Deepwater Horizon Oil Spill Natural Resource Damage Assessment

Texas Trustee Implementation Group Final 2017 Restoration Plan/Environmental Assessment: Restoration of Wetlands, Coastal, and Nearshore Habitats; and Oysters

2017

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Texas Trustee Implementation Group
Final 2017 Restoration Plan/Environmental Assessment:
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Executive Summary

This *Deepwater Horizon* Oil Spill Texas Trustee Implementation Group Final 2017 Restoration Plan/Environmental Assessment: Restoration of Wetlands, Coastal, and Nearshore Habitats; and Oysters (RP/EA) was prepared by the Texas Trustee Implementation Group (TIG) to initiate planning and restoration of lost natural resources in Texas as a result of the *Deepwater Horizon* (DWH) oil spill. The Texas TIG is responsible for restoring the natural resources and services within the Texas Restoration Area that were injured by the April 20, 2010, DWH oil spill and associated spill response efforts (collectively, the Incident). The Texas TIG has prepared this RP/EA to inform the public about its DWH natural resource damage assessment (NRDA) restoration planning efforts.

The purpose of restoration, as discussed in this document and detailed more fully in the *Deepwater Horizon* Oil Spill: Final Programmatic Damage Assessment and Restoration Plan and Final Programmatic Environmental Impact Statement (Final PDARP/PEIS), is to make the environment and the public whole for injuries resulting from the Incident by implementing restoration actions that return injured natural resources and services to baseline conditions and compensate for interim losses in accordance with the Oil Pollution Act of 1990 (OPA) and associated NRDA regulations. The Final PDARP/PEIS and Record of Decision (ROD) can be found at http://www.gulfspillrestoration.noaa.gov/restoration-planning/gulf-plan/.

The Texas TIG includes three Texas State Trustee agencies and four federal Trustee agencies: Texas Commission on Environmental Quality (TCEQ); Texas Parks and Wildlife Department (TPWD); Texas General Land Office (TGLO); U.S. Department of Commerce, represented by the National Oceanic and Atmospheric Administration (NOAA); U.S. Department of the Interior (DOI), represented by the U.S. Fish and Wildlife Service (USFWS); U.S. Department of Agriculture (USDA); and U.S. Environmental Protection Agency (EPA) (collectively, the Texas TIG). NOAA is the lead federal Trustee for preparing this RP/EA pursuant to the National Environmental Policy Act (NEPA). The federal and state agencies of the Texas TIG are acting as cooperating agencies for the purposes of compliance with NEPA in the development of this RP/EA. Each federal cooperating agency on the Texas TIG intends to adopt, if appropriate, the NEPA analyses in this RP/EA. In accordance with 40 CFR §1506.3(a), each of the three federal cooperating agencies (DOI, EPA, and USDA) participating on the Texas TIG will review the RP/EA for adequacy in meeting the standards set forth in its own NEPA implementing procedures and make a decision whether to adopt the analysis in the RP/EA. Adoption of the EA would be completed via signature on the relevant NEPA decision document. The Texas TIG has undertaken this restoration planning effort to meet the purpose of restoring those natural resources and services injured as a result of the Incident. Restoration activities are intended to restore or replace habitats, species, and services to their baseline condition and to compensate the public for interim losses from the time natural resources are injured until they recover to baseline conditions.

In developing a reasonable range of alternatives suitable for addressing the injuries caused by the Incident, the Texas TIG reviewed the Trustee programmatic restoration goals and Restoration Type-specific goals specified in the Final PDARP/PEIS. The Texas TIG also considered other criteria identified in the Final PDARP/PEIS, including screening factors in the OPA regulations (15 CFR §990.54), input from the public, the current and future availability of funds under the DWH NRDA settlement payment schedule, as well as projects already funded or proposed to be funded by the other DWH restoration funding sources.

Projects incorporated in the range of alternatives considered in this RP/EA were developed through review of DWH Trustee project ideas and projects proposed by the public since the DWH restoration planning process was initiated in 2010. The Texas TIG reviewed more than 800 restoration projects proposed by the public, non-governmental organizations, and state and federal agencies.

On May 18, 2017, the Texas TIG released a Draft RP/EA to inform the public about its DWH natural resource damage assessment (NRDA) restoration planning efforts and to seek public comment on the preferred restoration alternatives proposed in the document. In the Draft RP/EA, the Texas TIG identified and evaluated 16 different projects in the range of reasonable alternatives, as well as a No Action alternative[1]. After evaluation of all 16 projects, the Texas TIG proposed 13 projects as preferred for implementation. During the public review period, which began on May 18, 2017, and ended on June 19, 2017, the Texas TIG held two public meetings in Corpus Christi (June 7, 2017) and La Marque (June 8, 2017). The TIG considered the public comments received during this time, which informed the TIG's analyses and selection of the restoration projects in this document.

Chapter 7 this Final RP/EA, provides further detail on the public comment process and includes a summary of all public comments received on the Draft RP/EA and Texas TIG responses. This RP/EA reflects revisions to the Draft RP/EA arising from public comments received; progress on compliance with other laws, regulations, and Executive Orders; and continuing Texas TIG project development and consideration of potentially relevant information. This RP/EA also includes expanded Monitoring and Adaptive Management Plans for selected projects, attached as Appendix D to this document.

This RP/EA selects 13 preferred alternatives for implementation. Table ES-1 identifies the projects evaluated in the RP/EA and which of those projects are preferred for implementation.

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[1] For the purposes of this RP/EA, each proposed project is considered a separate alternative and so the terms may be used interchangeably in this document.

Table ES-1. The alternative name, Restoration Type, preferred and non-preferred projects, and associated project cost.

Alternative	Preferred/ Not Preferred	Project Costs
Replenish and Protect Oysters (Living Coastal and Marine Resources)		
Oyster Restoration Engineering*	Preferred	$309,000
Landscape Approach to Oyster Reef Restoration	Not Preferred	$15,258,000
Restore and Conserve Wetlands, Coastal, and Nearshore Habitats		
Bird Island Cove Habitat Restoration Engineering*	Preferred	$206,000
Essex Bayou Habitat Restoration Engineering*	Preferred	$372,000
Dredged Material Planning for Wetland Restoration*	Preferred	$1,964,000
McFaddin Beach and Dune Restoration	Preferred	$15,874,000
Bessie Heights Wetland Restoration	Preferred	$4,905,000
Pierce Marsh Wetland Restoration	Preferred	$3,095,000
Dollar Bay and Moses Lake Wetland Restoration	Not Preferred	$4,225,000
Indian Point Shoreline Erosion Protection	Preferred	$2,199,000
Bahia Grande Hydrologic Restoration	Preferred	$5,050,000
Follets Island Habitat Acquisition	Preferred	$2,037,000
Mid-Coast Habitat Acquisition	Preferred	$2,082,000
Matagorda Peninsula Habitat Acquisition	Not Preferred	$3,012,000
Bahia Grande Coastal Corridor Habitat Acquisition	Preferred	$2,271,000
Laguna Atascosa Habitat Acquisition	Preferred	$5,397,000

Note: **Alternatives proposing only engineering and design activities.*

List of Abbreviations and Acronyms

B	
BMP	best management practice
BOEM	Bureau of Ocean Energy Management
BP	BP Exploration and Production, Inc.
BUDM	beneficial use of dredged material
C	
CBBEP	Coastal Bend Bays and Estuaries Program
CCP	Comprehensive Conservation Plan
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CWA	Clean Water Act
D	
DMPA	dredged material placement area
DOI	United States Department of the Interior
DWH	*Deepwater Horizon*
E	
E&D	engineering and design
EA	environmental assessment
EFH	essential fish habitat
EO	Executive Order
EPA	United States Environmental Protection Agency
ESA	Endangered Species Act
F	
Final PDARP/PEIS	*Deepwater Horizon* Oil Spill: Final Programmatic Damage Assessment and Restoration Plan and Final Programmatic Environmental Impact Statement
FMC	Fishery Management Council
FMP	fishery management plan
FONSI	Finding of No Significant Impact
FR	*Federal Register*
G	
GBEP	Galveston Bay Estuary Program
GBF	Galveston Bay Foundation
GCERC	Gulf Coast Ecosystem Restoration Council
GEBF	Gulf Environmental Benefit Fund
GHG	greenhouse gas

GIWW	Gulf Intracoastal Waterway
GMFMC	Gulf of Mexico Fishery Management Council
H	
ha	hectares
HGB	Houston-Galveston-Brazoria Intrastate Air Quality Control Region
HMS	highly migratory species
L	
LANWR	Laguna Atascosa National Wildlife Refuge
M	
Magnuson-Stevens Act	Magnuson-Stevens Fishery Conservation and Management Act
MAM	monitoring and adaptive management
MMS	Minerals Management Service
N	
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NFWF	National Fish and Wildlife Foundation
NGOs	non-governmental organizations
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NOA	Notice of Availability
NOAA	National Oceanic and Atmospheric Administration
NRCS	Natural Resources Conservation Service
NRDA	natural resource damage assessment
NWR	National Wildlife Refuge
O	
OPA	Oil Pollution Act
OSHA	Occupational Safety and Health Administration
P	
PCBs	polychlorinated biphenyls
PDCs	Project Design Criteria
PE	professional engineer
ppt	parts per thousand
R	
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

S	
SH	State Highway
SNWW	Sabine-Neches Waterway
SOP	standard operating procedures
T	
TCEQ	Texas Commission on Environmental Quality
TDSHS	Texas Department of State Health Services
Texas Mid-Coast NWR	Texas Mid-Coast National Wildlife Refuge Complex
TGLO	Texas General Land Office
TIG	Trustee Implementation Group
TMDL	total maximum daily load
TNC	The Nature Conservancy
TPWD	Texas Parks and Wildlife Department
Trustee Council SOP	2016 Trustee Council Standard Operating Procedures for Implementation of the Natural Resource Restoration for the *Deepwater Horizon* (DWH) Oil Spill
TWDB	Texas Water Development Board
TxDOT	Texas Department of Transportation
U	
U.S.	United States
U.S.C.	United States Code
USACE	United States Army Corps of Engineers
USDA	United States Department of Agriculture
USFWS	United States Fish and Wildlife Service
W	
WMA	Wildlife Management Area

Important Definitions

Cooperating Agency: A cooperating agency is any federal agency other than a lead agency which has jurisdiction by law or special expertise with respect to any environmental impact involved in a federal action affecting the quality of the human environment. The selection and responsibilities of a cooperating agency are described in 40 Code of Federal Regulations (CFR) §1501.6. A state or local agency of similar qualifications or, when the effects are on a reservation, an Indian Tribe, may by agreement with the lead agency become a cooperating agency (40 CFR §1508.5). For this RP/EA, the National Oceanic and Atmospheric Administration (NOAA) is the lead agency and all other Trustee agencies in the Texas Trustee Implementation Group are cooperating agencies (U.S. Department of the Interior [DOI], U.S. Department of Agriculture [USDA], U.S. Environmental Protection Agency [EPA], Texas Parks and Wildlife Department [TPWD], Texas General Land Office [TGLO], and Texas Commission on Environmental Quality [TCEQ]).

