2.4 Alternative 4 (Preferred Alternative)

The Preferred Alternative would require a similar type and quantity of construction equipment when compared with Alternative 2, described above. Overall, impacts are expected to be short-term, minor, and adverse. The general impacts described above for Alternative 2 capture the impacts anticipated for implementation of the Preferred Alternative, although impacts would be less than those under Alternative 2 given the smaller area and shorter duration for construction.

D.2.1.4 Noise

D.2.1.4.1 AFFECTED ENVIRONMENT

Ambient sound captures the total sound in a specific environment, including both natural and anthropogenic sound; noise is unwanted sound. The level of noise varies depending on the season, time of day, number and types of noise sources, and distance from the noise source. The *Deepwater Horizon Oil Spill: Final Programmatic Damage Assessment and Restoration Plan and Final Programmatic Environmental Impact Statement* (Final PDARP/PEIS) states that the primary sources of terrestrial noise in the coastal environment are typically marine transportation and construction-related activities; sources of noise in the marine environment of the Gulf Coast region include marine transportation, military activities, and energy development. However, given that the project area is uninhabited, the primary sources of ambient noise likely to be present are boating vessels (recreational and commercial), occasional transient noise from aircraft (including seaplanes), and natural sounds from wind, wave action, and wildlife. Orleans Parish has a noise ordinance that establishes permissible sound levels for residential, business and commercial, and industrial land uses, and restricts the timing of activities of various sound levels; however, the project is not within a residential, business and commercial, or industrial area (New Orleans Code of Ordinances, Article IV).

D.2.1.4.2 ENVIRONMENTAL CONSEQUENCES

D.2.1.4.2.1 Alternative 1 – No Action

Under the No Action Alternative, the project would not be implemented and the short-term, minor, adverse localized noise impacts with implementation of the action alternatives would not occur. Overall, the No Action Alternative would have no effect on noise levels.

D.2.1.4.2.2 Alternative 2

Local airborne and underwater noise would increase during construction of Alternative 2 due to the operation of vessels, dredging and construction equipment, all-terrain vehicle traffic, and earthwork activities. The dominant airborne noise sources from project construction are expected to be earth-moving activities as well as dredging and discharge of sediment from the dredge pipe, which could potentially occur up to 24 hours per day. Crew boats would also be stationed nearby and may result in increased noise levels from construction personnel. However, the greatest potential for impacts from underwater noise would occur during impact hammer pile driving to install an estimated 1,570 steel piles to close channel gaps in areas where the ECD alignments of the MCAs cross minor streams. Noise impacts from pile driving would be temporary and limited to the duration of pile installation (assumed to take about 157 days).

Noise during construction would be mitigated by maintaining all equipment with properly functioning mufflers. Project construction would contribute to ambient sound levels; however, given the distance of the project area to residential areas and implementation of mitigation measures, project construction is not

expected to result in the generation of, or exposure of persons to, excessive noise or vibration levels. Noise would temporarily disturb and displace wildlife in the project area and vicinity, as described further in Sections D.2.2.1 through D.2.2.4. See Section D.2.2.4 for a detailed discussion of pile driving noise impacts on marine species. Recreational users on and around the project area (see Section D.2.3.5) would not be substantially affected by noise as they would likely not expend their time in or near areas undergoing active construction.

Alternative 2 would involve the greatest total restoration and habitat modification actions as it includes all potential project features. It would also take the longest amount of time to complete. Therefore, temporary noise increases would be greatest for this alternative when compared with the other action alternatives.

Overall, noise impacts associated with Alternative 2 would remain limited to construction activities and would be short-term, minor, and adverse, depending on proximity to those activities.

D.2.1.4.2.3 Alternative 3

Alternative 3 would require a similar type and quantity of construction equipment (including pile driving equipment). Overall, impacts are expected to be short-term, minor, and adverse. The general impacts described above for Alternative 2 capture the impacts anticipated for implementation of Alternative 3, although impacts would be slightly less given the smaller area and shorter duration for construction. Impacts of noise on wildlife are described further in Sections D.2.2.1 through D.2.2.4.

D.2.1.4.2.4 Alternative 4 (Preferred Alternative)

The Preferred Alternative would require a similar type and quantity of construction equipment (including pile driving equipment). Overall, impacts are expected to be short-term, minor, and adverse. The general impacts described above for Alternative 2 capture the impacts anticipated for implementation of the Preferred Alternative, although impacts would be slightly less given the smaller area and shorter duration for construction. Impacts of noise on wildlife are described further in Sections D.2.2.1 through D.2.2.4.

D.2.2 Biological Resources

This section discusses the resources within the biological environment including habitats, wildlife, marine and estuarine aquatic fauna, essential fish habitat (EFH), managed fish species, and protected species.

D.2.2.1 Habitats

D.2.2.1.1 AFFECTED ENVIRONMENT

The project area is characterized by low elevation, emergent brackish marsh interspersed with channels, ponds, and tidal areas. The project area contains no development or infrastructure.

The emergent marshes in the project area are classified as brackish marshes. Dominant vegetation includes wiregrass (*Spartina patens*) and a brackish mix consisting of smooth cordgrass (*Sporobolus alterniflorus*, previously *Spartina alterniflora*), wiregrass, black rush (*Juncus roemerianus*), and salt grass (*Distichlis spicata*) (CPRA, 2026).

Water depths generally do not exceed -5.0 ft NAVD 88 within larger ponds (e.g., Goose Pond) or within the Lake St. Catherine Borrow Area. There are deeper channels (e.g., Counterfeit Pass, St. Catherine Pass) where water depths exceed -15.0 ft NAVD 88 in some locations (T. Baker Smith, 2022) . These ponds and passes are outside of but adjacent to some portions of the MCAs.

Measured salinities between 2008 and 2025 near the project area (CRMS site 3784) range from 0.2 to 31.2 ppt with mean annual salinity of 5.1 ppt (CPRA, 2025a).

There are no oyster leases or oyster seed grounds within or near the project area or borrow area.

D.2.2.1.2 ENVIRONMENTAL CONSEQUENCES

D.2.2.1.2.1 Alternative 1 – No Action

Under the No Action Alternative, the project would not be implemented, and the short-term and long-term, minor to moderate, adverse impacts on existing wetland habitat associated with implementation of the action alternatives would not occur. However, the long-term benefits from habitat creation and increased longevity would also not occur. Over time, coastal processes, shoreline change, and erosion would contribute to habitat loss. The No Action Alternative would result in long-term, major, adverse impacts on available habitats over time.

D.2.2.1.2.2 Alternative 2

Short-term and long-term, minor to moderate, adverse impacts on the existing habitat types in the project area are expected due to construction activities associated with Alternative 2. These impacts are expected to be localized, with habitat disruption occurring primarily in areas of active construction. Land-based activities, such as site preparation, materials staging, and dredged material placement, would disturb and displace existing vegetation until construction activities have ceased and vegetation coverage has been reestablished. Vessels and construction equipment used to support restoration activities would result in temporary soil and sediment disturbance, including potential leaks from vehicle fuels and fluids.

Short-term, moderate, adverse impacts would occur in aquatic habitats that are actively dredged, or in which the sediment pipelines are laid directly on the waterbottom. Sediment disturbance and dredging would also increase suspended sediment concentrations, causing a localized decrease in water quality during active restoration.

BMPs, including vehicle maintenance and implementation of measures in a Spill Prevention, Response, and Reporting Plan, would be implemented to minimize the potential for spills and leaks of hazardous materials to impact habitats. Construction debris would be disposed of properly, and construction would comply with applicable permit conditions, including any requirements for the protection of water quality. BMPs would be used during the placement of material to minimize the potential for impacts on sensitive habitats due to misplacement or migration of materials into areas not planned for project impacts.

Habitat in the project area is subject to continuous loss due to relative sea level rise, wind and wave action, and other coastal processes. Once construction is complete, Alternative 2 would result in long-term benefits on wetland habitats within the project area by increasing the total quantity of available habitat. The habitat restoration features that would be constructed under Alternative 2 are shown in Table D- 1. In addition, the placement of fill would increase the elevation of marshes, and installation of shoreline protection would reduce potential erosion due to wave action and currents, reducing the long-term susceptibility of the project area to habitat loss. ECDs would be planted with appropriate vegetation to stabilize and extend the life of these features; anticipated plantings include roseau cane (*Phragmites australis*) and smooth cordgrass. Planting appropriate species would reduce the potential for the establishment or spread of invasive plants in newly constructed habitat. These vegetation plantings would also reduce erosion.

Table D- 2. Project Features for Each Alternative.

ALTERNATIVE	MARSH RESTORATION (AC)	SHORELINE PROTECTION (LF)	VEGETATION PLANTING (LF)
Alternative 1 – No Action	0	0	0

ALTERNATIVE	MARSH RESTORATION (AC)	SHORELINE PROTECTION (LF)	VEGETATION PLANTING (LF)
Alternative 2	2,468	27,544	12,695
Alternative 3	1,813	15,190	21,947
Alternative 4 - Preferred	1,320	14,867	19,768

Overall, Alternative 2 would result in the greatest total area of habitat impact and conversion during construction. However, construction of the full suite of features would also result in the greatest overall restoration and enhancement of East Orleans Landbridge when compared with the other action alternatives. Following construction, the combined material volumes from the restoration features would create and sustain the most habitat acreage compared to the other action alternatives, providing the greatest long-term benefits. Overall, while construction impacts are expected to be short-term to long-term, minor to moderate, and adverse, impacts following project implementation are expected to be long-term and beneficial, with 2,468 ac of habitat projected to be restored on East Orleans Landbridge immediately following construction compared to the No Action Alternative.

D.2.2.1.2.3 Alternative 3

The general impacts described above for Alternative 2 capture the impacts anticipated for implementation of Alternative 3, including habitat creation, shoreline protection, and increased marsh longevity. Construction of Alternative 3 would create less initial habitat than Alternative 2 and would provide less shoreline protection (see Table 2). Overall, impacts from construction are expected to be short-term to long-term, minor to moderate, and adverse; impacts following project implementation are expected to be long-term and beneficial.

D.2.2.1.2.4 Alternative 4 (Preferred Alternative)

The general impacts described above for Alternative 2 capture the impacts anticipated for implementation of the Preferred Alternative, including habitat creation, shoreline protection, and increased marsh longevity. Construction of the Preferred Alternative would create less initial habitat than Alternative 2 and would provide less shoreline protection (see Table D- 2). Overall, impacts from construction are expected to be short-term to long-term, minor to moderate, and adverse; impacts following project implementation are expected to be long-term and beneficial.

D.2.2.2 Wildlife Species

D.2.2.2.1 AFFECTED ENVIRONMENT

Many wildlife species, including mammals, reptiles, amphibians, and numerous bird species such as gulls, herons, egrets and blackbirds, would be expected to use marsh and open water habitats located within the project area. Mammals expected to occur within the project area include armadillos, dolphins, bats, coyotes, foxes, mice, nutria, opossum, otters, rabbits, rats, and raccoons. Reptiles expected to occur within the project area include alligators, anoles, skinks, lizards, snakes, and turtles (iNaturalist, n.d.). Marshes within the project area provide important nesting, brood-rearing, and foraging habitat for various bird species, including migratory birds and colonial nesting birds. Emergent marshes are also important nursery habitats for larval fish, crustaceans, and aquatic invertebrates. Benthic and epiphytic algae are also important producers in emergent marsh habitats (Klueh-Mundy et al., 2025).

A total of 145 bird species have been recorded within approximately 1 mi of the project area at Fort Pike (eBird, 2025b). These species include terns, egrets, kites, gulls, herons, and ducks as well as other songbirds and shorebirds. Migratory bird species generally nest in the U.S. and Canada during the summer months,

migrating south to the tropical regions of Mexico, Central and South America, and the Caribbean during the winter or non-breeding season. Some species of migratory birds winter along the Gulf Coast, including along coastal Louisiana. The Migratory Bird Treaty Act (MBTA) prohibits the take or killing of migratory birds, including their eggs, chicks, and active nests (40 Statutes at Large 755, as amended; 16 U.S. Code [U.S.C.] Section [§] 703 et seq.). Of the 145 bird species observed within 1 mi of the project area, 15 are listed as Birds of Conservation Concern by the U.S. Fish and Wildlife Service (USFWS, 2021). These species represent the highest conservation priorities of USFWS beyond those currently designated as threatened or endangered.

D.2.2.2.2 ENVIRONMENTAL CONSEQUENCES

D.2.2.2.2.1 Alternative 1 – No Action

Under the No Action Alternative, the project would not be implemented, and the short-term, moderate, adverse impacts on wildlife associated with the action alternatives would not occur. However, the long-term benefits to wildlife from habitat creation and increased habitat longevity would also not occur. Over time, coastal processes, shoreline change, and erosion would contribute to habitat loss resulting in long-term, moderate to major, adverse impacts on wildlife from habitat loss over time.

D.2.2.2.2.2 Alternative 2

Impacts on birds and other wildlife in the project area would include displacement and disturbance year-round (including during the breeding and wintering seasons) due to habitat disturbance, noise, lighting, and the presence of construction workers, vessels, and equipment during construction of Alternative 2. The bird species that dominate the wildlife community in the project area are highly mobile and would likely avoid areas of active construction. As such, the project is not expected to directly harm individual birds. Construction of the project would likely occur when birds that migrate to, and overwinter in, the project area are present. Wintering birds in the project area during construction activities may be disturbed by the operation (movement and noise) of heavy equipment and machinery or placement of fill material. In addition, placement of fill could result in smothering and mortality of invertebrates that provide forage for birds. Where restoration is ongoing, typical roosting and foraging activities would likely be disrupted, and birds may expend additional energy relocating to undisturbed habitat during project activities. These impacts would be short term for the duration of construction, and nearby suitable habitat would be available to support foraging and loafing. Prey species would be expected to re-colonize areas disturbed by construction and populate newly available habitat following restoration. If present, terrestrial mammals, reptiles, and amphibians are also expected to avoid areas with active project activities.

Construction would continue year-round, including times when birds that use the marshes are breeding or overwintering. Disturbance from construction could disrupt nesting birds or result in the abandonment of nests by adults; in addition, any nests present in the locations where fill is proposed would be lost. Birds and any other wildlife would return to the project area and new habitat quickly after restoration is complete. Construction would not begin until consultation with the Louisiana Department of Wildlife and Fisheries (LDWF) and USFWS is complete, and final agency consultation documents would be made available on the publicly available administrative record for the Natural Resource Damage Assessment (NRDA) for the DWH oil spill (see Section 1.10 of RP/EA #8.1 for more information).

Mammalian nuisance species such as native raccoons and invasive nutria and rats, if present, would consume marsh vegetation. Control measures may be implemented to identify and remove mammalian nuisance species. Measures may include monitoring for nuisance mammalian species and use of established lethal and non-lethal removal methods, which may include shooting, traps, and/or nets with transport offsite to reduce populations.

Once construction is complete, Alternative 2 would result in long-term, beneficial impacts on birds that use the project area as wintering habitat. Impacts would be associated with the increase in available habitat for nesting, foraging, and loafing. The marsh habitat created with the project would receive long-term protection from the proposed shoreline protection features.

Alternative 2 would result in the greatest overall restoration of East Orleans Landbridge as well as the most extensive habitat modifications. The types and quantities of construction equipment used would be similar to each of the other action alternatives; however, Alternative 2 would require the longest construction duration. Overall, while construction impacts are expected to be short-term, moderate, and adverse, impacts following project implementation are expected to be long-term and beneficial.

D.2.2.2.2.3 Alternative 3

The duration of construction for Alternative 3 would be similar to, although shorter than, Alternative 2, and the alternative would require a similar type and quantity of construction equipment, which is expected to disturb wildlife present in the project area.

Impacts from construction are expected to be short-term, moderate, and adverse; impacts following project implementation are expected to be long-term and beneficial. The general impacts described above for Alternative 2 capture the impacts anticipated for implementation of Alternative 3.

D.2.2.2.2.4 Alternative 4 (Preferred Alternative)

The duration of construction for the Preferred Alternative would be similar to, although shorter than, Alternative 3, and the alternative would require a similar type and quantity of construction equipment, which is expected to disturb wildlife present in the project area.

Impacts from construction are expected to be short-term, moderate, and adverse; impacts following project implementation are expected to be long-term and beneficial. The general impacts described above for Alternative 2 capture the impacts anticipated for implementation of the Preferred Alternative.

D.2.2.3 Marine and Estuarine Aquatic Fauna, EFH, and Managed Fish Species

D.2.2.3.1 AFFECTED ENVIRONMENT

D.2.2.3.1.1 Marine and Estuarine Aquatic Fauna

The marine and estuarine habitat within the project area provides essential nursery and foraging habitat to a variety of marine and estuarine aquatic fauna. Additionally, emergent marsh habitat within the project area also provides habitat and shelter to an abundance of fish and shellfish populations and plays a vital role in supporting recreational and commercial fisheries within the Gulf of America (Gulf). Based on surveys at CRMS site 3784, salinity within the project area ranges from 0.2 ppt to 31.2 ppt, indicating estuarine waters.

The marine and aquatic fauna of the East Orleans Landbridge support valuable recreational and commercial fisheries and also play a vital ecological role in the estuarine food web. Primary producers (e.g., phytoplankton, algae) convert sunlight into energy, which cycles nutrients into and out of the water column, forming the basis of the estuarine food web (NOAA, 2025). Primary producers serve important ecological roles by transferring energy up the estuarine food web to primary consumers (e.g., zooplankton, small fish, crustaceans), when eaten (Education Development Center, 2024). That energy is then transferred from primary consumers to secondary consumers, such as fish predators, marine mammals, and seabirds.

Estuarine fishery species consist of resident fishes that inhabit the emergent marsh habitat throughout their entire life cycle, as well as transient fishes that only utilize these habitats for a portion of their life cycle. Outside of these habitats, many fishes inhabit the lower portions of estuarine habitats, where prey is

abundant and salinity levels are higher, as well as the nearshore waters of the Gulf. Some common fish species found within the estuarine and marine habitats of the East Orleans Landbridge may include the spotted seatrout (*Cynoscion nebulosus*), black drum (*Pogonias cromis*), sailfin molly (*Poecilia latipinna*), Gulf killifish (*Fundulus grandis*), mullet (*Mugil spp.*), naked goby (*Gobiosoma bosc*), Atlantic croaker (*Micropogonias undulatus*), and bay anchovy (*Anchoa mitchilli*) (iNaturalist, n.d.).

Many sport fish species within the project area are commonly sought after for recreational harvest. These species include the red drum (*Sciaenops ocellatus*), spotted sea trout, sheepshead (*Archosargus probatocephalus*), and black drum. Several of these species vary in abundance within the waters around the project area due to seasonal migrations, habitat preferences based on life stages, and salinity levels. In addition to sport fish, several marine species that are economically important for both commercial and recreational harvest also inhabit the waters in and around the project area, including several species of penaeid shrimp (*Penaeidae* spp.), blue crab (*Callinectes sapidus*), and Atlantic croaker. Additional information on commercial and recreational fishing is included in Section D.2.3.8.

D.2.2.3.1.2 Essential Fish Habitat and Managed Fish Species

The National Marine Fisheries Service (NMFS) and Fishery Management Councils (FMC) created under the Magnuson-Stevens Fishery Conservation and Management Act, jointly manage fishery resources in the U.S. Exclusive Economic Zone. The Gulf Fishery Management Council (GFMC) was established for the Gulf to regulate commercially and recreationally valuable species and stocks through fishery management plans (FMP). Together, NMFS and GFMC maintain FMPs for specific species or species groups to regulate commercial and recreational fishing within their geographic regions. NMFS also manages the FMP for Highly Migratory Species (HMS), including billfish, tuna, swordfish, and sharks in the Gulf. Jurisdiction is determined by species rather than location, as species ranges often cross administrative boundaries.

FMCs are required to identify EFH for each fishery covered under an FMP, as well as Habitat Areas of Particular Concern (HAPC). EFH is defined as the waters and seafloor necessary for spawning, breeding, or growth to maturity of managed fish species (16 U.S.C. § 1802[10]). HAPCs are defined as subsets of EFH that exhibit one or more of the following traits: rare, stressed by human development, provide important ecological functions for federally managed species, or are especially vulnerable to anthropogenic (or human impact) degradation (NOAA Fisheries, 2025d). EFH and managed species identified within the project area are included in the following five FMPs:

- Coastal Migratory Pelagics (1 species)
- Red Drum
- Reef Fish (2 species)
- Shrimp (3 species)
- Highly Migratory Species (4 species)

The specific species within each FMP are presented in Table D- 3. No HAPCs were identified within the project area.

Table D- 3. Managed Species Potentially within the Project Area.

FMP	COMMON NAME	SCIENTIFIC NAME
Coastal Migratory Pelagics	Spanish Mackerel	*Scomberomorus maculatus*
Red Drum	Red Drum	*Sciaenops ocellatus*
Reef Fish	Gray Snapper	*Lutjanus griseus*

FMP	COMMON NAME	SCIENTIFIC NAME
Reef Fish	Lane Snapper	*Lutjanus synagris*
Shrimp	Brown Shrimp	*Farfantepenaeus aztecus*
Shrimp	Pink Shrimp	*Farfantepenaeus duorarum*
Shrimp	White Shrimp	*Litopenaeus setiferus*
Highly Migratory Species	Bull Shark	*Carcharhinus leucas*
Highly Migratory Species	Blacktip Shark	*Carcharhinus limbatus*
Highly Migratory Species	Atlantic Sharpnose Shark	*Rhizoprionodon terraenovae*
Highly Migratory Species	Scalloped Hammerhead Shark	*Sphyrna lewini*

Based on available data, EFH types expected or known to be present within the project area include emergent marsh, soft-bottom, sand/shell bottom, submerged aquatic vegetation (SAV), and water column habitat. The primary categories of EFH present within the project area are summarized below.

- Emergent Marsh: Emergent marshes, including brackish marshes, consist of vegetated wetlands with typically soft sediments, regular tidal inundation, some freshwater inputs, and low to moderate wave energy. Emergent marsh habitat is important nursery ground for many fish, shellfish, and other invertebrate species.
- Soft Bottom: Soft-bottom habitats are areas where the bottom sediments are soft mud, clay, or silt. This habitat type supports a diverse assemblage of organisms living within or on the sediment, including shrimp and many demersal species of fish. However, lower densities of fishes and invertebrates occur in soft-bottom communities compared to areas with hard bottom substrates.
- Sand/Shell Bottom: Areas where the bottom sediments consist of soft sand and/or shell, generally included in the term “soft bottom.”
- SAV: can be found throughout Louisiana’s coastal zone marshes and estuaries, typically on substrates that consist of sand/mud in water depths of 4.0 ft or less. Estuarine submerged vegetation beds are dominated by widgeon grass (*Ruppia maritima*) and other species (Klueh-Mundy et al., 2025).
- Water column: Water column habitat consists of all waters from the surface to the ocean floor (but not including the ocean bottom). This habitat type is particularly important for planktonic animals or life stages (eggs or larvae).

The GFMC manages over 40 species (GMFMC, 2005, 2016) and has developed five EFH “ecoregions” to refine their designations. Within each ecoregion, EFH was further defined as occurring either in estuarine (inside barrier islands and estuaries), nearshore (less than 18 meters or 59 ft deep), or offshore waters (greater than 18 meters or 59 ft deep). The project and borrow areas are in the estuarine waters of Ecoregion 3, which extends from Pensacola, Florida, west to the Mississippi River Delta. In estuarine habitats, EFH has been designated for five GFMC-managed species of fishes and crustaceans (Table D- 4). Additionally, NMFS manages HMS for which EFH has been designated based on distribution data rather than habitat type; EFH has been designated for five species of sharks in or near the project area (Table D- 5).

Table D- 4. EFH Requirements for Managed Species that Potentially Occur in Estuarine Habitats within the Project Area.

SPECIES	LIFE STAGE(S)	EFH
Red Drum	Larvae	Estuarine mud/soft bottom
Red Drum	Post Larvae	Estuarine emergent marsh, Estuarine sand and shell bottom, Estuarine mud/soft bottom
Red Drum	Early Juvenile	Estuarine emergent marsh, Estuarine mud/soft bottom
Red Drum	Adult	Estuarine emergent marsh, Estuarine sand and shell bottom, Estuarine mud/soft bottom
Gray Snapper	Adult	Estuarine emergent marsh, Estuarine sand and shell bottom
Lane Snapper	Early Juvenile	Estuarine mud/soft bottom, Estuarine sand and shell bottom
Lane Snapper	Late Juvenile	Estuarine mud/soft bottom, Estuarine sand and shell bottom
Brown Shrimp	Early Juvenile	Estuarine emergent marsh, Estuarine sand and shell bottom, Estuarine mud/soft bottom
White Shrimp	Early Juvenile	Estuarine emergent marsh, Estuarine mud/soft bottom

Table D- 5. Highly Migratory Species Potentially in the Project Area by Life Stage.

SPECIES	LIFE STAGE(S)
Bull Shark	Neonate, Juvenile
Blacktip Shark	Neonate, Juvenile, Adult
Atlantic Sharpnose Shark	Neonate, Juvenile, Adult
Scalloped Hammerhead Shark	Neonate

D.2.2.3.2 ENVIRONMENTAL CONSEQUENCES

D.2.2.3.2.1 Alternative 1 – No Action

Under the No Action Alternative, the project would not be implemented, and the short-term and long-term, minor to moderate, adverse impacts on marine and estuarine aquatic fauna (including EFH) associated with construction of the action alternatives would not occur. However, any long-term benefits from habitat creation and increased longevity would also not occur. Over time, coastal processes, shoreline change, and erosion would contribute to habitat loss and decreased protection from wave action resulting in long-term, major, adverse impacts on aquatic fauna (and EFH).

D.2.2.3.2.2 Alternative 2

Impacts on marine and estuarine aquatic fauna, including managed fish species and EFH present in the project area are expected due to construction activities associated with Alternative 2. These impacts include displacement and disturbance of aquatic fauna during construction of the action alternatives due to noise and the presence of vessels and equipment, as well as temporary impacts on water quality due to increased turbidity and suspended sediment concentrations and potential leaks from construction equipment and

vehicle fuels and fluids. Specifically, sediment movement within the borrow area would cause short-term, minor, adverse impacts on aquatic fauna due to the disruption of prey sources, disturbance due to noise, and temporary impacts on habitat quality due to increased turbidity and sedimentation. These adverse impacts are expected to be slightly greater under Alternative 2 than the other action alternatives because of the larger construction area and longer construction period for this Alternative but would still be short-term and minor.

Fish species that are present in the project area within the marine and estuarine habitats are highly mobile and would likely avoid areas of active construction. Mobile aquatic fauna disturbed and displaced in these areas would likely find refuge in nearby suitable habitats and then return to the project area after construction. However, direct effects on less mobile species, such as benthic invertebrates, would occur through injury or mortality due to dredging, placement of the sediment pipeline onto the waterbottom, sediment placement for marsh creation, and placement of shoreline protection features. The project would affect soft-bottom, sand and shell bottom, and water column habitat, particularly in the borrow area. There are no public oyster seed grounds in the project area.

While dredging and placement of material for the restoration components of the project would have short-term, moderate, adverse impacts on aquatic habitat, the temporary access channels would be backfilled following completion. The placement of shoreline protection features would cause the permanent loss of soft-bottom habitat but would also provide hardbottom substrate for sessile aquatic fauna to colonize and provide a source of prey for managed fish. Further, the shoreline protection features would provide long-term benefits by protecting marsh habitat from erosion and loss. BMPs for protection of habitat and water quality described in Section D.2.2.1 would minimize the potential for detrimental impacts on EFH during construction.

The placement of fill materials for restoration features would cause the long-term conversion of open water to marsh habitat as well as hardbottom where the shoreline protection features are installed. The project would provide a benefit to those species that depend on marsh habitats. Marine and estuarine habitats that would be affected by the placement of sediment for the action alternatives would return over time as marsh elevations subside naturally and are altered via coastal processes.

Overall, Alternative 2 would incorporate all the potential project features described for the action alternatives, resulting in the greatest associated construction impacts on aquatic fauna, EFH, and managed fish species as well as the most extensive long-term habitat modifications. However, Alternative 2 would also result in the creation of the most habitat acreage compared to the other action alternatives, providing the greatest long-term benefits to aquatic fauna, EFH, and managed fish species through increased habitat creation and increased marsh longevity that would similarly increase the longevity of associated high-quality aquatic habitats. Overall, while construction impacts are expected to be short-term to long-term, minor to moderate, and adverse, impacts following project implementation are expected to be long-term and beneficial.

D.2.2.3.2.3 Alternative 3

The impacts from construction activities would be similar for all action alternatives, including Alternative 3, and would require a similar type and quantity of construction equipment, resulting in disturbance to marine and estuarine aquatic fauna (including managed species) and EFH in the project area. With the exception of Alternative 2, construction of Alternative 3 would have the greatest total impacts on intertidal vegetation. Overall, impacts from construction are expected to be short-term to long-term, minor to moderate, and adverse; impacts following project implementation are expected to be long-term and beneficial. The general impacts described above for Alternative 2 capture the impacts anticipated for implementation of Alternative 3.

D.2.2.3.2.4 Alternative 4 (Preferred Alternative)

The impacts from construction activities would be similar for all action alternatives, including the Preferred Alternative, and would require a similar type and quantity of construction equipment, resulting in disturbance to marine and estuarine aquatic fauna (including managed species) and EFH in the project area. Construction of Alternative 4 would have the least total impacts on intertidal vegetation. Overall, impacts from construction are expected to be short-term to long-term, minor to moderate, and adverse; impacts following project implementation are expected to be long-term and beneficial. The general impacts described above for Alternative 2 capture the impacts anticipated for implementation of the Preferred Alternative.

D.2.2.4 Protected Species

Protected species can include any species that is covered by additional regulation, such as the Endangered Species Act (ESA), Marine Mammal Protection Act (MMPA), and MBTA. Species protected by the ESA and MMPA are discussed below. Species covered by the MBTA are discussed in Section D.2.2.2.

D.2.2.4.1 AFFECTED ENVIRONMENT

D.2.2.4.1.1 Threatened and Endangered Species

The ESA of 1973 (16 U.S.C. § 1531 et seq.) protects all federally listed threatened and endangered species, as well as their designated critical habitat. 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 LA TIG will request consultation with the USFWS and NMFS on the preferred alternative for this project.

For this project, the Action Area consists of a 1-mi buffer surrounding all restoration-related activities including the MCAs, dredge pipeline corridor, borrow area, and access corridor used by construction vessels transiting the Rigolets. A list of federally threatened and endangered species with the potential to occur within the project area was developed based on a review of the USFWS Information for Planning and Consultation System and the NMFS ESA Section 7 Mapper. In total, 12 species are potentially present within the project area (Table D- 6). In addition, the project area contains designated critical habitat for the Gulf Sturgeon (*Acipenser oxyrinchus desotoi*).

Table D- 6. Protected Species under the ESA with the Potential to Occur within the Project Area.

COMMON NAME	SCIENTIFIC NAME	JURISDICTION	CURRENT STATUS	TYPE
Tricolored Bat	*Perimyotis subflavus*	USFWS	Proposed Endangered	Mammal
West Indian Manatee	*Trichechus manatus*	USFWS	Threatened	Mammal
Eastern Black Rail	*Laterallus jamaicensis ssp. jamaicensis*	USFWS	Threatened	Bird
Red-cockaded woodpecker	*Picoides borealis*	USFWS	Threatened	Bird
Monarch Butterfly	*Danaus plexippus*	USFWS	Proposed Threatened	Insect

COMMON NAME	SCIENTIFIC NAME	JURISDICTION	CURRENT STATUS	TYPE
Alligator Snapping Turtle	*Macrochelys temminckii*	USFWS	Proposed Threatened	Reptile
Gopher Tortoise	*Gopherus polyphemus*	USFWS	Threatened	Reptile
Gulf Sturgeon	*Acipenser oxyrinchus desotoi*	USFWS (riverine environment) NMFS (estuarine/marine environment)	Threatened	Fish
Green Sea Turtle	*Chelonia mydas*	USFWS (terrestrial) NMFS (marine)	Threatened	Reptile
Kemp's Ridley Sea Turtle	*Lepidochelys kempii*	USFWS (terrestrial) NMFS (marine)	Endangered	Reptile
Loggerhead Sea Turtle	*Caretta caretta*	USFWS (terrestrial) NMFS (marine)	Threatened	Reptile
Giant Manta Ray	*Mobula birostris*	NMFS	Threatened	Fish

D.2.2.4.1.1.1 TRICOLORED BAT

The tricolored bat (*Perimyotis subflavus*) is proposed to be listed as endangered under the ESA (87 Federal Register [FR] 56381). It is one of North America's smallest insectivorous bats and is easily identified by its uniquely banded fur with dark bases, lighter middles, and dark tips. Fur coloration is highly variable, with individuals often appearing yellowish, ranging from pale yellow to nearly orange, but also commonly silvery gray, chocolate brown, or black. Historically common and wide-ranging, the species occupies forests across the eastern and central U.S., southern Canada, Mexico, and Central America, roosting in tree foliage during the warmer months (USFWS, 2026). Survey data from 1956 to 1990 documented observations of tricolored bats in the area. However, since then, no other observations have been reported (McCoshum et al., 2023). While suitable forested habitats that could support tricolored bats may be present within the broader buffer area, particularly in upland forested areas north of the Rigolets, the project footprint is entirely confined to brackish marsh habitat and lacks the forest canopy, edge habitats, and riparian corridors typically used by the species for roosting and foraging. Therefore, the tricolored bat is unlikely to occur within the project area.

D.2.2.4.1.1.2 WEST INDIAN MANATEE

The West Indian manatee (*Trichechus manatus*) was listed as an endangered species in 1967 and later reclassified as threatened under the ESA in 2017 (82 FR 16668). It is also federally protected under the MMPA of 1972. This species is a large marine mammal occurring in the southeastern region of the U.S., eastern Mexico, and in patchy distribution throughout the Caribbean, but predominantly occurring in Florida. The total range-wide population of West Indian manatees is estimated at 13,000. They inhabit marine, brackish, and freshwater systems such as estuaries, saltwater bays, slow moving rivers and river mouths, canals, and coastal areas alike. It is herbivorous and prefers nearshore habitats containing SAV (USFWS, n.d.-b). West Indian manatees are opportunistic feeders and feed on a wide variety of marine, estuarine, and freshwater plants some including cord grass (*Sporobolus* spp.), algae, turtle grass (*Thalassia testudinum)*, shoal grass (*Halodule wrightii*), manatee grass (*Syringodium filiforme*), and eel grass (*Zostera marina*) (USFWS, n.d.-g). A 2005 study on manatee occurrence in the northern Gulf, west of Florida, recorded various

manatee sightings in the waters of Louisiana from 1943 to 2004 including sightings in/near the project area (Fertl et al., 2005).

D.2.2.4.1.1.3 AVIAN SPECIES

The eastern black rail (*Laterallus jamaicensis ssp. jamaicensis*) was identified as potentially present within the project area. It was federally listed as a threatened species on November 9, 2020 (85 FR 63764). No critical habitat has been proposed for this species. One of five subspecies of black rail, the eastern black rail is a secretive marsh bird that occurs in emergent wetland habitat and contiguous uplands (USFWS, 2019). The range of this species extends across the Gulf Coast, and it has been documented in western coastal Louisiana; however, Louisiana is not currently known to support a breeding population of eastern black rail (USFWS, 2019; Watts, 2016). Further, Louisiana is considered to be on the periphery of known breeding areas for the species (Watts, 2016) as noted in the final rule listing the species under 85 FR 63764. Given that the East Orleans Landbridge marshes are outside areas of documented occurrences, it is unlikely that the eastern black rail occurs in the project area.

The red-cockaded woodpecker (*Picoides borealis*) is protected under the ESA. It was originally listed as endangered under the ESA in 1973 and was reclassified as threatened in 2024 due to population recovery throughout most of its range (89 FR 85294). It is a small black and white bird that lives in mature pine forests. Males have a tiny red mark on the side of the head, which gives the species its name. Their range is patchy across the southeastern U.S., including states such as Alabama, Florida, Georgia, Louisiana, the Carolinas, Texas, and Virginia (USFWS, 2024, 2025b). This species has highly specialized habitat requirements and is strongly associated with mature, open longleaf pine forests, which occur primarily north of the Rigolets. While suitable longleaf pine habitat may be present within the broader buffer area north of the Rigolets, the project footprint is entirely confined to brackish marsh habitat and lacks the upland pine forests required for nesting and foraging. Since the East Orleans Landbridge marshes lack the necessary habitat, it is unlikely that the red-cockaded woodpecker occurs in the project area.

D.2.2.4.1.1.4 MONARCH BUTTERFLY

The monarch butterfly (*Danaus plexippus*) is a candidate species and not yet listed or proposed for listing. Adult monarch butterflies are large and conspicuous, with bright orange wings surrounded by a black border and covered with black veins. Monarch butterflies in eastern and western North America exhibit long-distance migration (over 1,800 mi) and overwinter as adults at forested locations in Mexico and California. During the fall migration, monarchs feed on wildflowers along the Louisiana coast. Monarchs mate at the overwintering sites and then disperse. Upon their return in spring, females lay their eggs on their obligate milkweed host plant (primarily *Asclepias* spp.), and larvae feed on milkweed and sequester toxic chemicals (cardenolides) as a defense against predators. Multiple generations of monarchs are produced during the breeding season, with most adult butterflies living two to five weeks (USFWS, n.d.-e).

While milkweed may occur in terrestrial habitats within the Action Area, it was not recorded during 2025 vegetation assessments, and the area is not considered to contain suitable habitat for monarchs or their caterpillars.

D.2.2.4.1.1.5 ALLIGATOR SNAPPING TURTLE

The alligator snapping turtle (Macrochelys temminckii) is proposed to be listed as threatened under the ESA (86 FR 62434). It is the largest freshwater turtle in the U.S. and is known for its massive, prehistoric appearance. Notable physical characteristics include webbed toes, laterally positioned eyes that are not visible from above, and three prominent keels on the carapace (LDWF, n.d.-a). It inhabits rivers and waterways across the Midwest, Southeast, and parts of the Southwest, where it rests along the bottom (USFWS, 2025a). Often mistaken for the common snapping turtle, it can be distinguished by its heavily ridged shell and overall larger size. They inhabit large rivers, streams, canals, lakes, and swamps, favoring areas

with high forest canopy and underwater structures like root masses and submerged trees. In Louisiana, the species is distributed statewide, though it is less frequently encountered in marsh habitats (LDWF, n.d.-a). While suitable freshwater habitats with dense canopy cover may be present within the broader buffer area north of the Rigolets, the project footprint itself is entirely within brackish marsh and does not contain suitable foraging habitat. Therefore, the alligator snapping turtle is unlikely to occur within the project area.

D.2.2.4.1.1.6 GOPHER TORTOISE

The gopher tortoise (*Gopherus polyphemus*) is listed as threatened under the ESA and occurs in two distinct population segments (DPS) across its range: Western and Eastern. The Western DPS, where the species has been federally listed as threatened since 1987 (52 FR 25376), includes populations west of the Mobile and Tombigbee rivers in Alabama, Louisiana, and Mississippi. It is a medium-sized, terrestrial tortoise characterized by its dark brown to grayish black coloration and sturdy, dome-shaped shell. The species' range aligns closely with the historic longleaf pine ecosystem and historically included Alabama, Florida, Georgia, Louisiana, Mississippi, and South Carolina (USFWS, n.d.-d, 2022). In Louisiana, the gopher tortoise is restricted to upland longleaf pine and mixed pine-hardwood forests with very sandy, well-drained soils, and is known to occur in Washington, Tangipahoa, and St. Tammany parishes (LDWF, n.d.-b). While such upland habitats may be present within the broader buffer area north of the Rigolets, the project footprint itself is entirely within brackish marsh and does not contain suitable habitat for the species. Therefore, the gopher tortoise is unlikely to occur within the project area.

D.2.2.4.1.1.7 GULF STURGEON

The Gulf sturgeon is federally listed as threatened wherever found with designated critical habitat in coastal inshore waters of Louisiana and Mississippi. The species historically occurred from the Mississippi River to Tampa Bay, Florida, with sporadic records across the northern Gulf. The present range includes Lake Pontchartrain, Louisiana and nine river systems between Mississippi and Florida. The species is anadromous, spawning in rivers during the spring, and migrating into the estuaries and bays in the fall (NOAA Fisheries, 2025c). In the winter, adults may move further into marine waters, whereas younger fish (ages 2 to 3 years) would remain in estuarine and freshwater habitats. Estuarine and marine habitat includes shallow water habitats and shoals (5 to 7 ft deep), deeper waters near passes, unvegetated soft bottoms, and intertidal zones (NOAA Fisheries, 2025c). The species can live up to 50 years (up to 25 years on average) and grow up to 8 ft long (NOAA Fisheries, 2025c; 68 FR 13370).

Threats include contaminant runoff, dredging, river dams, and environmental changes. A recent modeling effort indicated that the Rigolets provides favorable habitat conditions for adult and sub-adult sturgeon during April-May and for juveniles during March-April, coinciding with the reentry period into the Pearl River (Brogdon et al., 2024). Habitat suitability extends across the Pontchartrain Basin and associated channels from October through May, though Lake St. Catherine offers lower habitat potential compared to the Rigolets, which serves as an outmigration corridor to Lake Borgne and the Gulf.

Gulf sturgeon prefer to forage in sediments with high sand content (Brogdon et al., 2024; Fox et al., 2002; Ross et al., 2009). The substrate in the borrow area is predominantly sandy clay with silt and shell fragments or clay with silt and trace sand, and none of the borings exceeded 43 percent sand (GeoEngineers, Inc., 2022). This indicates that the proposed borrow area does not contain preferred foraging habitat for the Gulf sturgeon. However, Gulf sturgeon may still be present in the area and may be using parts of the Action Area for foraging despite the lower quality habitat due to low sand contents. Accordingly, dredging of the Lake St. Catherine Borrow Area could potentially affect Gulf sturgeon.

D.2.2.4.1.1.8 SEA TURTLES

Three federally listed sea turtles, including the endangered Kemp's ridley (*Lepidochelys kempii*) and the threatened loggerhead (*Caretta caretta*) and green sea turtles (*Chelonia mydas*) potentially occur within the

project area. For this project, the species are under the shared jurisdiction of USFWS and NMFS (USFWS & NMFS, 1977). NMFS has jurisdiction in the marine environment and all waters adjacent to the terrestrial environment; USFWS has jurisdiction in terrestrial areas.

Sea turtles are found throughout the tropical and subtropical seas of the world, where they occur at or near the surface of the water. Female sea turtles nest on land and lay eggs. After 2 to 3 months, hatchlings emerge from nests and return to the ocean where they have a prolonged pelagic stage. Juveniles and adults use varying habitats, depending on the species, and adult females generally return to their natal coastal sand beaches to nest and lay their eggs. The Kemp's ridley sea turtle is considered the most critically endangered species of sea turtles and is primarily found within nearshore coastal habitats with muddy or sandy sea bottoms (NOAA Fisheries, 2025f). The loggerhead inhabits oceanic waters, as well as shallow water areas containing seagrass beds, salt marshes, bays, and tidal inlets (LDWF, n.d.-c). The green sea turtle is primarily herbivorous, spending most of its life in shallow coastal habitats where it feeds on seagrasses (NOAA Fisheries, 2025b). Threats to sea turtles include interactions with fishing gear; military operations; dredging operations; habitat alterations (including channel construction); vessel operations; marine debris and pollution; poaching; global environmental changes; cold-stunning; and predation (NOAA Fisheries, 2025f, 2025b).

D.2.2.4.1.1.9 GIANT MANTA RAY

The giant manta ray (*Mobula birostris*) was listed as a threatened species under the ESA in 2018 (83 FR 2916). This species inhabits tropical, subtropical, and temperate waters and can be found offshore, in oceanic waters, and productive coastal areas. Giant manta rays have also been observed in estuarine waters, oceanic inlets, intercoastal waterways, and bays. The global population size of this species is unknown, and small, highly fragmented populations are sparsely distributed around the world. The few regional population estimates range from 600 to 2,000 individuals (NOAA Fisheries, 2026a). The giant manta ray is an HMS, and their movements correspond with current circulation, seasonal upwelling, water temperatures, and location of food source. The primary diet of this species consists of planktonic organisms or zooplankton (NOAA Fisheries, 2026a).

D.2.2.4.1.2 Marine Mammals

In addition to the listed species discussed above, all marine mammals are protected under the MMPA of 1972, including the bottlenose dolphin (*Tursiops*). Under Section 3 of the MMPA, all marine mammals are protected from "take" which is defined as to "harass, hunt, capture, or kill or attempt to harass, hunt, capture, or kill any marine mammal." NMFS has authority over the marine mammals potentially occurring within the project area, with the exception of the West Indian manatee, which is under USFWS jurisdiction and protected under both the ESA and the MMPA.

Common bottlenose dolphins (*Tursiops truncatus*) are one of the most common marine mammal species in the northern Gulf, occurring widely throughout waters surrounding the project area (Vollmer & Rosel, 2013). This species can thrive on a wide variety of prey, some of which include fish, crustaceans (e.g., shrimp and crab), and squid. The primary threats to bottlenose dolphins include interactions with fishing gear, habitat destruction and degradation, biotoxins (harmful algal blooms), and illegal human harassment and feeding activities (NOAA Fisheries, 2025a).

The *Common Bottlenose Dolphin (Tursiops truncatus truncatus): Northern Gulf of Mexico Bay, Sound, and Estuary Stocks* report (Hayes et al., 2023) indicates an estimated abundance of 1,265 for the Mississippi Sound, Lake Borgne, Bay Boudreau stock. The boundary of the estuary is just south of the project area. It is likely that common bottlenose dolphins are transient users of the estuarine bays in the project area.

D.2.2.4.2 ENVIRONMENTAL CONSEQUENCES

D.2.2.4.2.1 Threatened and Endangered Species

For actions involving major construction activities with the potential to affect ESA-listed species or designated critical habitat, such as the proposed project, consultation should be requested from the USFWS and/or NMFS. Based on anticipated project impacts, the LA TIG is entering formal consultation with the USFWS and NMFS in accordance with Section 7 of the ESA. All consultation would be completed prior to project construction, and any avoidance and mitigation measures developed in coordination with the USFWS and NMFS during the formal consultation process would be implemented for the project.

The species discussions in this section incorporate and rely on analyses in the Biological Assessment (BA) prepared for this project, which will be publicly available. Although the BA includes the information that was necessary for formal consultation under the ESA, the below analysis also includes the information to comply with NEPA, including an assessment of alternatives.

The determinations from the BA are included in Table D- 7 and include:

- No effect: the proposed project would not affect a listed species;
- May affect, not likely to adversely affect: effects on a listed species are expected to be discountable (extremely unlikely to occur), insignificant (the impact would never reach the scale where take occurs), or completely beneficial; and
- May affect, likely to adversely affect: adverse effects on a listed species may occur as a direct or indirect result of the proposed project and the effect is not discountable, insignificant, or beneficial.

In addition to summarizing the ESA determinations made in the BA, a corresponding NEPA determination of impact is also provided, based on the definitions provided in the Final PDARP/PEIS. They include the following threatened and endangered species indicators for the following impacts, along with major impacts (which are not described here, as major, adverse impacts are not applicable to the project):

- No impact: there is no discernible or measurable impact. This would generally correlate with an ESA Section 7 no effect determination.
- Minor impact: impacts on threatened or endangered species, their habitats, or the natural processes sustaining them could be detectable, but small and localized, and could not measurably alter natural conditions. This impact would generally correlate with an ESA Section 7 may affect, not likely to adversely affect determination where effects are considered insignificant, discountable, and/or wholly beneficial.
- Moderate impact: impacts on threatened or endangered species, their habitats, or the natural processes sustaining them could be detectable and some alteration in the numbers of species or occasional responses to disturbance by some individuals could be expected, with some negative impacts on 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 on potential or designated critical habitat could occur. This impact would generally correlate with an ESA Section 7 may affect, likely to adversely affect determination for at least one listed species. No adverse modification of critical habitat could be expected.

Table D- 7. Summary of Impacts on Listed Species and Critical Habitats from the Action Alternatives.

Note: NE = no effect; NI = no impact; LAA = likely to adversely affect; NLAA = not likely to adversely affect. Information presented is summarized from the project BA.

COMMON NAME	SCIENTIFIC NAME	FEDERAL STATUS	ESA/NEPA EFFECT DETERMINATION	JURISDICTION	JUSTIFICATION
West Indian Manatee	*Trichechus manatus*	Threatened	NLAA/short-term to long-term, minor, adverse; long-term, beneficial	USFWS	The species has been documented near the East Orleans Landbridge project area. Construction activities would temporarily disturb or displace individuals, if present, but required BMPs (such as the *Standard Manatee Conditions for In-water Work* [USFWS, 2013]) would be implemented to minimize the potential for impact due to vessel strikes or construction activities. To minimize potential noise related impacts, the CPRA would implement the NMFS *Protected Species Construction Conditions* (NMFS, 2021a).
Tricolored Bat	*Perimyotis subflavus*	Proposed Endangered	NE/NI	USFWS	While suitable forested habitats that could support tricolored bats may be present within the broader buffer area, particularly in upland forested areas north of the Rigolets, the project footprint is entirely confined to brackish marsh habitat and lacks the forest canopy, edge habitats, and riparian corridors typically used by the species for roosting and foraging. Therefore, the tricolored bat is unlikely to occur within the project area.
Eastern Black Rail	*Laterallus jamaicensis ssp. Jamaicensis*	Threatened	NE/NI	USFWS	The East Orleans Landbridge marshes are outside areas of documented species occurrences; the species is not expected to occur in the project area.
Red-cockaded Woodpecker	*Picoides borealis*	Threatened	NE/NI	USFWS	The species range only overlaps within the access corridor. No modification of longleaf pine habitat is proposed along access routes.

COMMON NAME	SCIENTIFIC NAME	FEDERAL STATUS	ESA/NEPA EFFECT DETERMINATION	JURISDICTION	JUSTIFICATION
Alligator Snapping Turtle	*Macrochelys temminckii*	Proposed Threatened	NE/NI	USFWS	Species is proposed for listing, and the proponent does not wish to conference on the species at this time. The species range only overlaps within the access corridor, and in Louisiana, these turtles are mostly found in freshwater habitats, with very rare occurrences in marshes.
Gopher Tortoise	*Gopherus polyphemus*	Threatened	NE/NI	USFWS	The species range only overlaps within the access corridor. No modification of longleaf pine habitat is proposed along access routes.
Green Sea Turtle	*Chelonia mydas*	Threatened	NE/NI	USFWS	The species does not nest in the project area.
Kemp's Ridley Sea Turtle	*Lepidochelys kempii*	Endangered	NE/NI	USFWS	The species does not nest in the project area.
Loggerhead Sea Turtle	*Caretta caretta*	Threatened	NE/NI	USFWS	The species does not nest in the project area.
Gulf Sturgeon	*Acipenser oxyrinchus desotoi*	Threatened	NLAA/short-term to long-term, minor, adverse; long-term, beneficial	NMFS	Construction activities would temporarily disturb or displace individuals, if present, but required BMPs would be implemented to minimize the potential for impact due to vessel strikes or other construction activities. To minimize potential noise related impacts, CPRA would implement the NMFS *Protected Species Construction Conditions* (NMFS, 2021a).

COMMON NAME	SCIENTIFIC NAME	FEDERAL STATUS	ESA/NEPA EFFECT DETERMINATION	JURISDICTION	JUSTIFICATION
Gulf Sturgeon Critical Habitat	Critical Habitat Unit 8		NLAA/short-term to long-term, minor, adverse; long-term, beneficial	NMFS	Critical habitat is present in the Action Area. Dredging and construction activities would temporarily disturb some of the primary constituent elements of Gulf sturgeon critical habitat including food resources, water quality, and sediment quality. Impacts would be temporary and limited in extent.
Giant Manta Ray	*Mobula birostris*	Threatened	NLAA/short-term to long-term, minor, adverse; long-term, beneficial	NMFS	Construction activities would temporarily disturb or displace individuals, if present, but required BMPs would be implemented to minimize the potential for impact due to vessel strikes or other construction activities. To minimize potential noise related impacts, CPRA would implement the NMFS *Protected Species Construction Conditions* (NMFS, 2021a).
Monarch Butterfly	*Danaus plexippus*	Proposed Threatened	NE/NI	USFWS	While pollinator plant species may be present in terrestrial habitat in the project area, milkweed was not documented in CRMS vegetation assessments conducted in 2025 (CPRA, 2026), and suitable monarch butterfly or caterpillar habitat would not be directly affected by marsh fill for the project.

COMMON NAME	SCIENTIFIC NAME	FEDERAL STATUS	ESA/NEPA EFFECT DETERMINATION	JURISDICTION	JUSTIFICATION
Green Sea Turtle	*Chelonia mydas*	Threatened	NLAA/short-term to long-term, minor, adverse; long-term, beneficial	NMFS	This species may occur within the Action Area and could experience short-term, minor effects from dredging and marsh fill activities. Potential impacts include temporary avoidance of construction areas due to increased noise and turbidity, as well as risks of collision with vessels, entrapment during filling, or entanglement in dredge-related lines. Implementation of required BMPs will reduce the likelihood of these interactions. Individuals are expected to naturally move away from disturbance, minimizing the duration and severity of exposure.
Kemp's Ridley Sea Turtle	*Lepidochelys kempii*	Endangered	NLAA/short-term to long-term, minor, adverse; long-term, beneficial	NMFS	This species may occur within the Action Area and could experience short-term, minor effects from dredging and marsh fill activities. Potential impacts include temporary avoidance of construction areas due to increased noise and turbidity, as well as risks of collision with vessels, entrapment during filling, or entanglement in dredge-related lines. Implementation of required BMPs will reduce the likelihood of these interactions. Individuals are expected to naturally move away from disturbance, minimizing the duration and severity of exposure.

COMMON NAME	SCIENTIFIC NAME	FEDERAL STATUS	ESA/NEPA EFFECT DETERMINATION	JURISDICTION	JUSTIFICATION
Loggerhead Sea Turtle	*Caretta caretta*	Threatened	NLAA/short-term to long-term, minor, adverse; long-term, beneficial	NMFS	This species may occur within the Action Area and could experience short-term, minor effects from dredging and marsh fill activities. Potential impacts include temporary avoidance of construction areas due to increased noise and turbidity, as well as risks of collision with vessels, entrapment during filling, or entanglement in dredge-related lines. Implementation of required BMPs will reduce the likelihood of these interactions. Individuals are expected to naturally move away from disturbance, minimizing the duration and severity of exposure.

D.2.2.4.2.1.1 ALTERNATIVE 1 – NO ACTION

Under the No Action Alternative, the project would not be implemented, and the short-term to long-term, adverse impacts on ESA-listed species and critical habitat associated with the action alternatives would not occur. However, long-term benefits from habitat creation and increased marsh longevity would also not occur. Over time, coastal processes, shoreline change, and erosion would contribute to the loss of habitat utilized by ESA-listed species. The loss of these habitats would result in (up to) long-term, major, adverse impacts on threatened and endangered species as the species would lose essential habitat.

D.2.2.4.2.1.2 ALTERNATIVE 2

Impacts on threatened and endangered species and their habitats could occur as a result of project construction activities; however, there would be long-term benefits to protected species (particularly estuarine-dependent species) and their habitat once construction is complete. By restoring East Orleans Landbridge marshes and providing shoreline protection features, the project is expected to prolong the existence of marsh habitat.

Table D- 7 summarizes the potential impacts on threatened and endangered species for the action alternatives. BMPs would be implemented during construction to minimize the potential for impacts on protected species, including measures from the *Protected Species Construction Conditions* (NMFS, 2021a), *Measures for Reducing Entrapment Risk to Protected Species* (NMFS, 2012), *Vessel Strike Avoidance Measures* (NMFS, 2021b), and *Standard Manatee Conditions for In-water Work* (USFWS, 2013).

No impacts are anticipated for protected species such as the tricolored bat, eastern black rail, red-cockaded woodpecker, alligator snapping turtle, gopher tortoise, sea turtles (in terrestrial habitats), and monarch butterfly as they are not expected to be present in the project area and/or do not nest in the project area.

Potential short-term to long-term, minor, adverse effects on protected species such as West Indian manatee, sea turtle species (outside of terrestrial habitats), Gulf sturgeon (and critical habitat), and giant manta ray butterfly may include temporary, localized, noise impacts, entrapment, and collisions with vessels and/or dredging equipment. These species are able to move away from the project site and into adjacent suitable habitat, if disturbed. NMFS previously determined in dredging Biological Opinions that non-hopper-type dredging methods, such as the hydraulic dredge proposed in this project, are slower and extremely unlikely to overtake or adversely affect these species (NMFS, 2007). For each of these species, impacts would be avoided and minimized to the extent practicable through the implementation of the BMPs and protected measures described above. Following construction, long-term benefits to habitat quality and longevity are expected to provide long-term benefits to species that occur in the project area.

D.2.2.4.2.1.3 ALTERNATIVE 3

The duration of construction for Alternative 3 would be similar to, although shorter than, Alternative 2, and the Alternative would require a similar type and quantity of construction equipment, which is expected to disturb protected species present in the project area. The largest difference between the alternatives is the amount of habitat affected and created/restored/protected, which results in the same effective impact determinations for each species, as listed in Table D- 7, but with incrementally higher or lower impact or benefit.

Overall, protected species that do not nest in or frequent the project area would not be affected; protected species that may occur within the project area would be subject to potential short-term to long-term, minor, adverse effects from project construction. However, following construction, long-term benefits to habitat quality and longevity are expected to provide long-term benefits to listed species that occur in the project

area. The general impacts described above for Alternative 2 capture the impacts anticipated for implementation of Alternative 3.

D.2.2.4.2.1.4 ALTERNATIVE 4 (PREFERRED ALTERNATIVE)

The duration of construction for the Preferred Alternative would be similar to, although shorter than, each of the other action alternatives, and would require a similar type and quantity of construction equipment, which is anticipated to disturb protected species present in the project area. The largest difference between the alternatives is the amount of habitat affected and created/restored/protected, which results in the same effective impact determinations for each species, as listed in Table D- 7, but with incrementally higher or lower impact or benefit.

Overall, protected species that do not nest in or frequent the project area would not be affected; protected species that may occur within the project area would be subject to potential short- term to long-term, minor, adverse effects from project construction. However, following construction, long-term benefits to habitat quality and longevity are expected to provide long-term benefits to listed species that occur in the project area. The general impacts described above for Alternative 2 capture the impacts anticipated for implementation of the Preferred Alternative.

D.2.2.4.2.2 Marine Mammals

Marine mammals potentially occurring in the project area include both listed and non-listed species under the ESA. The West Indian manatee is protected by both the MMPA and ESA and is therefore included in the above section. This section focuses on bottlenose dolphins, which are protected only by the MMPA.

D.2.2.4.2.2.1 ALTERNATIVE 1 – NO ACTION

Under the No Action Alternative, the project would not be implemented and the short-term to long-term, minor, adverse impacts on dolphins associated with the action alternatives would not occur. However, the long-term benefits from habitat creation and longevity would also not occur. Over time, coastal processes, shoreline change, and erosion would contribute to habitat loss. Overall, the No Action Alternative would have a long-term, minor to moderate, adverse impact on dolphins.

D.2.2.4.2.2.2 ALTERNATIVE 2

Potential short-term to long-term, minor, adverse effects on bottlenose dolphins and their habitats could occur as a result of project construction activities; however, there would be long-term benefits to available habitat once construction is complete, which would benefit dolphins using the waters and habitats in the project area. Habitat restoration is further discussed in Section D.2.2.1. Dolphins in the project area could be affected by temporary disturbance due to the presence of vessels, equipment, and personnel; vessel strikes; and entrapment. In general, the measures to protect listed species from entrapment and vessel strikes identified in D.2.2.4.2.1 above would protect dolphins.

The greatest potential for impacts from underwater noise would occur during in-water construction activities, including sheet pile driving, and other impulsive or continuous sound sources associated with installation of shoreline protection features. These impacts would be temporary and limited to the duration of pile installation and other in-water work. NMFS has developed guidelines for noise thresholds likely to either cause behavioral effects via disturbance or injury via hearing loss to marine mammals (NMFS, 2026). Because construction activities could exceed applicable thresholds, the potential distances to injury and behavioral response thresholds for listed species based on the available multi-species and marine mammal acoustic tools (NMFS, 2026) are presented in Table D- 8 and Table D- 9.

Table D- 8. Thresholds for Injury and Behavioral Disturbance from Impulsive Noise and Pile Driving Sound Levels (NMFS, 2026).

Note: dB re 1 µPa = decibels relative to 1 microPascal; dB re 1 µPa2s = decibels relative to 1 microPascal squared normalized to 1 second; peak = peak sound pressure, RMS = root mean square; SELcum = cumulative sound exposure level; SPL = sound pressure level.

[a] Also referenced as mid-frequency cetaceans in previous NMFS guidance. This includes bottlenose dolphins in the Action Area.

SPECIES / HEARING GROUP	TYPE OF SOUND	PERMANENT INJURY CRITERIA, PEAK SPL (DB RE 1 µPA)	PERMANENT INJURY CRITERIA, SELCUM (DB RE 1 µPA2S)	BEHAVIORAL RESPONSE, RMS SPL (DB RE 1µPA)
High-frequency cetaceans[a]	Noise	230	193	160
Pile-Driving Sound Level: Source sound level, 24-inch (in) steel sheet pile at 10 m (33 ft) from pile and 2-6 m (6.5-19.7 ft) water depth	Pile Driving	209	166	175

Table D- 9. Isopleth Distances to Injury and Behavioral Disturbance from Impulsive Noise, Meters (ft) (NMFS, 2026).

Note: peak = peak sound pressure, RMS = root mean square; SELcum = cumulative sound exposure level; SPL = sound pressure level.

[a] Also referenced as mid-frequency cetaceans in previous NMFS guidance. This includes bottlenose dolphins in the Action Area.

SPECIES / HEARING GROUP	PERMANENT INJURY CRITERIA, PEAK SPL METERS (FT)	PERMANENT INJURY CRITERIA, SELCUM METERS (FT)	BEHAVIORAL RESPONSE, RMS SPL METERS (FT)
High-frequency cetaceans[a]	0.4 (1.3)	19.4 (63.7)	100.0 (328.1)

While the specific details of sheet pile driving are not known, a scenario based on impact hammer installation of 1,570, 24-in-diameter steel sheet piles at a rate of 20 piles per day was used to assess potential impacts. The project proposes use of 36-in sheet piles. The closest proxy available in the tool was a 24-inch diameter steel sheet pile which may underestimate sound exposure to species. As noted above, pile driving is likely to extend over approximately 157 days, resulting in fewer strikes per day and a smaller region of influence.

The isopleth distances for injury and behavioral effects for dolphins is less than 328 ft. CPRA would instruct personnel to assess the areas within 50 ft of pile driving locations prior to beginning pile driving and, if a protected species (such as a dolphin) is observed, avoid commencing pile driving activities until it has left the area of its own accord. CPRA would further instruct personnel to be alert for protected species in the vicinity of pile diving. Therefore, the potential for injury due to pile driving noise is low. Impacts on protected species are described in further detail in the BA (see the East Orleans Landbridge Restoration Project BA, which will be publicly available) and above.

Overall, potential short-term to long-term, minor, adverse effects on dolphins may include temporary, localized, noise impacts, entrapment, and collisions with vessels; however, these impacts would be avoided and minimized to the extent practicable though the implementation of the BMPs. Following construction, long-term benefits to habitat quality and longevity (see Section D.2.2.1) are expected to provide long-term benefits to the species that occur in the project area, including bottlenose dolphins.

D.2.2.4.2.2.3 ALTERNATIVE 3

The duration of construction for Alternative 3 would be similar to, although shorter than, Alternative 2, and the alternative would require a similar type and quantity of construction equipment, which is expected to disturb dolphins present in the project area through vessel traffic and noise. While the specific details of sheet pile driving are not known, a scenario based on impact hammer installation of 1,366, 24-in-diameter steel piles at a rate of 20 piles per day was used to assess potential impacts. Pile driving is likely to extend over approximately 137 days, resulting in fewer strikes per day and a smaller region of influence. However, following construction, long-term benefits to habitat quality and longevity are expected. Overall, impacts on dolphins from construction are expected to be short-term to long-term, minor, and adverse; however, impacts following project implementation are expected to be long-term and beneficial as habitat is created, restored, and/or protected. The general impacts described for Alternative 2, above, capture the impacts anticipated for implementation of Alternative 3.

D.2.2.4.2.2.4 ALTERNATIVE 4 (PREFERRED ALTERNATIVE)

The duration of construction for the Preferred Alternative would be similar to, although shorter than, each of the other action alternatives, and would require a similar type and quantity of construction equipment, which is expected to disturb dolphins present in the project area through vessel traffic and noise. While the specific details of sheet pile driving are not known, a scenario based on impact hammer installation of 827, 24-in-diameter steel piles at a rate of 20 piles per day was used to assess potential impacts. Pile driving is likely to extend over approximately 83 days, resulting in fewer strikes per day and a smaller region of influence. As discussed for Alternative 2, overall impacts on dolphins from construction are expected to be short-term to long-term, minor, and adverse; however, impacts following project implementation are expected to be long-term and beneficial as habitat is created, restored, and/or protected. The general impacts described for Alternative 2, above, capture the impacts anticipated for implementation of the Preferred Alternative.

D.2.3 Socioeconomic Resources

This section discusses relevant human resources including socioeconomics, cultural resources, infrastructure, land and marine management, tourism and recreation, aesthetics and visual resources, public health and safety, fisheries and aquaculture, and marine transportation.

D.2.3.1 Socioeconomics

D.2.3.1.1 AFFECTED ENVIRONMENT

The East Orleans Landbridge marshes in the project area have no structures and no permanent or temporary populations. However, communities along the Louisiana and Mississippi coast may use the marshes and the surrounding area for various recreational and commercial activities. The project area is within the City of New Orleans, Louisiana and within 5 mi of the City of Slidell, Louisiana.

D.2.3.1.2 ENVIRONMENTAL CONSEQUENCES

D.2.3.1.2.1 Alternative 1 – No Action

Under the No Action Alternative, the project would not be implemented, and the short-term, beneficial impacts associated with construction of the action alternatives would not occur. Implementation of the project is anticipated to benefit natural resources and therefore benefit local socioeconomic conditions over the long term. Under the No Action Alternative, these benefits would not be realized, resulting in a long-term, minor, adverse impact on socioeconomic factors over time from the continued degradation and loss of natural resources.

D.2.3.1.2.2 Alternative 2

The project area is uninhabited by people and would remain so under Alternative 2 (and all alternatives). However, construction of Alternative 2 would likely result in short-term to long-term, beneficial impacts on the local economy, particularly in local coastal areas. Short-term, beneficial impacts would be realized through the purchase of construction materials and equipment from local businesses, hiring a portion of the workforce from the local labor force, and spending in the nearby areas by project construction personnel.

Once the project is implemented, it could provide direct and indirect, long-term benefits to commercial and recreational fishing industries through increased fish populations and improved wildlife habitat. In addition, the restored marshes would aid in buffering coastal communities from the effects of coastal storms, such as flooding. Finally, the improved habitat may induce increased recreational and commercial activity in the area, which could also benefit area economies.

Though there are coastal communities nearby, they would not experience direct, adverse impacts from construction traffic, noise, or related emissions. Further, visual receptors in these communities are sufficiently removed such that project construction would not be visible.

Overall, Alternative 2 would have short-term, beneficial impacts during project construction and long-term, beneficial impacts after construction is complete. Construction of Alternative 2 has the longest duration compared to the other action alternatives. This longer construction period may result in additional economic benefits through local spending by the project workforce. Although all action alternatives would provide long-term, direct and indirect benefits to commercial and recreational fishing industries through increased fish populations and improved wildlife habitat, as well as indirect benefits from increased storm protection for coastal communities, the increased benefits would be higher for Alternative 2 compared to the other action alternatives given that it has the largest projected extent of habitat creation and protection.

D.2.3.1.2.3 Alternative 3

Alternative 3 would have short-term, beneficial impacts during project construction and long-term, beneficial impacts after construction is complete. Impacts on socioeconomics from Alternative 3 would be similar to those described above under Alternative 2; however, it would result in somewhat fewer short-term and long-term benefits than Alternative 2, given the decreased construction timeframe and reduced habitat creation and protection.

D.2.3.1.2.4 Alternative 4 (Preferred Alternative)

Overall, the Preferred Alternative would have short-term, beneficial impacts during project construction and long-term, beneficial impacts after construction is complete. Impacts on socioeconomics from the Preferred Alternative would be similar to those described above under Alternative 2; however, it would result in somewhat fewer benefits than Alternative 2, given the decreased construction timeframe and reduced habitat creation and protection.

D.2.3.2 Cultural Resources

D.2.3.2.1 AFFECTED ENVIRONMENT

Cultural resources are evidence of past human activity. In marine settings, these may include historic shipwrecks and associated debris such as armaments, ammunitions, barrels, and furnishings, as well as historic lighthouses and prehistoric and historic archaeological sites.

R. Christopher Goodwin & Associates, Inc. conducted a Phase I terrestrial cultural resources investigation for the project (R. Christopher Goodwin & Associates, Inc., 2022). This investigation included background

research for the area of potential effects (APE), field work, and analysis of data uncovered during the field work. Three, new, non-site cultural resources loci (PAC071422-01, PAC071722-01, and PAC080322-01) were recorded for the investigation, but the sites did not meet the Louisiana Division of Archaeology definition of an archeological site (i.e., less than five artifacts), and no further examination of the APE was recommended.

RECON Offshore, Full Fathom Five, and Cultural Resource Analysts conducted a preliminary marine remote sensing survey of the borrow area (T. Baker Smith, 2022). While multiple anomalies were detected in the magnetometer dataset, they were consistent with small modern items (e.g., crab traps, small debris) rather than cultural resources. Some locations within the borrow area returned signatures consistent with tree stumps. It was determined that the borrow area has moderate to low potential for cultural resources.