***Deepwater Horizon* (DWH) Trustees:** As specified in the Oil Pollution Act (OPA), natural resource trustees are designated to act on behalf of the public to assess and recover natural resource damages and to plan and implement actions to restore natural resources and resource services injured or lost as the result of a discharge of oil. Trustees fulfill these responsibilities by developing restoration plans, providing the public with meaningful opportunities to review and comment on proposed plans, implementing and monitoring restoration projects, managing natural resource damage funds, documenting trustee decisions through a public administrative record (including those that involve the use of recovered damages). The DWH Trustees include DOI as represented by the National Park Service, U.S. Fish and Wildlife Service (USFWS), and Bureau of Land Management; NOAA, on behalf of the Department of Commerce; USDA; EPA; TPWD, TGLO, and TCEQ; Louisiana Coastal Protection and Restoration Authority, Louisiana Oil Spill Coordinator's Office, Louisiana Department of Environmental Quality, Louisiana Department of Wildlife and Fisheries, and Louisiana Department of Natural Resources; Mississippi Department of Environmental Quality; Alabama Department of Conservation and Natural Resources and Geological Survey of Alabama; and Florida Department of Environmental Protection and Florida Fish and Wildlife Conservation Commission.

Early Restoration (as specified by the Framework Agreement): Early Restoration was intended to accelerate restoration of injured natural resources and their services, but not to fully compensate the public for all resulting injuries and losses. BP Exploration and Production, Inc. (BP) agreed to provide up to $1 billion toward Early Restoration projects in the Gulf of Mexico to address injuries to natural resources caused by the DWH oil spill in the Early Restoration Framework Agreement. Early Restoration proceeded in phases, with each phase adding additional projects to partially address injuries to nearshore resources, birds, fish, sea turtles, federally managed lands, and recreational uses. Sixty-five projects with a total cost of approximately $877 million were selected through the five phases of Early Restoration planning.

Implementing Trustee(s): Trustee Implementation Groups will identify one or more Implementing Trustee(s) for each selected restoration project. Implementing Trustee(s) may be designated for a project's entirety, or for one or more of a project's various implementation phases or components. The Implementing Trustee(s) are the primary entities responsible for implementation tasks, such as conducting or contracting to complete implementation phases, completing environmental compliance and permitting requirements, conducting project-specific monitoring, and maintaining projects in the long term.

Incident: On April 20, 2010, BP was using Transocean's mobile offshore drilling unit DWH to drill a well in the Macondo prospect (Mississippi Canyon 252– MC252) when the well blew out, and the drilling unit exploded, caught fire and subsequently sank in the Gulf of Mexico. The Incident is the largest maritime oil spill in U.S. history, discharging millions of barrels of oil over a period of 87 days. The term is used in this document to include the oil spill and all associated clean up response actions.

Lead Agency: The Council on Environmental Quality NEPA implementing regulations require a federal agency to serve as lead agency to supervise the NEPA analysis when more than one federal agency is involved in the same action (40 CFR §1501.5(a)). For this RP/EA, NOAA is the lead agency and all other Trustee agencies in the Texas Trustee Implementation Group are cooperating agencies (DOI, USDA, EPA, TPWD, TGLO, and TCEQ).

Natural Resource: Natural resources means land, fish, wildlife, biota, air, water, groundwater, drinking water supplies, and other such resources belonging to, managed by, held in trust by, appertaining to, or otherwise controlled by the United States (including the resources of the Exclusive Economic Zone), any state or local government or Indian tribe, or any foreign government, as defined in OPA (33 United States Code [U.S.C.] §2701(20)).

Natural Resource Damage Assessment (NRDA): The goal of the NRDA process is to return natural resources injured due to oil and chemical spills to pre-spill conditions and compensate the public for the time period that resources and services were impacted.

Restoration: Restoration is any action (or alternative), or combination of actions (or alternatives), to restore, rehabilitate, replace, or acquire the equivalent of injured natural resources and services. For the purposes of this document, the terms “alternative” and “project” are used interchangeably to describe restoration actions.

Texas Restoration Area: The DWH NRDA funds were distributed geographically to address the diverse suite of injuries that occurred at both regional and local scales. As specified in the Consent Decree[2] and Final PDARP/PEIS[3], specific amounts of money were allocated to seven geographic areas: each of the five Gulf States (Texas, Louisiana, Mississippi, Alabama, and Florida), Regionwide, and the Open Ocean. The Texas Restoration Area includes coastal and nearshore areas within the geographic jurisdiction of the state of Texas.

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[2] Consent Decree Among Defendant BP Exploration & Production Inc. (“BPXP”), The United States of America, and the States of Alabama, Florida, Louisiana, Mississippi, and Texas

[3] *Deepwater Horizon* Oil Spill: Final Programmatic Damage Assessment and Restoration Plan and Final Programmatic Environment Impact Statement (Final PDARP/PEIS)

Trustees (or Natural Resource Trustees): Trustees are those officials of the federal and state governments, of Indian tribes, and of foreign governments, designated under 33 U.S.C. 2706(b) of OPA. Trustees are entrusted to restore injured natural resources and lost services resulting from an incident involving a discharge or substantial threat of a discharge of oil.

Trustee Council: The Trustee Council is composed of Designated Natural Resource Trustee Officials, or their alternates, for each of the DWH Trustee agencies.

Trustee Council Standard Operating Procedures (SOP): The Trustee Council developed and approved the 2016 Trustee Council Standard Operating Procedures for Implementation of the Natural Resource Restoration for the *Deepwater Horizon* (DWH) Oil Spill (Trustee Council SOP) to address the long-term management, implementation, and administration of settlement funds for natural resource restoration.

Trustee Implementation Groups (TIGs): Established by the DWH Consent Decree and composed of individual DWH Trustee agency representatives for each Restoration Area defined in the Consent Decree. The TIGs develop plans for, choose, and implement specific restoration actions under the Final PDARP/PEIS. Each TIG makes all restoration decisions for the funding allocated to its Restoration Area, and ensures its actions are fully consistent with the Final PDARP/PEIS, Consent Decree, and Trustee Council SOP.

Species List

Amphibians

Common Name	Scientific Name
black-spotted newt	*Notophthalmus meridionalis*
Rio Grande Lesser siren	*Siren intermedia texana*

Birds

Common Name	Scientific Name
American widgeon	*Anas americana*
bald eagle	*Haliaeetus leucocephalus*
black rail	*Laterallus jamaicensis*
black-crowned night heron	*Nycticorax nycticorax*
blue-winged teal	*Anas discors*
Botteri’s sparrow	*Peucaea botterii*
brown jay	*Psilorhinus morio*
clapper rail	*Rallus crepitans*
dickcissel	*Spiza americana*
gadwall	*Anas strepera*
golden eagle	*Aquila chrysaetos*
great blue heron	*Ardea herodias*
great egret	*Ardea alba*
great kiskadee	*Pitangus sulphuratus*
green jay	*Cyanocorax yncas*
green-winged teal	*Anas crecca*
groove-billed ani	*Crotophaga sulcirostris*
LeConte’s sparrow	*Ammodramus leconteii*
lesser scaup	*Aythya affinis*
loon	*Gavia sp*.
mottled duck	*Anas fulvigula*
Northern Aplomado falcon	*Falco femoralis septentrionalis*
Northern pintail	*Anas acuta*
piping plover	*Charadrius melodus*
plain chachalaca	*Ortalis vetula*
reddish egret	*Egretta rufescens*
redhead	*Aythya americana*
roseate spoonbill	*Platalea ajaja*
seaside sparrow	*Ammodramus maritimus*
short-eared owl	*Asio flammeus*
snow geese	*Chen caerulescens*
snowy egret	*Egretta thula*
snowy plover	*Charadrius nivosus*

tricolored heron	*Egretta tricolor*
tropical parula	*Setophaga pitiayumi*
white-faced ibis	*Plegadis chihi*
white-tailed hawk	*Geranoaetus albicaudatus*
willet	*Tringa semipalmata*

Fish, Shellfish, and Aquatic Invertebrates

Common Name	Scientific Name
Atlantic bumper	*Chloroscombrus chrysurus*
Atlantic sharpnose shark	*Rhizoprionodon terraenovae*
blacktip shark	*Carcharhinus limbatus*
blue crab	*Callinectes sapidus*
blue fish	*Pomatomus saltatrix*
bonnethead shark	*Sphyrna tiburo*
brown shrimp	*Farfantepenaeus aztecus*
bull shark	*Carcharhinus leucas*
Eastern oyster	*Crassostrea virginica*
gray snapper	*Lutjanus griseus*
Gulf menhaden	*Brevoortia patronus*
Gulf stone crab	*Menippe adina*
lane snapper	*Lutjanus synagris*
lemon shark	*Negaprion brevirostris*
pink shrimp	*Farfantepenaeus duorarum*
porgy	*Sparidae*
red drum	*Sciaenops ocellatus*
scalloped hammerhead shark	*Sphyrna lewini*
Southern flounder	*Paralichthys lethostigma*
spinner shark	*Carcharhinus brevipinna*
spotted seatrout	*Cynoscion nebulosus*
tonguefish sp.	*Cynoglossidae*
white shrimp	*Litopenaeus setiferus*

Mammals

Common Name	Scientific Name
bobcat	*Lynx rufus*
Coue’s rice rat	*Oryzomys palustris*
jaguarundi	*Puma yagouaroundi*
javelina	*Pecari tajacu*
ocelot	*Leopardus pardalis*
West Indian manatee	*Trichechus manatus*