D.2.3.2.2 ENVIRONMENTAL CONSEQUENCES

D.2.3.2.2.1 Alternative 1 – No Action

Under the No Action Alternative, none of the proposed restoration activities would occur, and the project would not be implemented. There are no previously reported cultural resources in the proposed APE. A preliminary marine remote sensing survey of the borrow area and a Phase I terrestrial cultural resources investigation of the restoration area found no cultural resources within the project area. Although the discovery of archaeological deposits within the natural landscapes of the project area is possible, the likelihood is low. Under the No Action Alternative, there would be no short-term or long-term impacts on cultural resources.

D.2.3.2.2.2 Alternative 2

The Phase I terrestrial cultural resources investigation conducted in support of this proposed project found no cultural resources within the project area. Further, the preliminary marine remote sensing survey of the borrow area did not detect cultural resources. As a result, although construction of Alternative 2 would cause the greatest amount of sediment and ground disturbance, there would be no anticipated short-term or long-term impacts on cultural resources from implementation of Alternative 2, as none are located in the area. A complete review under Section 106 of the National Historic Preservation Act would be completed before construction activities begin. If any culturally or historically significant resources are identified during project preparations or predevelopment surveys, such areas would be avoided during construction.

D.2.3.2.2.3 Alternative 3

Neither the Phase I terrestrial cultural resources investigation nor the preliminary marine remote sensing survey found cultural resources within the project area. Similar to Alternative 2, there would be no anticipated short-term or long-term impacts on cultural resources from implementation of Alternative 3.

D.2.3.2.2.4 Alternative 4 (Preferred Alternative)

Neither the Phase I terrestrial cultural resources investigation nor the preliminary marine remote sensing survey found cultural resources within the project area. Similar to Alternative 2, there would be no anticipated short-term or long-term impacts on cultural resources from implementation of the Preferred Alternative.

D.2.3.3 Infrastructure

D.2.3.3.1 AFFECTED ENVIRONMENT

The East Orleans Landbridge marshes are uninhabited and only accessible by water or air. The project area contains brackish marsh and open water. There are no buildings or development directly on the marshes, and no roadway or recreational trail system exists within the project area.

There are no active oil or gas wells within the project area based on a review of the Louisiana Department of Conservation and Energy's (C&E) Strategic Online Natural Resources Information System Mapper (C&E, 2025).

Based on a desktop review, T. Baker Smith (2022) identified two existing pipelines, one in the borrow area and one in MCA 2. The abandoned, 4-in Florida Exploration Company flowline in the borrow area runs north to south across the western end of the borrow area and is approximately 8-10 ft below existing natural bottom. The existing, 6-in Gulfsouth pipeline runs east to west across in MCA 2 and is approximately 3-5 ft below existing grade. There is an abandoned platform at the western end of the Gulfsouth pipeline; it is outside of the MCA 2 boundary. There are also three plugged and abandoned well casings with or near MCA 2.

D.2.3.3.2 ENVIRONMENTAL CONSEQUENCES

D.2.3.3.2.1 Alternative 1 – No Action

Under the No Action Alternative, the project would not be implemented, and the long-term, beneficial impacts associated with implementation of the action alternatives would not occur. Impacts on infrastructure are not anticipated under the No Action Alternative.

D.2.3.3.2.2 Alternative 2

No impacts on infrastructure would occur during or after construction of Alternative 2. There are no active oil and gas wells in the project area. The abandoned flowline in the borrow area would be avoided during borrow area dredging operations. Though fill material would be added to MCA 2, the addition of that fill would not be expected to impact the Gulfsouth pipeline as it is already buried beneath the marsh surface. The project would have no impact on the existing infrastructure.

D.2.3.3.2.3 Alternative 3

No impacts on infrastructure would occur during or after construction of Alternative 3. There are no active oil and gas wells in the project area. The abandoned flowline in the borrow area would be avoided during borrow area dredging operations. Though fill material would be added to MCA 2, the addition of that fill would not be expected to impact the Gulfsouth pipeline as it is already buried beneath the marsh surface. The project would have no impact on the existing infrastructure.

D.2.3.3.2.4 Alternative 4 (Preferred Alternative)

No impacts on infrastructure would occur during or after construction of the Preferred Alternative. There are no active oil and gas wells in the project area. The abandoned flowline in the borrow area would be avoided during borrow area dredging operations. The extent of MCA 2 is reduced compared to other action alternatives, and the Gulfsouth pipeline is outside of the revised boundary. The project would have no impact on the existing infrastructure.

D.2.3.4 Land and Marine Management

D.2.3.4.1 AFFECTED ENVIRONMENT

The Federal Coastal Zone Management Act encourages states to develop coastal management programs for preserving statewide coastal resources. Once a state develops an approved coastal management program, "federal consistency" requires that any federal actions affecting coastal land or water resources (the Coastal Zone) be consistent with the state's program. The C&E Office of Coastal Management (OCM) oversees the state's Coastal Zone Management Program. The project is located within the Louisiana Coastal Zone established by the State and Local Coastal Resources Management Act of 1978, modified in 2012 (DENR, 2026).

Orleans Parish has a Local Coastal Zone Management Plan (CZMP) that was developed in 1985 and approved in 1987. The Orleans CZMP divided the parish into eight environmental management units (EMU) (New Orleans City Planning Commission, 1985) with each EMU assigned customized management goals based on environmental characteristics, existing uses, and existing resources. The project (including the borrow area) is located within EMU VIII (Chef Menteur/Rigolets) and includes goals and objectives related to conserving renewable natural resources and controlling shoreline erosion (New Orleans City Planning Commission, 1985).

D.2.3.4.2 ENVIRONMENTAL CONSEQUENCES

D.2.3.4.2.1 Alternative 1 – No Action

Under the No Action Alternative, the project would not be implemented, and the short-term, adverse impacts associated with implementation of the action alternatives would not occur. However, any long-term benefits, as discussed below, would also not occur. Overall, the No Action Alternative would have no measurable effect on land and marine management.

D.2.3.4.2.2 Alternative 2

Construction of Alternative 2 would result in temporary access restrictions to land and marine management areas. Restricted access to areas of active construction (both on land and water) would be short term and minor. Once completed, the project would result in direct, long-term, beneficial impacts on land and marine management in the project area by meeting the goals/objectives of the CZMP, which include conservation of natural resources and erosion control.

Overall, Alternative 2 would result in direct, short-term, minor, adverse, but direct, long-term, beneficial impacts on land and marine management in the project area. Although all action alternatives would provide long-term, direct benefits on land and marine management, the benefits would be greater for Alternative 2 compared to the other action alternatives given the size of the project and the overall larger area to be restored.

D.2.3.4.2.3 Alternative 3

Overall, Alternative 3 would result in direct, short-term, minor, adverse impacts from restricted access during construction and direct, long-term, beneficial impacts on land and marine management in the project area. Impacts on land and marine management for Alternative 3 would be the same as those described above under Alternative 2; however, it would result in somewhat fewer short-term impacts than Alternative 2, given the decreased construction timeframe and slightly reduced long-term benefits from habitat creation/protection.

D.2.3.4.2.4 Alternative 4 (Preferred Alternative)

Overall, the Preferred Alternative would result in direct, short-term, minor, adverse impacts from restricted access during construction and direct, long-term, beneficial impacts on land and marine management in the project area. Impacts on land and marine management for the Preferred Alternative would be the same as those described above under Alternative 2; however, it would result in somewhat fewer short-term impacts than Alternative 2, given the decreased construction timeframe and slightly reduced long-term benefits from habitat creation/protection.

D.2.3.5 Tourism and Recreational Use

D.2.3.5.1 AFFECTED ENVIRONMENT

The waters in and around the East Orleans Landbridge marshes are a popular destination for boating, fishing, hunting, bird watching, photography, and other recreational activities. While the marshes are uninhabited, tourism to and around the project area is frequent. In addition, some portions in/near the project area are leased to recreational waterfowl hunters.

D.2.3.5.2 ENVIRONMENTAL CONSEQUENCES

D.2.3.5.2.1 Alternative 1 – No Action

Under the No Action Alternative, the project would not be implemented, and the short-term, adverse impacts associated with implementation of the action alternatives would not occur. However, any long-term benefits, including enhanced experiences due to improved habitat for fish and wildlife species, would also not be realized, resulting in a long-term, minor, adverse impact on tourism and recreational use associated with continued habitat degradation and loss.

D.2.3.5.2.2 Alternative 2

Impacts on tourism and recreational use may occur during construction of any of the action alternatives due to the presence of construction equipment and personnel, the temporary disturbance of fish and wildlife habitat from construction activities, and the increase in boat traffic within the project area. As discussed above, a variety of recreational activities occur on and around the project area. During construction of the project, portions of East Orleans Landbridge marshes and surrounding waterways would be inaccessible to the public where active construction is occurring. Fishing would still be permitted in areas that are not actively under construction.

After construction is complete, there would likely be long-term, beneficial impacts on tourism and recreation as a result of the restoration activities. Improved habitat for fish and wildlife species would result in an increase in these populations, providing a better recreational experience for tourists who visit the area. The restoration activities could also provide a socioeconomic benefit to charter companies and businesses specializing in tourism in the area.

Overall, short-term, minor, adverse impacts on tourism and recreational use would occur during construction of Alternative 2 due to the presence of construction equipment and personnel, with long-term, beneficial impacts occurring due to improved habitats. The construction period for Alternative 2 would be longer than the other alternatives, which would result in impacts on tourism and recreational use over a longer period of time; however, the amount of improved habitat would be greater than the other action alternatives, resulting in slightly higher beneficial impacts following construction of the project.

D.2.3.5.2.3 Alternative 3

Short-term, minor, adverse impacts on tourism and recreational use may occur during construction due to the presence of construction equipment and personnel, with long-term, beneficial impacts due to improved habitats. Impacts on tourism and recreational use from Alternative 3 would be similar to those described above under Alternative 2, although the long-term benefits would be slightly less given the decrease in habitat created and shoreline protected by Alternative 3.

D.2.3.5.2.4 Alternative 4 (Preferred Alternative)

Short-term, minor, adverse impacts on tourism and recreational use may occur during construction due to the presence of construction equipment and personnel, with long-term, beneficial impacts due to improved habitats. Impacts on tourism and recreational use from the Preferred Alternative would be similar to those described above under Alternative 2, although the long-term benefits would be slightly less given the decrease in habitat created and shoreline protected by the Preferred Alternative.

D.2.3.6 Aesthetics and Visual Resources

D.2.3.6.1 AFFECTED ENVIRONMENT

Visual resources include natural and manmade components of the environment perceived by human receptors. “Aesthetics” refers to beauty in both form and appearance. Perceptions and aesthetic values may vary among individuals depending upon personal preferences.

The project area is an uninhabited area with no permanent structures or surface infrastructure. The area remains relatively natural, dominated by brackish marsh and open waters. Viewsheds to the project site are mainly offered from aircraft and boat though the marshes and activities associated with the project may be visible from onshore locations in the Lake Catherine community, which is approximately 1 mi to the east.

D.2.3.6.2 ENVIRONMENTAL CONSEQUENCES

D.2.3.6.2.1 Alternative 1 – No Action

Under the No Action Alternative, the project would not be implemented, and the short-term, adverse impacts associated with changes in the viewshed from the action alternatives would not occur. However, any long-term benefits from the project (including any wildlife viewing opportunities associated with habitat creation) would also not be realized, resulting in a long-term, minor, adverse impact on local aesthetics and visual resources associated with continued habitat degradation and loss.

D.2.3.6.2.2 Alternative 2

Given its location, the project area would be visible by air or boat as well as by members of nearby neighborhoods. Construction equipment, personnel, and vessel traffic would be visible to nearby visual receptors during active construction periods; although these impacts would be adverse, they would be short term and minor.

Implementation of the project would restore and protect marsh habitat, which would enhance habitat for birds and other species, thereby enhancing the natural aesthetic of the marsh. This would result in a long-term, beneficial impacts on aesthetic and visual resources. The magnitude of these beneficial impacts would vary depending on an individual visual receptor’s perceptions and preferences.

Overall, Alternative 2 would have minor, short-term, adverse impacts on aesthetics and visual resources during project construction and long-term, beneficial impacts after construction is complete. Whether the individual features of this alternative, or the resulting marsh areas created, would be discernable to viewers

would depend on an individual visual receptor's familiarity with the current viewshed and knowledge of such features. While the magnitude of these beneficial impacts would vary depending on an individual visual receptor's perceptions and preferences, the larger restoration area associated with Alternative 2 would result in a larger change in the viewshed compared to the other alternatives discussed below.

D.2.3.6.2.3 Alternative 3

Overall, the construction of Alternative 3 would result in short-term, minor, adverse impacts on aesthetic and visual resources and long-term, beneficial impacts once construction is complete. Impacts on visual receptors in the project area from Alternative 3 would be similar to those described above under Alternative 2 but would result in somewhat less of a change to the visual properties of East Orleans Landbridge marshes.

D.2.3.6.2.4 Alternative 4 (Preferred Alternative)

Overall, the construction of the Preferred Alternative would have short-term, minor, adverse impacts on aesthetic and visual resources and long-term, beneficial impacts after construction is complete. Impacts on visual receptors in the project area from the Preferred Alternative would be similar to those described above under Alternative 2 but would result in somewhat less of a change to the visual properties of East Orleans Landbridge marshes.

D.2.3.7 Public Health and Safety

D.2.3.7.1 AFFECTED ENVIRONMENT

Public health and safety considerations include the health and safety of the general public, including boaters, and personnel involved in activities related to the construction of the proposed project. Additionally, coastal marshes act as a buffer to reduce the effects of flooding, wave action, saltwater intrusion, storm surge, and tidal current.

Executive Order (EO) 13045, Protection of Children from Environmental Health Risks and Safety Risks (1997), requires that project-related environmental health and safety risks to children are identified and assessed and disproportionate risks to children are addressed.

The project would be constructed on uninhabited land within the East Orleans Landbridge. Open water adjacent to the project area is open to the public for recreational and commercial activities. Public access to the project area is limited to boat and air traffic. The project area is uninhabited, but the closest access points are approximately 1 mi to the north off of Chef Menteur Highway.

D.2.3.7.2 ENVIRONMENTAL CONSEQUENCES

D.2.3.7.2.1 Alternative 1 – No Action

Under the No Action Alternative, the project would not be implemented, and the long-term, beneficial impacts associated with restoration activities from the action alternatives would not occur. The No Action Alternative would result in long-term, minor, adverse impacts on public health and safety caused by continued coastal erosion and land loss which increases the risk of flooding, wave action, saltwater intrusion, storm surge, and tidal current further inland.

D.2.3.7.2.2 Alternative 2

Construction of the project would not adversely impact public health and safety. Although heavy construction equipment and marine vessels would be used during construction, navigational safety measures would be followed to ensure the safety of the general public, including boaters and construction

personnel. BMPs such as developing a Stormwater Pollution Prevention Plan and implementing warning signs would minimize the possibility of impacts on public health and safety. All U.S. Coast Guard (USCG) rules and state/federal laws would be followed during construction, and construction activities would be conducted to avoid, to the greatest extent feasible, any unreasonable interference with public health and safety.

Implementation of the project would result in long-term, beneficial effects on public health and safety through the restoration and protection of East Orleans Landbridge marshes. The restoration activities would increase the longevity of the marshes, which act as a buffer to reduce the effects of wave action, storm surge, and tidal currents, providing the benefit of increased storm risk reduction for coastal communities.

Additionally, the project would comply with EO 13045, Protection of Children from Environmental Health Risks and Safety Risks and does not represent disproportionately high and adverse environmental health or safety risks to children. Implementation of the project would not create other public health and safety concerns.

D.2.3.7.2.3 Alternative 3

Impacts on public health and safety for Alternative 3 would be similar to Alternative 2 including long-term, beneficial impacts.

D.2.3.7.2.4 Alternative 4 (Preferred Alternative)

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

D.2.3.8 Fisheries and Aquaculture

D.2.3.8.1 AFFECTED ENVIRONMENT

The area surrounding the East Orleans Landbridge marshes is available for both commercial and recreational fishing. Commercial fishery landings in 2024 in Louisiana were about 694 million pounds and resulted in a total commercial revenue of 324 million dollars. The dominant fishery in Louisiana (by monetary value) is shellfish (NOAA Fisheries, 2024a).

Recreational fishing is also an important activity in the state. The LDWF collects yearly data on recreational fishing efforts and catches to provide key data to guide them in fisheries management practices. According to the LDWF LA Creel Recreational Survey, in 2025, there were a total of 1,648,362 angler trips within Louisiana (LDWF, 2026a). Of these, 442,621 trips were within the Pontchartrain Basin, which includes an area from the northern border of Louisiana down through the Chandeleur Islands. These trips resulted in a total of 1.4 million fish landings, dominated by seatrout species.

There are no oyster leases or oyster public seed grounds within the project area.

D.2.3.8.2 ENVIRONMENTAL CONSEQUENCES

D.2.3.8.2.1 Alternative 1 – No Action

Under the No Action Alternative, the project would not be implemented, and the short-term, minor, adverse impacts associated with implementation of the action alternatives would not occur. However, any long-term benefits (including enhanced fisheries in the Action Area) would also not be realized, resulting in a long-term, minor, adverse impact on fisheries from the continued degradation and loss of high-quality fish habitat.

D.2.3.8.2.2 Alternative 2

A temporary decline in fish and mobile aquatic species near active construction, including within the borrow area, conveyance corridors, and temporary access channels, would likely occur due to relocation away from construction activities and would result in diminished commercial and recreational fishing experiences or relocation to another area.

However, these species are expected to return once the project's construction activities have concluded, resulting in a short-term, minor, adverse impact on commercial and recreational fishing experiences in the Action Area.

As discussed further in Sections D.2.2.1 and D.2.2.3, impacts following project implementation are generally expected to be long-term and beneficial. While the shoreline protection features along the ECDs would result in a permanent loss of soft-bottom habitat, they would provide hard substrate that would act as fish habitat and would provide long-term benefits by protecting marsh habitat from erosion and loss.

Overall, the project would have minor, short-term, adverse impacts during project construction and long-term, beneficial impacts after construction is complete. However, as discussed in Section D.2.2.3, the combined material volumes from the restoration features would create and sustain the most habitat acreage compared to the other action alternatives, proving the greatest long-term benefits, including for EFH.

D.2.3.8.2.3 Alternative 3

Alternative 3 would have minor, short-term, adverse impacts during project construction and long-term, beneficial impacts after construction is complete. Impacts on fisheries and aquatic species from Alternative 3 would be similar to those described above under Alternative 2 but would create less habitat for increased fish use.

D.2.3.8.2.4 Alternative 4 (Preferred Alternative)

The Preferred Alternative would have minor, short-term, adverse impacts during project construction and long-term, beneficial impacts after construction is complete. Impacts on fisheries and aquatic species from the Preferred Alternative would be similar to those described above under Alternative 2 but would create less habitat for increased fish use.

D.2.3.9 Marine Transportation

D.2.3.9.1 AFFECTED ENVIRONMENT

The project area is located within state waters in Orleans Parish, Louisiana. The closest shipping fairways near the project provide access to the Mississippi River and Mississippi Sound. The nearest shipping fairways that provide access to the Mississippi River (and subsequently to the Port of New Orleans and St. Bernard Port) include the Gulf Intracoastal Waterway (GIWW) and the Rigolets. The GIWW is located immediately south of the project area and the Rigolets to the north and east of the project area. The majority of marine traffic near the project area would be from recreational and commercial fishing vessels.

D.2.3.9.2 ENVIRONMENTAL CONSEQUENCES

D.2.3.9.2.1 Alternative 1 – No Action

Under the No Action Alternative, the project would not be implemented, and the short-term, minor, adverse impacts associated with marine traffic from the action alternatives would not occur. Overall, the No Action Alternative would have no measurable effect on marine transportation.

D.2.3.9.2.2 Alternative 2

The majority of marine traffic near the project area would be from recreational and commercial fishing vessels. During construction, various construction vessels may be present in and around the East Orleans Landbridge marshes. These vessels could readily divert around the project area during active construction periods, resulting in short-term, minor, adverse impacts. The USCG posts a weekly Local Notice to Mariners (LNM), which provides information on any navigation hazards or marine information of interest (USCG, 2026). Any potential hazards or closings around the East Orleans Landbridge that would impede traffic navigation would be posted in the weekly LNM. Following completion of construction activities, associated vessel traffic would cease and there would be no long-term, adverse impacts from the project on marine transportation.

D.2.3.9.2.3 Alternative 3

The project would have short-term, minor, adverse impacts on marine traffic (generally restricted to visiting recreational or commercial vessels) during project construction, which would cease after construction is complete. Impacts on marine transportation from Alternative 3 would be similar to those described above under Alternative 2 but would occur over a slightly shorter period of time.

D.2.3.9.2.4 Alternative 4 (Preferred Alternative)

The project would have short-term, minor, adverse impacts on marine traffic (generally restricted to visiting recreational or commercial vessels) during project construction, which would cease after construction is complete. Impacts on marine transportation from the Preferred Alternative would be similar to those described above under Alternative 2 but would occur over a slightly shorter period of time.

D.3 Resources Analyzed in Detail: Raccoon Island Restoration

The following sections describe the affected environment by resource category[14] followed by the environmental consequences of each Raccoon Island Restoration alternative. For purposes of this document, the proposed action is considered implementation of the Preferred Alternative, Alternative 3. Two non-preferred Alternatives (2 and 6) and a No Action Alternative (Alternative 1) are also analyzed. See Chapter 2 for full details on each Alternative.

The No Action Alternative (Alternative 1) is analyzed first as a basis for comparison of potential environmental consequences of the action alternatives, followed by the action alternatives (Alternatives 2, 3, and 6). As noted in Chapter 2, all project design specifications (for example, acreage, linear feet, etc.) discussed in this document are approximate and would continue to be refined through final E&D; however, the environmental consequences would not be expected to diverge from what is analyzed in this RP/EA #8.1.

[14] Tiering from the *Deepwater Horizon Oil Spill: Final Programmatic Damage Assessment and Restoration Plan and Final Programmatic Environmental Impact Statement (*PDARP/PEIS), the resource categories evaluated in this RP/EA #8.1 are organized in the same structure (i.e., physical, biological, and socioeconomic resources). NOAA's updated NEPA procedures note the need to consider the effects of the project on the quality of life of the American people. In this document, those effects are captured under the following subheadings: cultural resources, infrastructure, land and marine management, tourism and recreation, aesthetics and visual resources, fisheries and aquaculture, and marine transportation.

D.3.1 Physical Resources

This section discusses resources of the natural and physical environment, including geology, soils, topography, hydrology, water quality, noise, and air quality.

D.3.1.1 Geology and Substrates

D.3.1.1.1 AFFECTED ENVIRONMENT

Raccoon Island is located within the Terrebonne Basin barrier shoreline at the western end of the Isles Dernières barrier island chain in coastal Louisiana. The island formed during the late Holocene and represents part of a sediment-limited erosional barrier arc along the northern Gulf. Barrier islands in this region are low-relief landforms composed of unconsolidated sands, silts, and organic-rich sediments that are continuously shaped by wave action, tides, storm events, and longshore sediment transport (Kindinger et al., 2013). Net sediment transport along the Isles Dernières chain generally trends from east to west, with periodic reversals during major storm events. Hurricanes and strong tropical systems frequently generate overwash and breaching, redistributing sediment from the Gulf-facing beach and dune system landward into back-barrier marsh and tidal shoals. These processes contribute to landward island migration and changes in island morphology over time (CPRA, 2022; Penland et al., 1985).

Raccoon Island has experienced substantial shoreline retreat and land loss over the past century due to limited sediment supply, regional subsidence, relative sea level rise, and repeated storm impacts (Penland et al., 2003). Historical mapping and monitoring indicate that sediment losses associated with storms and chronic wave erosion have outpaced natural sediment inputs, resulting in narrowing of the island platform and degradation of dune and marsh habitats (Kindinger et al., 2013). Although previous restoration efforts have included beach nourishment, breakwater construction, terminal groin installation, and vegetation plantings, long-term sediment deficits continue to influence island stability.

Soils on Raccoon Island consist primarily of Scatlake muck and Felicity loamy fine sand. Scatlake muck is a very poorly drained mineral soil that occurs within the back-barrier marsh areas of the island. Felicity loamy fine sand is distributed along the shoreface, beach, and supratidal habitats and consists of somewhat poorly drained sandy soils characteristic of barrier island environments (USDA NRCS, 2025). These soil types reflect the transition from organic-rich marsh substrates on the bayside of the island to sand-dominated sediments along the Gulf-facing shoreline.

Sediment used for restoration would be sourced from the Ship Shoal Block 88 (SSB88) Borrow Area located on the Outer Continental Shelf (OCS). Vibracores collected within the borrow area indicate surficial sand deposits occurring at depths ranging from approximately 8 to 23 ft below the seafloor, with no overburden removal required to access suitable material. Grain size analyses of the surficial sands show mean grain sizes ranging from approximately 0.15 millimeters to 0.21 millimeters, which are coarser than existing on-island sediments and therefore expected to provide increased stability once placed. The average percent fines and silt within the borrow material ranges from approximately 2 to 5 percent, with localized upper limits of up to 9 percent.

D.3.1.1.2 ENVIRONMENTAL CONSEQUENCES

D.3.1.1.2.1 Alternative 1 – No Action

Under the No Action Alternative, the project would not be implemented. There would be no adverse impacts in the short term, as geology and substrate conditions would remain the same as existing conditions. In the long term, the lack of sediment input combined with continued subsidence and sea level rise, as described

above, would contribute to continued shoreline erosion, accelerated land loss, and increased inundation of Raccoon Island, which would leave the island more vulnerable to breaching and segmentation during storm events. Continued land loss could lead to conversion of the island into shallow sand shoals. Therefore, under the No Action Alternative, impacts on geology and substrates would be long-term, major, and adverse.

D.3.1.1.2.2 Alternative 2

Short-term, minor to moderate, adverse impacts on terrestrial substrates would be expected during construction of Alternative 2, such as localized soil disturbances and compaction from beach, dune, and marsh fill sediment placement and the use of several types of land-based earth-moving equipment and transportation equipment during site preparation and fill activities. Short-term, minor to moderate, adverse impacts on aquatic substrates may result from the use of sea-borne equipment during site preparation and excavation activities at the SSB88. The scale of terrestrial impacts under Alternative 2 would be the same as the other action alternatives, as the on-island fill area is the same. The scale of underwater impacts under Alternative 2 would be slightly less than the other action alternatives, as the footprint is smaller. Construction activities for Alternative 2 are estimated to last 370 days (Baird-Stantec JV, 2026a).

Long-term, moderate, adverse impacts on aquatic substrates would result from dredging activities that would remove an estimated 2.9 million cy of material from the SSB88 Borrow Area (Baird-Stantec JV, 2026a). However, while this removal of substrate from the SSB88 Borrow Area would result in long-term, moderate, adverse impacts (lasting longer than the duration of project construction), it would occur within an offshore sand resource area with regional sediment exchange.

The anticipated method for mining the SSB88 Borrow Area and conveying it to the placement sites would be a hydraulic cutterhead dredge and piped to Raccoon Island. Depending on final pipeline length and hydraulic requirements, one or more booster pumps may be installed along the pipeline alignment to maintain slurry transport efficiency between the borrow area and the placement sites. The in-water construction activities would result in localized disturbances on aquatic substrates, constituting short-term, minor, adverse impacts. There would be anticipated short-term, minor to moderate, adverse impacts on soils along the nearshore conveyance corridor and associated offshore conveyance corridors resulting from ground disturbance from placement of material and dredge outfall pipe, as well as from the earthwork required for site preparation and construction activities. The sediment pipeline installed within the conveyance corridors would not require excavation for pipeline installation, as the sediment pipelines would be placed directly on the seafloor without trenching. There would be short-term and minor adverse impacts from the dredging of temporary access channels to provide construction access to Raccoon Island for equipment (e.g., marsh buggy excavators, bulldozers, and front-end loaders) and personnel, which would be refilled with side-cast material at the end of construction. Rock barges, loaders, trucks, and/or cranes/clamshell mechanical dredges may be used for breakwater maintenance.

Alternative 2 would create and restore approximately 401 ac of Raccoon Island, including a total of approximately 99 ac of beach, dune, and intertidal habitat and approximately 302 ac of marsh platform habitat. At year 20, approximately 54 ac of beach, dune, and intertidal habitat and approximately 296 ac of marsh platform habitat would remain. While placement of large quantities of fill material on and adjacent to Raccoon Island would cause short-term, minor to moderate, adverse impacts on the existing substrates, this fill material placement, vegetation planting, and use of hay bales would help stabilize terrestrial and underwater soils and reduce erosion in the long term by restoring and increasing soil surface, resulting in an overall long-term, beneficial impact on substrates, contributing to the restoration of geomorphologic and ecologic form and function. There would also be long-term, beneficial impacts on Raccoon Island from maintaining and raising Gulfside breakwaters, which would protect the substrate and geology of the

shoreline of Raccoon Island and maintain habitat. Alternative 2 is expected to result in long-term benefits to sediments and soils in the project area.

Alternative 2 would raise and extend the existing terminal groin 300 ft west; it would have a crest elevation of +6.0 ft NAVD88. This groin modification would alter sediment transport patterns at the eastern end of Raccoon Island by increasing the structure's capacity to retain sand within the project footprint. By reducing eastward alongshore sediment losses, the modified groin would promote accumulation and stabilization of placed beach and dune sediments adjacent to the structure. This change is expected to result in localized, long-term, beneficial impacts to terrestrial substrates by improving sediment retention and reducing erosion potential in the vicinity of the groin. Modification of the terminal groin could result in minor, long-term, adverse effects to substrates downdrift of the structure due to reduced sediment transport beyond the groin. However, design assumptions indicate that sediment bypass would continue through periodic overwash and transport around the structure, which would limit the magnitude of downdrift effects. Overall, the raised and extended groin would be expected to improve substrate stability within the project area while causing only localized and minor alterations to regional sediment dynamics.

Overall, Alternative 2 would result in short-term and long-term, minor to moderate, adverse impacts on geology and terrestrial and aquatic substrates during construction activities and long-term, beneficial impacts on geology and substrates from an expansion in the island's footprint, higher elevation, and reduced erosion.

D.3.1.1.2.3 Alternative 3 (Preferred Alternative)

Similar to Alternative 2, short-term and long-term, minor to moderate, adverse impacts on terrestrial and aquatic substrates would be expected during construction of the Preferred Alternative; however, impacts would be greater than in Alternative 2 because this Alternative includes both living shoreline and traditional breakwater components of the Bayside Shoreline Protection Structures (BSPS), expanding the project footprint and extending the construction duration (495 days). Rock barges, loaders, trucks, and/or cranes/clamshell mechanical dredges may be used for BSPS and living shoreline maintenance and construction. Installation of the BSPS would result in localized, long-term, beneficial impacts to substrates by reducing marsh edge erosion and stabilizing sediments along the bayside margin of the island, though minor localized disturbance of shallow aquatic substrates would occur during rock placement.

The Preferred Alternative would create and restore approximately 410 ac of Raccoon Island, including a total of approximately 102 ac of beach, dune, and intertidal habitat and approximately 308 ac of marsh platform habitat. At year 20, approximately 59 ac of beach, dune, and intertidal habitat and approximately 304 ac of marsh platform habitat would remain.

Like Alternative 2, there would also be long-term, beneficial impacts on geology and substrates from an expansion in the island's footprint, higher elevation, and reduced erosion.

D.3.1.1.2.4 Alternative 6

Similar to the Alternative 2, short-term and long-term, minor to moderate, adverse impacts on terrestrial and aquatic substrates would be expected during construction of Alternative 6 However, compared to the Preferred Alternative, impacts would be greater because Alternative 6 includes only traditional breakwater segments and a greater overall length and number of BSPS structures, resulting in a larger area of rock placement and associated substrate modification, as well as a longer construction duration (535 days).

Alternative 6 would create and restore approximately 412 ac of Raccoon Island, including a total of approximately 102 ac of beach, dune, and intertidal habitat and approximately 310 ac of marsh platform habitat. At year 20, approximately 60 ac of beach, dune, and intertidal habitat, and approximately 309 ac of marsh platform habitat would remain.

Like Alternative 2, there would also be long-term, beneficial impacts geology and substrates from an expansion in the island's footprint, higher elevation, and reduced erosion.

D.3.1.2 Hydrology and Water Quality

D.3.1.2.1 AFFECTED ENVIRONMENT

The project area is bordered by the Gulf to the south and Caillou Bay to the north, forming a transition between marine and estuarine environments. Hydrology within the project area is influenced primarily by astronomical tides, wind-driven water levels, storm surge, and wave overtopping associated with seasonal storm events.

Barrier islands play an important role in regulating nearshore hydrology by attenuating wave energy, limiting storm surge penetration, and moderating tidal exchange between the Gulf and interior bays. As barrier islands erode or breach, increased tidal exchange can alter circulation patterns, salinity regimes, and hydrodynamic conditions within adjacent estuarine waters. Raccoon Island currently provides partial hydrologic protection to Caillou Bay; however, ongoing erosion and island narrowing have reduced its effectiveness as a natural barrier.

Hydrologic conditions across Raccoon Island reflect frequent tidal and storm-driven inundation. Based on the 2024 Stantec Habitat Reporting Tool (HRT) developed using the Barrier Island Comprehensive Monitoring (BICM) HRT, the north side of the island includes low-lying areas that are infrequently but regularly flooded during elevated tides and storm events, as well as higher elevation areas that are flooded less frequently (Baird-Stantec JV, 2026c). Depressional areas with limited tidal connectivity may experience episodic flooding followed by evaporation, which can result in elevated salinity conditions. The western and northwestern portions of the island include low-elevation mud flat areas that are exposed at lower tides and inundated during higher water levels. The Gulf-facing shoreline is subject to regular wave action and dynamic water-level fluctuations.

Water quality within the project area reflects typical coastal conditions influenced by tidal exchange, marine processes, and limited freshwater input. Caillou Bay (LDEQ subsegment LA120801-00) is listed as impaired due to pathogens, specifically enterococcus from wildlife and unknown sources. This subsegment fully supports secondary contact recreation, fish and wildlife propagation, and oyster propagation, but does not fully support primary contact recreation (LDEQ, 2024).

The adjacent Terrebonne Basin Coastal Bays and Gulf Waters to the State 3-mi limit (subsegment LA120806-00) is also listed as impaired. Suspected causes of impairment include dissolved oxygen, mercury, and enterococcus. This subsegment fully supports secondary contact recreation and oyster propagation but does not fully support primary contact recreation or fish and wildlife propagation. Both subsegments are included on the 2024 Clean Water Act Section 303(d) List of Impaired Waterbodies (LDEQ, 2024).

Data from the nearest CRMS station (CRMS 0376) shows salinities ranging from 1.5 to 38.8 ppt between 2006 and 2024 (CPRA, 2025b). From 2000-2025, dissolved oxygen concentrations in Caillou Bay ranged from 5.01 to 12.48 mg/L, exceeding the estuarine water quality standard of 4 mg/L (LDEQ, 2011, 2023, 2025).

Water depths within the project area vary spatially, with shallow nearshore waters surrounding the island and increasing depths with distance into the Gulf or toward the mainland. Open water areas adjacent to the island and associated shoals are generally shallow, while deeper waters occur offshore. The SSB88 Borrow Area is located approximately 8.6 mi south of Raccoon Island and occupies approximately 622 ac. Water depths within the borrow area range from approximately 19 to 21 ft NAVD88. Across Ship Shoal more

broadly, water depths range from approximately 10 ft on the western side of the shoal to approximately 23 to 30 ft on the eastern side.