Plants

Common Name	Scientific Name
American elm	*Ulmus americana*
American lotus	*Nelumbo lutea*
annual seepweed	*Suaeda linearis*
big bluestem	*Andropogon gerardii*
black mangrove	*Avicennia germinans*
black willow	*Salix nigra*
blackrush	*Juncus romerianus*
bracted blazing star/coastal gay-feather	*Liatris bracteata*
bulltongue	*Sagittaria lancifolia*
bushy bluestem	*Andropogon glomeratus*
bushy seaside tansy/sea oxeye daisy	*Borrichia frutescens*
California bulrush	*Schoenoplectus californicus*
common reed	*Phragmites australis*
cordgrass	*Spartina sp*.
cypress	*Taxodium distichum*
duckweed	*Lemna sp.*
dwarf saltwort	*Salicornia bigelovii*
eastern baccharis	*Baccharis halimifolia*
eastern gamagrass	*Tripsacum dactyloides*
fanwort	*Cabomba caroliniana*
giant cutgrass	*Zizaniopsis milacea*
green ash	*Fraxinus pennsylvanica*
gulf cordgrass	*Spartina spartinae*
indiangrass	*Sorghastrum nutans*
laurel oak	*Quercus laurifolia*
little bluestem	*Schizachyrium scoparium*
maidencane	*Panicum hemitomon*
manatee grass	*Syringodium filiforme*
marshhay cordgrass	*Spartina patens*
Olney bulrush	*Schoenoplectus americanus*
perennial saltmarsh aster	*Symphyotrichum tenuifolium*
pickleweed	*Salicornia sp.*
red maple	*Acer rubrum*
Rio Grande ayenia	*Ayenia limitaris*
rush	*Juncus sp.*
Salk/seashore saltgrass	*Distichlis spicata*
sand spikerush	*Eleocharis montevidensis*
seashore paspalum	*Paspalum vaginatum*
shoal grass	*Halodule wrightii*
shoregrass	*Monanthochloe littoralis*

smooth cordgrass	*Spartina alterniflora*
spikerush	*Eleocharis sp.*
squarestem spikerush	*Eleocharis quadrangulata*
sturdy/saltmarsh bulrush	*Bolboschoenus robustus*
sweetgum	*Liquidambar styraciflua*
switchgrass	*Panicum virgatum*
tupelo	*Nyssa sp.*
turtle weed	*Batis sp.*
Virginia glasswort	*Salicornia virginica*
watershield	*Brasenia screben*
widgeon grass	*Ruppia maritima*
woolly rosemallow	*Hibiscus lasiocarpos*

Reptiles

Common Name	Scientific Name
American alligator	*Alligator mississippiensis*
Atlantic hawksbill sea turtle	*Eretmochelys imbricate*
green sea turtle	*Chelonia mydas*
horned lizard	*Phrynosoma cornutum*
Kemp's ridley sea turtle	*Lepidochelys kempii*
leatherback sea turtle	*Dermochelys coriacea*
loggerhead sea turtle	*Caretta caretta*
Texas horned lizard	*Phrynosoma cornutum*
Texas indigo snake	*Drymarchon corais erebennus*
Texas tortoise	*Gopherus berlandieri*

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1 Introduction, Purpose and Need, and Public Participation

This *Deepwater Horizon* Oil Spill Texas Trustee Implementation Group Final 2017 Restoration Plan/Environmental Assessment: Restoration of Wetlands, Coastal, and Nearshore Habitats; and Oysters (RP/EA) was prepared by the Texas Trustee Implementation Group (TIG) to initiate planning and restoration of lost natural resources in Texas as a result of the *Deepwater Horizon* (DWH) oil spill. The Texas TIG is responsible for restoring the natural resources and services within the Texas Restoration Area that were injured by the April 20, 2010, DWH oil spill and associated spill response efforts (collectively, the Incident). The Texas TIG has prepared this RP/EA to inform the public about its DWH natural resource damage assessment (NRDA) restoration planning efforts. The purpose of restoration, as discussed in this document and detailed more fully in the *Deepwater Horizon* Oil Spill: Final Programmatic Damage Assessment and Restoration Plan and Final Programmatic Environmental Impact Statement (Final PDARP/PEIS), is to make the environment and the public whole for injuries resulting from the Incident by implementing restoration actions that return injured natural resources and services to baseline conditions and compensate for interim losses in accordance with the Oil Pollution Act of 1990 (OPA) and associated NRDA regulations. The Final PDARP/PEIS and Record of Decision (ROD) can be found at http://www.gulfspillrestoration.noaa.gov/restoration-planning/gulf-plan/.

The Texas TIG includes three Texas State Trustee agencies and four federal Trustee agencies: Texas Commission on Environmental Quality (TCEQ); TPWD; Texas General Land Office (TGLO); U.S. Department of Commerce, represented by the National Oceanic and Atmospheric Administration (NOAA); U.S. Department of the Interior (DOI), represented by the U.S. Fish and Wildlife Service (USFWS); U.S. Department of Agriculture (USDA); and U.S. Environmental Protection Agency (EPA) (collectively, the Texas TIG). NOAA is the lead federal Trustee for preparing this RP/EA pursuant to the National Environmental Policy Act (NEPA). The federal and state agencies of the Texas TIG are acting as cooperating agencies for the purposes of compliance with NEPA in the development of this RP/EA. Each federal cooperating agency on the Texas TIG intends to adopt, if appropriate, the NEPA analysis in this RP/EA. In accordance with 40 Code of Federal Regulations (CFR) §1506.3(a), each of the three federal cooperating agencies (DOI, EPA, and USDA) participating on the Texas TIG will review the RP/EA for adequacy in meeting the standards set forth in its own NEPA implementing procedures. Adoption of the EA would be completed via signature on the relevant NEPA decision document. There are no other cooperating federal, state, or local entities, or tribes.

1.1 Background and Summary of the Settlement

On April 20, 2010, the DWH mobile drilling unit exploded, caught fire, and eventually sank in the Gulf of Mexico, resulting in a massive release of oil from the BP Exploration and Production, Inc. (BP) Macondo well, causing loss of life and extensive natural resource injuries. Initial efforts to cap the well following the explosion were unsuccessful, and for 87 days after the explosion, the well continuously and uncontrollably discharged oil and natural gas into the northern Gulf of Mexico. Approximately 3.19 million barrels (134 million gallons) of oil were released into the ocean (U.S. v. BP et al. 2015). Oil spread from the deep ocean to the surface and nearshore environment from Texas to Florida. Extensive response actions were undertaken to try to reduce harm to people and the environment. However, many of these response actions had collateral impacts on the environment and on natural resource services.

On February 19, 2016, the DWH Trustees issued a Final PDARP/PEIS detailing a specific proposed plan to fund and implement restoration projects across the Gulf of Mexico region into the future as restoration funds become available. That document describes Restoration Types that meet Trustee programmatic restoration goals that the DWH Trustees should use to guide restoration planning. On March 29, 2016, in accordance with OPA and NEPA, the DWH Trustees published a Notice of Availability (NOA) of a ROD for the Final PDARP/PEIS in the Federal Register (81 FR 17438). Based on the DWH Trustees' injury determination established in the Final PDARP/PEIS, the ROD set forth the basis for the DWH Trustees' decision to select Alternative A: Comprehensive Integrated Ecosystem Alternative. The DWH Trustees' selection of Alternative A includes the funding allocations established in the Final PDARP/PEIS.

On April 4, 2016, the United States District Court for the Eastern District of Louisiana entered a consent decree resolving the DWH Trustees' claims against BP for natural resources damages under OPA. Under the Consent Decree Among Defendant BP Exploration & Production Inc. ("BPXP"), The United States of America, and the States of Alabama, Florida, Louisiana, Mississippi, and Texas (Consent Decree), BP agreed to pay a total of $8.1 billion in natural resource damages (which includes the $1 billion that BP previously committed to pay for Early Restoration[4] projects) over a 15-year period, and up to an additional $700 million for adaptive management or to address injuries to natural resources that are presently unknown but may come to light in the future. The settlement allocated a specific sum of money to the Restoration Areas in each of the Gulf States, as well as Regionwide and Open Water, to conduct restoration (U.S. Department of Justice 2016).

Each Restoration Area has a specific monetary allocation to each of five Restoration Types specified in the Consent Decree. The DWH settlement allocation for the Texas TIG by Restoration Type is set forth in Table 1-1.

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[4] BP agreed to provide up to $1 billion toward Early Restoration projects in the Gulf of Mexico to address injuries to natural resources caused by the DWH oil spill in the Early Restoration Framework Agreement. Early Restoration proceeded in phases, with each phase adding additional projects to partially address injuries to nearshore resources, birds, fish, sea turtles, federally managed lands, and recreational uses. Sixty-five projects with a total cost of approximately $877 million were selected through the five phases of Early Restoration planning.

Table 1-1. Allocation of *Deepwater Horizon* Settlement Funds for the Texas Restoration Area by Restoration Type

Restoration Goal	Restoration Type	Total Texas Settlement Funds	Allocated During Early Restoration	Funds Remaining for Allocation
Restore and Conserve Habitat	Wetlands, Coastal, and Nearshore Habitats	$100,000,000	$0	$100,000,000
Restore Water Quality	Nutrient Reduction (nonpoint source)	$22,500,000	$0	$22,500,000
Replenish and Protect Living Coastal and Marine Resources	Sea Turtles	$27,465,000	$19,965,000	$7,500,000
	Birds	$40,603,770	$20,603,770	$20,000,000
	Oysters	$22,500,000	$0	$22,500,000
Provide and Enhance Recreational Opportunities	Provide and Enhance Recreational Opportunities	$18,582,688	$18,582,688	$0
Monitoring, Adaptive Management, and Administrative Oversight to Support Restoration Implementation		$6,500,000	$0	$6,500,000
Total NRD Funding for Texas:		**$238,151,458**	**$59,151,458**	**$179,000,000**

More details on the background of the Incident, its impact on the Gulf of Mexico ecosystem, and additional context for the settlement and allocation of funds can be found in the Final PDARP/PEIS.

1.2 DWH Trustees, Trustee Council, and TIGs

The DWH Trustees are the government entities authorized under OPA to act as trustees on behalf of the public to 1) assess the natural resource injuries resulting from the Incident, and then 2) develop and implement a restoration plan to compensate the public for those injuries. Trustees fulfill these responsibilities by developing restoration plans, providing the public with a meaningful opportunity to suggest restoration projects and to review and comment on proposed plans, implementing and monitoring restoration projects, managing natural resource damage funds, and documenting trustee decisions through a public administrative record. The DWH Trustees are responsible for governance of restoration planning throughout the entire Gulf Coast. To work collaboratively on the NRDA, the DWH

Trustees organized a Trustee Council composed of Designated Natural Resource Trustee Officials, or their alternates, for each of the DWH Trustee agencies.

The following federal and state agencies are designated DWH Trustees[5]:

- DOI as represented by the National Park Service, USFWS, and Bureau of Land Management;
- NOAA, on behalf of the DOC;
- USDA;
- EPA;
- TPWD, TGLO, and TCEQ;
- Louisiana Coastal Protection and Restoration Authority, Louisiana Oil Spill Coordinator's Office, Louisiana Department of Environmental Quality, Louisiana Department of Wildlife and Fisheries, and Louisiana Department of Natural Resources;
- Mississippi Department of Environmental Quality;
- Alabama Department of Conservation and Natural Resources and Geological Survey of Alabama; and
- Florida Department of Environmental Protection and Florida Fish and Wildlife Conservation Commission.