Dredge pipeline corridors and equipment access corridors connecting the borrow area to the project site transit nearshore waters and portions of Coup Colin. Although the borrow area lies relatively close to shore, hydrologic conditions within the SSB88 Borrow Area are generally marine dominated.

D.3.1.2.2 ENVIRONMENTAL CONSEQUENCES

D.3.1.2.2.1 Alternative 1 – No Action

Under the No Action Alternative, the project would not be implemented, and the short-term and long-term, moderate, adverse impacts on water quality and hydrology associated with construction of the action alternatives would not occur. However, over the long term, the continued land loss discussed in Section D.2.1.1.1 would make Raccoon Island more susceptible to inundation and lead to increased tidal exchange in the project area, which could lead to increased salinities in Caillou Bay due to overtopping and inundation. Overall, the No Action Alternative would have a long-term, moderate, adverse impact on the hydrologic stability and water quality conditions in the project area.

D.3.1.2.2.2 Alternative 2

In the short term, sediment disturbance during dredge and fill operations that would occur during construction would result in localized and temporary increases in suspended sediment concentrations and turbidity in the work areas, representing a short-term, minor to moderate, adverse impact on water quality. These impacts are expected to be slightly lower under Alternative 2 than the other action alternatives because of the smaller construction area and shorter construction period (370 days), but would still be considered short-term and minor. These dredge and fill operations during the construction period could also result in minor changes in dissolved oxygen, nutrients, temperature, and salinity in the immediate vicinity of sediment disturbance. However, these impacts would be temporary, limited to periods of active dredging, and are expected to dissipate rapidly after the construction period.

The use of different types of sea-borne equipment, land-based earth-moving equipment, and transportation equipment during construction could result in short-term, minor to moderate, adverse impacts on water quality due to potential fuel leaks or vehicle fluid leaks. The severity of the impact would depend upon the quantity and type of material released. Construction debris would be disposed of properly, and construction would comply with applicable permit conditions, including any requirements for the protection of water quality. BMPs, including vehicle maintenance and implementation of measures in a Spill Prevention, Response, and Reporting Plan, would be implemented to minimize the potential for spills and leaks of hazardous materials. These construction BMPs, in addition to other avoidance and mitigation measures as required by state and federal regulatory agencies, would minimize hydrology and water quality impacts.

Offshore sand dredging activities associated with Alternative 2 include sediment extraction from SSB88 Borrow Area. This dredging would result in temporary increases in turbidity and total suspended solids, which may cause short-term, minor to moderate, adverse localized changes in water column parameters, including dissolved oxygen, in the immediate vicinity of active dredging. These effects are generally limited in spatial extent and are expected to dissipate rapidly following the completion of dredging activities (Pickens et al., 2020). In addition to these short-term effects, offshore sand shoals, such as Ship Shoal, have been shown to influence local hydrographic conditions, including dissolved oxygen, temperature, and circulation patterns, and may function as localized hypoxia refuges. Studies in the northern Gulf have documented elevated dissolved oxygen concentrations over shoal features relative to surrounding waters during hypoxic conditions (Craig, 2012; Dubois et al., 2009). Similarly, Reeves et al. (2018) documented higher dissolved oxygen levels over shoal-associated features compared to adjacent deeper areas. As such,

sediment removal from shoal features within the SSB88 Borrow Area has the potential to reduce localized hypoxia refuge capacity and alter fine-scale dissolved oxygen gradients.

Once constructed, the project would provide long-term, beneficial impacts on water quality due to the presence of the improved breakwater in addition to vegetation plantings within the beach, dune, and marsh features on Raccoon Island. The breakwater improvements and plantings would be expected to reduce turbidity from potential island erosion. The improved breakwater could also serve as habitat for filter feeders such as barnacles growing over time that would improve water quality. Alternative 2 would also create areas of marsh and sediments that could support natural physical, chemical, and biological processes that improve water quality via nutrient exchange (O'Donnell et al., 2018). The project would also provide long-term, beneficial impacts on hydrology by increasing island longevity which would prolong the barrier island system's ability to regulate tidal exchange and salinity in Caillou Bay. The maintenance and enhancement of the terminal groin would also help retain sediment along the eastern portion of the island and reduce the likelihood of breaching, which would support continued regulation of tidal exchange and hydrodynamic patterns in adjacent waters.

According to the Louisiana Water Quality Inventory (LDEQ, 2024), there is insufficient data available to determine the suspected cause of increased enterococcus for subsegment LA120801-00. A potential contributing cause could be the presence of avian populations that utilize Raccoon Island. Bird populations are expected to increase as a result of the proposed project, which could increase concentrations of avian fecal matter in waters surrounding the area, causing a long-term, minor, adverse impact on water quality in the vicinity of the island. Water quality in the subsegment LA120801-00 would be expected to continue to fully support the designated use for fish and wildlife propagation and not support primary contact recreation (LDEQ, 2024).

Overall, Alternative 2 would result in short-term, minor to moderate, adverse impacts on hydrology and water quality during construction activities; long-term, minor to moderate, adverse impacts on water quality from decreased dissolved oxygen at SSB88 Borrow Area and continued contribution of avian fecal matter; long-term, beneficial impacts on water quality from reduced erosion, reduced turbidity, and potential growth of filter feeders on the breakwater; and long-term, beneficial impacts on hydrology through increased island longevity and improved sediment retention associated with the maintained terminal groin.

D.3.1.2.2.3 Alternative 3 (Preferred Alternative)

Similar to Alternative 2, short-term and long-term, minor to moderate, adverse impacts on hydrology and water quality would be expected during and after construction of the Preferred Alternative due to dredging, fill placement, and equipment use. These impacts would be slightly greater than under Alternative 2 because construction would occur over a longer duration (approximately 495 days) and include additional in-water work associated with installation of the living shoreline BSPS. The Preferred Alternative would also include expansion and raising of the BSPS, which under this Alternative includes both living shoreline and traditional breakwater components. The BSPS would modify localized sediment transport patterns and nearshore hydrodynamics along the bayside margin of the island by reducing wave energy and shoreline erosion, contributing to improved sediment retention and water clarity over time.

Following construction, impacts would be similar to those described for Alternative 2, with long-term, minor, adverse impacts from contribution of avian fecal matter and long-term, beneficial impacts on water quality and hydrology from reduced erosion, marsh development, and increased island longevity In addition, the living shoreline components of the BSPS would provide substrate for colonization by filter-feeding organisms such as oysters and barnacles, which could contribute to localized improvements in water clarity. Overall, the Preferred Alternative would result in slightly greater short-term construction impacts than

Alternative 2 but comparable long-term, beneficial effects on hydrology and water quality, with the added potential for water quality improvements associated with living shoreline features.

D.3.1.2.2.4 Alternative 6

Similar to Alternatives 2 and 3, short-term and long-term, minor to moderate, adverse impacts on hydrology and water quality would be expected during and after construction of Alternative 6 due to dredging, fill placement, and equipment use. These impacts would be slightly greater than the other action alternatives because Alternative 6 would have the longest construction duration (approximately 535 days). Alternative 6 would include the largest extent of in-water work associated with a greater number and overall length of the traditional BSPS breakwater structures compared to the Preferred Alternative.

Following construction, impacts would be similar to those described for Alternative 2, including long-term, minor, adverse impacts related to contribution of avian fecal matter and long-term, beneficial impacts on water quality and hydrology from shoreline stabilization, marsh creation, and prolonged barrier island function. While the traditional breakwater only BSPS would provide substrate for colonizing organisms, they are expected to provide fewer direct water quality benefits than the living shoreline components included in the Preferred Alternative. Overall, Alternative 6 would result in slightly greater short-term construction impacts than the other action alternatives due to longer duration, but similar long-term hydrologic and water quality benefits.

D.3.1.3 Air Quality

D.3.1.3.1 AFFECTED ENVIRONMENT

In accordance with the Clean Air Act of 1970, as amended, the USEPA has established the NAAQS for six criteria pollutants considered harmful to public health and the environment: carbon monoxide, lead, nitrogen dioxide, ozone, particulate matter, and sulfur dioxide. Primary NAAQS are established to protect public health, while secondary standards provide protection against decreased visibility and damage to animals, crops, vegetation, and structures.

LDEQ is responsible for regulating and ensuring compliance with the Clean Air Act within the State of Louisiana. The USEPA is the regulatory authority for air pollution sources located on the OCS; however, pollution sources located within 25 mi of the state seaward boundary are required to comply with the air quality requirements of the corresponding onshore area.

For regulatory purposes, geographic areas are classified as attainment, nonattainment, or unclassifiable based on whether ambient concentrations of criteria pollutants meet NAAQS. Areas that meet all applicable standards are designated as attainment areas, while areas exceeding standards are designated as nonattainment. Areas with insufficient data may be classified as unclassifiable. The Raccoon Island Restoration Project is located in Terrebonne Parish, Louisiana. USEPA has designated Terrebonne Parish as being in attainment for all criteria pollutants under the NAAQS (USEPA, 2026).

Raccoon Island is uninhabited and is accessible only by water or air. Existing air quality conditions in the project area are influenced primarily by transient emission sources such as marine vessels, aircraft, and equipment associated with navigation and coastal activities, as well as regional background air pollutants transported by prevailing winds from distant onshore sources. The nearest major air pollution sources are located within Donaldsonville, with the closest point approximately 72 mi to the north, although there are many relatively minor pollution sources, such as Houma, closer to the project area (USEPA, 2024). Overall, air quality conditions in the project area are representative of a remote coastal environment with limited localized emission sources.

D.3.1.3.2 ENVIRONMENTAL CONSEQUENCES

D.3.1.3.2.1 Alternative 1 – No Action

Under the No Action Alternative, the project would not be implemented, and the short-term, minor, adverse air quality impacts associated with implementation of the action alternatives would not occur. However, any long-term benefits (including any potential air quality benefits associated with increased vegetation) would also not occur. Overall, the No Action Alternative would have no measurable effect on air quality.

D.3.1.3.2.2 Alternative 2

Short-term, minor, adverse impacts on air quality would occur during construction of Alternative 2 due to dust generation and exhaust emissions from construction equipment and earthwork activities. These activities would include grading, bulldozing, dredging, excavating, material placement, and construction-related welding. Additional short-term emissions would result from increased vessel and aircraft traffic associated with transporting equipment, materials, and construction personnel to and from the project area, as well as the operation of support vessels and temporary worker accommodations. The estimated construction duration for Alternative 2 (370 days) is the shortest of all the action alternatives, such that the activities causing air impacts would last approximately 4-5 months shorter than the other action alternatives.

These air quality impacts would be localized and temporary in nature and are not expected to result in exceedances of the NAAQS. Fugitive dust emissions are anticipated to be minor because construction activities would primarily involve coarse-grained sandy material, which is less prone to becoming airborne than finer sediments. Where feasible, standard dust control and emission reduction measures on construction equipment, such as filters or other emission control technologies, may be implemented to further limit particulate matter emissions.

Combustion emissions from on-road and off-road construction equipment and marine vessels would be mitigated through compliance with applicable federal and state emission standards and operational requirements. Given the remote, uninhabited nature of Raccoon Island and the absence of nearby sensitive receptors, short-term construction-related air emissions would not be expected to measurably affect regional air quality. After construction, an increase in marsh vegetation could potentially provide a long-term benefit to the air quality for the area (USEPA, 2025).

Overall, Alternative 2 would result in short-term, minor, adverse impacts on air quality during construction, with no long-term, adverse effects anticipated following completion of construction activities.

D.3.1.3.2.3 Alternative 3 (Preferred Alternative)

The Preferred Alternative would require a similar type and quantity of construction equipment when compared with Alternative 2, described above. Overall, impacts are expected to be short-term, minor, and adverse; the general impacts described above for Alternative 2 capture the impacts anticipated for implementation of the Preferred Alternative, although impacts would be slightly greater than those under Alternative 2 given the inclusion of both living shoreline and traditional BSP components, a broader geographic construction footprint, and longer duration (495 days) for construction.

D.3.1.3.2.4 Alternative 6

Alternative 6 would require a similar type and quantity of construction equipment when compared with Alternative 2, described above. Overall, impacts are expected to be short-term, minor, and adverse. The general impacts described above for Alternative 2 capture the impacts anticipated for implementation of Alternative 6, although impacts would be greater than those under Alternative 2 given the larger number and length of traditional BSPS, expanded construction footprint, and longer duration (535 days) for construction.

D.3.1.4 Noise

D.3.1.4.1 AFFECTED ENVIRONMENT

Ambient sound represents the total sound within an environment, including both natural and human-generated sources, whereas noise is generally defined as unwanted sound. Sound levels vary depending on seasonal conditions, time of day, the number and type of sound sources, and distance from those sources. The Final PDARP/PEIS identifies marine transportation and construction-related activities as the primary sources of terrestrial noise in coastal environments. Noise sources within the marine environment of the northern Gulf region also include vessel traffic, military activities, and energy development operations.

The Raccoon Island project area is uninhabited and accessible only by water or air. As a result, existing ambient noise levels are primarily influenced by intermittent vessel traffic (recreational and commercial), occasional aircraft activity, including helicopters and seaplanes, and natural sound sources such as wind, wave action, and wildlife.

Terrebonne Parish maintains noise regulations that establish permissible sound levels and regulate the timing of certain construction activities within residential, commercial, agricultural, and industrial land use areas. However, the Raccoon Island project area is not located within developed land use zones subject to these ordinances (Terrebonne Parish Code of Ordinances, Chapter 14). Therefore, parish noise regulations are not applicable to the project area due to the absence of developed land uses.

D.3.1.4.2 ENVIRONMENTAL CONSEQUENCES

D.3.1.4.2.1 Alternative 1 – No Action

Under the No Action Alternative, the project would not be implemented, and the short-term, minor, adverse, localized noise impacts with implementation of the action alternatives would not occur. Overall, the No Action Alternative would have no effect on noise levels.

D.3.1.4.2.2 Alternative 2

Short-term, minor, adverse increases in local airborne and underwater noise would occur during construction of Alternative 2 due to operation of dredging equipment, marine vessels, construction equipment, and earthwork activities. The dominant airborne noise sources during construction are expected to include sediment dredging and pumping operations, earth-moving and material placement activities, and vessel traffic associated with transport of equipment, materials, and construction personnel. These activities could occur on extended work schedules, including nighttime operations where operationally necessary.

Underwater noise would primarily result from dredging activities, vessel operation, sediment discharge, and placement of shoreline protection and structural features. Construction of shoreline stabilization elements and improvements to existing structures, including the terminal groin, may require installation of structural components that could generate temporary increases in underwater noise. Any such activities would be limited to the duration of construction and are expected to be localized in extent.

Noise generated during construction would be reduced through implementation of standard BMPs, including maintaining equipment in proper working condition and using functioning mufflers or manufacturer-recommended noise attenuation devices. Although construction activities would temporarily increase ambient sound levels in the project area, the remote and uninhabited nature of Raccoon Island and the absence of nearby residential or commercial receptors would limit the potential for human noise exposure. Accordingly, construction activities are not expected to result in generation of, or exposure of persons to, excessive noise or vibration levels.

Construction-related noise may temporarily disturb or displace wildlife in the project area and surrounding waters. These potential effects are addressed in detail within Sections D.2.2.1 through D.2.2.4. Recreational vessel traffic occurs periodically in waters surrounding Raccoon Island; however, recreational users are unlikely to remain in close proximity to active construction areas and therefore would not be expected to experience substantial noise-related impacts.

Alternative 2 would involve extensive sediment placement and shoreline stabilization activities and would require sustained construction operations over the duration of the project. As a result, temporary increases in ambient noise would occur throughout the construction period but would remain localized and intermittent. Following completion of construction activities, noise levels in the project area would return to baseline conditions.

Overall, noise impacts associated with Alternative 2 would be limited to construction activities and would be short-term, minor, and adverse, depending on proximity to construction operations.

D.3.1.4.2.3 Alternative 3 (Preferred Alternative)

The Preferred Alternative would require a similar type and quantity of construction equipment (including pile driving equipment). Overall, impacts are expected to be short-term, minor, and adverse, and the general impacts described above for Alternative 2 capture the impacts anticipated for implementation of the Preferred Alternative, although impacts would be slightly greater given the larger area and longer duration for construction. In addition to the noise sources described for Alternative 2, the Preferred Alternative would include limited pile driving to install an estimated four timber piles for signage associated with shoreline protection structures, resulting in temporary localized increases in airborne and underwater noise. Noise impacts from pile driving would be temporary and limited to the duration of pile installation (conservatively assumed to take about 4 days), and pile driving would be limited to daylight hours. Impacts of noise on wildlife are described further in Sections D.2.2.1 through D.2.2.4. See Section D.2.2.4 for a detailed discussion of pile driving noise impacts on marine species.

D.3.1.4.2.4 Alternative 6

Alternative 6 would require a similar type and quantity of construction equipment as the Preferred Alternative (including pile driving equipment). Overall, impacts are expected to be short-term, minor, and adverse, and the general impacts described above for Alternative 2 capture the impacts anticipated for implementation of Alternative 6, although impacts would be slightly greater given the larger area, longer duration for construction, and pile driving associated with installation of signage for shoreline protection structures. Impacts of noise on wildlife are described further in Sections D.2.2.1 through D.2.2.4.

D.3.2 Biological Resources

This section discusses the resources within the biological environment, including habitats, wildlife, marine and estuarine aquatic fauna, EFH, managed fish species, and protected species.

D.3.2.1 Habitats

D.3.2.1.1 AFFECTED ENVIRONMENT

The project area includes terrestrial, wetland, and aquatic habitats associated with Raccoon Island, as well as adjacent offshore environments influenced by restoration activities, vessel transit, dredge pipeline corridors, and sand borrow operations. The project area encompasses Raccoon Island, nearshore waters

extending approximately 1 mi from the island, the SSB88 Borrow Area, dredge pipeline corridors, and vessel access routes.

Raccoon Island supports a dynamic mosaic of beach, dune, marsh, mangrove, intertidal flat, and shallow-water habitats structured along elevation and salinity gradients typical of Louisiana barrier island systems. Vegetation communities transition from sparsely vegetated Gulf-facing beaches and dunes to saline marsh and scattered mangrove stands along the bayside and interior portions of the island. These habitats provide nesting, roosting, nursery, and refuge functions for birds, fish, invertebrates, and other coastal-dependent wildlife.

D.3.2.1.1.1 Terrestrial and Wetland Habitat

Terrestrial and wetland habitats on Raccoon Island consist primarily of beach and dune habitats, saline marsh, unvegetated flats, and mud flats Figure D- 1. These habitats form a mosaic shaped by storm overwash, tidal flooding, sediment transport, and elevation variability.

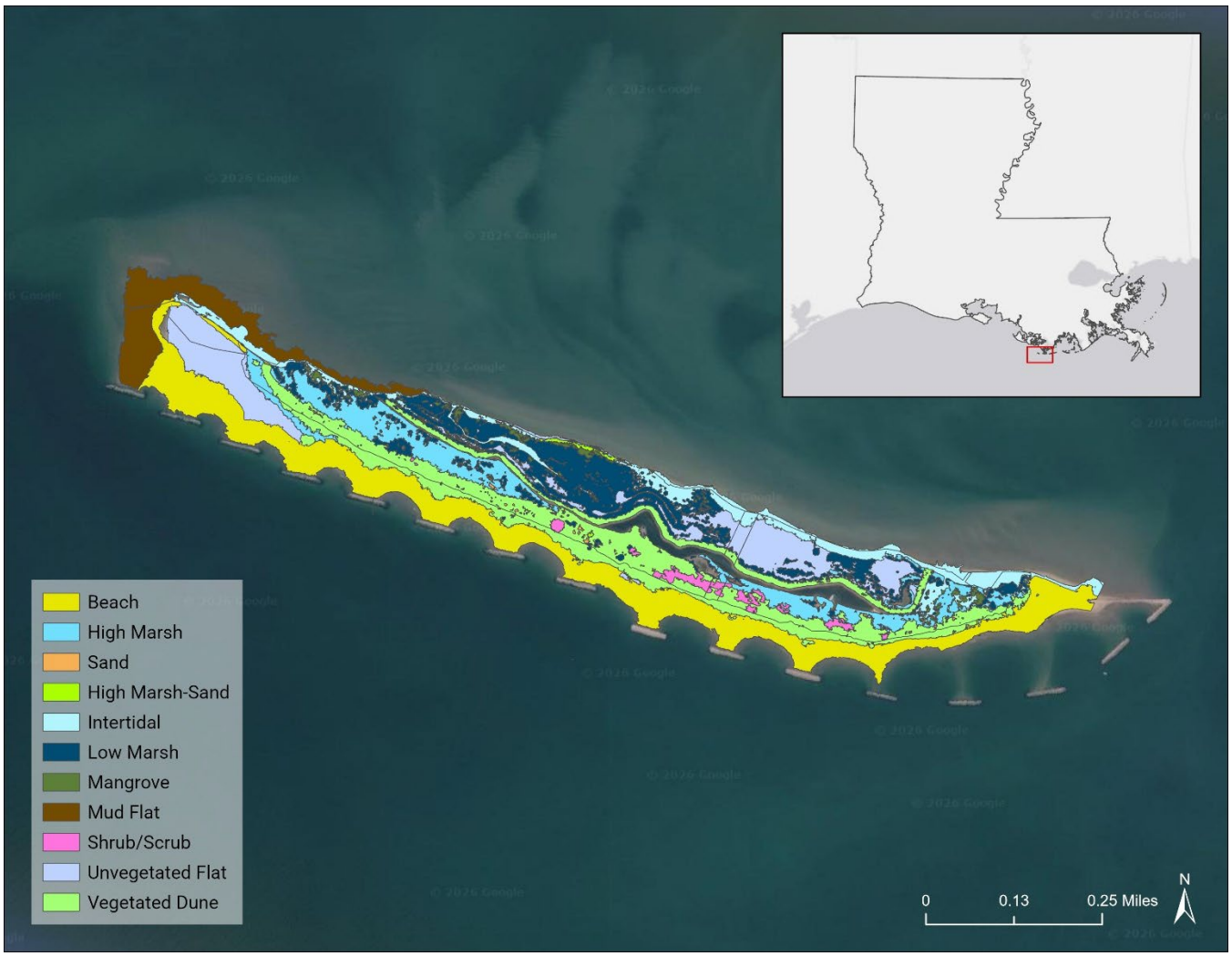

Figure D- 1. 2024 Habitat Classification Map.

The Gulf-facing shoreline of Raccoon Island consists primarily of sandy beach and dune habitat characterized by active sediment transport driven by wind and wave processes (Baird-Stantec JV, 2026c). These habitats are typically sparsely vegetated and are periodically reshaped by storm events and overwash processes. Beach and dune habitats provide important nesting and resting habitat for birds and function as the primary geomorphic barrier protecting interior marsh habitats (Baird-Stantec JV, 2026c).

Wetlands on Raccoon Island are classified as saline marsh and mangrove and are primarily located along the bayside and interior portions of the island. Based on the 2024 Stantec HRT, marsh habitats on Raccoon Island include both low marsh and high marsh zones that reflect differences in elevation and flooding frequency (Baird-Stantec JV, 2026c).

Low marsh habitats generally occur at elevations ranging from approximately −0.5 to +1.5 ft NAVD88 and are periodically inundated by tidal flooding and storm overwash (Baird-Stantec JV, 2026c). Vegetation in this habitat type includes smooth cordgrass (*Sporobolus alterniflorus*, previously *Spartina alterniflora*), black rush (*Juncus roemerianus*), and salt wort (*Batis maritima*). Although not a dominant plant species, black mangrove (*Avicennia germinans*) may still be found in low marsh. High marsh habitats typically occur at elevations between approximately +1.5 and +2.0 ft NAVD88 and experience less frequent flooding associated with elevated tides and storm surge. High marsh vegetation includes wiregrass (*Spartina patens* or *Sporobolus pumilus*), salt grass (*Distichlis spicata*), seashore paspalum (*Paspalum vaginatum*), and goldenrod (*Solidago spp.*). Saline marsh and mangrove habitats provide important nursery habitat for fish and invertebrate species and contribute to shoreline stabilization and sediment retention (Baird-Stantec JV, 2026c).

Unvegetated flats occur within low-lying depressional areas of the island that experience episodic tidal flooding followed by evaporation, which can result in hypersaline soil conditions that limit vegetation establishment (Baird-Stantec JV, 2026c). Mud flats are present primarily along the western and northwestern portions of the island and represent some of the lowest elevation habitats on Raccoon Island. These areas consist of unconsolidated mud and shell substrate that is exposed during lower tidal conditions and flooded during higher water levels (Baird-Stantec JV, 2026c).

D.3.2.1.1.1 Aquatic Nearshore Habitat

Aquatic habitats surrounding Raccoon Island include shallow nearshore waters, open marine waters of the Gulf, and estuarine waters of Caillou Bay. Nearshore and bayside waters adjacent to the island are characterized primarily by soft-bottom mud and sand substrates typical of shallow estuarine and barrier island environments. In contrast, open marine waters south of the island transition to broader continental shelf conditions, where sediment composition varies and may include sandy shoal features, mixed sand-mud substrates, and deeper soft-bottom habitats.

Nearshore waters adjacent to the island provide transitional habitat between marsh, beach, and open water environments and function as important nursery and foraging areas for estuarine-dependent species. The estuarine waters north of Raccoon Island provide productive nursery habitat for numerous fish and invertebrate species. Marine waters south of the island support transient fish, invertebrates, and protected species that utilize barrier island habitats for foraging and movement corridors.

D.3.2.1.1.2 Offshore Sandy Shoal Habitat

The SSB88 Borrow Area is approximately 8.6 mi south of Raccoon Island, located along the northwestern edge of Ship Shoal, a submerged barrier island system within the OCS. Ship Shoal forms a sandy, bathymetric high surrounded by predominantly muddy sediments and supports productive habitat for marine and estuarine nekton species. The sandy shoal environment provides important foraging habitat for protected marine species and supports benthic communities distinct from surrounding soft-bottom habitats. The water depth ranges from approximately 23 to 30 ft on the eastern side of the shoal to approximately 10 ft on the western side (Xu et al., 2024). The water depth within the SSB88 Borrow Area generally ranges from approximately 18 to 30 ft, with much of the area occurring at depths near 20 ft, based on recent bathymetric survey data (APTIM, 2025).

Ship Shoal has been used previously as a sand source for multiple regional barrier island and headland restoration projects and continues to function as both a sediment resource and a biologically productive offshore habitat.

D.3.2.1.2 ENVIRONMENTAL CONSEQUENCES

D.3.2.1.2.1 Alternative 1 – No Action

Under the No Action Alternative, the project would not be implemented, and the short-term and long-term, minor to moderate, adverse impacts on existing terrestrial and marine habitats associated with implementation of the action alternatives would not occur. However, the long-term benefits from habitat creation and increased longevity would also not occur. Over time, coastal processes, shoreline change, overwash, and erosion and migration of sediments into adjacent waters would contribute to habitat loss. While the No Action Alternative would provide the greatest area of subtidal habitat, over time, sediment is expected to migrate away from the project area, and the loss of beach and dune habitat would leave the subtidal habitat more vulnerable to wave action, resulting in long-term conversion to open water. The No Action Alternative would result in major, long-term, adverse impacts on available habitats over time.

D.3.2.1.2.2 Alternative 2

Short-term and long-term, minor to moderate, adverse impacts on existing terrestrial and wetland habitats on Raccoon Island would occur as a result of construction activities associated with Alternative 2. These impacts would be localized and primarily confined to areas of active construction. Land-based activities, including site preparation, materials staging, and placement of dredged material for beach, dune, marsh platform, and marsh mound construction, would temporarily disturb and displace existing vegetation and substrates until construction activities are completed and habitats begin to reestablish.

Vessels and construction equipment used to support restoration activities would result in temporary disturbance of soils and sediments within both terrestrial and aquatic habitats, including potential leaks from vehicle fuels and fluids. Short-term, moderate, adverse impacts would occur in aquatic habitats that are actively dredged or where sediment pipelines are placed directly on the seafloor. Dredging and sediment placement activities would increase suspended sediment concentrations, resulting in localized and temporary reductions in water quality during active construction.

BMPs, including routine equipment maintenance and implementation of measures identified in a Spill Prevention, Response, and Reporting Plan, would be implemented to minimize the potential for spills or leaks of fuels, oils, or other hazardous materials. Construction debris would be properly managed and disposed of, and all construction activities would comply with applicable permit conditions, including requirements related to habitat protection and water quality. BMPs would also be implemented during placement of fill material to minimize the potential for impacts to sensitive habitats outside the planned construction footprint.

Direct impacts to existing habitat types (Figure D- 1) were quantified using the 2024 Stantec HRT classification (Baird-Stantec JV, 2026c) and are summarized in Table D- 10. The HRT-based impact summary identifies the acreage of each existing habitat type temporarily or permanently disturbed during construction. In total, approximately 63.2 acres of the 133.6 acres of mapped habitat (just under half) would be directly affected by construction activities. Impacts are concentrated within shoreline and intertidal environments. These HRT habitat classes were then cross-walked to the Avian Guidance Document (AGD) habitat groupings to allow comparison with projected habitat outcomes. For example, mud flat (9.7 ac existing) and intertidal (11.0 ac existing) habitats together correspond to the intertidal classification under the AGD framework.

Table D- 10. Direct Impacts on Existing 2024 Stantec HRT Habitat Classification from Construction.

HRT CLASSIFICATION	EXISTING HABITAT (AC)	HABITAT IMPACT (AC)	AGD HABITAT EQUIVALENT
Mud Flat	9.7	9.5	Intertidal
Intertidal	11.0	4.2	Intertidal
Beach	32.1	32.3	Beach
Unvegetated Flat	16.4	7.6	Unvegetated Flat
Low Marsh	19.6	0.2	Saline Marsh (Low)
Mangrove	2.3	0.1	Saline Marsh
High Marsh	14.6	1.0	Saline Marsh (High)
Vegetated Dune	25.9	8.0	Dune
Scrub/Shrub	2.0	0.3	Scrub/Shrub
Total	133.6	63.2	N/A

The AGD construction impact table (Table D- 11) summarizes direct disturbance by specific habitat classifications as well as grouping into broader habitat categories (e.g., beach/dune/Gulfside intertidal and mound/marsh). Impacts are concentrated within the dune (5 ac), beach (13 ac), and Gulfside intertidal (23 ac) habitats, where 100% of the mapped acreage (41 ac total) would be affected. In contrast, the mound/marsh habitat (90 ac) grouping would experience approximately 2% impact overall, indicating only minor effects within those habitat types. Overall, both the HRT and AGD classifications indicate that marsh and mangrove habitats would experience minimal impacts, especially compared to dune, beach, and intertidal habitats.

Table D- 11. Direct Impacts on Existing AGD Habitat Classification from Construction.

AGD CLASSIFICATION	EXISTING HABITAT (AC)	HABITAT IMPACT (AC)	PERCENTAGE OF HABITAT IMPACTED
Dune	5	5.0	100%
Beach	13	13.0	100%
Intertidal (Gulf side)	23	23.0	100%
Subtotal: Beach/Dune/Gulfside Intertidal	41	41.0	100%

AGD CLASSIFICATION	EXISTING HABITAT (AC)	HABITAT IMPACT (AC)	PERCENTAGE OF HABITAT IMPACTED
Scrub/Shrub	2	0.4	20%
Mound	0	0	0%
Meadow	26	0	0%
Unvegetated Flat	9	0.3	3%
Saline Marsh (unvegetated)	10	0	0%
Saline Marsh (High)	21	0.6	3%
Saline Marsh (Low)	22	0.4	2%
Subtotal: Mound/Marsh	90	1.7	2%
Total	131	42.7	33%

Raccoon Island is subject to ongoing habitat loss due to relative sea level rise, subsidence, wind and wave action, and other coastal processes. Following completion of construction, Alternative 2 would result in long-term, beneficial impacts to terrestrial, wetland, and aquatic habitats by increasing the overall extent and elevation of barrier island habitat. Placement of beach, dune, and marsh fill would increase island elevations, reduce the vulnerability of habitats to erosion and inundation, and enhance the island's capacity to retain sediment over time. Habitat features constructed under Alternative 2 would include beach and dune restoration along the Gulf-facing shoreline and marsh creation along the bayside of the island. These features are designed to create sustainable beach slopes and stable marsh platforms that support habitat persistence and accept overwash sediments, thereby enhancing long-term habitat resilience.

In addition to the marsh platform, Alternative 2 would include construction of several marsh mound features designed to provide elevated habitat within the restored marsh footprint. The mound fill would be constructed to a crest elevation of approximately +6.0 ft NAVD88, allowing the features to remain within the elevation range suitable for scrub-shrub habitat even after expected settlement associated with consolidation and subsidence. These elevated areas provide important nesting and refuge habitat for colonial waterbirds and other coastal avifauna by reducing the likelihood of nest inundation during high water or storm events. The mounds also increase habitat heterogeneity across the restored platform, creating localized areas of higher elevation that support woody vegetation and shrub communities while maintaining adjacent marsh habitat. By maintaining elevations above surrounding marsh areas over the project life, the mound features contribute to the persistence of higher-elevation habitats and help sustain the overall restored island for the 20-year project life.

Newly constructed habitats would be planted with appropriate native vegetation to stabilize sediments, reduce erosion, and promote habitat development. Planting appropriate species would also reduce the potential for the establishment or spread of invasive plants in newly constructed habitat. Vegetation plantings under Alternative 2 would be designed to reflect post-construction elevation gradients, inundation frequency, and salinity conditions to promote successful habitat establishment and long-term stability.

Lower elevation and more frequently inundated areas would be planted with salt-tolerant emergent marsh and shrub species, including smooth cordgrass, which is capable of persisting under frequent flooding and propagating upslope as conditions allow. Higher elevation beach and dune areas, including dune crests and upper side slopes, would be seeded and planted with native grasses to stabilize sediments and support dune development. Final planting locations and species composition would be refined based on observed post-construction site conditions to maximize vegetation survival, habitat function, and long-term resilience of restored habitats. Hay bales would be incorporated into the restoration as a low-cost sediment control measure and would help promote localized dune formation.

In addition to providing sandy shoreline habitat, constructed sand features would serve as sediment reservoirs that contribute to island maintenance as longshore and overwash processes continue over time. Marsh creation areas would provide foraging and refuge habitat for shrub and ground-nesting birds, along with other coastal birds, while also supporting estuarine-dependent fish and invertebrates. These areas would serve as stable sediment-retention platforms, increasing the longevity of restored habitats. Shoreline protection features incorporated under Alternative 2 would further support habitat sustainability by reducing erosion from wave and current action.

Table D- 12 summarizes the habitat types and acreages anticipated immediately following completion of restoration activities under Alternative 2. Table D- 12 presents projected habitat conditions over a multi-decadal analysis period, reflecting changes in habitat extent and elevation associated with coastal processes such as erosion, subsidence, sea level rise, and overwash. Under Alternative 2, modeled results indicate a substantial increase in total habitat acreage at target year (TY)-1 relative to existing conditions, driven by beach, dune, and marsh platform construction. Over the 20-year analysis period, gradual reductions in beach/dune acreage reflect anticipated erosion and redistribution of sediments. However, total habitat acreage and elevation remain substantially greater than under the No Action Alternative. The long-term projections demonstrate that restored habitats persist at higher elevations and greater extents compared to existing conditions, indicating improved habitat resilience and reduced conversion to open water.