The DWH NRDA funds were distributed geographically to address the diverse suite of injuries that occurred at both regional and local scales. As specified in the Consent Decree and Final PDARP/PEIS, specific amounts of money were allocated to seven geographic areas: each of the five Gulf States (Texas, Louisiana, Mississippi, Alabama, and Florida), Regionwide, and the Open Ocean. The Texas Restoration Area includes coastal and nearshore areas within the geographic jurisdiction of the state of Texas. The funding distribution was based on the DWH Trustees understanding and evaluation of exposure and injury to natural resources and services, as well as their evaluation of where restoration spending for the various Restoration Types will be most beneficial within the ecosystem-level restoration portfolio.

TIGs are composed of individual DWH Trustee agency representatives and make all restoration decisions for the funding allocated to its Restoration Area, and ensure its actions are fully consistent with OPA requirements. Each TIG develops plans for, chooses, and implements specific restoration actions under the Final PDARP/PEIS (see Chapter 7 of the Final PDARP/PEIS).

1.3 Authorities and Regulations

As an oil pollution event, the Incident is subject to the provisions of OPA, 33 United States Code (U.S.C.) §§2701, *et seq.* In addition, the OPA NRDA regulations require that restoration planning actions undertaken by federal trustees comply with the NEPA, 42 U.S.C. §§4321 *et seq.*, and the regulations guiding its implementation at 40 CFR Parts 1500-1508 (15 CFR §990.23). More information about OPA,

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[5] The federal trustees are designated pursuant to OPA (33 U.S.C. §2706(b)(2)) and by Executive Order 12777 (1991); Executive Order 13158 (2000); and Executive Order 13626 (2012). Although a trustee under OPA by virtue of the proximity of its facilities to the *Deepwater Horizon* oil spill, the U.S. Department of Defense is not a member of the Trustee Council and did not participate in development of the Final PDARP/PEIS.

NEPA, and their application to DWH restoration planning can be found in Chapters 5 and 6 of the Final PDARP/PEIS.

1.3.1 OPA Compliance

A primary goal of OPA is to make the environment and public whole for injuries to natural resources and services resulting from an oil discharge or substantial threat of an oil discharge. Under OPA, each party responsible for a vessel or facility from which oil is discharged, or which poses the substantial threat of a discharge, is liable for, among other things, removal costs and damages for injury to, destruction of, loss, or loss of use of natural resources, including the reasonable cost of assessing the damage.

This process of injury assessment and restoration planning is referred to as NRDA. NRDA is described in OPA (33 U.S.C. §2706), the National Oil and Hazardous Substances Pollution Contingency Plan (40 CFR §§300.600-300.615), the Texas Oil Spill Prevention and Response Act (Texas Natural Resources Code Chapter 40), and the State of Texas Natural Resource Damage Assessment rules (Title 31, Texas Administrative Code Chapter 20). Per these regulations, the NRDA process generally involves three main phases:

- Preassessment, in which the trustees evaluate the potential for injuries to natural resources resulting from the incident;
- Restoration planning, in which the trustees evaluate and quantify the extent of injuries to natural resources to determine the need for, type of, and extent of restoration; and
- Restoration implementation, in which the trustees plan and ensure that restoration is implemented.

The DWH Trustees, through the TIGs, have initiated the restoration implementation phase of the NRDA for the Incident. As part of this phase, the Texas TIG has prepared this Final RP/EA, which identifies a reasonable range of alternatives in the Texas Restoration Area, evaluates those alternatives under applicable criteria, and selects a suite of preferred alternatives for implementation.[6]

1.3.2 NEPA Compliance

NEPA requires federal agencies to consider the potential environmental impacts of planned actions. It provides a mandate and framework for federal agencies to determine if their proposed actions have significant environmental effects and related social and economic effects. It also mandates that federal agencies consider these effects when choosing between alternative approaches, and inform and involve the public in the environmental analysis and decision-making process. NEPA and its implementing regulations (40 CFR Parts 1500-1508) outline the responsibilities of federal agencies in the NEPA process. In this document, the Texas TIG addresses these requirements by tiering from environmental analyses conducted in the Final PDARP/PEIS, evaluating existing analyses, incorporating by reference relevant analyses from existing project environmental assessments (EAs) and conservation plans, and

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[6] For the purposes of this RP/EA, each proposed project is considered a separate alternative and so the terms “project” and “alternative” may be used interchangeably in this document.

preparing environmental consequences analyses for projects as appropriate. See Chapter 4 for more information on tiering and incorporation by reference under NEPA and how they apply to this RP/EA.

1.4 Trustee Council Standard Operating Procedures

Another document which guides restoration planning is the 2016 Trustee Council Standard Operating Procedures for Implementation of the Natural Resource Restoration for the *Deepwater Horizon* (DWH) Oil Spill (Trustee Council SOP).[7] The Trustee Council developed the standard operating procedures (SOP) for administration, implementation, and long-term management of restoration under the Final PDARP/PEIS. The Trustee Council SOP documents the overall structure, roles, and decision-making responsibilities of the Trustee Council and provides the common procedures to be used by all TIGs. The Trustee Council SOP addresses, among other issues, the following topics: decision-making and delegation of authority, funding, administrative procedures, project reporting, monitoring and adaptive management (MAM), consultation opportunities among the DWH Trustees, public participation, and the Administrative Record.

The Trustee Council SOP was developed and approved by consensus of the Trustee Council and may be amended as needed. The division of responsibilities among the Trustee Council, TIGs, and Individual Trustee Agencies is summarized in Table 7.2-1 of the Final PDARP/PEIS.

1.5 Restoration Purpose and Need

The Texas TIG has undertaken this restoration planning effort to meet the purpose of restoring those natural resources and services injured as a result of the Incident. Restoration activities are intended to restore or replace habitats, species, and services to their baseline condition (primary restoration) and to compensate the public for interim losses from the time natural resources are injured until they recover to baseline conditions (compensatory restoration). This RP/EA is consistent with the Final PDARP/PEIS, which identifies extensive and complex injuries to natural resources and services across the Gulf of Mexico, as well as a need and plan for comprehensive restoration consistent with OPA. This RP/EA falls within the scope of the purpose and need identified in the Final PDARP/PEIS. As described in Section 5.3 of the Final PDARP/PEIS, the five Trustee programmatic restoration goals (Table 1-1) for restoration work independently and together to benefit injured resources and services. The selected alternatives in this RP/EA address two of the five Trustee programmatic restoration goals: 1) Restore and Conserve Habitat and 2) Replenish and Protect Living Coastal and Marine Resources. Additional information about the Purpose and Need for DWH NRDA restoration can be found in Section 5.3.2 of the Final PDARP/PEIS.

Consistent with the Trustee programmatic restoration goals, the Final PDARP/PEIS also identifies goals for each Restoration Type (Sections 5.5.2 through 5.5.14). These Restoration Type-specific goals help to guide restoration planning and project selection for each Restoration Type. To help meet these goals, implementation of this RP/EA will address the Wetlands, Coastal, and Nearshore Habitat Restoration Type, using the following Restoration Approaches in the Texas Restoration Area: create, restore and

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[7] The Trustee Council SOP is available through the NOAA Restoration Portal, here: http://www.gulfspillrestoration.noaa.gov/sites/default/files/wp-content/uploads/DWH-SOPs.pdf.

enhance coastal wetlands; restore and enhance dunes and beaches; and protect and conserve marine, coastal, estuarine and riparian habitats.

1.6 Proposed Action: TX TIG 2017 RP/EA

To address the Trustee programmatic restoration goals and Restoration Type-specific goals described in the Final PDARP/PEIS, the Texas TIG proposes to undertake the planning and implementation of 13 projects identified as preferred alternatives in this RP/EA to provide compensatory restoration of lost oysters and wetlands, coastal, and nearshore habitat in the Texas Restoration Area using funds allocated in the Consent Decree and Final PDARP/PEIS. Table 1-2 identifies these projects, along with the full range of reasonable alternatives considered. For the Nutrient Reduction (nonpoint source) Restoration Type, the Texas TIG has determined additional restoration planning is necessary, and does not propose any restoration projects in this RP/EA. In addition, the Sea Turtle and Bird Restoration Types are not addressed in this RP/EA. Alternatives considered for implementation in this plan are described briefly below and detailed in Chapters 3 and 4.

Table 1-2. The alternative name, Restoration Type, preferred and non-preferred projects, and associated project costs

Alternative	Preferred/ Not Preferred	Project Costs
Replenish and Protect Oysters (Living Coastal and Marine Resources)		
Oyster Restoration Engineering*	Preferred	$309,000
Landscape Approach to Oyster Reef Restoration	Not Preferred	$15,258,000
Restore and Conserve Wetlands, Coastal, and Nearshore Habitats		
Bird Island Cove Habitat Restoration Engineering*	Preferred	$206,000
Essex Bayou Habitat Restoration Engineering*	Preferred	$372,000
Dredged Material Planning for Wetland Restoration*	Preferred	$1,964,000
McFaddin Beach and Dune Restoration	Preferred	$15,874,000
Bessie Heights Wetland Restoration	Preferred	$4,905,000
Pierce Marsh Wetland Restoration	Preferred	$3,095,000
Dollar Bay and Moses Lake Wetland Restoration	Not Preferred	$4,225,000
Indian Point Shoreline Erosion Protection	Preferred	$2,199,000
Bahia Grande Hydrologic Restoration	Preferred	$5,050,000
Follets Island Habitat Acquisition	Preferred	$2,037,000
Mid-Coast Habitat Acquisition	Preferred	$2,082,000
Matagorda Peninsula Habitat Acquisition	Not Preferred	$3,012,000
Bahia Grande Coastal Corridor Habitat Acquisition	Preferred	$2,271,000

Alternative	Preferred/ Not Preferred	Project Costs
Laguna Atascosa Habitat Acquisition	Preferred	$5,397,000

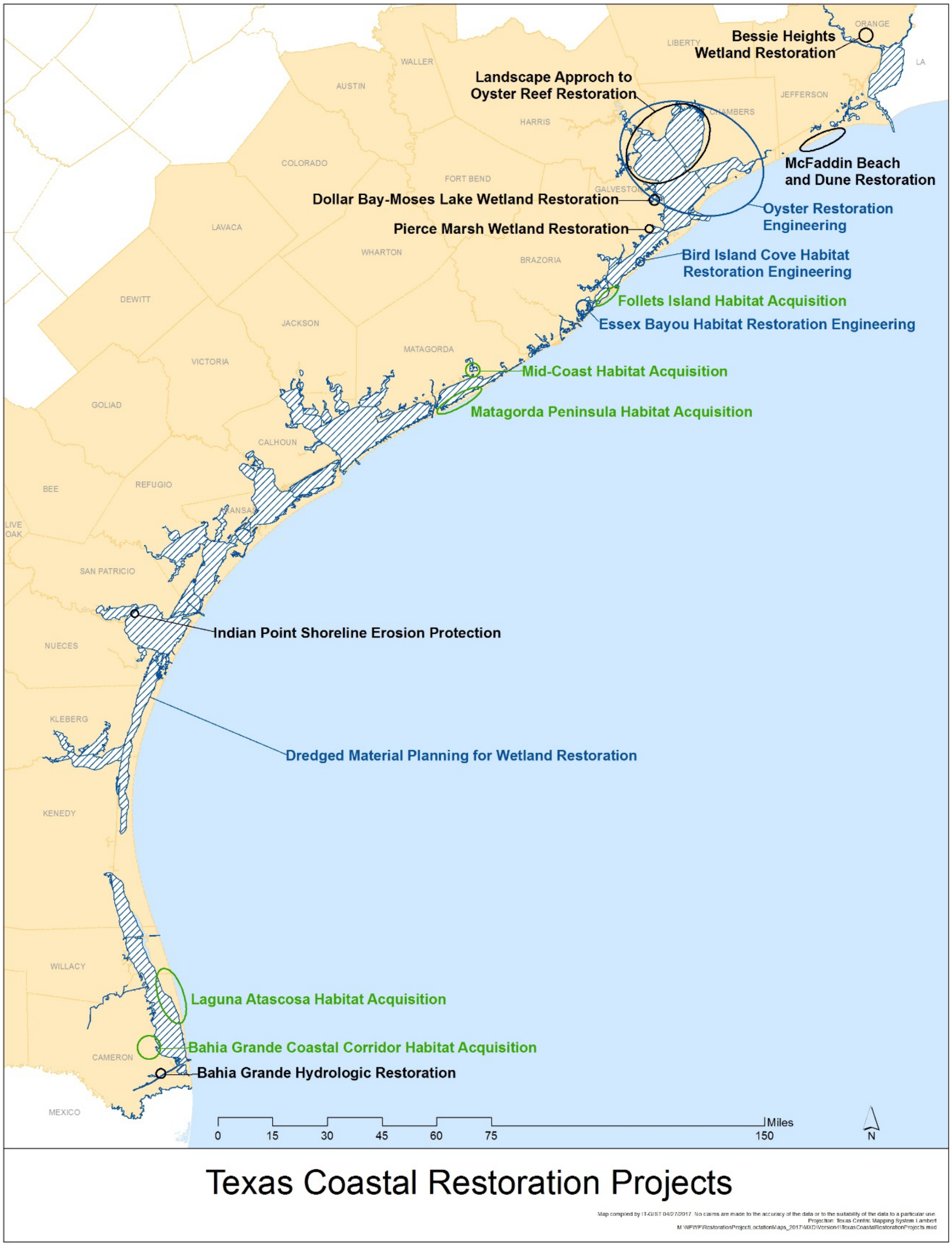
*Note: *Alternatives proposing only engineering and design activities.*

The Texas TIG will propose additional restoration projects in Texas to address the Oyster and Wetlands, Coastal, and Nearshore Habitat Restoration Types, as well as projects to address the Nutrient Reduction (nonpoint source), Sea Turtle, and Bird Restoration Types, in subsequent restoration plans.

1.7 Alternatives Evaluated in this Plan

Projects in this RP/EA were developed through review of DWH Trustee project ideas and projects proposed by the public since the DWH restoration planning process was initiated in 2010. Public involvement is an important component of restoration planning (Final PDARP/PEIS, Section 1.7).

In total, the Texas TIG evaluated 16 different projects and two No Action alternatives as the reasonable range of alternatives in this RP/EA. These projects are intended to contribute to the restoration of habitats, species, and services in the Texas Restoration Area. Through the alternative evaluation process described in the remainder of this document, the Texas TIG selected 13 projects as preferred alternatives. Table 1-2 identifies the projects evaluated and which of those projects are preferred for implementation. The locations of all the alternatives are shown in Figure 1-1.



Map compiled by IT-GIST 04/27/2017. No claims are made to the accuracy of the data or to the suitability of the data to a particular use.
Projection: Texas Centric Mapping System Lambert
M:\NFWF\RestorationProjectLoctationMaps_2017\MXD\Version4\TexasCoastalRestorationProjects.mxd

Figure 1-1. Location of the reasonable range of alternatives evaluated.

1.8 Severability of Projects

In this RP/EA, the Texas TIG selects 13 preferred restoration project alternatives with a total funding of $45,761,000. The alternatives presented in this RP/EA were individually selected for implementation. Additional alternatives may be selected for implementation future restoration plans by the Texas TIG.

1.9 Coordination with Other Gulf Restoration Programs

As discussed in Section 1.5.6 of the Final PDARP/PEIS, the DWH Trustees are committed to coordination with other Gulf of Mexico restoration programs to maximize the overall ecosystem impact of DWH NRDA restoration efforts. During the course of the restoration planning process, the Texas TIG has coordinated and will continue to coordinate with other DWH oil spill and Gulf of Mexico restoration programs, including the Resources and Ecosystems Sustainability, Tourist Opportunities, and Revived Economies of the Gulf Coast States Act (RESTORE Act) as implemented by the Gulf Coast Ecosystem Restoration Council (GCERC); the Gulf Environmental Benefit Fund (GEBF) managed by the National Fish and Wildlife Foundation (NFWF); in addition to other state and federal funding sources.

In so doing, the Texas TIG has been reviewing the implementation of projects in other coastal restoration programs and is attempting to create synergies with those programs to ensure the most effective use of available funds for the maximum coastal benefit. This coordination will ensure that funds are allocated for critical restoration projects across the affected regions of the Gulf of Mexico and within appropriate coastal Texas areas. The Texas TIG will continue to collaborate with other restoration programs to maximize cost savings and restoration benefits to the resources in coastal Texas that were injured by the Incident.

For example, at least two projects selected in this RP/EA are receiving partial funding through the RESTORE Act, including Bessie Heights Wetland Restoration and Pierce Marsh Wetland Restoration. Additional projects may be considered for future NFWF GEBF and/or RESTORE Act funding to expand or complement projects selected in this RP/EA, including McFaddin Beach and Dune Restoration, Follets Island Habitat Acquisition, and Dredged Material Planning for Wetland Restoration.

1.10 Public Participation

OPA, NEPA, and the Trustee Council SOP require the DWH Trustees to consider public comments on the restoration planning process associated with the Incident. On October 1, 2010, the DWH Trustees published the Notice of Intent to Conduct Restoration Planning (75 FR 60800). The DWH Trustees sought restoration project ideas from the public through two websites: the DWH Trustee website (NOAA Gulf Spill web portal) http://www.gulfspillrestoration.noaa.gov and later the state of Texas website (Restore the Texas Coast web portal) https://www.RestoretheTexasCoast.org, resulting in the submission of over 800 projects relevant to Texas. In preparation for the Draft RP/EA, on July 6, 2016, the Texas TIG requested the public submit project ideas through the two websites for restoration projects in the Texas

Restoration Area.[8] As part of the project solicitation, the Texas TIG indicated its intention to focus on three Restoration Types for the current round of restoration planning:

- Replenish and Protect Living Coastal and Marine Resources (Oysters),
- Restore and Conserve Wetlands, Coastal, and Nearshore Habitats, and
- Restore Water Quality through Nutrient Reduction (nonpoint source).

The Texas TIG chose to focus on these three Restoration Types because projects benefitting these Types had not been funded and implemented in Texas as part of Early Restoration. During Early Restoration, projects were selected in the Texas Restoration Area that began restoration of injuries for lost recreational use, sea turtles, and birds. Focusing on the oysters, nutrient reduction, and habitat projects allowed the Texas TIG to address restoration needs for Restoration Types not yet addressed in the Texas Restoration Area. Despite the focus on these restoration types, the Texas TIG did consider important opportunities for additional restoration and protection of avian resources and sea turtles. In developing the Draft RP/EA, the Texas TIG considered projects submitted by the public via the Restore the Texas Coast and NOAA Gulf Spill web portals between 2010 and August 31, 2016, as specified in the July 6, 2016 request.

On May 18, 2017, the Texas TIG published a Draft RP/EA. The public was encouraged to review and comment on the Draft RP/EA during a 30-day comment period. During this period, the Texas TIG hosted two public meetings: one in Corpus Christi, TX (June 7) and one in La Marque, TX (June 8). The Texas TIG also hosted a web-based comment submission site and provided a P.O. Box where the public could provide comments. As a result, the Texas TIG received submissions from private citizens; state and local agencies; non-governmental organizations; and private businesses.

The public comment period closed on June 19, 2017. During this time, the Texas TIG received a total of 117 individual submissions from private citizens, businesses, federal, state and local agencies, nongovernmental organizations, and others. The Texas TIG received comments via public meetings, web-based submissions, email, and mailed-in submissions. Overall, the Texas TIG received general comments about the Draft RP/EA, comments regarding project selection and implementation, comments offering assistance or expertise, comments in support of specific projects, comments proposing alternative projects, comments on the monitoring and adaptive management planning process, and comments on the public comment process.

Chapter 7 of this document provides further detail on the public comment process and includes a summary of all public comments received on the Draft RP/EA and Texas TIG responses. This RP/EA reflects revisions to the Draft RP/EA arising from public comments received; progress on compliance with other laws, regulations, and Executive Orders; and continuing Texas TIG project development and

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[8] The public request can be viewed here: http://www.gulfspillrestoration.noaa.gov/2016/06/texas-trustee-implementation-group-calls-restoration-project-proposals

consideration of potentially relevant information. This RP/EA also includes expanded Monitoring and Adaptive Management Plans for selected projects, attached as Appendix D to this document.

1.10.1 Administrative Record

Pursuant to 15 CFR §990.45, the DWH Trustees opened a publicly available administrative record for the Incident, including restoration planning activities, concurrently with the publication of the 2010 Notice of Intent. DOI is the lead federal DWH Trustee responsible for maintaining the Administrative Record, which can be found at http://www.doi.gov/deepwaterhorizon/adminrecord. Information about Texas TIG restoration planning, project implementation, and Early Restoration project implementation is available to the public through the Administrative Record and other outreach efforts, including http://www.gulfspillrestoration.noaa.gov.