Table D- 12. Avian Guidance Document (AGD) Habitat Sustainability on Raccoon Island.

ALTERNATIVE	TARGET YEAR (TY)	BEACH/ DUNE/ GULFSIDE INTERTIDAL HABITAT (AC)	MOUND/ MARSH HABITAT (AC)	TOTAL HABITAT (AC)
1 (No Action)	TY-0	41	90	131
1 (No Action)	TY-1	41	113	154
1 (No Action)	TY-5	26	120	146
1 (No Action)	TY-10	19	121	140
1 (No Action)	TY-20	9	138	147
2	TY-0	41	90	131
2	TY-1	99	302	401
2	TY-5	73	304	377

ALTERNATIVE	TARGET YEAR (TY)	BEACH/ DUNE/ GULFSIDE INTERTIDAL HABITAT (AC)	MOUND/ MARSH HABITAT (AC)	TOTAL HABITAT (AC)
2	TY-10	67	302	369
2	TY-20	54	296	350
3 (Preferred)	TY-0	41	90	131
3 (Preferred)	TY-1	102	308	410
3 (Preferred)	TY-5	79	312	391
3 (Preferred)	TY-10	72	306	378
3 (Preferred)	TY-20	59	305	364
6	TY-0	41	90	131
6	TY-1	102	310	412
6	TY-5	77	314	391
6	TY-10	72	313	385
6	TY-20	60	309	369

Overall, Alternative 2 would result in short-term to long-term, minor to moderate, adverse impacts to existing habitats during construction. However, following project implementation, Alternative 2 would provide long-term, beneficial effects by increasing habitat acreage, improving habitat elevation, and enhancing the resilience of terrestrial, wetland, and aquatic habitats on Raccoon Island compared to existing conditions and the No Action Alternative.

D.3.2.1.2.3 Alternative 3 (Preferred Alternative)

The general habitat impacts described for Alternative 2 also apply to the Preferred Alternative, including habitat creation, increased habitat elevation, and improved habitat longevity. Similar construction activities under the Preferred Alternative would result in temporary disturbance to terrestrial, wetland, and aquatic habitats within areas of active construction.

The Preferred Alternative differs from Alternative 2 through the addition of bayside shoreline protection in the form of a mixture of rubble-mound living shoreline BSPS and traditional breakwater BSPS. These structures would provide increased protection to bayside marsh and shoreline habitats by reducing wave energy and erosion, thereby enhancing the stability and persistence of adjacent marsh and intertidal habitats. In addition to shoreline protection, the BSPS would create additional intertidal and shallow subtidal habitat, supporting aquatic organisms and increasing habitat complexity along the bayside of Raccoon Island. Construction of the BSPS would result in localized, short-term, minor to moderate, adverse impacts to aquatic substrates and nearby habitats during placement of materials. However, these impacts would be limited in extent and duration. Following construction, the BSPS are expected to provide long-term, beneficial

effects by reducing shoreline erosion, supporting marsh retention, and creating hard and intertidal substrate that would enhance habitat availability for aquatic organisms.

Compared to Alternative 2, the Preferred Alternative would result in greater long-term habitat stability and resilience along the bayside shoreline due to the added shoreline protection features, while overall construction-related impacts would be similar in nature and magnitude.

Direct existing habitat disturbance under the Preferred Alternative is the same as Alternative 2 (Table D- 10 and Table D- 11). There would be additional subtidal impacts not captured in these tables from the installation of the BSPS. The AGD habitat projections (Table D- 12) indicates that the Preferred Alternative results in the greater total habitat acreage at TY-1 compared to Alternative 2. Over the 20-year analysis period, modeled projections show improved persistence of both beach/dune and marsh habitats relative to Alternative 2, reflecting the stabilizing influence of the combined living shoreline and traditional breakwater BSPS features. Long-term trajectories demonstrate higher retained acreage of marsh platform and intertidal habitat when compared to the No Action Alternative and modest improvements relative to Alternative 2 (Table D- 12).

Overall, the Preferred Alternative would result in short-term to long-term, minor to moderate, adverse impacts on habitats during construction and long-term, beneficial impacts following implementation. The addition of a combination of living shoreline and traditional breakwater BSPS would enhance habitat longevity and provide additional intertidal habitat compared to Alternative 2, resulting in improved long-term habitat outcomes for Raccoon Island.

D.3.2.1.2.4 Alternative 6

The general habitat impacts described for Alternative 2 and the Preferred Alternative also apply to Alternative 6, including habitat creation, increased habitat elevation, and improved habitat longevity. Construction activities under Alternative 6 would result in temporary disturbance to terrestrial, wetland, and aquatic habitats within areas of active construction, consistent with the other action alternatives.

Alternative 6 includes BSPS similar in function to those proposed under the Preferred Alternative; however, these features would consist of traditional segmented breakwaters rather than living shoreline structures. As a result, Alternative 6 would provide comparable protection to bayside shoreline and marsh habitats by reducing wave energy and shoreline erosion. However, traditional segmented breakwaters are expected to provide fewer intertidal and shallow subtidal habitat benefits and lower habitat complexity when compared to the living shoreline BSPS proposed under the Preferred Alternative.

Construction of traditional shoreline protection structures would result in localized, short-term, minor to moderate, adverse impacts to aquatic substrates and adjacent habitats during material placement. Because Alternative 6 includes a larger structural footprint and the longest construction duration among the action alternatives, temporary construction-related habitat disturbances would persist for a longer period under this Alternative. As a result, short-term impacts to habitats during construction would be greater for Alternative 6 compared to Alternatives 2 and 3.

Following construction, Alternative 6 would result in long-term, beneficial impacts to habitats by stabilizing the bayside shoreline, reducing erosion, and supporting the persistence of adjacent marsh and intertidal habitats. While overall habitat creation and protection benefits would be substantial, the reduced habitat complexity associated with traditional shoreline protection structures would result in comparatively fewer aquatic habitat benefits than the Preferred Alternative.

Direct, existing habitat disturbance under Alternative 6 is the same as Alternative 2 (Table D- 10 and Table D- 11). There would be additional subtidal impacts not captured in these tables from the installation of the BSPS, these impacts would be slightly higher than the Preferred Alternative. The AGD habitat projections

(Table D- 12) indicate that Alternative 6 results in the greatest immediate increase in total habitat acreage at TY-1 among the action alternatives. Over the 20-year analysis period, modeled projections show improved persistence of both beach/dune and marsh habitats relative to Alternative 2, reflecting the stabilizing influence of the traditional breakwater BSPS features. Long-term trajectories demonstrate higher retained acreage of marsh platform and intertidal habitat when compared to the No Action Alternative and modest improvements relative to Alternatives 2 and 3 (Table D- 12).

Overall, Alternative 6 would result in short-term to long-term, minor to moderate, adverse impacts on habitats during construction and long-term, beneficial impacts following implementation. Compared to Alternatives 2 and 3, Alternative 6 would involve greater temporary construction impacts due to its longer construction duration, while providing similar shoreline protection benefits but fewer aquatic habitat enhancements than the living shoreline approach proposed under the Preferred Alternative.

D.3.2.2 Wildlife Species

D.3.2.2.1 AFFECTED ENVIRONMENT

The wildlife community within the project area is dominated by avian species, particularly coastal and marine birds that utilize barrier island habitats for nesting, foraging, roosting, and resting. Raccoon Island provides important habitat for waterfowl, gulls and terns, wading birds, marsh birds, and shorebirds with tens of thousands that use the island during breeding, migratory, and wintering periods (Baird-Stantec JV, 2026c; DWH Trustees, 2023). Barrier islands in coastal Louisiana provide isolated nesting and resting habitats that are naturally separated from many terrestrial predators, making them important for avian reproductive success and seasonal habitat use. Recent observations and regional monitoring programs, such as the Avian Data Monitoring Portal, indicate that more than 100 bird species have been recorded using Raccoon Island and nearby barrier islands, reflecting the site's importance within the Mississippi Flyway (DWH Trustees, 2023; eBird, 2025a).

Migratory bird species using Raccoon Island generally breed in the U.S. and Canada and migrate along the Mississippi Flyway, with many species wintering along the Gulf Coast. Both breeding and non-breeding birds may be present within the project area, depending on season and environmental conditions. Use of the island by birds varies spatially and temporally in response to habitat availability, elevation, disturbance, and storm-related changes in island morphology. Some species using the island are identified by the LDWF as Species of Greatest Conservation Need (SGCN), particularly colonial nesting waterbirds and shorebirds associated with barrier island habitats (eBird, 2025a; Holcomb et al., 2015; Klueh-Mundy et al., 2025).

Many avian species occurring in the project area are protected under the MBTA, which prohibits the take of migratory birds, including their eggs, chicks, and active nests, except as permitted by regulation. Coastal barrier island habitats such as those present on Raccoon Island are particularly important for colonial nesting waterbirds and shorebirds that require open, sparsely vegetated substrates and proximity to foraging areas.

Because of the island's separation from the mainland, records of non-avian terrestrial wildlife use are limited. The project area provides minimal habitat for resident terrestrial mammals, and wildlife use is largely restricted to avian species adapted to dynamic coastal environments. Potential presence of nonnative species that could affect avian habitat or nesting success is considered low and is addressed through BMPs and monitoring measures described in later sections of this appendix.

Overall, wildlife use of the project area reflects the dynamic nature of barrier island ecosystems, with bird species composition and abundance varying seasonally and in response to storm events, habitat condition, and island elevation.

D.3.2.2.2 ENVIRONMENTAL CONSEQUENCES

D.3.2.2.2.1 Alternative 1 – No Action

Under the No Action Alternative, the project would not be implemented, and the short-term, moderate, adverse impacts on terrestrial wildlife (including resident and migratory birds) associated with the action alternatives would not occur. However, the long-term benefits to wildlife from habitat creation and increased habitat longevity would also not occur. Over time, coastal processes, shoreline change, overwash, and erosion would contribute to habitat loss on Raccoon Island. Beach and dune bird habitat is projected to decrease significantly by TY-20 (see Table D- 12), resulting in long-term, moderate to major, adverse impacts on wildlife from continued habitat loss.

D.3.2.2.2.2 Alternative 2

Short-term, moderate, adverse impacts on birds and other wildlife using the project area would occur during construction of Alternative 2 due to habitat disturbance, increased noise and lighting, and the presence of construction personnel, vessels, and equipment. These impacts would be temporary and localized to areas of active construction and could occur year-round, including during migratory, wintering, and breeding periods.

Bird species using Raccoon Island are generally highly mobile and are expected to avoid areas of active construction. Temporary displacement and disturbance may occur as birds relocate to adjacent undisturbed habitats for foraging, roosting, or loafing during active construction. In addition, placement of fill material and associated earthwork could temporarily reduce the availability of invertebrate prey resources in localized areas, potentially affecting foraging opportunities for shorebirds and other species.

Because project construction is scheduled to be approximately 370 days for Alternative 2, construction may overlap with periods when federally protected shorebirds, including piping plover (*Charadrius melodus*) and rufa red knot (*Calidris canutus rufa*) (discussed further in Section D.2.2.4), are present within the project area. Wintering and migratory birds may be disturbed by construction-related activity, including equipment movement and sediment placement. Where habitat disturbance occurs, birds may expend additional energy relocating to suitable habitat elsewhere on the island or within nearby coastal areas. These effects would be short-term and would be limited to the duration of construction activities.

Bird abatement measures may be implemented during construction, where necessary, to discourage birds from using active construction areas and to reduce the potential for disturbance or injury. Such measures could include visual deterrents or other hazing techniques. Any bird abatement activities would be implemented in coordination with applicable regulatory requirements and agency guidance. If construction activities occur during periods when birds are nesting, disturbance could result in nest abandonment or loss of nests located within active construction areas.

Consistent with coordination approaches used for other Louisiana barrier island restoration projects, the LA TIG would consult with LDWF and USFWS to develop and implement appropriate mitigation measures for colonial nesting waterbirds and other species, as needed. Such measures may include seasonal work restrictions near active colonies, establishment of nest buffers, monitoring of nesting areas, or other avoidance measures required by resource agencies. Where feasible, work would be scheduled outside peak nesting periods; if work must occur during nesting seasons, agency-required protective measures would be implemented. These coordination efforts would ensure that fill placement and construction activities avoid active nests to the extent practicable and minimize disturbance to nesting wildlife. Construction would not proceed until coordination with LDWF and USFWS is complete, and the resulting consultation documentation would be maintained in the project administrative record. Implementation of these measures would ensure compliance with applicable regulations, including the MBTA.

Once construction is complete, Alternative 2 would result in long-term, beneficial impacts to birds using the project area by increasing the extent, elevation, and stability of suitable habitat for nesting, foraging, roosting, and loafing. Restored beach, dune, and marsh habitats would provide improved habitat conditions relative to existing degraded conditions. Changes in the extent of bird habitat over time are summarized in Table D- 12, which reflects projected habitat conditions based on post-construction elevation and coastal process modeling. By TY-20, Alternative 2 would provide substantially more suitable bird habitat than the No Action Alternative, including approximately 54 ac of beach, dune, and intertidal habitat compared to approximately 9 ac under the No Action Alternative. Additionally, by TY-20, Alternative 2 would provide more than double the mound and marsh habitat (296 ac) compared to the No Action Alternative (138 ac).

Maintenance of the Gulfside breakwaters would help protect restored beach and dune habitats from wave-driven erosion, supporting the long-term persistence of nesting and roosting habitat for coastal birds and other wildlife. In addition, expansion of the terminal groin would improve retention of beach sediments along the eastern portion of the island, helping to maintain suitable nesting substrate and reducing the likelihood of habitat loss due to breaching or shoreline retreat. Together, these features would enhance the durability of restored wildlife habitat and contribute to long-term ecological benefits within the project area.

Overall, Alternative 2 would result in short-term, moderate, adverse impacts to birds during construction due to disturbance and displacement, followed by long-term, beneficial impacts associated with increased availability and resilience of coastal bird habitat following project implementation.

D.3.2.2.2.3 Alternative 3 (Preferred Alternative)

The general impacts described above for Alternative 2 also apply to the Preferred Alternative. The duration of construction for the Preferred Alternative (495 days) would be longer than Alternative 2. As a result, short-term, moderate, adverse impacts to wildlife, particularly birds from disturbance, displacement, noise, lighting, and construction activity would be similar in nature to those described for Alternative 2 but would persist for a longer duration due to the extended construction timeline.

As with Alternative 2, wildlife present during construction, including migratory and wintering species such as piping plover and rufa red knot (see Section D.2.2.4), may experience temporary disturbance and displacement from active construction areas. Avoidance and minimization measures developed in coordination with the LDWF and USFWS would be implemented, as appropriate, to reduce potential impacts to nesting or wintering birds.

The Preferred Alternative differs from Alternative 2 through the addition of living shoreline and traditional breakwater BSPS. These structures are expected to provide long-term protection of bayside marsh and shoreline habitats, thereby increasing habitat stability and persistence for birds that utilize marsh and intertidal areas for foraging and roosting. In addition, the living shoreline BSPS would create intertidal and shallow subtidal habitat along the bayside, which may enhance prey availability and foraging opportunities for shorebirds and other species that utilize edge and intertidal environments.

Projected changes in bird habitat under the Preferred Alternative are summarized in Table D- 12, which reflects modeled habitat conditions over time. By TY-20, the Preferred Alternative would provide approximately 5 additional acres of beach, dune, and intertidal habitat, about 9 additional acres of marsh and mound, and approximately 14 additional acres of habitat overall relative to Alternative 2. These increases reflect the additional shoreline protection and stabilization features incorporated under this Alternative (see Table D- 12). Compared to Alternative 2, Alternative 3 is expected to provide improved long-term habitat resilience due to the additional shoreline protection features and associated intertidal habitat complexity.

Overall, the Preferred Alternative would result in short-term, moderate, adverse impacts to wildlife (particularly birds) during construction, followed by long-term, beneficial impacts associated with enhanced

habitat stability, protection of marsh and shoreline areas, and the addition of intertidal foraging habitat along the bayside of Raccoon Island.

D.3.2.2.2.4 Alternative 6

The general impacts described for Alternatives 2 and the Preferred Alternative also apply to Alternative 6. Construction under Alternative 6 is anticipated to require approximately 535 days, representing the longest construction duration among the action alternatives. Although the type and quantity of construction equipment would be similar to those used under the other alternatives, the extended construction timeline would result in short-term, moderate, adverse impacts to wildlife, particularly birds that persist for a longer period. As with the other alternatives, disturbance would include displacement from active construction areas due to noise, lighting, equipment movement, and the presence of construction personnel.

Wildlife present during construction, including migratory and wintering shorebirds such as piping plover and rufa red knot discussed in Section D.2.2.4, may temporarily relocate to adjacent undisturbed habitats within the island or surrounding coastal areas. Avoidance and minimization measures, including coordination with LDWF and USFWS, would be implemented as appropriate to reduce potential impacts to nesting and wintering birds.

Alternative 6 includes traditional segmented BSPS that would provide long-term protection of marsh and shoreline habitats, thereby enhancing the stability and persistence of bird habitat on the island. As with the Preferred Alternative, shoreline stabilization would support long-term habitat retention and reduce erosion-related habitat loss. However, because Alternative 6 utilizes traditional segmented breakwaters rather than living shoreline structures, it would provide comparatively fewer intertidal and shallow subtidal habitat benefits along the bayside. As a result, while island-based nesting and roosting habitat would be enhanced and protected, aquatic edge and intertidal foraging benefits would be less pronounced than under the Preferred Alternative.

Projected changes in bird habitat under Alternative 6 are summarized in Table D- 12, reflecting modeled habitat conditions over time. By TY-20, Alternative 6 would provide approximately 1 additional acre of beach, dune, and intertidal habitat, approximately 4 additional acres of marsh and mound habitat, and approximately 5 additional acres of habitat overall relative to the Preferred Alternative.

Overall, Alternative 6 would result in short-term, moderate, adverse impacts to wildlife (particularly birds) during construction due to disturbance and displacement, followed by long-term, beneficial impacts associated with increased habitat elevation, improved shoreline stability, and enhanced resilience of nesting and roosting habitats on Raccoon Island.

D.3.2.3 Marine and Estuarine Aquatic Fauna, EFH, and Managed Fish Species

D.3.2.3.1 AFFECTED ENVIRONMENT

D.3.2.3.1.1 Marine and Estuarine Aquatic Fauna

The marine and estuarine habitats within the project area provide essential nursery, foraging, and migratory habitat for a variety of aquatic fauna typical of coastal Louisiana barrier island systems. These habitats include bayside estuarine waters, Gulf-facing nearshore marine waters, sand and shell bottom substrates, soft-bottom sediments, and water column habitat.

Emergent marsh and mangrove habitats along the bayside of Raccoon Island provide structurally complex habitat that supports juvenile fish, crustaceans, and other invertebrates. These habitats function as nursery grounds for many estuarine-dependent species and contribute to regional recreational and commercial fisheries productivity. Soft-bottom and sand/shell substrates support benthic invertebrate communities,

including shrimp, crabs, and demersal fish species, while the water column supports planktonic organisms and early life stages of managed fish species.

The project area is located within Gulf Ecoregion 4 as defined by the NMFS. Salinity regimes reflect both estuarine and marine influence, with Caillou Bay providing estuarine conditions and the Gulf representing marine habitat. The transitional nature of the barrier island environment supports both resident estuarine species and transient marine species that utilize nearshore habitats seasonally or during specific life stages.

Wetlands and water bottoms in the project areas provide nursery and foraging habitat for a variety of ecologically and economically important marine fishery species identified in the GFMC EFH source documents and regional monitoring programs (GMFMC, 2005), such as Atlantic croaker (*Micropogonias undulatus*), spot (*Leiostomus xanthurus*), spotted seatrout (*Cynoscion nebulosus*), sand seatrout (*Cynoscion arenarius*), black drum (*Pogonias cromis*), longnose killifish (*Fundulus similis*), Atlantic brief squid (*Lolliguncula brevis*), blue crab (*Callinectes sapidus*), lesser blue crab (*Callinectes similis*), Gulf menhaden (*Brevoortia patronus*), southern flounder (*Paralichthys lethostigma*), broad flounder (*Paralichthys squamilentus*), striped mullet (*Mugil cephalus*), white mullet (*Mugil curema*), silversides (*Menidia beryllina* and *Membras martinica*) and anchovies (*Anchoa mitchilli*, *Anchoa hepsetus*, and *Anchoa nasuta*) (Thompson, 1988; U.S. Army Corps of Engineers [USACE], 2010; Williams, 1998). Some of these species serve as prey for other fish species managed under the Magnuson-Stevens Fishery Conservation and Management Act (MSA) by GFMC (e.g., reef fish) and highly migratory species managed by NMFS (e.g., sharks, billfish, tunas).

These species support both recreational and commercial fisheries and play important ecological roles within the estuarine and nearshore marine food web. Primary producers within marsh and aquatic habitats contribute organic material that supports zooplankton, invertebrates, and juvenile fishes, which in turn support higher trophic level species, including larger predatory fishes, seabirds, and marine mammals.

D.3.2.3.1.2 Essential Fish Habitat and Managed Fish Species

NMFS and FMC created under the MSA, jointly manage fishery resources in the U.S. Exclusive Economic Zone (EEZ). GFMC was established for the Gulf to regulate commercially and recreationally valuable species and stocks through FMP. Together, NMFS and GFMC maintain FMPs for specific species or species groups to regulate commercial and recreational fishing within their geographic regions. NMFS also manages the FMP for HMS, including billfish, tuna, swordfish, and sharks in the Gulf. Jurisdiction is determined by species rather than location, as species ranges often cross administrative boundaries.

FMCs are required to identify EFH for each fishery covered under an FMP, as well as HAPC. EFH is defined as the waters and seafloor necessary for spawning, breeding, or growth to maturity of managed fish species (16 U.S.C. § 1802[10]). HAPCs are defined as subsets of EFH that exhibit one or more of the following traits: rare, stressed by human development, provide important ecological functions for federally managed species, or are especially vulnerable to anthropogenic (or human impact) degradation (NOAA Fisheries, 2025d). EFH and managed species identified within the project area are included in the following five FMPs:

- Coastal Migratory Pelagics (2 species)
- Red Drum
- Reef Fish (6 species)
- Shrimp (2 species)
- Highly Migratory Species (5 species)

The specific species within each FMP are presented in Table D- 13 of RP/EA #8.1. No HAPCs were identified within the project area. Additional information on managed species and EFH is provided in the Raccoon Island Restoration Project EFH Assessment, which will be made publicly available.

Table D- 13. Managed Species Potentially within the Project Area.

FMP	COMMON NAME	SCIENTIFIC NAME
Coastal Migratory Pelagics	Cobia	*Rachycentron canadum*
Coastal Migratory Pelagics	King Mackerel	*Scomberomorus cavalla*
Red Drum	Red Drum	*Sciaenops ocellatus*
Reef Fish	Red Snapper	*Lutjanus campechanus*
Reef Fish	Gray Snapper	*Lutjanus griseus*
Reef Fish	Almaco Jack	*Seriola rivoliana*
Reef Fish	Greater Amberjack	*Seriola dumerili*
Reef Fish	Lane Snapper	*Lutjanus synagris*
Reef Fish	Gray Triggerfish	*Balistes capriscus*
Shrimp	Brown Shrimp	*Farfantepenaeus aztecus*
Shrimp	White Shrimp	*Litopenaeus setiferus*
Highly Migratory Species	Bull Shark	*Carcharhinus leucas*
Highly Migratory Species	Blacktip Shark	*Carcharhinus limbatus*
Highly Migratory Species	Atlantic Sharpnose Shark	*Rhizoprionodon terraenovae*
Highly Migratory Species	Scalloped Hammerhead Shark	*Sphyrna lewini*
Highly Migratory Species	Spinner Shark	*Carcharhinus brevipinna*

Based on available BICM and project-specific HRT data (Baird-Stantec JV, 2026c), EFH types expected or known to be present within the restoration area include estuarine (i.e., inside barrier island) mangrove and emergent marsh; soft bottom as well as sand and shell substrates; and water column. Categories of EFH in the Ship Shoal Borrow Area include marine sand and soft bottoms, and marine water column (GMFMC, 2005). The primary categories of EFH present within the project area are summarized below.

- Mangroves: Mangrove habitat consists of communities of halophytic trees and shrubs in typically soft sediments with regular tidal inundation, some freshwater inputs, and low to moderate wave energy. Mangrove habitat within the project area includes black mangrove stands. There are just over 2 ac of this habitat type (Table D- 10) remaining within the project area, scattered sparsely throughout the center and bayside of the island.

- Emergent Marsh: Emergent marshes, including tidal wetlands and salt marshes, consist of vegetated wetlands with typically soft sediments, regular tidal inundation, some freshwater inputs, and low to moderate wave energy. This habitat type occurs along the bayside of Raccoon Island; vegetation includes smooth cordgrass, black rush, and salt wort. Black mangrove is also scattered throughout the emergent marsh region of Raccoon Island. Emergent marsh habitats are important nursery grounds for many fish, shellfish, and other invertebrate species.
- Soft Bottom: Soft-bottom habitats are areas where the bottom sediments are soft mud, clay, or silt. This habitat type supports a diverse assemblage of organisms living within or on the sediment, including shrimp and many demersal fish species. However, lower densities of fishes and invertebrates occur in soft-bottom communities compared to areas with hard-bottom substrates.
- Sand/Shell Bottom: Areas where the bottom sediments consist of soft sand and/or shell, generally included in the term "soft bottom."
- Water column: Water column habitat consists of all waters from the surface to the ocean floor (but not including the ocean bottom). This habitat type is particularly important for planktonic animals or life stages (eggs or larvae).
- Nearshore Shoal: Soft bottom consisting of sand, shell, and submerged bank formations, often along barrier islands and within 25 fathoms are vital spawning, nursery, or foraging habitat for red drum, reef fish, and coastal migratory pelagics.
- Drift Algae (*Sargassum*): Drift algae (*Sargassum*) forms floating, nutrient-rich, protective mats for juvenile fish and crustaceans. *Sargassum* Inundation Events involve climate-driven arrivals of *Sargassum* on the coastline peaking with south winds during the summer.

The GFMC manages over 40 species (GMFMC, 2005, 2016) and has developed five EFH "ecoregions" to refine their designations. Within each ecoregion, EFH was further defined as occurring either in estuarine (inside barrier islands and estuaries), nearshore (less than 18 m or 59 ft deep), or offshore waters (greater than 18 m or 59 ft deep). The project is located within estuarine and nearshore waters of Eco-Region 4. Eco-Region 4 is the northwest Gulf from the Mississippi River Delta westward to Freeport, Texas. This eco-region includes the Louisiana Deltaic Plain and is influenced by both the Mississippi and Atchafalaya rivers. EFH has been designated for ten GFMC-managed species of fishes and crustaceans (Table D- 14). Additionally, NMFS manages HMS for which EFH has been designated based on distribution data rather than habitat type; EFH has been designated for five species of sharks in or near the project area (Table D- 15).

Table D- 14. EFH Requirements of Managed Species that Potentially Occur in Habitats within the Project Area.

SPECIES	LIFE STAGE	EFH
Brown shrimp	Post-larvae, juvenile	nearshore sand/shell bottom, nearshore mud/soft bottom
White shrimp	Eggs, larvae, juvenile, sub-adult, adult, spawning adult	nearshore sand/shell bottom, nearshore mud/soft bottom
Red drum	Eggs, larvae, post-larvae, juvenile, and adult	nearshore sand/shell bottom, nearshore mud/soft bottom, nearshore pelagic
King mackerel	Juvenile	nearshore pelagic
Cobia	Eggs, larvae, post-larvae, juvenile, adult	nearshore pelagic

SPECIES	LIFE STAGE	EFH
Red snapper	Juvenile, adult	nearshore sand/shell bottom, nearshore mud/soft bottom, nearshore shoal/banks, nearshore reefs
Grey snapper	Adult	nearshore sand/shell bottom, nearshore mud/soft bottom, nearshore shoal/banks, nearshore reefs
Lane snapper	Juvenile, adult	nearshore sand/shell bottom, nearshore mud/soft bottom, nearshore shoal/banks, nearshore reefs
Gray triggerfish	Larvae, post-larvae, juvenile	nearshore drift algae (sargassum)
Almaco jack	Juvenile	nearshore drift algae (sargassum)
Greater amberjack	Juvenile	nearshore drift algae (sargassum)

Table D- 15. Highly Migratory Species Potentially in the Project Area by Life Stage.

SPECIES	LIFE STAGE(S)
Bull Shark	Neonate, Juvenile
Blacktip Shark	Neonate, Juvenile, Adult
Atlantic Sharpnose Shark	Neonate, Juvenile, Adult
Scalloped Hammerhead Shark	Neonate
Spinner Shark	Neonate, Juvenile

D.3.2.3.2 ENVIRONMENTAL CONSEQUENCES

D.3.2.3.2.1 Alternative 1 – No Action

Under the No Action Alternative, the project would not be implemented and the short-term and long-term, minor to moderate, adverse impacts on marine and estuarine aquatic fauna (including EFH) associated with construction of the action alternatives would not occur. However, any long-term benefits from habitat creation and increased longevity would also not occur. Over time, ongoing coastal processes including shoreline retreat, subsidence, sea level rise, overwash, and island fragmentation would continue to alter habitat distribution within the restoration area. Modeling of future without project conditions indicates that continued loss of island elevation would result in conversion of supratidal and intertidal habitats to subtidal open water and soft-bottom habitats over the 20-year analysis period. While this conversion may result in an increase in total aquatic acreage, the shift would reflect degradation of structured barrier island and marsh habitats and increased exposure of estuarine waters to wave energy.

As island fragmentation progresses, nursery and foraging habitats associated with emergent marsh, mangrove, and shallow intertidal areas would decline, reducing habitat quality and structural complexity for managed fish species and other aquatic fauna. Conversion to open water and soft-bottom substrates would result in a transition toward more ubiquitous habitat types with lower productivity and reduced ecological function relative to intact marsh and barrier island systems. Under the No Action Alternative, marine and estuarine aquatic fauna and EFH would experience long-term, major, adverse impacts due to continued habitat loss, reduced shoreline protection, and degradation of estuarine and nearshore habitat structure within the project area.

D.3.2.3.2.2 Alternative 2

Short-term to long-term, minor to moderate, adverse impacts on marine and estuarine aquatic fauna, including managed fish species and EFH present in the project area, are expected due to construction activities associated with Alternative 2. These impacts include temporary displacement and disturbance of aquatic fauna due to noise and the presence of vessels and construction equipment, temporary increases in turbidity and suspended sediment concentrations, and potential localized water quality effects associated with dredging and fill placement activities. Physical crushing of benthic and slow-moving fauna may also occur from dredging, anchoring, or other construction equipment. In addition, localized sedimentation (e.g., smothering) of benthic organisms may occur in areas of sediment deposition. Additional impacts may include dredge entrainment of fish and invertebrates, disturbance to floating Sargassum habitat from vessel transit, and behavioral effects associated with artificial lighting from construction equipment and support vessels. Accidental spills or leaks of fuel or other substances could also result in localized, short-term impacts to aquatic habitats and species.

Dredging within the SSB88 Borrow Area and sediment placement within restoration areas would result in short-term to long-term, minor to moderate, adverse impacts on aquatic fauna due to disturbance of benthic communities, disruption of prey resources, and temporary reductions in habitat quality caused by increased turbidity. Mobile fish and nekton species present within the marine and estuarine habitats of the project area are highly mobile and are expected to avoid active construction areas and return following completion of work. Noise becoming inaudible at approximately 500 ft and vibration during pumping operations may result in localized displacement of motile species (Pickens et al., 2020).

Benthic and other slow-moving fauna within the dredged and filled areas would be subject to direct impacts, including burial, crushing, and removal of individuals and habitat (Pickens et al., 2020). In addition, sedimentation associated with dredging and fill placement may result in smothering of benthic organisms in areas of deposition. Recovery of benthic communities within the SSB88 Borrow Area and other affected areas would occur through natural recolonization process. This recovery is expected to occur over the long-term as benthic habitat is re-established and organisms repopulate the disturbed substrate. The rate of recolonization would depend on sediment characteristics, hydrodynamic conditions, and proximity to undisturbed source populations. Additional details regarding EFH and associated impacts are provided in the EFH Assessment (Raccoon Island Restoration Project EFH Assessment, which will be made publicly available).

Placement of sediment pipelines on the seafloor and construction of restoration features would temporarily affect soft-bottom and water column EFH. In addition, placement of fill to create beach, dune, and marsh habitats would result in the conversion of certain areas of open water and intertidal habitats to supratidal or vegetated habitats. Temporary training dikes constructed along the shoreline and within marsh fill areas to contain hydraulically placed sediment may impound water in localized areas during construction; however, these features would be degraded prior to demobilization. BMPs described in Section D.3.2.1 would be implemented to minimize impacts to EFH and water quality.

Maintenance of the Gulfside breakwater would help reduce wave energy and shoreline erosion, supporting the persistence of intertidal and nearshore habitats that function as nursery and foraging areas for managed fish species and other aquatic fauna. In addition, expansion of the terminal groin would improve retention of beach sediments and reduce the likelihood of breaching or rapid shoreline retreat, thereby helping maintain adjacent estuarine and shallow marine EFH over the long term.

Although construction activities would result in temporary habitat disturbance and conversion, Alternative 2 is designed to restore barrier island elevation and reduce long-term habitat loss associated with erosion, subsidence, and fragmentation. Modeling of future with project conditions indicates that aquatic habitats,

including intertidal and subtidal areas, would remain present and evolve over time as coastal processes redistribute sediments. Specific design elements, including constructed tidal creeks and varied intertidal and subtidal elevations, are intended to maintain habitat diversity and support EFH functions over the 20-year design life. Additional analysis of the impacts on EFH is included in the project-specific EFH assessment (Raccoon Island Restoration Project EFH Assessment, which will be made publicly available).

Alternative 2 would reduce long-term degradation of estuarine and nearshore habitats by stabilizing the barrier island system and buffering interior waters from storm energy. While construction impacts are expected to be short-term to long-term, minor to moderate, and adverse, impacts following project implementation are expected to be long-term and beneficial due to improved habitat stability, maintenance of marsh and intertidal areas, and enhanced resilience of EFH within the project area.

D.3.2.3.2.3 Alternative 3 (Preferred Alternative)

The general types of impacts described for Alternative 2 would also occur under the Preferred Alternative. Because the Preferred Alternative includes construction of both living shoreline and traditional breakwater BSPS components, in-water construction activities would occur for a longer duration and across a larger portion of the bayside shoreline than under Alternative 2. Installation of the BSPS would temporarily disturb bay-bottom habitats and water column EFH through pile placement, stone placement, and associated vessel anchoring and maneuvering. In addition, areas directly beneath the placed structures would experience permanent conversion of soft-bottom EFH to hard substrates. These activities would result in localized, short-term, minor to moderate, adverse impacts on marine and estuarine species due to increased turbidity, noise, and temporary habitat disruption.

However, unlike Alternative 2, the living shoreline BSPS would create structurally complex, shallow-water habitat along the bayside shoreline. The rock substrate and interstitial spaces associated with the living shoreline features would provide hard substrate for colonization by oysters and other sessile invertebrates and would create refuge habitat for juvenile fish, shrimp, and crabs. The reduction in wave energy landward of the structures would promote calmer, lower-turbidity conditions conducive to the development and persistence of intertidal and shallow subtidal habitats. These conditions are expected to enhance foraging and nursery habitat for managed fish species and other estuarine-dependent fauna over the long term.

Modeling indicates that restoration features would stabilize the island system and maintain intertidal and shallow subtidal habitat acreage over the 20-year design life. By protecting the bayside shoreline from erosion and fragmentation, the BSPS would support the long-term persistence of emergent marsh and adjacent estuarine EFH.

Overall, while the Preferred Alternative would result in slightly greater short-term, construction-related impacts to aquatic fauna and EFH compared to Alternative 2 due to the additional in-water construction activities associated with the living shoreline BSPS, it is expected to provide greater long-term ecological benefits through enhanced habitat complexity, shoreline stabilization, and improved nursery and foraging habitat. Construction impacts are anticipated to be short-term to long-term, minor to moderate, and adverse; impacts following project implementation are expected to be long-term and beneficial.

D.3.2.3.2.4 Alternative 6

The general types of impacts described for Alternatives 2 and 3 would also occur under Alternative 6. Alternative 6 includes installation of traditional segmented breakwater BSPS. Construction of these features would require extended in-water work, including rock placement and associated vessel anchoring and maneuvering. In addition, areas directly beneath the placed structures would experience permanent conversion of soft-bottom EFH to hard substrates. Because Alternative 6 has the longest overall construction duration of the action alternatives, in-water disturbances would persist for a longer period

compared to Alternatives 2 and 3. As a result, short-term, adverse impacts related to turbidity, underwater noise, temporary habitat disturbance, and displacement of aquatic fauna would be slightly greater under Alternative 6.

The traditional BSPS would result in localized, permanent conversion of some soft-bottom and shallow-water EFH to hard substrate. While these structures would provide some colonization surface for sessile invertebrates and may attract reef-associated or structure-oriented species, they would not provide the same degree of intertidal habitat complexity or shallow-water nursery function as the living shoreline features proposed under the Preferred Alternative. The segmented breakwaters would primarily function as wave attenuation structures rather than intertidal habitat features.

Despite these differences, the traditional BSPS would provide long-term benefits by reducing shoreline erosion, decreasing wave energy along the bayside shoreline, and protecting adjacent emergent marsh and shallow estuarine habitat from continued fragmentation and conversion to open water. By stabilizing the shoreline and maintaining intertidal elevations over time, Alternative 6 would support the persistence of marsh and nearshore EFH within the project area over the 20-year design life. These conditions are expected to enhance foraging and nursery habitat for managed fish species and other estuarine-dependent fauna over the long term.

Overall, Alternative 6 would result in the greatest short-term construction-related impacts to marine and estuarine aquatic fauna and EFH due to its longer construction duration and extended in-water work. However, following completion of construction, the shoreline stabilization and habitat restoration features would provide long-term, beneficial effects by maintaining and protecting estuarine and nearshore EFH. Construction impacts are expected to be short-term to long-term, minor to moderate, and adverse; impacts following project implementation are expected to be long-term and beneficial.

D.3.2.4 Protected Species

Protected species can include any species that is covered by additional regulation, such as the ESA, MMPA, and MBTA. Species protected by the ESA and MMPA are discussed below. Species covered by the MBTA are discussed in Section D.3.2.2.

D.3.2.4.1 AFFECTED ENVIRONMENT

D.3.2.4.1.1 Threatened and Endangered Species

The ESA of 1973 (16 U.S.C. § 1531 et seq.) protects all federally listed threatened and endangered species, as well as their designated critical habitat. 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 LA TIG will request consultation with the USFWS and NMFS on the Preferred Alternative for this project.

For ESA consultation, an Action Area is defined under 50 Code of Federal Regulations Section (§) 402.02, as including “all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action.” For this project, the Action Area includes the area affected by restoration activities, including the restoration area, SSB88 Borrow Area, and a 1-mile buffer surrounding these areas. In addition, the project includes vessel transit routes to and from the project area through offshore and nearshore waters where marine and estuarine species may occur (collectively referred to as the Vessel Transit zone of influence (ZOI)). However, routes for this project have not yet been specified and are therefore considered separate from the Action Area. Typically, for this type of barrier island restoration,

boats transit from the following ports: Venice, Fourchon, Morgan City, and Houma/Cocodrie, Louisiana; Pascagoula, Gulfport, and Biloxi, Mississippi; Houston/Galveston, Texas; and Tampa, Florida.

A list of federally threatened and endangered species with the potential to occur within the Action Area was developed based on a review of the USFWS Information for Planning and Consultation System and NMFS' ESA Section 7 Mapper. In total, 13 species are potentially present within the Action Area (see Table D- 16). In addition, the Action Area contains designated critical habitat for the piping plover and proposed critical habitat for the rufa red knot. The Vessel Transit ZOI contains designated critical habitat for loggerhead sea turtle, and proposed critical habitat for the Rice's whale *(Balaenoptera ricei)*, and green sea turtle.

Table D- 16. ESA Federally Listed or Proposed Species Potentially Occurring in the Action Area or Vessel Transit ZOI.

Note: [a] These species have designated or proposed critical habitat in the Action Area or Vessel Transit ZOI.

COMMON NAME	SCIENTIFIC NAME	JURISDICTION	CURRENT STATUS	TYPE
West Indian manatee	*Trichechus manatus*	USFWS	Threatened	Mammal
Rice's Whale[a]	*Balaenoptera ricei*	NMFS	Endangered	Mammal
Sperm Whale	*Physeter macrocephalus*	NMFS	Endangered	Mammal
Piping Plover[a]	*Charadrius melodus*	USFWS	Threatened	Bird
Rufa Red Knot[a]	*Calidris canutus rufa*	USFWS	Threatened	Bird
Eastern Black Rail	*Laterallus jamaicensis ssp. jamaicensis*	USFWS	Threatened	Bird
Loggerhead Sea Turtle[a]	*Caretta caretta*	USFWS (nesting beaches)/NMFS (marine environment)	Threatened	Reptile
Kemp's Ridley Sea Turtle	*Lepidochelys kempii*	USFWS (nesting beaches)/NMFS (marine environment)	Endangered	Reptile
Green Sea Turtle[a]	*Chelonia mydas*	USFWS (nesting beaches)/NMFS (marine environment)	Threatened	Reptile
Leatherback Sea Turtle	*Dermochelys coriacea*	USFWS (nesting beaches)/NMFS (marine environment)	Endangered	Reptile
Hawksbill Sea Turtle	*Eretmochelys imbricata*	USFWS (nesting beaches)/NMFS (marine environment)	Endangered	Reptile
Monarch Butterfly	*Danaus plexippus*	USFWS	Proposed Threatened	Insect

COMMON NAME	SCIENTIFIC NAME	JURISDICTION	CURRENT STATUS	TYPE
Giant Manta Ray	*Manta birostris*	NMFS	Threatened	Fish

D.3.2.4.1.2 West Indian Manatee

The West Indian manatee (*Trichechus manatus;* hereafter referred to as manatee) was listed as an endangered species in 1967 and later reclassified as threatened under the ESA in 2017 (82 FR 16668). The manatee is also federally protected under the MMPA of 1972. This species is a large marine mammal occurring in the southeastern region of the U.S., eastern Mexico, and in patchy distribution throughout the Caribbean, but predominantly occurring in Florida. The total range-wide population of manatees is estimated at 13,000. Manatees inhabit marine, brackish, and freshwater systems such as estuaries, saltwater bays, slow moving rivers and river mouths, canals, and coastal areas alike. The manatee is herbivorous and prefers nearshore habitats containing SAV (USFWS, n.d.-g). Manatees are opportunistic feeders and feed on a wide variety of marine, estuarine, and freshwater plants some including cord grass (*Sporobolus* spp.), algae, turtle grass (*Thalassia testudinum*), shoal grass (*Halodule wrightii*), manatee grass (*Syringodium filiforme*), and eel grass (*Zostera marina*) (USFWS, n.d.-b). While there have been manatee sightings throughout much of the broader Terrebonne coastal waters (Slone et al., 2022), there have been no documented sightings of manatees specifically around Raccoon Island or the Isles Dernières barrier island chain. However, manatees could occur in waters that may be transversed by vessels transiting from ports to the project area.

D.3.2.4.1.3 Whale Species

The Rice's whale was listed as endangered under the ESA in 2019 (84 FR 15446) and was recognized as a distinct species in 2021 (86 FR 47022). Rice's whales, unlike most baleen whale species, do not migrate long distances and are the only baleen whale species known to reside in the Gulf year-round (Hayes et al., 2023; NOAA Fisheries, 2026b). This species is most consistently located along the continental shelf break in the northeastern Gulf, in water depths ranging from approximately 100 to 400 meters (328 to 1,312 ft), an area designated by NMFS as its core distribution zone. However, passive acoustic monitoring has detected Rice's whale vocalizations beyond this core area, suggesting a broader distribution within the Gulf than previously documented.

Critical habitat for the Rice's whale has been proposed to include waters between the 100- and 400-meter (328- to 1,312-ft) isobaths throughout portions of the Gulf (88 FR 47453). The restoration area is located in nearshore and shallow coastal waters and does not occur within proposed critical habitat, and Rice's whales would not occur in this area. However, Rice's whales and their proposed critical habitat could potentially occur in offshore waters that may be traversed by project-related vessels, particularly along transit routes crossing deeper continental shelf waters (Soldevilla et al., 2022). All NMFS best management practices for transiting through proposed critical habitat will be followed.

The sperm whale (*Physeter macrocephalus*) is listed as endangered under the ESA (35 FR 18319). Sperm whales are deep-diving, toothed whales that occur worldwide and are present year-round in the Gulf. In the Gulf, sperm whales are most commonly associated with continental slope and offshore waters, generally occurring in water depths greater than approximately 200 meters (656 ft), with higher densities documented along the continental slope and in deeper offshore waters. Sperm whales forage primarily on squid and deep-water fish species and routinely dive to substantial depths during feeding (NOAA Fisheries, 2021).

Unlike Rice's whales, sperm whales have a broader global distribution and are more widely distributed throughout the deeper waters of the Gulf rather than being restricted to a narrow shelf break zone. Sperm

whales are not known to occur in shallow nearshore waters such as those within the restoration area; however, they could occur within deeper offshore waters that may be transited by project-related vessels traveling to and from ports.

There is no designated critical habitat for sperm whales in the Gulf. Given their offshore distribution and preference for deep-water habitats, sperm whales would not occur within the shallow restoration footprint. However, vessel traffic associated with the project could overlap with offshore habitat where sperm whales are present.

D.3.2.4.1.4 Avian Species

The eastern black rail (*Laterallus jamaicensis jamaicensis*), piping plover, and rufa red knot, each federally listed as threatened under the ESA, were identified as potentially present within the Action Area (eBird, 2025a).

The eastern black rail was federally listed as threatened on November 9, 2020 (85 FR 63764). No critical habitat has been designated for this species. The eastern black rail is a secretive marsh bird that inhabits emergent wetlands with dense herbaceous vegetation and adjacent upland transition zones. Suitable habitat typically includes high marsh areas with shallow flooding and dense vegetation structure (USFWS, n.d.-c, 2019).

Although the species' range extends along portions of the Gulf Coast, Louisiana is considered to be at the periphery of the known breeding range, and the state is not currently known to support a breeding population. Given the offshore location of the barrier island system and the limited extent of dense high marsh habitat, the likelihood of occurrence within the Action Area is low.

The Atlantic Coast and Northern Great Plains populations of the piping plover were federally listed as threatened in January 1986 (50 FR 50626). Critical habitat for wintering piping plovers was designated in 2001 (66 FR 36038) and includes portions of Louisiana barrier island habitats, including Raccoon Island (USFWS, n.d.-a). Piping plovers are small, migratory shorebirds that winter along the Gulf Coast, including coastal Louisiana. They typically winter between mid-July and mid-May and spend the majority of the annual cycle on wintering grounds (USFWS, 2015). Preferred wintering habitats include coastal sand spits, tidal flats, shoals, sandbars, overwash areas, and sparsely vegetated beaches. Foraging habitats include sand and mud flats and ephemeral pools where plovers feed on macroinvertebrates (USFWS, 2015). The project area contains sandy beach and intertidal habitats consistent with wintering and foraging habitat for the species.

The rufa red knot was federally listed as threatened in January 2015 (79 FR 73705). Critical habitat has been proposed for portions of the species' range, including barrier island habitats along the Gulf Coast, including Raccoon Island (88 FR 22530). Rufa red knots are migratory shorebirds that winter in coastal marine and estuarine habitats characterized by exposed intertidal sediments that support invertebrate prey (USFWS, n.d.-f). Wintering habitat includes sand spits, shoals, tidal flats, and sandbars (USFWS, 2020). Rufa red knots that winter along the Gulf Coast typically arrive in late summer and remain through mid-May before migrating to Arctic breeding grounds. Juveniles may remain in wintering habitat into early summer. The project area provides suitable wintering and foraging habitat for rufa red knots, particularly along sandy beaches and intertidal flats (USFWS, 2020).

D.3.2.4.1.5 Monarch Butterfly

The monarch butterfly (*Danaus plexippus*) is a candidate species and not yet listed; it is proposed for listing as threatened. Adult monarch butterflies are large and conspicuous, with bright orange wings surrounded by a black border and covered with black veins. Monarch butterflies in eastern and western North America exhibit long-distance migration (over 1,800 mi) and overwinter as adults at forested locations in Mexico and California. During the fall migration, monarchs feed on wildflowers along the Louisiana coast. Monarchs

mate at the overwintering sites and then disperse. Upon their return in spring, females lay their eggs on their obligate milkweed host plant (primarily *Asclepias* spp.), and larvae feed on milkweed and sequester toxic chemicals (cardenolides) as a defense against predators. Multiple generations of monarchs are produced during the breeding season, with most adult butterflies living two to five weeks (USFWS, n.d.-e). Monarch butterflies may utilize Louisiana barrier islands during migration. While pollinator plant species may be present in terrestrial habitat on Raccoon Island, milkweed was not documented in vegetation assessments (USACE & CPRA, 2010).

D.3.2.4.1.6 Sea Turtles

Five federally listed sea turtles, including the endangered hawksbill (*Eretmochelys imbricata*), Kemp's ridley (*Lepidochelys kempii*), and leatherback (*Dermochelys coriacea*), and the threatened loggerhead (*Caretta caretta*) and green (*Chelonia mydas*), occur or potentially occur in the marine waters of the Gulf. Of these, Kemp's ridley, loggerhead, and green sea turtles may occur within the Action Area and Vessel Transit ZOI in nearshore and offshore waters. Hawksbill sea turtles are typically associated with coral reefs, rocky areas, and hardbottom habitats (NOAA Fisheries, 2025e), while leatherbacks primarily occupy oceanic waters (NOAA Fisheries, 2025g). Hawksbill and leatherback sea turtles are not considered further since they are not expected to occur within the Action Area or Vessel Transit ZOI due to the lack of suitable habitat and their limited occurrence in the northern Gulf.

Sea turtle species are under the shared jurisdiction of USFWS and NMFS, with USFWS having responsibility for nesting beaches and NMFS having jurisdiction in the marine environment. Neither the restoration area nor the SSB88 Borrow Area overlaps designated or proposed critical habitat for any sea turtle species. Designated critical habitat for the loggerhead sea turtle and proposed critical habitat for the green sea turtle occur southeast of the project area in deeper offshore waters that may overlap with vessel transits.

Sea turtles are found throughout tropical and subtropical waters, occupying a range of marine habitats depending on life stage and species. Female sea turtles nest on sandy beaches; hatchlings emerge and enter a pelagic stage before transitioning to nearshore or coastal habitats as juveniles and adults. The Kemp's ridley primarily inhabits nearshore coastal waters with muddy or sandy bottoms (NOAA Fisheries, 2025f). Loggerheads utilize both oceanic and nearshore habitats, including bays and tidal inlets. Green sea turtles are primarily herbivorous and commonly associated with shallow coastal habitats, particularly those containing SAV (NOAA Fisheries, 2025b); however, no seagrass beds occur within the restoration area at Raccoon Island.

There is no documented sea turtle nesting on Raccoon Island. Potential occurrence within the Action Area would be limited to in-water presence in marine and nearshore habitats. Sea turtles may occur in the vicinity of Ship Shoal and other sandy bathymetric highs in the northern Gulf, where they forage on benthic invertebrates. Individuals may also be present in nearshore Gulf waters adjacent to barrier islands and around existing shoreline protection features, which can provide structure that attracts prey species.

D.3.2.4.1.7 Giant Manta Ray

The giant manta ray (*Manta birostris*) was listed as a threatened species under the ESA in 2018 (83 FR 2916). This species inhabits tropical, subtropical, and temperate waters and can be found offshore, in oceanic waters, and productive coastal areas. Giant manta rays have also been observed in estuarine waters, oceanic inlets, intracoastal waterways, and bays. The global population size of this species is unknown, and small, highly fragmented populations are sparsely distributed around the world. The few regional population estimates range from 600 to 2,000 individuals (NOAA Fisheries, 2026a). The giant manta ray is an HMS, and their movements correspond with current circulation, seasonal upwelling, water temperatures, and location of food sources. The primary diet of this species consists of planktonic organisms or zooplankton (NOAA

Fisheries, 2026a). Several inshore sightings have been documented off the coast of Louisiana (NOAA Fisheries, 2024b).

D.3.2.4.1.8 Marine Mammals

In addition to the listed species discussed above, all marine mammals are protected under the MMPA of 1972, including the bottlenose dolphin. Under Section 3 of the MMPA, all marine mammals are protected from "take" which is defined as to "harass, hunt, capture, or kill or attempt to harass, hunt, capture, or kill any marine mammal." NMFS has authority over the marine mammals potentially occurring within the Action Area and Vessel Transit ZOI, with the exception of the manatee, which is under USFWS jurisdiction.

Common bottlenose dolphins (*Tursiops truncatus truncatus*) occur widely throughout the waters surrounding the project area (Vollmer & Rosel, 2013), and the Barataria-Terrebonne estuarine system supports the two largest bays, sounds, and estuaries stocks of bottlenose dolphins in Louisiana west of the Mississippi River (Sinclair et al., 2017). This species can thrive on a wide variety of prey, some of which include fish, crustaceans (for example, shrimp and crab), and squid. The primary threats to bottlenose dolphins include interactions with fishing gear, habitat destruction and degradation, biotoxins (harmful algal blooms), and illegal human harassment and feeding activities (NOAA Fisheries, 2025a).

Photo-ID surveys of the Terrebonne-Timbalier Bay stock, which includes waters around the Isles Dernières, were conducted during June 2016 (summer season) and January 2017 (winter season) using two center-console research vessels. Overall, survey efforts recorded a total of 378 sightings of bottlenose dolphin groups composed of 3,612 individuals (summer n = 1,930; winter n = 1,682), and calves were present in 43% (n = 163) of the total group sightings and comprised 9.5% (n = 173) and 7.3% (n = 123) of the total number of dolphins recorded during the summer and winter survey, respectively (Sinclair et al., 2017).

D.3.2.4.2 ENVIRONMENTAL CONSEQUENCES

D.3.2.4.2.1 Threatened and Endangered Species

For actions involving major construction activities with the potential to affect ESA-listed species or designated critical habitat, such as the proposed project, a BA must be submitted to the USFWS and/or NMFS. Based on anticipated project impacts, the LA TIG is requesting consultation with the USFWS and NMFS in accordance with Section 7 of the ESA, and included in the Raccoon Island Restoration Project BA, which will be made publicly available. All consultation would be completed prior to project construction, and any avoidance and mitigation measures developed in coordination with the USFWS and NMFS during the consultation process would be implemented for the project.

The species discussions in this section incorporate and rely on assessments in the BA. Although the BA includes the information that was necessary for formal consultation under the ESA, the below analysis also includes the information to comply with NEPA, including an assessment of alternatives.

The determinations from the BA are included in Table D- 17 and Table D- 18 and include:

- No effect: the proposed project would not affect a listed species.
- May affect, not likely to adversely affect: effects on a listed species are expected to be discountable (extremely unlikely to occur), insignificant (the impact would never reach the scale where take occurs), or completely beneficial.
- May affect, likely to adversely affect: adverse effects on a listed species may occur as a direct or indirect result of the proposed project and the effect is not discountable, insignificant, or beneficial.

In addition to summarizing the ESA determinations made in the BA, a corresponding NEPA determination of impact is also provided, based on the definitions provided in the Final PDARP/PEIS. They include the following threatened and endangered species indicators for the following impacts, along with major impacts (which are not described here, as major, adverse impacts are not applicable to the project):

- No impact: there is no discernible or measurable impact. This would generally correlate with an ESA Section 7 no effect determination.
- Minor impact: impacts on threatened or endangered species, their habitats, or the natural processes sustaining them could be detectable, but small and localized, and could not measurably alter natural conditions. This impact would generally correlate with an ESA Section 7 may affect, not likely to adversely affect determination where effects are considered insignificant, discountable, and/or wholly beneficial.
- Moderate impact: impacts on threatened or endangered species, their habitats, or the natural processes sustaining them could be detectable and some alteration in the numbers of species or occasional responses to disturbance by some individuals could be expected, with some negative impacts on 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 on potential or designated critical habitat could occur. This impact would generally correlate with an ESA Section 7 may affect, likely to adversely affect determination for at least one listed species. No adverse modification of critical habitat could be expected.

Table D- 17. Summary of Impacts on Listed Species Under USWFS Jurisdiction and Critical Habitats from the Action Alternatives.

Note: NE = no effect; NI = no impact; LAA = likely to adversely affect; NLAA = not likely to adversely affect. Information presented is summarized from the project BA.

COMMON NAME	SCIENTIFIC NAME	FEDERAL STATUS (OR CRITICAL HABITAT UNIT, IF APPLICABLE)	COMMON NAME	SCIENTIFIC NAME
Eastern Black Rail	*Laterallus jamaicensis ssp. jamaicensis*	Threatened	NE/NI	Raccoon Island is outside areas of documented species occurrences, and, given the island's location offshore, the species is not expected to occur in the project area.

COMMON NAME	SCIENTIFIC NAME	FEDERAL STATUS (OR CRITICAL HABITAT UNIT, IF APPLICABLE)	COMMON NAME	SCIENTIFIC NAME
Piping Plover	*Charadrius melodus*	Threatened	LAA/short-term to long-term, moderate, adverse; long-term, beneficial	The species is known to occur in the project area. Construction would cause temporary short-term disturbance and displacement from the localized foraging and resting areas within the footprint of active construction. Available, undisturbed habitat would be present elsewhere on Raccoon Island during construction and, following restoration, the project would benefit the species due to an increase in available wintering habitat.
Piping Plover Critical Habitat	N/A	Unit LA-4	NLAA/short-term to long-term, minor, adverse; long-term, beneficial	While the project would involve the placement of fill on some areas of critical habitat, overall, the project would expand the area of available critical habitat, as well as barrier island longevity. Newly restored habitats are expected to present the essential physical and biological features needed to support piping plover.
Rufa Red Knot	*Calidris canutus rufa*	Threatened	LAA/short-term to long-term, moderate, adverse; long-term, beneficial	The species is known to occur in the project area. Construction would cause temporary short-term disturbance and displacement from the localized foraging and resting areas within the footprint of active construction. Available, undisturbed habitat would be present elsewhere on Raccoon Island during construction and, following restoration, the project would benefit the species due to an increase in available wintering habitat.

COMMON NAME	SCIENTIFIC NAME	FEDERAL STATUS (OR CRITICAL HABITAT UNIT, IF APPLICABLE)	COMMON NAME	SCIENTIFIC NAME
Red Knot Critical Habitat	N/A	Proposed, Unit LA-3	NLAA/short-term to long-term, minor, adverse; long-term, beneficial	While the project would involve the placement of fill on some areas of proposed critical habitat, overall, the project would expand the area of available habitat, as well as barrier island longevity. Newly restored habitats are expected to present the essential physical and biological features needed to support red knots.
West Indian Manatee	*Trichechus manatus*	Threatened	NLAA/short-term to long-term, minor, adverse; long-term, beneficial	Construction activities would temporarily disturb or displace individuals, if present, but agency-required BMPs such as the USFWS' *Standard Manatee Conditions for In-water Work* (USFWS, 2013) must be implemented to prevent or minimize the potential for impact due to vessel strikes or construction activities. To prevent or minimize potential noise related impacts, NOAA must implement the NMFS *Protected Species Construction Conditions* (NMFS, 2021a).
Loggerhead Sea Turtle	*Caretta caretta*	Threatened	NE/NI	The species does not nest in the project area.
Kemp's Ridley Sea Turtle	*Lepidochelys kempii*	Endangered	NE/NI	The species does not nest in the project area.
Green Sea Turtle	*Chelonia mydas*	Threatened	NE/NI	The species does not nest in the project area.
Leatherback Sea Turtle	*Dermochelys coriacea*	Endangered	NE/NI	The species does not nest in the project area.
Hawksbill Sea Turtle	*Eretmochelys imbricata*	Endangered	NE/NI	The species does not nest in the project area.

COMMON NAME	SCIENTIFIC NAME	FEDERAL STATUS (OR CRITICAL HABITAT UNIT, IF APPLICABLE)	COMMON NAME	SCIENTIFIC NAME
Monarch Butterfly	*Danaus plexippus*	Proposed Threatened	NE/NI	While pollinator plant species may be present in terrestrial habitat in the project area, milkweed was not documented in vegetation assessments, and suitable monarch butterfly or caterpillar habitat would not be directly affected by beach, dune, or marsh fill for the project.

Table D- 18. Summary of Impacts on Listed Species Under NOAA NMFS Jurisdiction and Critical Habitats from the Action Alternatives.

Note: NE = no effect; NI = no impact; LAA = likely to adversely affect; NLAA = not likely to adversely affect. Information presented is summarized from the project BA.

COMMON NAME	SCIENTIFIC NAME	FEDERAL STATUS (OR CRITICAL HABITAT UNIT, IF APPLICABLE)	ESA/NEPA EFFECT DETERMINATION	TYPE
Loggerhead Sea Turtle	*Caretta caretta*	Threatened	NLAA/short-term to long-term, minor, adverse; long-term, beneficial	Take of individuals is unlikely with the use of cutterhead dredging. Construction activities would temporarily disturb or displace individuals, if present, but agency-required BMPs must be implemented to prevent or minimize the potential for impact due to vessel strikes or construction activities. To prevent or minimize potential construction related impacts, NOAA must implement the NMFS *Protected Species Construction Conditions* (NMFS, 2021a).
Loggerhead Sea Turtle Critical Habitat	N/A	Northwest Atlantic DPS	NE/NI	Raccoon Island is not within the critical habitat, and potential overlap would be restricted to vessel transit pathways. Vessel transit is not expected to have any effects on the primary constituent elements (PCEs) or physical and biological features (PBFs) for this critical habitat.

COMMON NAME	SCIENTIFIC NAME	FEDERAL STATUS (OR CRITICAL HABITAT UNIT, IF APPLICABLE)	ESA/NEPA EFFECT DETERMINATION	TYPE
Kemp's Ridley Sea Turtle	*Lepidochelys kempii*	Endangered	NLAA/short-term to long-term, minor, adverse; long-term, beneficial	Take of individuals is unlikely with the use of cutterhead dredging. Construction activities would temporarily disturb or displace individuals, if present, but agency-required BMPs must be implemented to prevent or minimize the potential for impact due to vessel strikes or construction activities. To prevent or minimize potential construction related impacts, NOAA must implement the NMFS *Protected Species Construction Conditions* (NMFS, 2021a).
Green Sea Turtle	*Chelonia mydas*	Threatened	NLAA/short-term to long-term, minor, adverse; long-term, beneficial	Take of individuals is unlikely with the use of cutterhead dredging. Construction activities would temporarily disturb or displace individuals, if present, but agency-required BMPs would be implemented to prevent or minimize the potential for impact due to vessel strikes or construction activities. To prevent or minimize potential construction related impacts, NOAA would implement the NMFS *Protected Species Construction Conditions* (NMFS, 2021a).
Green Sea Turtle Critical Habitat	N/A	Proposed, North Atlantic DPS	NE/NI	Raccoon Island is not within the proposed critical habitat, and potential overlap would be restricted to vessel transit pathways. Vessel transit is not expected to have any effects on the PCEs or PBFs for this critical habitat.
Leatherback Sea Turtle	*Dermochelys coriacea*	Endangered	NE/NI	The species does not occur in the Action Area with any regularity, particularly in proximity to Raccoon Island.
Hawksbill Sea Turtle	*Eretmochelys imbricata*	Endangered	NE/NI	The species does not occur in the Action Area with any regularity, particularly in proximity to Raccoon Island.

COMMON NAME	SCIENTIFIC NAME	FEDERAL STATUS (OR CRITICAL HABITAT UNIT, IF APPLICABLE)	ESA/NEPA EFFECT DETERMINATION	TYPE
Giant Manta Ray	*Manta birostris*	Threatened	NLAA/short-term to long-term, minor, adverse; long-term, beneficial	Construction activities would temporarily disturb or displace individuals, if present, but agency-required BMPs must be implemented to prevent or minimize the potential for impact due to vessel strikes or other construction activities. To prevent or minimize potential construction related impacts, NOAA must implement the NMFS *Protected Species Construction Conditions* (NMFS, 2021a).
Rice's Whale	*Balaenoptera ricei*	Endangered	NLAA/short-term to long-term, minor, adverse (vessel access only)	Occurrences of Rice's whales are unlikely for this project and limited to the vessel transit pathways in deeper waters. Potential impacts include vessel strikes which would be prevented or minimized by implementing BMPs for vessel operation (Full list of BMPs available in Raccoon Island Restoration Project BA, which will be made publicly available).
Rice's Whale critical habitat	N/A	Proposed	NE/NI	Raccoon Island is not within the proposed critical habitat and overlap with the Action Area would be restricted to vessel transit pathways. Vessel transit is not expected to have any effects on the PBFs for this critical habitat.
Sperm Whale	*Physeter macrocephalus*	Endangered	NLAA/short-term to long-term, minor, adverse (vessel access only)	Occurrences of sperm whales are unlikely for this project and limited to the vessel transit pathways in deeper waters. Potential impacts include vessel strikes which would be prevented or minimized by implementing BMPs for vessel operation. (Full list of BMPs available in Raccoon Island Restoration Project BA, which will be made publicly available).

D.3.2.4.2.1.1 ALTERNATIVE 1 – NO ACTION

Under the No Action Alternative, the project would not be implemented, and the short-term to long-term, minor to moderate, adverse impacts on ESA-listed species associated with construction of the action alternatives would not occur. However, long-term benefits from habitat creation, shoreline stabilization, and increased barrier island longevity would also not occur.

Over time, coastal processes, shoreline change, overwash, and erosion would continue to affect the island. Modeling of future without project conditions indicates that continued loss of island elevation would result in conversion of supratidal and intertidal habitats to subtidal open water and soft-bottom habitats over the 20-year analysis period. The loss of beach, dune, and marsh habitats would reduce available wintering and foraging habitat for ESA-listed shorebirds, including piping plover and rufa red knot, and would diminish the overall suitability of the island as coastal wildlife habitat.

While the No Action Alternative would maintain existing marine habitats, continued island degradation could reduce the ecological function of nearshore environments that support prey species and refuge areas used by protected marine fauna. ESA-listed sea turtles could still occur in offshore and nearshore waters adjacent to the island, but habitat loss along the shoreline could reduce foraging opportunities over time. Overall, the No Action Alternative would result in the gradual loss of barrier island habitat and associated ecological functions, leading to long-term, (up to) major, adverse impacts on threatened and endangered species that rely on coastal and nearshore habitats in the Action Area.

D.3.2.4.2.1.2 ALTERNATIVE 2

Potential short-term to long-term, minor to moderate, adverse effects on threatened and endangered species and their habitats could occur as a result of project construction activities; however, long-term benefits to protected species, particularly shorebirds and marine species, are expected once construction is complete. By restoring Raccoon Island and incorporating shoreline stabilization and sediment retention features, the project is expected to prolong the persistence of barrier island habitat and associated nearshore environments that support ESA-listed species.

Table D- 17 and Table D- 18 summarize the potential impacts on threatened and endangered species for Alternative 2. As further described in the BA (see Raccoon Island Restoration Project BA, which will be made publicly available), BMPs would be implemented during construction to prevent or minimize the potential for impacts on protected species, including measures from the *Protected Species Construction Conditions* (NMFS, 2021a), *Measures for Reducing Entrapment Risk to Protected Species* (NMFS, 2012), *Vessel Strike Avoidance Measures and Reporting for Mariners* (NMFS, 2021b), and *Standard Manatee Conditions for In-water Work* (USFWS, 2013).

In summary, potential short-term to long-term, minor, adverse effects on protected species such as manatee, dolphins, sea turtle species occurring in the marine environment, Rice's whale, sperm whale, and other large marine fauna may include temporary, localized noise impacts, entrapment risks, and collisions with vessels or dredging equipment. For each of these species, impacts would be avoided and minimized to the extent practicable through implementation of the BMPs and protected species measures described above.

Potential short-term to long-term, minor to moderate, adverse effects would occur where the project would affect shorebirds and their associated designated or proposed critical habitat (piping plover and rufa red knot), as well as marine species utilizing nearshore and offshore waters. These species may be temporarily displaced or disturbed by construction noise, vessel activity, or localized turbidity during dredging and sediment placement. However, following construction, long-term benefits to habitat quality and island longevity are expected to provide improved and more resilient coastal habitat that supports wintering shorebirds and maintains productive nearshore waters used by marine species.

Maintenance of the Gulfside breakwaters would reduce shoreline erosion and help preserve beach and dune habitats used by ESA-listed shorebirds for roosting and foraging. In addition, expansion of the terminal groin would improve retention of beach sediments and reduce the likelihood of breaching or rapid shoreline retreat, supporting the persistence of intertidal and supratidal habitats within designated or proposed critical habitat areas. By maintaining barrier island elevation and continuity, these features would contribute to long-term habitat stability for listed shorebirds and help sustain nearshore ecological functions that support protected marine species.

Overall, while construction impacts associated with Alternative 2 are expected to be short-term to long-term, minor to moderate, and adverse, impacts following project implementation are expected to be long-term and beneficial due to the stabilization of barrier island habitats and the associated ecological functions that support threatened and endangered species. Adverse impacts associated with implementation of this alternative would be avoided, minimized, or mitigated to the extent practicable through implementation of BMPs, the ESA protected species measures, and other avoidance and minimization measures developed during permitting, consultation, and environmental review processes (see Raccoon Island Restoration Project BA, which will be made publicly available). These measures include implementation of protected species construction conditions, spill prevention measures, and coordination with resource agencies.

D.3.2.4.2.1.3 ALTERNATIVE 3 (PREFERRED ALTERNATIVE)

The duration of construction for the Preferred Alternative would be longer than Alternative 2 (495 days compared to 370 days) and would require a similar type and quantity of construction equipment, which is expected to disturb protected species present in the project area. The principal difference between the Preferred Alternative and Alternative 2 is the inclusion of both living shoreline and traditional BSPS features, which would extend the in-water construction footprint but also provide additional shoreline stabilization and habitat complexity. The impacts to protected marine species would be similar to those in Alternative 2. Because the Preferred Alternative involves additional shoreline structure installation and a longer construction duration than Alternative 2, the potential for temporary disturbance in nearshore waters would be incrementally greater.