1.11 Document Organization

This RP/EA is divided into the following chapters:

- **Front Matter** (Comment Period, Executive Summary, List of Abbreviations and Acronyms, Important Definitions, Species List);
- **Chapter 1** (Introduction, Purpose and Need, and Public Participation): Introductory information and context for the document;
- **Chapter 2** (Restoration Planning Process): Background on the NRDA restoration planning process, summary of injuries to resources resulting from the Incident that the Texas TIG addressed in this RP/EA, how restoration projects were screened to address those injuries, and how the reasonable range of alternatives was developed;
- **Chapter 3** (OPA Evaluation of Alternatives): Evaluation of the reasonable range of alternatives for NRDA restoration against criteria set forth in OPA, and identification of a suite of preferred restoration alternatives;
- **Chapter 4** (Environmental Assessment): Discussion of affected environment, environmental setting, NEPA regulations, and environmental consequences of each of the reasonable range of alternatives in this RP/EA;
- **Chapter 5** (Cumulative Impacts): Discussion of cumulative environmental impacts of the preferred alternatives;
- **Chapter 6** (Compliance with Other Laws and Regulations): Discussion of additional federal and state laws that may apply to the preferred alternatives;
- **Chapter 7** (Public Comment on the Draft 2017 Restoration Plan and Environmental Assessment): Summary of comments received from the public during the comment period and the Texas TIG's responses;

- **Chapter 8** (Preferred and Non-Preferred Alternatives): Summarizes evaluation of alternatives and identifies the preferred alternatives selected in this RP/EA;
- **Chapter 9** (List of Preparers and Reviewers): Identification of individuals who substantively contributed to the development of this document;
- **Chapter 10** (List of Repositories): Identification of locations where document is available for public review;
- **Chapter 11** (References); and
- **Appendices** (A – Project Screening Rubric and Table, B – Construction Site Air Quality Best Management Practices, C – Guidelines for NEPA Impact Determinations, D—Monitoring and Adaptive Management [MAM] Plans, E—Coastal Zone Management Act Correspondence, F—Finding of No Significant Impact [FONSI]).

2 Restoration Planning Process

NRDA restoration under OPA is a process that includes evaluating injuries to natural resources and natural resource services to determine the types and extent of restoration needed to address the injuries. Restoration activities need to produce benefits that are related to or have a nexus (connection) to natural resource injuries and service losses resulting from a spill. The trustees must identify a reasonable range of restoration alternatives and then evaluate those proposed alternatives. The OPA NRDA regulations (15 CFR §990.54) provide factors to be used by trustees to evaluate projects designed to compensate the public for injuries caused by oil spills. Under the OPA regulations (15 CFR §990.53), the Texas TIG developed a screening process to identify a reasonable range of alternatives to be further evaluated in this plan.

This chapter of the RP/EA describes the screening process used by the Texas TIG to identify the reasonable range of alternatives included in this RP/EA. The reasonable range of alternatives identified is consistent with the DWH Trustees' selected programmatic alternative and the goals identified in the Final PDARP/PEIS. Consequently, this chapter also summarizes the restoration decisions stated in the Final PDARP/PEIS and ROD, the relationship of the Final PDARP/PEIS to this document, injuries addressed by this restoration plan, and the projects considered in the reasonable range of alternatives. The restoration planning process was also conducted in accordance with the Consent Decree, Trustee Council SOP, OPA regulations, and NEPA regulations.

2.1 Final PDARP/PEIS & Record of Decision

Given the potential magnitude and breadth of restoration for injuries resulting from the Incident, the DWH Trustees prepared a Final PDARP/PEIS under OPA and NEPA to analyze alternative Restoration Approaches and establish targeted Restoration Type-specific goals to consistently guide restoration decisions. On February 19, 2016, the DWH Trustees issued the Final PDARP/PEIS detailing a programmatic plan to fund and implement restoration projects across the Gulf of Mexico region over the next 15 years. Based on the DWH Trustees' thorough assessment of impacts to the Gulf's natural resources, a comprehensive, integrated ecosystem restoration approach for restoration implementation was proposed.

On March 29, 2016, in accordance with OPA and NEPA, the DWH Trustees published a NOA of a ROD for the Final PDARP/PEIS in the Federal Register (81 FR 17438). Based on the DWH Trustees' injury determination established in the Final PDARP/PEIS, the ROD sets forth the basis for the DWH Trustees' decision to select Alternative A: Comprehensive Integrated Ecosystem Alternative. The DWH Trustees' selection of Alternative A includes the funding allocations established in the Final PDARP/PEIS. More information about Alternative A can be found in Sections 5.5 and 5.10 of the Final PDARP/PEIS.

2.1.1 Relationship of this RP/EA to the Final PDARP/PEIS

As a programmatic restoration plan, the Final PDARP/PEIS provides direction and guidance for identifying, evaluating, and selecting future restoration projects to be carried out by the TIGs (Section 5.10.4 and Chapter 7 of the Final PDARP/PEIS). The DWH Trustees elected to prepare a programmatic environmental impact statement to support the analysis of the environmental impacts of the reasonable range of alternatives, to consider the multiple related actions that may occur because of restoration planning efforts, and to allow for a better analysis of cumulative impacts of potential actions.

In the Final PDARP/PEIS, the DWH Trustees developed a set of Restoration Types for inclusion in programmatic alternatives with an objective to seek a diverse set of projects providing benefits to a broad array of potentially injured resources and services they provide. Ultimately, this process resulted in the inclusion of 13 Restoration Types related to four of the Trustee programmatic restoration goals (Table 2-1 – Bold text indicates the Restoration Types in the Texas Restoration Area for which DWH NRDA funding has not been completely allocated [see Table 1-1]). The Consent Decree and Final PDARP/PEIS allocated funding for just five Restoration Types[9] in the Texas Restoration Area:

- Wetlands, Coastal, and Nearshore Habitats,
- Nutrient Reduction (nonpoint source),
- Oysters,
- Birds, and
- Sea Turtles.

Table 2-1. The Trustee programmatic restoration goals and associated Restoration Types identified in the Final PDARP/PEIS.

Trustee Programmatic Restoration Goals	Restoration Type
Restore and Conserve Habitat	**Wetlands, Coastal, and Nearshore Habitats** Habitat Projects on Federally Managed Lands
Restore Water Quality	**Nutrient Reduction (nonpoint source)** Water Quality
Replenish and Protect Living Coastal & Marine Resources	Fish and Water Column Invertebrates Sturgeon Submerged Aquatic Vegetation **Oysters** **Sea Turtles** Marine Mammals **Birds** Mesophotic and Deep Benthic Communities
Provide and Enhance Recreational Opportunities	Provide and Enhance Recreational Opportunities

On July 6, 2016, the Texas TIG began soliciting project ideas for restoration projects in Texas, and indicated its intention to focus on Restoration Types previously unaddressed by Early Restoration:

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[9] All available DWH NRDA funds allocated to the Restoration Type: Provide and Enhance Recreational Opportunities, in the Texas Restoration Area were addressed in Early Restoration.

Oysters; Nutrient Reduction (nonpoint source); and Wetlands, Coastal, and Nearshore Habitats. As stated in the request, the Texas TIG still considered any time-critical opportunities for additional restoration and protection of birds and sea turtles. Project proposals that fit into the Sea Turtle and Bird Restoration Types that were not considered time-critical were ultimately held for consideration in future restoration planning efforts.

2.2 Summary of Injuries Addressed in the RP/EA

Chapter 4 of the Final PDARP/PEIS summarizes the injury assessment, which documented the nature, degree, and extent of injuries from the Incident to both natural resources and the services they provide. Restoration projects identified in this RP/EA and in future Texas TIG restoration plans are designed to address injuries in the Texas Restoration Area resulting from the Incident. This RP/EA selects alternatives for the following Restoration Types which are described in the Final PDARP/PEIS: Oysters and Wetlands, Coastal, and Nearshore Habitats. This section summarizes the information from Chapter 4 of the Final PDARP/PEIS injury assessment and establishes the nexus for restoration planning for these particular resources.

2.2.1 Benthic Resources and Nearshore Marine Ecosystem (Oysters)

The DWH Trustees evaluated the toxicity and injury of oil to bottom-dwelling organisms, including fish, oysters, and crustaceans, as part of the nearshore resource toxicity testing work (Final PDARP/PEIS Sections 4.5 and 4.6). Documented injuries to both subtidal and nearshore oysters resulted in a loss of ecological services provided by these organisms.

Oysters play a unique role in the coastal ecosystem, providing improved water quality and habitat for economically and ecologically important marine species. They serve not only as a harvestable resource, but also provide habitat for other aquatic organisms such as shrimp, crabs, and finfish. They provide filtration services that improve water quality and clarity. Oyster reefs adjacent to marshes reduce marsh erosion; when these reefs were injured, erosion increased.

Oyster populations were severely impacted throughout the Gulf due to the Incident. As discussed in the Final PDARP/PEIS (Section 4.6), exposure to oil injured large populations of oysters occupying most of the estuaries along the northern Gulf of Mexico. Across the Gulf, between 4 and 8.3 billion subtidal oysters (adult equivalents) are estimated to have been lost due to direct mortality and a consequent lack of reproduction. Over three generations (which represents a minimum recovery time), these lost oysters would have produced a total of 240 to 508 million pounds of oyster meat.

2.2.2 Nearshore Ecosystem (Wetlands, Coastal, and Nearshore Habitat)

The Incident caused significant injuries to the nearshore marine ecosystem across the northern Gulf of Mexico (Final PDARP/PEIS Section 4.6). At least 1,300 miles (2,100 kilometers) of shoreline were exposed to oil from the spill. A wide variety of nearshore and coastal resources were injured over hundreds of miles of shoreline, including shoreline beaches and sediments and organisms that live on and in the sand and sediment. Sand beaches and their associated dunes are integral to the northern Gulf of Mexico ecosystem, playing many important economic, recreational, and ecological roles. Sand beaches and dunes provide habitat to a diversity of biota, including crabs, snails, worms, and other small organisms, which in turn are food for larger biota such as birds, fish, and turtles (Final PDARP/PEIS Section 4.6.6).

The Incident also resulted in injuries to marsh habitats, including marsh plants and associated organisms. As discussed in the Final PDARP/PEIS, [o]iling 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 (Final PDARP/PEIS Section 4.6.4.1). Further, marsh plants help stabilize shorelines by holding, retaining, and accumulating marsh sediments. They also contribute to coastal flood protection by reducing storm surge and waves, and they provide critical structural habitat (as refuge and forage) for a wide variety of organisms (Final PDARP/PEIS Section 4.11.4).

2.3 Screening for Reasonable Range of Alternatives

In developing a reasonable range of alternatives suitable for addressing the injuries caused by the Incident, the Texas TIG reviewed the Trustee programmatic restoration goals and Restoration Type-specific goals specified in the Final PDARP/PEIS (see Section 2.2 of this RP/EA). The Texas TIG also considered other criteria identified in the Final PDARP/PEIS, including screening factors in the OPA regulations (15 CFR §990.54), input from the public, the current and future availability of funds under the DWH NRDA settlement payment schedule, as well as projects already funded or proposed to be funded by the other DWH restoration funding sources (NFWF GEBF and RESTORE Act). Consistent with Section 9.4.1.4 of the Trustee Council SOP, the Texas TIG, and individual Trustee agencies within the TIG developed project ideas and considered relevant project ideas submitted by the public.

2.3.1 Phasing of Projects

The Final PDARP/PEIS provides the structure for TIGs to propose different strategies to implement, or in some cases, phase proposed restoration projects across multiple restoration plans. For example, a TIG may propose funding a planning phase (e.g., initial engineering and design [E&D] and compliance) in one restoration plan for a conceptual project. This approach would allow the TIG to develop projects to the extent needed to fully consider a subsequent implementation phase of that project in a future restoration plan. The Texas TIG proposes this strategy for several E&D projects discussed in Chapters 3 and 4 of this RP/EA.

2.3.2 Texas TIG Screening Process

The Texas TIG reviewed the Final PDARP/PEIS Programmatic Trustee Goals and developed a set of selection criteria for identifying projects to develop a reasonable range of alternatives for restoration in this RP/EA. The Texas TIG initially prioritized three Restoration Types described in the Final PDARP/PEIS (Oysters; Nutrient Reduction; and Wetland, Coastal, and Nearshore Habitat) for inclusion in this RP/EA.

The project screening process developed by the Texas TIG for the purpose of preparing the RP/EA included ideas submitted by the public via the Restore the Texas Coast and NOAA Gulf Spill Restoration web portals. Project submissions began in 2010 and continued through August 2016. The Texas TIG reviewed more than 800 restoration projects proposed by the public, non-governmental organizations

(NGOs), and state, federal, and local agencies. Projects within the Texas Restoration Area in both portals identified above were combined, and a cumulative project list was then sorted by the five Restoration Types identified in the Final PDARP/PEIS (Oysters; Nutrient Reduction [nonpoint source]; Wetlands, Coastal, and Nearshore Habitat; Sea Turtles; and Birds). Projects were considered for funding in more than one Restoration Type where appropriate. Projects that did not meet the goals of any Restoration Type eligible for funds in the Texas Restoration Area were removed from consideration (see more detail on Restoration Types in Section 2.4.2.1).

The Texas TIG project screening process is illustrated below. Project review and screening took place in several stages, and is broadly presented in a step-wise manner in Figure 2-1, including the number of projects considered at each stage of review. Table 2-2 outlines the criteria considered by Texas TIG during the project screening process. Further details of each stage of the project selection process are presented in Sections 2.4.2.1 through 2.4.2.5.

Table 2-2. Overview of criteria considered by the Texas TIG in project screening process

Stage of Screening	Criteria/Factors Considered
Consistency with one or more Restoration Type as defined in the Final PDARP/PEIS	Project objectives are consistent with one or more of the five Restoration Types identified in the Final PDARP/PEIS for which funding in the Texas Restoration Area was allocated: – Oysters – Nutrient Reduction (nonpoint source) – Wetland, Coastal, and Nearshore Habitats – Sea Turtles – Birds
Consistency with Prioritized Restoration Types	Project is consistent with the prioritized Restoration Types identified in the July 6, 2016, public request for project ideas: – Project replenishes and protects identified living coastal and marine resources: oysters, or – Project restores water quality through nutrient reduction (nonpoint sources), or – Project restores and conserves wetland, coastal, and nearshore habitat, or – Project presents unique opportunities for restoration that benefits sea turtles or birds.

Stage of Screening	Criteria/Factors Considered
Evaluation based on OPA Factors	Project is evaluated on the extent to which it meets screening factors defined in the OPA regulations (15 CFR §990.554): – Project delivers benefits cost-effectively – Project meets trustee goals – Project has a reasonable probability of success: organization & technical feasibility – Project prevents future and collateral injury to natural resources and services – Project benefits more than one natural resource and/or service – Project would not negatively impact public health and safety
Evaluation based on Additional Criteria determined by the Texas TIG	Project is evaluated on the extent to which it meets additional criteria determined by the Texas TIG: – Project is not already required by existing regulations – Project complies with applicable laws and regulations – Project supports existing regional or local conservation efforts or plans – Project has not already been funded – Project is anticipated to provide ecological or public benefits within a reasonable/acceptable amount of time – Project is capable of providing long-term, sustainable ecological or public benefits – Project is time critical – Project offers opportunities for external funding and/or collaboration
Evaluation within Restoration Type	Remaining projects sorted into Restoration Approach, then ranked according to tallied score from previous screening steps. Those which ranked into “high” and “medium” categories were carried forward (process described in further detail in Section 2.4.2.4.
Additional Considerations	Other factors the TIG considered during the screening process include: – Availability of funds for the Restoration Type – Project readiness (the project can start to be implemented in a relatively short period of time) – Project timeliness (the need for the project is time-critical) – Nexus to injury (the project accounts for injuries to public resources incurred by Texas as a result of the Incident)

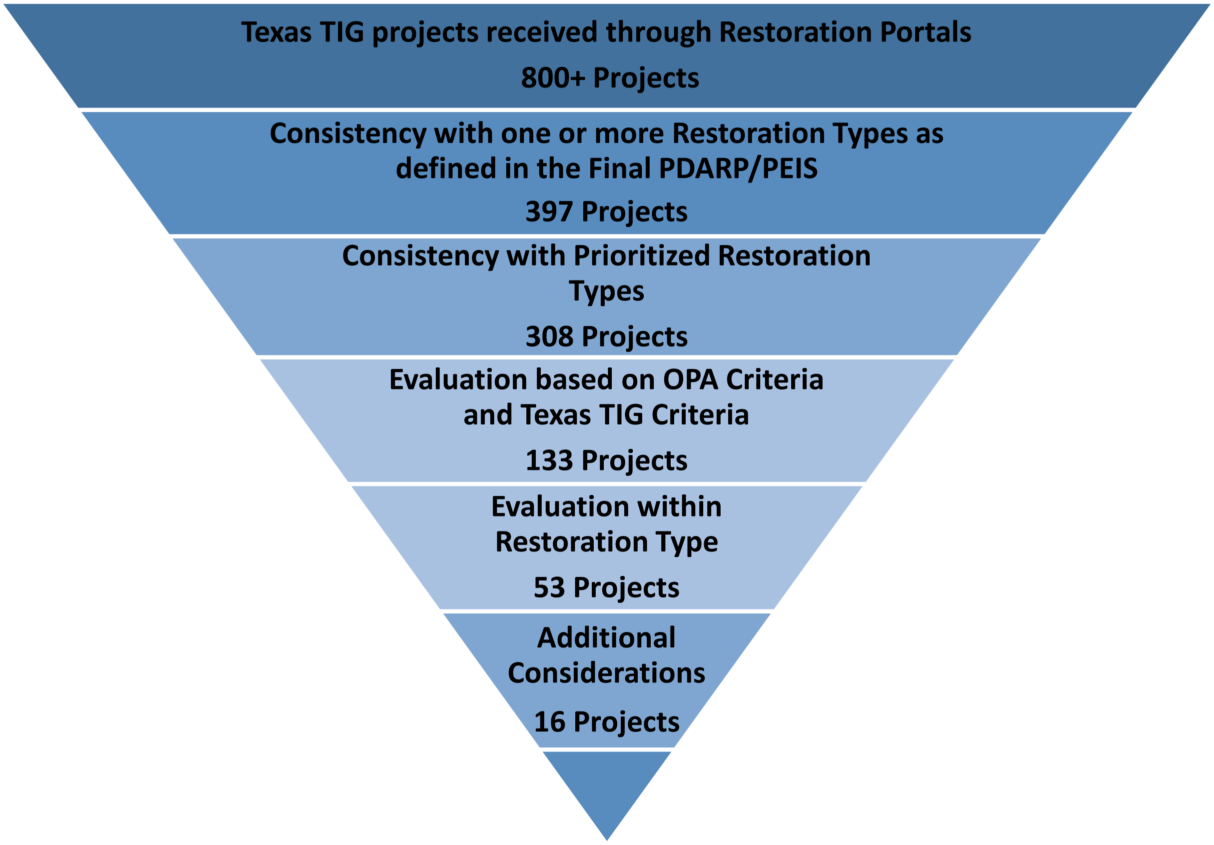

Figure 2-1. Overview of Texas TIG Project Screening Process

2.3.2.1 Consistency with the Restoration Types in the Final PDARP/PEIS

The OPA regulations allow trustees to establish additional incident-specific evaluation and selection factors to use in developing a reasonable range of alternatives and restoration projects (15 CFR §990.54). For this Incident, the DWH Trustees have determined that preferred alternatives and subsequent restoration plans and projects must also be consistent with the Trustee programmatic restoration goals outlined in Section 5.3.1 of the Final PDARP/PEIS, Programmatic Trustee Goals, and with the Restoration Types described in Section 5.5, Alternative A: Comprehensive Integrated Ecosystem Restoration (Preferred Alternative).

Initially, the Texas TIG screened projects based on the extent to which the project met the goals of one or more Restoration Types identified for the Texas Restoration Area (Wetlands, Coastal and Nearshore Habitats; Nutrient Reduction; Oysters; Sea Turtles; and Birds). As defined in the Final PDARP/PEIS, the project had to fit into at least one of the Restoration Types listed above in order to be considered further in the review process. Figure 2-2 graphically summarizes the Trustee programmatic restoration goals and associated Restoration Types identified in the Final PDARP/PEIS.