Potential short-term to long-term, minor to moderate, adverse effects would also occur for protected shorebirds and their associated designated or proposed critical habitat (piping plover and rufa red knot) due to disturbance, noise, and localized habitat modification during construction. However, the BSPS features, particularly the living shoreline components, would provide long-term benefits by reducing shoreline erosion, stabilizing intertidal habitat, and creating structurally complex nearshore environments that can support prey production and foraging opportunities for coastal wildlife.

Following construction, the increased shoreline stability and enhanced intertidal habitat diversity associated with the Preferred Alternative are expected to improve habitat longevity and ecological function when compared to Alternative 2. These conditions would provide long-term benefits to listed species that utilize coastal and nearshore environments within the project area (see Table D- 17 and Table D- 18).

Overall, while construction impacts associated with the Preferred Alternative are expected to be short-term to long-term, minor to moderate, and adverse, impacts following project implementation are expected to be long-term and beneficial due to improved shoreline stability and the added ecological value of living shoreline features. Adverse impacts would be avoided, minimized, or mitigated through implementation of BMPs, the ESA protected species measures, and other provisions developed during permitting and consultation (see Raccoon Island Restoration Project BA, which will be made publicly available).

D.3.2.4.2.1.4 ALTERNATIVE 6

The duration of construction for Alternative 6 would be the longest of the action alternatives (535 days) and would require a similar type and quantity of construction equipment as Alternatives 2 and 3. As a result, protected species present in the project area would experience disturbance for a longer period relative to the other alternatives. The overall impacts to protected marine species would be similar to those in Alternatives 2 and 3. Because Alternative 6 involves the longest construction duration and substantial in-water work associated with shoreline protection features, the temporal extent of disturbance would be greater than under Alternatives 2 or 3.

Potential short-term to long-term, minor to moderate, adverse effects would also occur for protected shorebirds and their associated designated or proposed critical habitat (piping plover and rufa red knot) due to disturbance, noise, and localized habitat modification during construction. Following construction, the shoreline protection features included in Alternative 6 would reduce erosion and improve the persistence of intertidal and supratidal habitats, providing long-term benefits to listed shorebirds and other coastal species.

Unlike the Preferred Alternative, the shoreline protection features proposed under Alternative 6 would consist of traditional BSPS structures, which would stabilize the shoreline but provide less intertidal habitat complexity than living shoreline approaches. As a result, while long-term habitat stability benefits would occur, the ecological enhancement of nearshore habitat for protected species would be somewhat less than under the Preferred Alternative.

Overall, while construction impacts associated with Alternative 6 are expected to be short-term to long-term, minor to moderate, and adverse, impacts following project implementation are expected to be long-term and beneficial due to increased shoreline stability and improved habitat persistence, though ecological benefits would be slightly reduced compared to the Preferred Alternative (see Table D- 17 and Table D- 18). Adverse impacts would be avoided, minimized, or mitigated through implementation of BMPs, the ESA protected species measures, and other provisions developed during permitting and consultation (see Raccoon Island Restoration Project BA, which will be made publicly available).

D.3.2.4.2.2 Marine Mammals

Marine mammals potentially occurring in the Action Area or Vessel Transit ZOI include both listed and non-listed species under the ESA. The Rice's whale, sperm whale, and manatee are protected by both the MMPA and ESA and are therefore included in the above section. This section focuses on bottlenose dolphins, which are protected only by the MMPA.

D.3.2.4.3 ALTERNATIVE 1 – NO ACTION

Under the No Action Alternative, the project would not be implemented, and the short-term to long-term, minor, adverse impacts on bottlenose dolphins associated with construction activities under the action alternatives would not occur. However, long-term benefits from habitat creation, shoreline stabilization, and increased barrier island longevity would also not occur. Over time, coastal processes, shoreline change, overwash, and erosion would contribute to continued island degradation and conversion of intertidal and supratidal habitats to open water and soft-bottom environments. Although open water habitat would persist, the progressive loss of barrier island structure would reduce the diversity of nearshore habitats that support prey availability and productive foraging areas for dolphins. Overall, the No Action Alternative would result in long-term, minor to moderate, adverse impacts on bottlenose dolphins due to continued habitat degradation and reduced ecological productivity in the nearshore environment.

D.3.2.4.4 ALTERNATIVE 2

Potential short-term to long-term, minor, adverse effects on bottlenose dolphins and their habitat could occur as a result of construction activities associated with Alternative 2. However, long-term benefits to

habitat productivity and stability, once construction is complete, would be expected to benefit dolphins using the waters within the project area. By restoring and stabilizing the barrier island, the project is expected to prolong the persistence of nearshore habitats that support prey resources and productive foraging areas for local dolphin populations. Habitat restoration is further discussed in Section D.2.2.1.

Dolphins in the project area could be affected by temporary disturbance due to the presence of vessels, equipment, and personnel; potential vessel strikes; and entrapment risks associated with temporary construction features. In general, the measures to protect listed species from entrapment and vessel strikes described in D.2.2.4.2.1 above would also reduce risks to dolphins.

The greatest potential for impacts from underwater noise would occur during in-water construction activities, including dredging operations, vessel maneuvering, sediment discharge, and other continuous or intermittent construction sound sources. These impacts would be temporary and limited to periods of active in-water work. NMFS has developed acoustic thresholds that identify sound levels likely to cause behavioral disturbance or injury to marine mammals (NOAA Fisheries, 2023, 2024c). Because construction activities may exceed applicable thresholds, the potential distances to injury and behavioral response thresholds for marine mammals are presented in Table D- 19 and Table D- 20.

Table D- 19. Thresholds for Injury and Behavioral Disturbance from Impulsive Noise and Pile Driving Sound Levels.

Note: dB re 1 µPa = decibels relative to 1 microPascal; dB re 1 µPa^{2}s = decibels relative to 1 microPascal squared normalized to 1 second; peak = peak sound pressure, RMS = root mean square; SELcum = cumulative sound exposure level; SPL = sound pressure level. Generated using the NMFS Multi-Species Pile Driving Calculator tool.

[a] Also referenced as mid-frequency cetaceans in previous NMFS guidance. This includes bottlenose dolphins in the Action Area.

SPECIES / HEARING GROUP	TYPE OF SOUND	PERMANENT INJURY CRITERIA, PEAK SPL (DB RE 1 µPA)	PERMANENT INJURY CRITERIA, SELCUM (DB RE 1 µPA^{2}S)	BEHAVIORAL RESPONSE, RMS SPL (DB RE 1 µPA)
High-frequency cetaceans[a]	Noise	230	193	160
Source sound level, 12-inch timber pile at 10 m measurement distance from pile	Pile Driving	182	157	167

Table D- 20. Isopleth Distances to Injury and Behavioral Disturbance from Impulsive Noise, Meters (ft).

Note: peak = peak sound pressure, RMS = root mean square; SELcum = cumulative sound exposure level; SPL = sound pressure level. Generated using the NMFS Multi-Species Pile Driving Calculator tool

[a] Also referenced as mid-frequency cetaceans in previous NMFS guidance. This includes bottlenose dolphins in the Action Area.

SPECIES / HEARING GROUP	PERMANENT INJURY CRITERIA, PEAK SPL METERS (FT)	PERMANENT INJURY CRITERIA, SELCUM METERS (FT)	BEHAVIORAL RESPONSE, RMS SPL METERS (FT)
High-frequency cetaceans[a]	0.0 (0.0)	0.3 (1.0)	29.3 (96.1)

Maintenance of the Gulfside breakwater would help reduce shoreline erosion and maintain the diversity of nearshore habitats that support prey resources for dolphins. Expansion of the terminal groin would further promote sediment retention and shoreline continuity, helping sustain productive shallow-water foraging areas and supporting long-term ecological productivity within the project area.

Overall, potential short-term to long-term, minor, adverse effects on dolphins may include temporary disturbance, localized underwater noise impacts, entrapment risk, and vessel interactions. Adverse impacts associated with implementation of this alternative would be avoided, minimized, or mitigated to the extent

practicable through implementation of BMPs, the ESA protected species measures, and other avoidance and minimization measures developed during permitting, consultation, and environmental review processes (see Raccoon Island Restoration Project BA, which will be made publicly available). These measures include implementation of protected species construction conditions, spill prevention measures, and coordination with resource agencies. Following construction, long-term improvements in habitat stability and productivity are expected to provide long-term benefits to bottlenose dolphins using the project area.

D.3.2.4.5 ALTERNATIVE 3 (PREFERRED ALTERNATIVE)

The duration of construction for the Preferred Alternative would be longer than Alternative 2 (approximately 495 days compared to 370 days), and the Preferred Alternative would require a similar type and quantity of construction equipment, which is expected to disturb dolphins present in the project area through vessel traffic, in-water work, and underwater noise. Installation of both living shoreline and traditional BSPS components would extend the duration of in-water construction relative to Alternative 2 and could result in localized increases in underwater sound and disturbance during construction.

Unlike Alternative 2, the Preferred Alternative would include limited pile driving associated with installation of signage for shoreline protection structures. Although the number of piles is small and installation duration is short, pile driving represents the primary impulsive noise source evaluated for marine mammals in this analysis. The specific details of pile driving are not finalized; conservative assumptions were used to evaluate potential sound exposure and zones of influence (Table D- 19 and Table D- 20). The resulting distances to injury or behavioral thresholds are expected to remain localized around active construction areas. Construction personnel would be instructed to visually monitor waters near pile driving locations prior to initiating work and to delay activities if a dolphin is observed within the monitoring zone. Personnel would also remain alert for marine mammals during construction activities. Therefore, the potential for injury due to underwater noise is expected to be low.

However, following construction, long-term benefits to habitat stability and productivity are expected. The living shoreline BSPS would reduce shoreline erosion, stabilize nearshore conditions, and create structurally complex intertidal and shallow subtidal habitat that can support prey resources used by dolphins. These features may enhance foraging opportunities by supporting fish and invertebrate communities along the protected shoreline.

Overall, impacts on dolphins from construction are expected to be short-term to long-term, minor, and adverse due to temporary disturbance, underwater noise, and vessel presence. Following project implementation, impacts are expected to be long-term and beneficial as habitat is restored, stabilized, and enhanced, including the addition of protected nearshore habitat associated with the living shoreline BSPS. The general impacts described for Alternative 2 capture the types of impacts anticipated for implementation of Alternative 3, with the primary difference being the slightly longer duration of in-water construction and the additional long-term habitat benefits provided by the shoreline protection features. Adverse impacts would be avoided, minimized, or mitigated through implementation of BMPs, the ESA protected species measures, and other provisions developed during permitting and consultation (see Raccoon Island Restoration Project BA, which will be made publicly available).

D.3.2.4.6 ALTERNATIVE 6

The duration of construction for Alternative 6 would be the longest of the action alternatives (approximately 535 days) and would require a similar type and quantity of construction equipment as Alternatives 2 and 3. As with the Preferred Alternative, limited pile driving associated with installation of shoreline protection signage would occur and would represent a localized impulsive noise source evaluated using the acoustic thresholds and distances (Table D- 19 and Table D- 20). The longer construction period, combined with

extended in-water work associated with installation of shoreline protection structures, is expected to result in a longer period of disturbance to dolphins present in the project area through vessel traffic, equipment operation, and underwater noise.

Although the traditional BSPS proposed under Alternative 6 would provide shoreline stabilization and reduce erosion, these structures would generally provide less structural habitat complexity than the living shoreline features proposed under Alternative 3. As a result, while Alternative 6 would still protect nearshore habitats that support prey resources used by dolphins, it may provide comparatively fewer direct habitat enhancement benefits than the Preferred Alternative.

Overall, impacts on dolphins from construction are expected to be short-term to long-term, minor, and adverse due to temporary disturbance, underwater noise, and vessel activity. Following project implementation, impacts are expected to be long-term and beneficial as shoreline stabilization and restored island elevation help maintain productive nearshore habitats and foraging opportunities for dolphins. The general impacts described for Alternative 2 capture the types of impacts anticipated for implementation of Alternative 6, with the primary differences being the longer duration of construction and the slightly reduced habitat enhancement potential compared to the Preferred Alternative. Adverse impacts would be avoided, minimized, or mitigated through implementation of BMPs, the ESA protected species measures, and other provisions developed during permitting and consultation (see Raccoon Island Restoration Project BA, which will be made publicly available).

D.3.3 Socioeconomic Resources

This section discusses relevant human resources, including socioeconomics, cultural resources, infrastructure, land and marine management, tourism and recreation, aesthetics and visual resources, public health and safety, fisheries and aquaculture, and marine transportation.

D.3.3.1 Socioeconomics

D.3.3.1.1 AFFECTED ENVIRONMENT

Raccoon Island has no permanent residents, structures, or public infrastructure, and it is not accessible by road. Raccoon Island is part of the Isle Dernières Barrier Island Refuge managed by LDWF, and public access and use are therefore limited relative to developed coastal areas. However, the island and surrounding waters are used intermittently for recreational and commercial activities such as fishing, boating, and birdwatching. The island also supports important ecological resources that contribute indirectly to regional fisheries productivity and coastal storm-risk reduction. Raccoon Island is located in Terrebonne Parish, Louisiana, approximately 15 to 20 mi south of the nearest mainland communities, including Cocodrie and other small coastal settlements that rely on the surrounding waters for commercial and recreational use. Restoration of the island is expected to provide benefits to nearby coastal communities by helping sustain habitat for fisheries and wildlife, supporting recreational use, and contributing to the long-term resilience of the Terrebonne Basin shoreline

D.3.3.1.2 ENVIRONMENTAL CONSEQUENCES

D.3.3.1.2.1 Alternative 1 – No Action

Under the No Action Alternative, the project would not be implemented, and construction-related short-term economic benefits would not occur. Implementation of the project is anticipated to improve natural resources and barrier island function, which would indirectly support regional fisheries productivity,

recreational use, and coastal resilience over the long term. Under the No Action Alternative, these indirect benefits would not be realized. Continued degradation and loss of barrier island habitat would likely reduce ecosystem services that support regional economic activity, resulting in a long-term, minor, adverse impact on socioeconomic conditions over time.

D.3.3.1.2.2 Alternative 2

The project area is uninhabited and would remain so under Alternative 2. Construction activities associated with Alternative 2 would result in short-term, beneficial impacts on the local and regional economy. These benefits would occur through the purchase of construction materials and equipment, employment of a portion of the workforce from the regional labor pool, and spending in nearby coastal communities by project personnel during the construction period.

Following construction, Alternative 2 would provide long-term, beneficial socioeconomic impacts through improvements to fisheries habitat, wildlife resources, and barrier island stability. Restoration of beach, dune, and marsh habitats would support commercial and recreational fisheries productivity and could enhance opportunities for recreational boating, fishing, and wildlife viewing in the area. In addition, improved island elevation and shoreline stability would contribute to storm attenuation and wave-energy reduction benefits for inland waters, which indirectly support the resilience of nearby coastal communities.

Nearest mainland communities in Terrebonne Parish are located tens of miles north of the project area and would not experience direct adverse impacts related to construction traffic, noise, or visual disturbance. Because work would occur offshore and away from populated areas, construction activities would not be visible from the mainland.

Overall, Alternative 2 would result in short-term, beneficial economic impacts during the approximately 370-day construction period and long-term, beneficial impacts associated with improved habitat, fisheries productivity, and barrier island function. Although Alternative 2 would provide measurable long-term benefits, the magnitude of these benefits would be lower than under alternatives that include additional shoreline protection features and greater habitat creation and associated ecosystem service benefits (see Table D-12).

D.3.3.1.2.3 Alternative 3 (Preferred Alternative)

Impacts on socioeconomic resources under the Preferred Alternative would be similar to those described for Alternative 2. Construction would generate short-term, beneficial economic impacts through regional spending on labor, equipment, materials, and services during the approximately 495-day construction period. Following construction, the Preferred Alternative would provide long-term, beneficial socioeconomic impacts through improvements to fisheries habitat, wildlife resources, and barrier island stability. In addition to the benefits described for Alternative 2, the inclusion of living shoreline BSPS features would be expected to enhance intertidal habitat and support aquatic productivity along the bayside shoreline. These features could provide incremental benefits to commercial and recreational fisheries and associated economic activity in the region.

Because the Preferred Alternative includes additional shoreline features and a longer construction duration than Alternative 2, it would likely result in slightly greater short-term economic benefits during construction and modestly greater long-term ecosystem service benefits. However, impacts on nearby communities would remain indirect, and no adverse socioeconomic effects are anticipated. Overall, the Preferred Alternative would result in short-term and long-term, beneficial impacts on socioeconomic resources, with slightly greater benefits than Alternative 2 due to increased habitat protection and creation (see Table D- 12).

D.3.3.1.2.4 Alternative 6

Impacts on socioeconomic resources under Alternative 6 would be similar to those described for Alternatives 2 and 3. Construction would generate short-term, beneficial economic impacts through regional spending on labor, materials, equipment, and services during the approximately 535-day construction period, which is the longest among the action alternatives and therefore could result in slightly greater short-term economic benefits. Following construction, Alternative 6 would provide long-term, beneficial socioeconomic impacts through improved fisheries habitat, wildlife resources, and barrier island stability. Shoreline protection features would help reduce erosion and support the longevity of restored habitats, contributing to indirect benefits for commercial and recreational fisheries and associated economic activity. However, because the bayside protection features would consist of traditional BSPS rather than living shoreline elements, Alternative 6 may provide somewhat fewer ecosystem service benefits related to aquatic productivity than the Preferred Alternative.

As with the other action alternatives, nearby communities would not experience direct, adverse impacts from construction activities due to the offshore location of the project, and visual or noise effects would be minimal. Overall, Alternative 6 would result in short-term and long-term, beneficial impacts on socioeconomic resources, with the greatest short-term economic activity during construction, but slightly fewer long-term ecological productivity benefits than the Preferred Alternative (see Table D- 12).

D.3.3.2 Cultural Resources

D.3.3.2.1 AFFECTED ENVIRONMENT

Cultural resources include evidence of past human activity, such as archaeological sites, historic structures, and cultural landscapes. For the Raccoon Island Restoration Project, cultural resources considerations focus primarily on the potential for archaeological deposits within the island and adjacent submerged areas.

A Phase I archaeological survey of Raccoon Island was conducted in February 2024 to evaluate the presence of historic or prehistoric cultural resources within the APE. The investigation included background research, a pedestrian survey of the island, and excavation of 21 shovel tests across accessible portions of the island. No intact historic or prehistoric deposits, structures, or artifacts were identified during the survey, and archival research indicates that such resources are unlikely to occur within the APE (Baird-Stantec JV, 2026b).

Historical review shows that Raccoon Island is one of the remnants of the former Isle Dernière resort island, which was largely destroyed by the 1856 hurricane and subsequently fragmented by storms and erosion. Although the historic resort once contained hotels, houses, and other structures, the present island landmass is not located in the same position as the original settlement and has been heavily altered by coastal processes, subsidence, and repeated storm events. These geomorphic conditions, along with poorly drained soils and continual shoreline reworking, result in low potential for preservation of archaeological materials on the existing island (Baird-Stantec JV, 2026b).

Review of the Louisiana Cultural Resources Map and other archival sources found no previously recorded archaeological sites or historic properties within the project area (Baird-Stantec JV, 2026b). Based on field results and background research, the survey concluded that the project would result in no historic properties affected, provided that standard unanticipated discovery procedures are followed during construction.

In addition to the Phase I terrestrial survey conducted on Raccoon Island, cultural resource investigations were completed for the SSB88 Borrow Area and associated pipeline corridor between September 16 and 20, 2025 (APTIM, 2025). During this effort, 81.35 nautical miles of high-resolution geophysical data were

collected, and cultural resource review of magnetometer and sidescan data was performed to identify and evaluate magnetic anomalies and potential contacts. The results of these investigations are documented in the Remote Sensing Survey Technical Memoranda and support a determination that no historic properties would be affected within the investigated borrow area, provided that standard unanticipated discovery procedures are implemented during construction (APTIM, 2025). In addition, two subsurface features interpreted as paleo channels (relict fluvial features) were identified within portions of the pipeline conveyance corridor. These features are deeply buried; however, they represent geomorphic features that may have had potential to support past human use along their margins.

D.3.3.2.2 ENVIRONMENTAL CONSEQUENCES

D.3.3.2.2.1 Alternative 1 – No Action

Under the No Action Alternative, none of the proposed restoration activities would occur, and the project would not be implemented. There are no previously reported cultural resources in the proposed APE. A Phase I cultural resources investigation was conducted in support of this proposed project and found no cultural resources within the project area (Baird-Stantec JV, 2026b). Although the discovery of archaeological deposits within the natural landscapes of the project area is possible, the normal setting is not conducive to their preservation. Therefore, even in normal conditions, the potential for encountering preserved cultural materials with the existing environment within the project area is categorized as low. Under the No Action Alternative, there would be no short-term or long-term impacts on cultural resources.

D.3.3.2.2.2 Alternative 2

The Phase I cultural resources survey conducted for the project identified no historic properties or archaeological sites within the project area or associated offshore borrow area and pipeline conveyance corridor (APTIM, 2025; Baird-Stantec JV, 2026b), although subsurface geophysical investigations identified two deeply buried paleo channel features within the pipeline corridor that are not expected to be directly affected by dredging activities. As a result, although construction of Alternative 2 would involve sediment placement, grading, and other ground-disturbing activities, no short-term or long-term adverse impacts on known cultural resources are anticipated because none are present within the project footprint. Compliance with Section 106 of the National Historic Preservation Act would be completed prior to construction. Construction planning may incorporate minor design considerations, such as avoiding placement of booster pumps or other stationary equipment over identified paleo channel features where practicable, to further minimize the potential for disturbance. In the unlikely event that previously unidentified cultural materials or human remains are encountered during construction, work would cease in the vicinity of the discovery and appropriate avoidance, notification, and consultation procedures would be implemented in coordination with the Louisiana State Historic Preservation Officer and other appropriate parties.

D.3.3.2.2.3 Alternative 3 (Preferred Alternative)

The Phase I cultural resources investigation conducted in support of this proposed project found no cultural resources within the project area. As with Alternative 2, construction planning may avoid placement of booster pumps or other stationary equipment over the identified paleo channel features. Similar to Alternative 2, there would be no anticipated short-term or long-term impacts on cultural resources from implementation of the Preferred Alternative.

D.3.3.2.2.4 Alternative 6

The Phase I cultural resources investigation conducted in support of this proposed project found no cultural resources within the project area. As with Alternative 2, construction planning may avoid placement of booster pumps or other stationary equipment over the identified paleo channel features. Similar to

Alternative 2, there would be no anticipated short-term or long-term impacts on cultural resources from implementation of Alternative 6.

D.3.3.3 Infrastructure

D.3.3.3.1 AFFECTED ENVIRONMENT

Raccoon Island is remote, uninhabited, and accessible only by boat or aircraft. There are no permanent structures, utilities, or transportation infrastructure located on the island itself. The surrounding environment is dominated by barrier-island shoreface, marsh, and open water habitats typical of the Terrebonne Basin barrier shoreline.

Offshore infrastructure in the broader project vicinity primarily consists of numerous pipelines, wellheads, and platform facilities located both seaward and landward of the island, several of which occur within a few miles of the restoration footprint (Baird-Stantec JV, 2023). Available Bureau of Ocean Energy Management (BOEM) data indicate that existing pipelines and well infrastructure occur in the offshore area near the project, but the proposed borrow area and conveyance corridors have been sited to avoid these features where possible. NOAA review of National Pipeline Mapping System data confirmed that no additional infrastructure resources occur within the project area beyond those identified in BOEM and state datasets (Baird-Stantec JV, 2023). BOEM and state datasets further indicate that there are no active oil and gas wells located within the project area including the borrow area or conveyance corridors.

Magnetometer and geophysical surveys conducted between approximately 2003 and 2018 in the vicinity of Raccoon Island identified numerous magnetic anomalies associated with prior infrastructure, debris, or unknown sources. Coverage of these surveys is generally good in offshore areas, including the Ship Shoal Borrow Area, but is more limited within some proposed pipeline corridors and borrow investigation zones. To address these data gaps, high-resolution geophysical surveys were conducted in 2025 within the Ship Shoal Borrow Area and associated pipeline conveyance corridors (APTIM, 2025). These investigations included bathymetry, sub-bottom profiler, sidescan sonar, and magnetometer data collection and review to verify pipeline locations, identify magnetic anomalies, and evaluate potential infrastructure or cultural resource constraints. Survey results were used to confirm avoidance of known infrastructure features and to screen for previously unidentified obstructions. Overall, infrastructure within the project area is limited and largely offshore, consisting primarily of existing pipelines and associated facilities.

D.3.3.3.2 ENVIRONMENTAL CONSEQUENCES

D.3.3.3.2.1 Alternative 1 – No Action

Under the No Action Alternative, the project would not be implemented, and the long-term, beneficial impacts associated with implementation of the action alternatives would not occur. Impacts on infrastructure are not anticipated under the No Action Alternative.

D.3.3.3.2.2 Alternative 2

No direct impacts on infrastructure would occur during or after construction of Alternative 2 because no roads, utilities, or built facilities exist on Raccoon Island. Offshore infrastructure in the broader project vicinity consists primarily of existing pipelines and associated oil and gas facilities. The borrow area and conveyance corridors have been sited to avoid known infrastructure to the extent practicable. Where crossings of existing pipelines cannot be avoided, coordination with pipeline owners and implementation of standard protection measures (such as separation distances, protective mats, or crossing protocols) would ensure that construction activities do not damage or interfere with existing infrastructure.

Because sediment pipelines used for material transport would be temporary and installed on or above the seabed during construction, they are not expected to affect existing buried pipelines or other offshore facilities. Following construction, all temporary conveyance infrastructure would be removed.

Overall, Alternative 2 is not expected to result in adverse impacts on existing infrastructure. Stabilization and restoration of the island would provide long-term, indirect benefits by helping reduce shoreline retreat, breaching risk, and wave energy reaching nearshore waters. Although no infrastructure occurs on the island itself, offshore pipelines, wells, and platforms are present in the surrounding shelf environment, including areas landward of the island (Baird-Stantec JV, 2023). By maintaining the barrier island's position and continuity, the project may help moderate nearshore hydrodynamic conditions and sediment movement in the vicinity, which could contribute to maintaining stable seabed conditions near existing infrastructure over time.

D.3.3.3.2.3 Alternative 3 (Preferred Alternative)

Infrastructure conditions under the Preferred Alternative would be the same as those described for Alternative 2. Construction would avoid known pipelines to the extent practicable, and any unavoidable crossings would be coordinated with owners and implemented using standard protection measures. Therefore, no permanent or adverse impacts on infrastructure are anticipated. Restoration of the island may provide indirect benefits by helping maintain shoreline position and nearshore sediment stability over time.

D.3.3.3.2.4 Alternative 6

Infrastructure conditions under Alternative 6 would be the same as those described for alternatives 2 and 3. Construction would avoid known pipelines where practicable, and any unavoidable crossings would be coordinated with owners and implemented using standard protection measures. No permanent or adverse impacts on infrastructure are anticipated. Restoration and shoreline stabilization may provide indirect benefits by helping maintain shoreline position and nearshore sediment stability over time.

D.3.3.4 Land and Marine Management

D.3.3.4.1 AFFECTED ENVIRONMENT

The Federal Coastal Zone Management Act encourages states to develop coastal management programs for preserving coastal resources. Once a state develops an approved coastal management program, federal consistency requires that federal actions affecting coastal land or water resources be consistent with that program. The C&E OCM oversees the Louisiana Coastal Resources Program. The project is located within the Louisiana Coastal Zone established under the State and Local Coastal Resources Management Act of 1978 (DENR, 2026).

Terrebonne Parish has an approved Local Coastal Program that establishes land and water use policies to guide development and resource protection within the parish coastal zone (Terrebonne Parish, 2000). The project area lies within coastal management areas designated for barrier island restoration, shoreline stabilization, and habitat protection, and is consistent with state and parish objectives to maintain barrier island systems, sustain fisheries habitat, and reduce storm risk to interior marshes and communities.

Raccoon Island is part of the Isle Dernières Barrier Island Refuge, which is managed by LDWF on behalf of the State of Louisiana (Baird-Stantec JV, 2026c; Holcomb et al., 2015; Klueh-Mundy et al., 2025). The island represents an important colonial waterbird colonies in the northern Gulf, providing critical habitat for brown pelican (*Pelecanus occidentalis*) and numerous other species identified within Louisiana's Wildlife Action Plan as SGCN, as well as fish and invertebrates that rely on barrier island habitats (Holcomb et al., 2015; Klueh-Mundy et al., 2025). Restoration and protection of the island are consistent with state wildlife

conservation priorities (Holcomb et al., 2015; Klueh-Mundy et al., 2025) and coastal restoration goals (CPRA, 2023).

Portions of the project area extend into state and federal waters subject to fisheries management under the MSA. These waters are managed to support sustainable fisheries, protect essential fish habitat, and maintain ecological productivity of coastal and marine environments.

The project area is not located within a National Wildlife Refuge, designated wilderness area, or Coastal Barrier Resources System unit. However, the island and surrounding waters are recognized as important for habitat protection, fisheries productivity, and coastal resilience, and restoration of the island aligns with federal and state coastal resource management objectives (Baird-Stantec JV, 2024; CPRA, 2023).

D.3.3.4.2 ENVIRONMENTAL CONSEQUENCES

D.3.3.4.2.1 Alternative 1 – No Action

Under the No Action Alternative, the project would not be implemented, and short-term construction-related effects would not occur. However, long-term benefits associated with habitat restoration, shoreline stabilization, and increased barrier island persistence would also not occur. Continued erosion, overwash, and island fragmentation would reduce the effectiveness of the refuge in meeting its habitat protection objectives and would diminish the island's role in supporting state coastal management goals.

Although regulatory frameworks and management jurisdictions would remain unchanged, the progressive degradation of barrier island habitat would be inconsistent with state, parish, and refuge management objectives for habitat conservation, fisheries support, and coastal resilience. Therefore, the No Action Alternative would result in long-term, minor to moderate, adverse effects relative to land and marine management goals in the project area.

D.3.3.4.2.2 Alternative 2

As discussed above, Raccoon Island is part of the Isle Dernières Barrier Island Refuge, which is managed by LDWF. Portions of the project would occur within refuge boundaries, including areas of beach, dune, and marsh habitats, and combined with maintenance and enhancement of the Gulfside breakwater and terminal groin, would improve shoreline stability and sediment retention. These actions would support the refuge's management objectives of protecting and enhancing habitat for colonial nesting waterbirds, other wildlife species, and coastal fisheries resources (Holcomb et al., 2015; Klueh-Mundy et al., 2025).

Construction of Alternative 2 would result in temporary access restrictions within areas of active construction on both land and adjacent waters. These access limitations would be short-term, minor, adverse, and limited to the duration of active construction activities.

Following construction, Alternative 2 would result in direct, long-term, beneficial impacts on land and marine management within the project area. The restoration of beach, dune, and marsh habitats and stabilization of the shoreline would support the refuge's management objectives of protecting and enhancing habitat for colonial nesting waterbirds, other wildlife species, and coastal fisheries resources. The project would also be consistent with the goals of the Louisiana Coastal Zone Management Program and Terrebonne Parish's local coastal management framework by promoting shoreline stabilization, habitat restoration, and coastal resilience.

Overall, Alternative 2 would result in short-term, minor, adverse impacts on land and marine management objectives due to temporary construction-related access restrictions, and long-term, beneficial impacts through habitat restoration, shoreline stabilization, and support of refuge management goals.

D.3.3.4.2.3 Alternative 3 (Preferred Alternative)

Overall, the impacts described for Alternative 2 would also occur under the Preferred Alternative, though construction would occur over a longer duration (495 days), resulting in slightly greater short-term disturbance within the refuge and adjacent waters.

Following construction, the Preferred Alternative would result in long-term, beneficial impacts on land and marine management objectives in the project area through restoration and stabilization of barrier island habitats that support refuge management objectives. The inclusion of both traditional and living shoreline components of the BSPS would provide additional shoreline stabilization and ecological enhancement benefits relative to Alternative 2, further supporting coastal habitat conservation goals under the Louisiana Coastal Zone Management Program and Terrebonne Parish's coastal management framework.

Overall, the Preferred Alternative would result in short-term, minor, adverse impacts during construction and long-term, beneficial impacts following implementation, with slightly greater long-term management benefits than Alternative 2 due to the additional habitat stabilization and enhancement features (see Table 3-9. Estimated Project Features and Construction Costs for the Raccoon Island Restoration Project Alternatives.).

D.3.3.4.2.4 Alternative 6

The general types of impacts described for Alternatives 2 and 3 would also occur under Alternative 6. Because Alternative 6 has the longest construction duration (535 days), these short-term restrictions would persist slightly longer than under Alternatives 2 and 3, but would remain localized and temporary.

Following construction, Alternative 6 would result in long-term, beneficial impacts on land and marine management objectives in the project area through restoration and stabilization of barrier island habitats that support refuge management objectives and coastal management goals. The traditional BSPS would enhance island stability and support habitat conservation; however, because the shoreline protection features would be traditional structures rather than living shoreline elements, long-term ecological enhancement benefits would be somewhat lower than under the Preferred Alternative, though still beneficial overall.

Overall, Alternative 6 would result in short-term, minor, adverse impacts during construction and long-term, beneficial impacts following implementation, with benefits generally comparable to Alternative 2 but slightly less than the Preferred Alternative due to reduced ecological enhancement associated with shoreline protection features (see Table 3-9. Estimated Project Features and Construction Costs for the Raccoon Island Restoration Project Alternatives.).

D.3.3.5 Tourism and Recreational Use

D.3.3.5.1 AFFECTED ENVIRONMENT

Raccoon Island is managed as part of the Isles Dernières Barrier Island Refuge by LDWF. Management of the refuge emphasizes protection of colonial nesting birds and sensitive coastal habitats, and public access to the island itself is restricted to minimize disturbance to wildlife and habitat resources. Although access to the island is limited, the surrounding waters are used for recreational activities. Fishing occurs in nearshore waters around the island and within adjacent bays, and the area is recognized for supporting large seabird colonies, making it a destination for bird viewing from vessels operating offshore. Recreational boating also occurs in surrounding waters, though the island's remote offshore location and access limitations result in relatively low visitation compared to more accessible coastal recreation areas.

D.3.3.5.2 ENVIRONMENTAL CONSEQUENCES

D.3.3.5.2.1 Alternative 1 – No Action

Under the No Action Alternative, the project would not be implemented, and short-term construction-related effects on recreation would not occur. However, long-term benefits associated with maintaining barrier island habitat and wildlife resources would also not occur. Continued shoreline retreat, overwash, and island fragmentation would reduce the availability of suitable habitat for fish and wildlife species that support recreational fishing and wildlife viewing opportunities in the area.

Over time, degradation of the island and associated habitats could diminish the recreational value of the surrounding waters and reduce the area's attractiveness for boating, fishing, and bird viewing. Therefore, the No Action Alternative would result in long-term, minor to moderate, adverse impacts on tourism and recreational use associated with continued habitat loss and reduced ecological function.

D.3.3.5.2.2 Alternative 2

Short-term, minor, adverse impacts on tourism and recreational use could occur during construction of Alternative 2 due to the presence of construction equipment and personnel, temporary disturbance of fish and wildlife habitat, and increased vessel traffic in the project area. Portions of waters immediately surrounding the island may be temporarily restricted during active construction for safety purposes, which could limit access for recreational fishing and boating in localized areas. However, recreational use would still be possible in nearby waters outside of active work zones, and the temporary nature of construction activities would limit the duration of these impacts. Shoreline protection activities, including maintenance and enhancement of the Gulfside breakwater and terminal groin, would occur within nearshore waters but would not permanently restrict public access beyond existing refuge limitations.

Following construction, long-term, beneficial impacts on tourism and recreational use are expected as a result of improved island stability and habitat conditions. Restoration of beach, dune, and marsh habitats would support fish and wildlife populations, which could enhance recreational fishing opportunities and wildlife viewing from surrounding waters. Increased island longevity and shoreline stability would also help maintain the area's value as a destination for boating and bird viewing over the long term.

Overall, Alternative 2 would result in short-term, minor, adverse impacts on tourism and recreational use during construction and long-term, beneficial impacts following project implementation due to improved habitat conditions and sustained recreational opportunities in surrounding waters.

D.3.3.5.2.3 Alternative 3 (Preferred Alternative)

Impacts on tourism and recreational use under the Preferred Alternative would be similar to those described for Alternative 2. Because the Preferred Alternative would include additional shoreline protection features and a longer construction duration (495 days), temporary disturbances to boating, fishing, and wildlife viewing opportunities could persist slightly longer than under Alternative 2.

Following construction, long-term, beneficial impacts on tourism and recreation are expected to be somewhat greater than those under Alternative 2. In addition to the benefits associated with improved island stability and habitat conditions, the living shoreline components of the BSPS would enhance nearshore habitat complexity and productivity. These habitat additions would support fish and invertebrate communities, potentially improving fishing opportunities and wildlife viewing in adjacent waters. These improvements would help maintain the area's recreational value over time.

Overall, the Preferred Alternative would result in short-term, minor, adverse impacts on tourism and recreational use during construction and long-term, beneficial impacts following project implementation, with benefits expected to be slightly greater than Alternative 2 due to enhanced habitat conditions.

D.3.3.5.2.4 Alternative 6

Impacts on tourism and recreational use under Alternative 6 would be similar to those described for Alternative 2 and Alternative 3. Because Alternative 6 would have the longest construction duration (535 days), these temporary disruptions to boating, fishing, and wildlife viewing opportunities could persist longer than under the other action alternatives.

Following construction, long-term, beneficial impacts on tourism and recreation are expected due to improved island stability, enhanced habitat conditions, and continued support for recreational fishing and wildlife viewing in surrounding waters. However, because Alternative 6 would include traditional shoreline protection features without the living shoreline features associated with the Preferred Alternative, the magnitude of long-term, recreational benefits related to nearshore habitat productivity may be slightly less than the Preferred Alternative, though still beneficial overall.

Overall, Alternative 6 would result in short-term, minor, adverse impacts on tourism and recreational use during construction and long-term, beneficial impacts following project implementation.

D.3.3.6 Aesthetics and Visual Resources

D.3.3.6.1 AFFECTED ENVIRONMENT

Visual resources include natural and human-influenced components of the environment perceived by human viewers. “Aesthetics” refers to beauty in both form and appearance, including landforms, vegetation, water features, and any built elements. Perceptions of aesthetic values may vary among observers depending on personal preferences and viewing context.

The project area consists of a barrier island landscape characterized primarily by sandy shoreline, dunes, marsh vegetation, and surrounding open waters. There are no permanent residential structures, roads, or utilities on the island. The visual setting is therefore dominated by natural coastal features, including beach, marsh, tidal channels, and offshore waters, with occasional visibility of existing shoreline protection features, including portions of the Gulfside breakwaters.

Views of the island are primarily available from vessels operating in surrounding waters and from aircraft. Recreational users, including anglers and wildlife observers, may experience views of the island while boating in adjacent bays and nearshore waters. Because the island is located offshore and separated from populated mainland communities, the project area is not visible from nearby towns or coastal highways.

Overall, the visual character of the project area is defined by its undeveloped barrier island setting, natural shoreline features, and open water views, with limited existing human-made elements.

D.3.3.6.2 ENVIRONMENTAL CONSEQUENCES

D.3.3.6.2.1 Alternative 1 – No Action

Under the No Action Alternative, the project would not be implemented, and short-term visual changes associated with construction activities would not occur. However, long-term benefits associated with restoration of barrier island landforms and vegetation would also not occur.

Continued shoreline retreat, overwash, and island fragmentation would likely reduce the extent of beach, dune, and marsh features over time, resulting in a simplified and increasingly degraded visual landscape characterized by reduced vegetation, lower island elevation, and expanded open-water areas. These changes would diminish the natural visual character of the island and surrounding waters.

Therefore, the No Action Alternative would result in long-term, minor, adverse impacts on aesthetic and visual resources associated with continued degradation of natural barrier island features.

D.3.3.6.2.2 Alternative 2

Given its offshore location, the project area would primarily be visible from vessels operating in nearby waters and from aircraft. During construction of Alternative 2, equipment, personnel, and construction vessels would be visible to recreational boaters and other users of the surrounding waters. These visual changes would represent short-term, minor, adverse impacts during periods of active construction. Shoreline protection activities, including maintenance and enhancement of the Gulfside breakwater and terminal groin, would not substantially alter the island's existing visual character because these features are already present and are low-profile relative to the overall barrier island landscape.

Following construction, restoration of beach, dune, and marsh habitats would reinforce the island's natural coastal landforms and vegetation patterns and help reestablish a more continuous barrier island profile consistent with historic conditions. The stabilization of the shoreline and reestablishment of vegetated features would enhance the natural appearance of the island relative to existing degraded conditions. These changes would result in long-term, beneficial impacts on aesthetic and visual resources. The degree to which these changes are noticeable would vary depending on viewer familiarity with the island and surrounding waters.

Overall, Alternative 2 would result in short-term, minor, adverse impacts on aesthetics and visual resources during construction and long-term, beneficial impacts following project implementation. Because Alternative 2 includes the smallest restoration footprint, the magnitude of long-term visual change would be slightly less pronounced than for the other two action alternatives.

D.3.3.6.2.3 Alternative 3 (Preferred Alternative)

Construction of the Preferred Alternative would result in similar aesthetic and visual impacts as Alternative 2. Because the Preferred Alternative includes a longer construction duration than Alternative 2, these temporary visual disturbances would occur over a somewhat longer period.

Following construction, impacts on visual resources would be similar to those described for Alternative 2, with long-term, beneficial effects associated with restoration of beach, dune, and marsh habitats and improved shoreline stability. In addition, the BSPS, which includes both traditional and living shoreline components, would introduce low-profile shoreline features along portions of the marsh edge. The living shoreline elements are designed to mimic natural shoreline forms and would generally be perceived as compatible with the island's natural coastal morphology.

Whether individual restoration features or shoreline protection elements would be distinguishable to viewers would depend on their familiarity with existing island conditions and awareness of restoration activities. Overall, the Preferred Alternative would result in short-term, minor, adverse visual impacts during construction and long-term, beneficial impacts following project implementation.

D.3.3.6.2.4 Alternative 6

Overall impacts for Alternative 6 would be similar to those discussed in Alternatives 2 and 3. Because Alternative 6 has the longest construction duration of the action alternatives, these temporary visual disturbances would occur over the longest period.

Following construction, impacts on visual resources would be similar to those described for Alternatives 2 and 3, with long-term, beneficial effects associated with restoration of beach, dune, and marsh habitats and improved shoreline stability. The Alternative 6 shoreline protection features, including traditional breakwater BSPS, would create more visibly engineered shoreline features than the living shoreline elements of the

Preferred Alternative. However, these features would remain low-profile consistent with coastal restoration features commonly present along barrier shorelines.

Whether individual restoration or shoreline protection features would be distinguishable to viewers would depend on familiarity with existing island conditions and awareness of restoration activities. Overall, Alternative 6 would result in short-term, minor, adverse visual impacts during construction and long-term, beneficial impacts following project implementation.

D.3.3.7 Public Health and Safety

D.3.3.7.1 AFFECTED ENVIRONMENT

Public health and safety considerations include the safety of the general public, including boaters and fishermen using surrounding waters, as well as the safety of personnel involved in project construction and implementation. Barrier islands also provide important protective functions by helping reduce the effects of storm surge, wave action, flooding, and saltwater intrusion on interior coastal waters and communities.

EO 13045, Protection of Children from Environmental Health Risks and Safety Risks (1997), requires that potential environmental health and safety risks to children be identified and assessed and that disproportionate risks be addressed.

The project would occur on an uninhabited barrier island and adjacent open waters. Access to the island is limited and managed, and the surrounding waters remain open to the public for navigation, fishing, and other recreational uses. The area is remote, with access primarily by boat, and there are no permanent residents or public facilities on the island itself. The nearest populated communities are located along the Terrebonne Parish coast, 15 to 20 mi to the north and west of the project area.

D.3.3.7.2 ENVIRONMENTAL CONSEQUENCES

D.3.3.7.2.1 Alternative 1 – No Action

Under the No Action Alternative, the project would not be implemented, and the long-term, beneficial effects associated with restoration and stabilization of the barrier island would not occur. Continued coastal erosion, land loss, and island fragmentation would reduce the island's ability to buffer wave energy, storm surge, and tidal forces from interior waters. This reduction in natural storm protection could contribute to increased flooding risk, wave exposure, and saltwater intrusion affecting nearby coastal areas over time.

Therefore, the No Action Alternative would result in long-term, minor, adverse impacts on public health and safety associated with continued degradation of natural coastal protection features.

D.3.3.7.2.2 Alternative 2

Construction of Alternative 2 would not adversely impact public health and safety. Although heavy construction equipment and marine vessels would be used during construction, these risks would be minimized through implementation of navigational controls, safety notifications, marked work zones, and coordination with the USCG. BMPs, such as development of a Stormwater Pollution Prevention Plan, spill prevention measures, and installation of warning signage, would minimize the potential for impacts on public health and safety. Construction contractors would also be required to comply with applicable occupational safety regulations and project-specific safety plans to protect worker health and safety. All applicable federal and state regulations would be followed during construction, and activities would be conducted to avoid, to the greatest extent practicable, any unreasonable interference with public safety or navigation.

Implementation of Alternative 2 would result in long-term, beneficial effects on public health and safety through restoration and stabilization of the barrier island. By increasing island longevity and maintaining its function as a natural buffer, the project would help reduce the effects of wave action, storm surge, and tidal currents on adjacent interior waters and coastal communities, thereby contributing to regional storm risk reduction.

Additionally, the project would comply with EO 13045, Protection of Children from Environmental Health Risks and Safety Risks, and would not be expected to pose disproportionately high or adverse environmental health or safety risks to children. Implementation of Alternative 2 would not create other public health or safety concerns.

D.3.3.7.2.3 Alternative 3 (Preferred Alternative)

Impacts on public health and safety for the Preferred Alternative would be similar to Alternative 2 and would be long-term and beneficial impacts. In addition, signage associated with BSPS may be installed to enhance navigational awareness and public safety for boaters operating near the structures.

D.3.3.7.2.4 Alternative 6

Impacts on public health and safety for Alternative 6 would be similar to Alternative 2 and would be long-term and beneficial. As with the Preferred Alternative, signage associated with BSPS may be installed to enhance navigational awareness and public safety.

D.3.3.8 Fisheries and Aquaculture

D.3.3.8.1 AFFECTED ENVIRONMENT

Waters in and around the project area support both commercial and recreational fisheries that contribute to the local and regional coastal economy. Commercial fishing is an important economic activity in Louisiana. In 2024, commercial fishery landings in the state totaled approximately 695 million pounds, with a dockside value of about $324 million (NOAA Fisheries, 2024a). Shellfish fisheries accounted for the majority of the total commercial value, while finfish species represented a smaller proportion of landings and revenue.

Recreational fishing is also an important activity in the state. The LDWF collects annual data on recreational fishing effort and catch through the LA Creel Survey to inform fisheries management decisions. According to LDWF data, there were approximately 1.65 million recreational angler trips statewide in 2025, including both charter and private/shore-based fishing effort (LDWF, 2026a). Within the Terrebonne/Timbalier Basin, which includes waters surrounding the project area, LDWF estimates indicate approximately 332,000 angler trips in 2025 (LDWF, 2026a). This level of effort reflects substantial recreational use of the Terrebonne coastal system, including nearshore Gulf waters and adjacent estuarine habitats that support a variety of commonly targeted sport fish species. A review of the LDWF Oyster Map (LDWF, 2026b) shows that oyster resources and aquaculture activity in the broader Terrebonne Basin are generally concentrated farther inland to the north and northeast, where salinity and substrate conditions are more favorable for sustained oyster production. Aquaculture facilities and active oyster leases are not located within the project area.

D.3.3.8.2 ENVIRONMENTAL CONSEQUENCES

D.3.3.8.2.1 Alternative 1 – No Action

Under the No Action Alternative, the project would not be implemented, and the short-term disturbances associated with construction would not occur. However, continued barrier island erosion and fragmentation would increase exposure of interior estuarine waters to wave energy, salinity shifts, and habitat degradation.

Over time, these changes could reduce the quality and persistence of marsh and shallow-water nursery habitats that support recreationally and commercially important species.

Therefore, the No Action Alternative would result in long-term, minor, adverse impacts on fisheries resources and fishing opportunities within the Terrebonne Basin.

D.3.3.8.2.2 Alternative 2

A temporary decline in fish and other mobile aquatic species in and near active construction areas would likely occur due to avoidance of construction activities and temporary disturbance of habitats, including within the borrow area, dredge pipeline corridor, and placement areas. This may result in localized, short-term reductions in catch rates and/or displacement of recreational and commercial fishing effort to adjacent waters during active construction (370 days). However, because most finfish and many mobile invertebrates are expected to relocate away from active dredging and fill operations and return following completion, impacts on fishing experiences and fishing opportunity within the project area are expected to be short-term, minor, and adverse.

No public oyster seed grounds and no oyster leases are located within the project area; therefore, Alternative 2 would not directly affect managed oyster resources through placement of material on designated oyster areas. Temporary increases in turbidity and suspended sediments during dredging and fill operations could, however, cause short-term, minor, adverse effects on water column conditions and benthic habitat quality in localized work areas, with the greatest potential for effects occurring during active dredging and sediment placement (see Section D.2.2.3, and the project-specific EFH analysis in the Raccoon Island Restoration Project EFH Assessment, which will be made publicly available). Any such water-quality related effects are expected to be temporary and dissipate after construction ceases.

Following construction, Alternative 2 is expected to provide long-term, beneficial effects to fisheries resources through increased barrier island habitat area and longevity, which would support and protect estuarine nursery function landward of the island and improve habitat conditions for prey resources over time (see Section D.2.2.3). In addition, hard structure improvements associated with Gulfside breakwater maintenance are expected to provide localized habitat for sessile organisms (Goelz et al., 2020) and associated forage communities, potentially increasing habitat complexity and foraging opportunities for managed fish species in the vicinity of those features (see Section D.2.2.3 and the Raccoon Island Restoration Project EFH Assessment, which will be made publicly available). Enhancement of the terminal groin would promote sediment retention and shoreline continuity, supporting long-term island stability. By reducing the likelihood of island breaching and helping moderate exchange between nearshore Gulf waters and interior bays, the project would help support salinity gradients and hydrodynamic conditions that contribute to nursery habitat function in the Terrebonne Basin.

Aquaculture facilities are not located within the project area and would not be directly affected by construction activities. Any effects on aquaculture would be indirect and would be expected to be negligible. By supporting long-term coastal habitat stability and water-quality function at a regional scale, Alternative 2 could indirectly contribute to environmental conditions favorable to aquaculture-dependent resources.

Overall, Alternative 2 would result in short-term, minor, adverse impacts to fisheries and fishing experiences during construction and long-term, beneficial impacts following construction due to restored habitat and improved island longevity.

D.3.3.8.2.3 Alternative 3 (Preferred Alternative)

Overall, impacts for the Preferred Alternative would be similar to those in Alternative 2. Construction would extend over a longer duration than Alternative 2 (495 days), resulting in a slightly longer period of temporary disturbance to aquatic habitats and potential displacement of mobile fish and invertebrate species from

active work areas. However, these species are expected to return once construction activities are completed, and impacts during construction would remain localized and temporary.

Post-construction conditions under the Preferred Alternative would provide benefits similar to those described for Alternative 2, with the addition of habitat complexity associated with the living shoreline components of the BSPS, which also includes traditional structural elements. The intertidal components of these features, including oyster cultch material placed to promote colonization by reef-forming organisms, would provide additional structured habitat that could support juvenile fishes, invertebrates, and forage species. These features would also help protect adjacent estuarine nursery areas and contribute to improved habitat persistence over time. Colonization of these structures by oysters and other filter-feeding organisms could contribute to localized improvements in water clarity and benthic productivity, further supporting estuarine food-web dynamics (see Section D.2.2.3).

Overall, the Preferred Alternative would result in short-term, minor, adverse impacts during construction and long-term, beneficial impacts after construction, with potentially greater long-term fisheries habitat benefits than Alternative 2 due to the addition of living shoreline features.

D.3.3.8.2.4 Alternative 6

The construction impacts of Alternative 6 would be similar to those discussed in Alternatives 2 and 3. Construction under Alternative 6 would have the longest duration of the action alternatives (535 days), resulting in a somewhat longer period of temporary disturbance to aquatic habitats and potential displacement of mobile fish and invertebrate species from active work areas. As with the other action alternatives, these species are expected to return once construction activities are completed, and construction-related impacts would remain localized and temporary.

Following construction, Alternative 6 would provide long-term benefits similar to those described for Alternative 2 through restoration and stabilization of barrier island habitats that support estuarine nursery and foraging areas (see Section D.2.2.3). The traditional BSPS would help reduce shoreline erosion and maintain adjacent aquatic habitats; however, unlike the Preferred Alternative, these structures would not include intertidal living shoreline components designed to promote reef-forming organisms. As a result, Alternative 6 would provide fewer direct habitat benefits to intertidal aquatic species compared to the Preferred Alternative.

Overall, Alternative 6 would result in short-term, minor, adverse impacts during construction and long-term, beneficial impacts after construction, with benefits generally similar to Alternative 2 but with a longer construction disturbance period and fewer intertidal habitat enhancements than the Preferred Alternative.

D.3.3.9 Marine Transportation

D.3.3.9.1 AFFECTED ENVIRONMENT

The project area is located offshore of Terrebonne Parish in south-central Louisiana. Raccoon Island lies approximately 13 mi south of Cocodrie and approximately 20 mi south of Dularge, the nearest populated coastal communities. The SSB88 Borrow Area is located approximately 8.6 mi farther offshore of the island. The project is situated outside any major federal navigation channels or designated deep-draft shipping fairways. The nearest offshore shipping fairway providing access to the Mississippi River and regional ports is located approximately 70 mi south of the project area. Marine traffic in the vicinity of the project is therefore dominated by commercial fishing vessels, recreational boats, and offshore service vessels associated with regional energy infrastructure rather than deep-draft commercial shipping. The nearest major port serving offshore activity is Port Fourchon, located approximately 45 mi east-southeast of the

project area. Additional port and navigation infrastructure occur along the Houma Navigation Canal and the GIWW, located approximately 35 mi north of the project area. Because the project area and borrow area are located well outside major shipping corridors and deep-draft navigation routes, marine traffic near the site is generally limited to smaller commercial, recreational, and offshore support vessels operating in coastal waters.

D.3.3.9.2 ENVIRONMENTAL CONSEQUENCES

D.3.3.9.2.1 Alternative 1 – No Action

Under the No Action Alternative, the project would not be implemented, and the short-term, adverse impacts associated with marine traffic from the action alternatives would not occur. Overall, the No Action Alternative would have no measurable effect on marine transportation.

D.3.3.9.2.2 Alternative 2

No major shipping fairways occur within or near the project area, and marine traffic in the vicinity is primarily associated with commercial and recreational fishing vessels and offshore service traffic. During construction of Alternative 2, dredges, support vessels, and material transport barges would be present in and around Raccoon Island, the conveyance corridors, and the SSB88 Borrow Area. These vessels would temporarily increase localized vessel traffic and may require other users to navigate around active work zones.

Because the project area is located well outside major navigation corridors, vessel operators would be able to safely transit around construction areas using surrounding open waters without substantial route changes or delays. As a result, construction activities would result in short-term, minor, adverse impacts on marine transportation.

The USCG issues weekly LNM that provide information on navigation hazards and temporary construction zones (USCG, 2026). If necessary, temporary safety zones or navigation advisories could also be established in coordination with the USCG to ensure safe vessel passage during construction. Any navigation restrictions, safety zones, or hazards associated with project construction would be communicated through these LNM, helping minimize risks to vessel operators and maintaining navigational safety.

Following completion of construction, project-related vessel activity would cease and no long-term, adverse impacts on marine transportation are anticipated.

D.3.3.9.2.3 Alternative 3 (Preferred Alternative)

The project would have short-term, minor, adverse impacts on marine traffic (generally limited to local recreational, commercial fishing, and offshore service vessels) during project construction, which would cease after construction is complete. Impacts on marine transportation from the Preferred Alternative would be similar to those described above under Alternative 2 but would occur over a slightly longer period of time (approximately 125 days longer).

D.3.3.9.2.4 Alternative 6

The project would have short-term, minor, adverse impacts on marine traffic (generally limited to local recreational, commercial fishing, and offshore service vessels) during project construction, which would cease after construction is complete. Impacts on marine transportation from Alternative 6 would be similar to those described above under Alternative 2, but would occur over a longer period of time (approximately 165 days longer).

D.4 Summary of Environmental Consequences of Alternatives

D.4.1 East Orleans Landbridge Restoration

The NEPA analysis found that the action alternatives would result in some short-term to long-term, minor to moderate, adverse impacts on certain resources. The adverse impacts would be offset by the long-term, beneficial impacts that the alternative would generate. The No Action Alternative would result in long-term, minor to major, adverse impacts with no beneficial impacts.

A summary of impacts for the No Action Alternative, the Preferred Alternative, and the other action alternatives for the East Orleans Landbridge Restoration Project is provided in Table D- 21. Summary of Environmental Consequences for East Orleans Landbridge Restoration Alternatives.. For each alternative and resource category, beneficial or no effects are noted, as is the longest duration and most severe adverse effect level, as applicable.

Table D- 21. Summary of Environmental Consequences for East Orleans Landbridge Restoration Alternatives.

Note: NE = No effect, S = Short-term, L = Long-term, Min = Minor, Mod = Moderate, Maj = Major, + = Beneficial effect, - = Adverse effect.

RESOURCE	ALTERNATIVE 1 (NO ACTION)	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 4 (PREFERRED ALTERNATIVE)
Geology and Substrates	L Maj -	S, L Min to Mod - / L +	S, L Min to Mod - / L +	S, L Min to Mod - / L +
Hydrology and Water Quality	L Mod -	S Min to Mod - / L +	S Min to Mod - / L +	S Min to Mod - / L +
Air Quality	NE	S Min - / L +	S Min - / L +	S Min - / L +
Noise	NE	S Min - / NE	S Min - / NE	S Min - / NE
Habitats	L Maj -	S, L Min to Mod - / L +	S, L Min to Mod - / L +	S, L Min to Mod - / L +
Wildlife Species	L Mod to Maj -	S Mod - / L +	S Mod - / L +	S Mod - / L +
Marine and Estuarine Aquatic Fauna, EFH, and Managed Fish Species	L Maj -	S, L Min to Mod - / L +	S, L Min to Mod - / L +	S, L Min to Mod - / L +
Protected Species (Threatened and Endangered)	L Maj	S, L Min - / L +	S, L Min - / L +	S, L Min - / L +
Protected Species (Marine Mammals)	L Min to Mod –	S, L Min - / L +	S, L Min - / L +	S, L Min - / L +
Socioeconomics	L Min -	S + / L +	S + / L +	S + / L +
Cultural Resources	NE	NE	NE	NE
Infrastructure	NE	NE	NE	NE

RESOURCE	ALTERNATIVE 1 (NO ACTION)	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 4 (PREFERRED ALTERNATIVE)
Land and Marine Management	NE	S Min - /L +	S Min - /L +	S Min - /L +
Tourism and Recreational Use	L Min -	S Min - /L +	S Min - /L +	S Min - /L +
Aesthetics and Visual Resources	L Min -	S Min - /L +	S Min - /L +	S Min - /L +
Public Health and Safety	L Min -	NE /L +	NE /L +	NE /L +
Fisheries and Aquaculture	L Min -	S Min - /L +	S Min - /L +	S Min - /L +
Marine Transportation	NE	S Min - / NE	S Min - / NE	S Min - / NE

D.4.2 Raccoon Island Restoration

A summary of impacts for the No Action Alternative, the Preferred Alternative, and the other action alternatives for the Raccoon Island Restoration Project is provided in Table D- 22. Summary of Environmental Consequences for Raccoon Island Restoration Alternatives.. For each alternative and resource category, beneficial or no effects are noted, as is the longest duration and most severe adverse effect level, as applicable.

Table D- 22. Summary of Environmental Consequences for Raccoon Island Restoration Alternatives.

Note: NE = No effect, S = Short-term, L = Long-term, Min = Minor, Mod = Moderate, Maj = Major, + = Beneficial effect, - = Adverse effect.

RESOURCE	ALTERNATIVE 1 (NO ACTION)	ALTERNATIVE 2	ALTERNATIVE 3 (PREFERRED ALTERNATIVE)	ALTERNATIVE 6
Geology and Substrates	L Maj -	S, L Min to Mod - / L +	S, L Min to Mod - / L +	S, L Min to Mod - / L +
Hydrology and Water Quality	L Mod -	S, L Min to Mod - / L +	S, L Min to Mod - / L +	S, L Min to Mod - / L +
Air Quality	NE	S Min - / L +	S Min - / L +	S Min - / L +
Noise	NE	S Min - / NE	S Min - / NE	S Min - / NE
Habitats	L Maj -	S, L Min to Mod - / L +	S, L Min to Mod - / L +	S, L Min to Mod - / L +
Wildlife Species	L Mod to Maj -	S Mod - / L +	S Mod - / L +	S Mod - / L +

RESOURCE	ALTERNATIVE 1 (NO ACTION)	ALTERNATIVE 2	ALTERNATIVE 3 (PREFERRED ALTERNATIVE)	ALTERNATIVE 6
Marine and Estuarine Aquatic Fauna, EFH, and Managed Fish Species	L Maj -	S, L Min to Mod - / L +	S, L Min to Mod - / L +	S, L Min to Mod - / L +
Protected Species (Threatened and Endangered)	L Maj -	S, L Min to Mod - / L +	S, L Min to Mod - / L +	S, L Min to Mod - / L +
Protected Species (Marine Mammals)	L Min to Mod -	S, L Min - / L +	S, L Min - / L +	S, L Min - / L +
Socioeconomics	L Min -	S + / L +	S + / L +	S + / L +
Cultural Resources	NE	NE	NE	NE
Infrastructure	NE	NE / L+	NE / L+	NE / L+
Land and Marine Management	L Min to Mod -	S Min - /L +	S Min - /L +	S Min - /L +
Tourism and Recreational Use	L Min to Mod -	S Min - /L +	S Min - /L +	S Min - /L +
Aesthetics and Visual Resources	L Min -	S Min - /L +	S Min - /L +	S Min - /L +
Public Health and Safety	L Min -	NE / L+	NE / L+	NE / L+
Fisheries and Aquaculture	L Min -	S Min - /L +	S Min - /L +	S Min - /L +
Marine Transportation	NE	S Min - / NE	S Min - / NE	S Min - / NE

D.5 NEPA Consideration of Additional Reasonably Foreseeable Environmental Effects

D.5.1 East Orleans Landbridge Restoration

Past, present, and reasonably foreseeable future actions near the East Orleans Landbridge Restoration project were identified to effectively consider potential reasonably foreseeable environmental effects. The spatial boundary used to identify these actions includes a 1-mi buffer surrounding the project area that encompasses the marsh areas, borrow areas, access corridors, and adjacent environments influenced by construction and long-term geomorphic processes. The temporal boundaries include the project construction duration and the 20-year analysis period used throughout this RP/EA #8.1.

The list of past, present, and future projects was compiled using C&E, USACE, USEPA, National Fish and Wildlife Foundation, USFWS, USDA, NOAA, and Resources and Ecosystems Sustainability, Tourist Opportunities, and Revived Economies of the Gulf Coast States Act Council websites, reports, and databases. The past and potential future activities near the East Orleans Landbridge Restoration project area include marsh restoration as described in Table D- 23. Projects Considered in the Reasonably Foreseeable Environmental Effects Analysis..

Table D- 23. Projects Considered in the Reasonably Foreseeable Environmental Effects Analysis.

CATEGORY	PROJECT NAME	APPLICANT/PROPONENT	SUMMARY	ESTIMATED TIMEFRAME
Past	New Orleans Landbridge Shoreline Stabilization and Marsh Creation Project (PO-0169)	CWPPRA, USFWS	Marsh creation and shoreline stabilization to maintain integrity of East Orleans Landbridge	Construction completed in 2023

As described above, the resource areas with potential for reasonably foreseeable environmental effects and therefore analyzed further include geology and substrates; hydrology and water quality; habitats; wildlife species; marine and estuarine fauna (including managed fish species) and EFH; and protected species. Since the project is a restoration project, it would create long-term benefits to these resources but would also have some short-term and/or long-term, adverse impacts. The anticipated short-term, adverse impacts on hydrology and water quality, habitats, and wildlife could be minimized with the development and implementation of BMPs.

The effects from the alternatives and the identified actions are expected to result in net beneficial impacts on the resources listed above when taking into account past, present, and reasonably foreseeable future actions. The previously constructed New Orleans Landbridge Shoreline Stabilization and Marsh Creation project is expected to contribute to habitat benefits through marsh creation and shoreline protection on areas north of the East Orleans Landbridge, which will provide secondary benefits to wildlife species and estuarine fauna. The dredging of Lake St. Catherine for this project, north of the East Orleans Landbridge Restoration alternatives' borrow area, resulted in placement of dredged material on areas east and west of U.S. Highway 90. Thus, the LA TIG concludes that the alternatives in this RP/EA #8.1 would not contribute substantially to reasonably foreseeable adverse environmental effects when added to other past, present, or reasonably foreseeable future actions.

Under the No Action Alternative described in Section 1.6, the East Orleans Landbridge Restoration project would not be implemented. Under the No Action Alternative, the existing habitats would continue to degrade due to erosion, local subsidence, and sea level rise, which could result in the decrease of habitat and the species which utilize that habitat. This would likely impact various resources including geology and substrates, hydrology and water quality, habitats, wildlife species, marine and estuarine fauna (including EFH and managed fish species), protected species, socioeconomics, tourism and recreational use, aesthetics and visual resources, public health and safety, and fisheries and aquaculture. When the No Action Alternative is analyzed in combination with other past, present, and reasonably foreseeable future actions, short-term and long-term, adverse impacts on the resources identified would likely occur. Despite the beneficial impacts of the past, present, and reasonably foreseeable future projects, there would be continued degradation of habitats and species that utilize the habitat under the No Action Alternative. Continued coastal erosion and land loss would increase the risk of flooding, wave action, saltwater intrusion, storm surge, and tidal current further inland.

D.5.2 Raccoon Island Restoration

Past, present, and reasonably foreseeable future actions near the Raccoon Island Restoration Project were identified to effectively consider potential reasonably foreseeable environmental effects. The spatial boundary used to identify these actions includes a 5-mi buffer surrounding the project footprint that encompasses the island, borrow areas, conveyance corridors, and adjacent marine environments influenced by construction and long-term geomorphic processes. The temporal boundaries include the anticipated construction duration and the 20-year analysis period used throughout this RP/EA #8.1.

The list of past, present, and reasonably foreseeable future projects was compiled using publicly available information from state and federal agencies, including the NRCS, CPRA, Louisiana coastal program, USACE, NOAA, and other restoration program databases. Past and potential future activities near the Raccoon Island Restoration Project area include maintenance dredging, marsh restoration, shoreline protection, and emergency response projects, as summarized in Table D- 24.

Table D- 24. Projects Considered in the Reasonably Foreseeable Environmental Effects Analysis.

CATEGORY	PROJECT NAME	APPLICANT/ PROPONENT	SUMMARY	ESTIMATED TIMEFRAME
Past	Raccoon Island Shoreline Protection/Marsh Creation (TE-48)	NRCS; CPRA	Shoreline protection constructed eight segmented Gulf breakwaters	2007
Past	Whiskey Island Restoration (TE-50)	CPRA	Sand mined from Ship Shoal Blocks 43 and 67 to create 316 ac of back barrier marsh	2009
Past	Raccoon Island Shoreline Protection/Marsh Creation (TE-48)	NRCS; CPRA	Marsh creation using mixed sediment from offshore placed to create 60 ac of back barrier habitat	2013

CATEGORY	PROJECT NAME	APPLICANT/ PROPONENT	SUMMARY	ESTIMATED TIMEFRAME
Past	NRDA Caillou Lake Headlands Restoration Project (TE-100)	CPRA	Sand mined from Ship Shoal Block 88 to create/restore 846 ac of subtidal, intertidal, supratidal, and dune habitat	2018
Past	West Belle Headland Restoration (TE-176)	CPRA	Sand mined from Ship Shoal Lease Block 88 and S. Pelto 12 for beach and dune restoration and back barrier marsh restoration	2020
Past	Trinity-East, Terrebonne Basin Barrier Island & Beach Nourishment (TE-143)	CPRA	Sand mined from Ship Shoal South Pelto 13 and 14 Lease Blocks for beach and dune restoration and back barrier marsh restoration	2021

As described above, the resource areas with potential for reasonably foreseeable environmental effects and therefore analyzed further include geology and substrates; hydrology and water quality; habitats; wildlife species; marine and estuarine fauna (including managed fish species) and EFH; and protected species. Because the project is a restoration action, it would be expected to create long-term benefits to these resources while also producing some short-term and localized, adverse impacts during construction. Anticipated short-term, adverse impacts on hydrology and water quality, habitats, and wildlife would be minimized through the implementation of BMPs and construction controls.

The effects from the alternatives and the identified actions are expected to result in net beneficial impacts on the resources listed above when taking into account past, present, and reasonably foreseeable future actions. Restoration and shoreline stabilization efforts in the Terrebonne Basin have historically contributed to sediment retention, habitat persistence, and protection of adjacent estuarine resources, and similar outcomes are expected from the Raccoon Island Restoration Project.

Under the No Action Alternative described in Section 1.6, the Raccoon Island Restoration Project would not be implemented. Existing habitats would continue to degrade due to erosion, subsidence, and sea level rise, which would reduce the extent and quality of barrier island habitats and the species that depend on them. This would likely impact environmental resources, including geology and substrates, hydrology and water quality, habitats, wildlife species, marine and estuarine fauna, protected species, socioeconomics, tourism and recreation, aesthetics and visual resources, public health and safety, and fisheries resources. Continued land loss would also increase exposure of interior wetlands and coastal communities to wave energy, storm surge, and salinity intrusion.

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