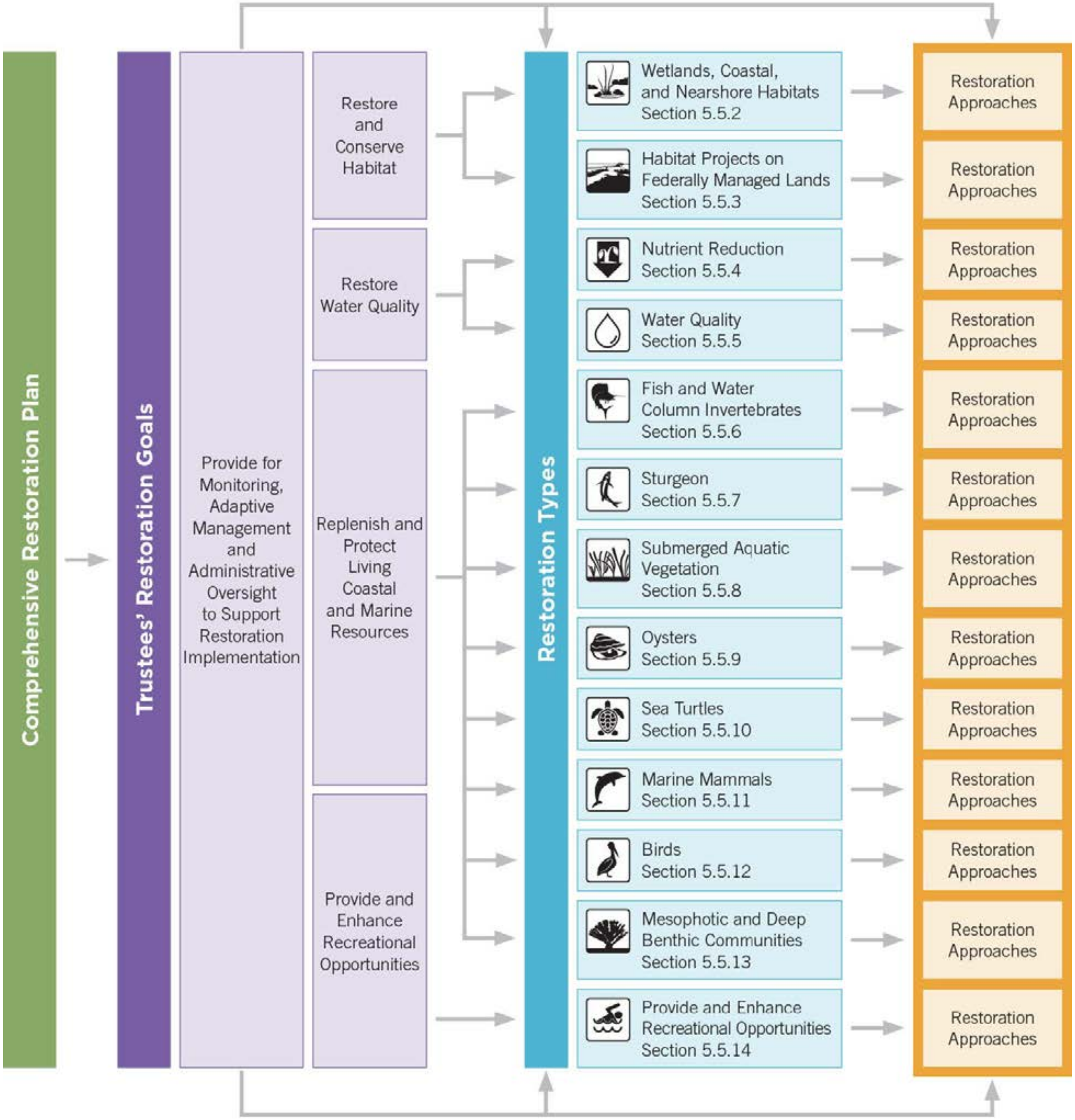

Figure 2-2. The DWH Trustees' comprehensive restoration plan showing the Trustee programmatic restoration goals and the related Restoration Types connecting to Restoration Approaches (Provided as Figure 5.4-1 in the Final PDARP/PEIS.)

Chapter 5 of the Final PDARP/PEIS also specified goals for each Restoration Type to guide restoration within the framework of each Type (see Table 2-3).

Table 2-3. Goals of Each Restoration Type (Chapter 5 of the Final PDARP/PEIS)

Restoration Type	Goal of the Restoration Type
Wetlands, Coastal, and Nearshore Habitats	– 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 of Mexico, 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.
Nutrient Reduction (nonpoint source)	– Reduce nutrient loadings to Gulf Coast estuaries, habitats, and resources that are threatened by chronic eutrophication, hypoxia, or harmful algal blooms or that suffer habitat losses associated with water quality degradation. – Where appropriate, co-locate nutrient load reduction projects with other restoration projects to enhance ecological services provided by other Restoration Approaches. – Enhance ecosystem services of existing and restored Gulf Coast habitats.
Oysters	– Restore oyster abundance and spawning stock to support a regional oyster larvae pool sufficient for healthy recruitment levels to subtidal and nearshore oyster reefs. – Restore resilience to oyster populations that are supported by productive larval source reefs and sufficient substrate in larval sink areas to sustain reefs over time. – Restore a diversity of oyster reef habitats that provide ecological functions for estuarine-dependent fish species, vegetated shoreline and marsh habitat, and nearshore benthic communities.
Birds	– Restore lost birds by facilitating additional production and/or reduced mortality of injured bird species. – Restore or protect habitats on which injured birds rely. – Restore injured birds by species where actions would provide the greatest benefits within geographic ranges that include the Gulf of Mexico.

Restoration Type	Goal of the Restoration Type
Sea Turtles	– Implement an integrated portfolio of Restoration Approaches to address all injured life stages (hatchling, juvenile, and adult) and species of sea turtles. – Restore injuries by addressing primary threats to sea turtles in the marine and terrestrial environment such as bycatch in commercial and recreational fisheries, acute environmental changes (e.g., cold water temperatures), loss or degradation of nesting beach habitat (e.g., coastal armoring and artificial lighting), and other anthropogenic threats. – Restore sea turtles in the various geographic and temporal areas within the Gulf of Mexico and Atlantic Ocean that are relevant to injured species and life stages. – Support existing conservation efforts by ensuring consistency with recovery plans and recovery goals for each of the sea turtle species.

2.3.2.2 Consistency with Prioritized Restoration Types

In developing a reasonable range of alternatives, the Texas TIG considered the benefits of ongoing sea turtle and bird Early Restoration projects. Since these ongoing projects are already benefiting bird and sea turtle resources in the Texas Restoration Area, the Texas TIG determined that this RP/EA would focus on other resources not prioritized in Early Restoration. The Texas TIG made a public request for project proposals on July 6, 2016, which identified three Restoration Types that would be prioritized for inclusion in this RP/EA: Oysters; Nutrient Reduction (nonpoint source); and Wetland, Coastal, and Nearshore Habitats. As stated in the request, the Texas TIG still considered any time-critical opportunities for additional restoration and protection of birds and sea turtles. Project proposals that fit into the Sea Turtle and Bird Restoration Types that were not considered time-critical were ultimately held for consideration in future restoration planning efforts.

2.3.2.3 OPA Factors and Texas TIG Criteria Evaluation

Subsequently, the Texas TIG reviewed each individual project based on the screening factors established in the OPA regulations (15 CFR §990.54(a)), which govern the NRDA process, as well as specific factors identified by the Texas TIG. Additional criteria that would assist in the identification of fatal flaws that would remove projects from further consideration were also established.

The OPA factors include:

- The cost to carry out the alternative;
- The extent to which each alternative is expected to meet the goals and objectives of returning the injured natural resources and services to baseline and/or compensating for interim losses;
- The likelihood of success of each alternative [based on both technical and organizational feasibility];

- The extent to which each alternative will prevent future injury as a result of the incident and avoid collateral injury as a result of implementing the alternative;
- The extent to which each alternative benefits more than one natural resources and/or service; and
- The effect of each alternative on public health and safety.

Additional criteria identified by the Texas TIG:

- Whether or not the alternative is already required by existing laws or regulations;
- Whether or not the alternative complies with all applicable laws and regulations;
- The extent to which each alternative supports existing regional or local conservation efforts or plans;
- Whether or not the alternative is already funded through a different source;
- The extent to which each alternative is sustainable and would produce long-term benefits without the assistance of continuous funding into the future;
- The extent to which each alternative is time critical; and
- The extent to which each alternative offers opportunities for collaboration and/or leveraged external funding sources.

In addition, the Texas TIG established a set of minimum criteria based on the above that each project had to satisfy in order to move forward in the review process. A project was removed from consideration if:

- The project would cause significant collateral damage or would cause future injury to natural resources;
- Similar projects or methodologies had been previously implemented with limited or no success;
- The project would result in significant negative effects on human health and safety or any ongoing or anticipated remedial actions;
- The project is already required by existing regulations, permits, settlements, or enforcement orders;
- The project has already been funded and no longer requires funding; or
- The anticipated benefits of project activities will take an unreasonable amount of time to come to fruition.

Each project was scored based on the factors and criteria described above. The Texas TIG tracked this decision-making process utilizing a project proposal screening table. Additional detail on each of the screening criteria and a copy of the screening table are including in this document as Appendix A.

2.3.2.4 Evaluation within Restoration Types

After the initial OPA screening, the Texas TIG sorted each proposed project alternative by its respective Restoration Type. In order to ensure consistency with the Final PDARP/PEIS, and due to the disproportionate number of projects categorized in the Wetlands, Coastal, and Nearshore Habitat Restoration Type, projects within this Restoration Type were further separated according to the

Restoration Approaches identified in the Final PDARP/PEIS (see Chapter 6 of the Final PDARP/PEIS). The Restoration Approaches considered by the Texas TIG were:

1) Create, restore, and enhance coastal wetlands;
2) Restore and enhance dunes and beaches; and
3) Protect and conserve marine, coastal, estuarine, and riparian habitats.

For efficiency, the Texas TIG first identified the projects most appropriate for phasing at this time and funding for E&D type activities only. Projects considered ready for full implementation projects were then identified as habitat construction or conservation and preservation through acquisition. Construction projects included three Restoration Approaches: create, restore, and enhance coastal wetlands; restore and enhance dunes and beaches; and create, restore, and enhance barrier and coastal islands and headlands. The fourth Restoration Approach (protect and conserve marine, coastal, estuarine, and riparian habitats) encompassed all the projects involving conservation and preservation through acquisition.

Only one Restoration Approach (restore oyster reef habitat) is identified for the Oyster Restoration Type in the Final PDARP/PEIS. In addition, the Texas TIG determined that it was unnecessary to subdivide projects under the Restoration Type Nutrient Reduction (nonpoint source) by Restoration Approach.

Scores developed from the previous stage of screening were then summed, and the project alternatives were then sorted by “high”, “medium”, and “low” according to the project’s score. In all restoration groupings, “high” and “medium” projects were retained for further consideration by the Texas TIG. Within each restoration grouping, these “high” and “medium” projects were evaluated against one another in consideration of their associated Restoration Type. For some projects and consistent with the Final PDARP/PEIS, the Texas TIG considered different strategies from what was originally proposed to enhance the project with regard to one or more selection factors.

2.3.2.5 Additional Considerations

In order to narrow the proposed projects down to a reasonable range of alternatives, the Texas TIG also considered the availability of funds over time for each Restoration Type, project readiness and timeliness, nexus to injury, and the need to allocate those funds for restoration across the various coastal resources and habitats in Texas. Priority was placed on projects that could make the most significant impact over the greatest geographical area in light of the available funding. Duplicative projects were consolidated as encountered throughout the process.

2.4 Alternatives Not Considered for Further Evaluation in this Plan

Following the screening steps outlined above, there were a number of project submittals which included project activities that would provide benefits to restore water quality (nutrient reduction); enhance oysters; and restore wetland, coastal, and nearshore habitats. Of these projects, the Texas TIG project screening described in this chapter resulted in the reasonable range of alternatives considered for this RP/EA. The remaining projects could be evaluated and potentially selected in a future restoration plan. However, these projects are not further considered for evaluation in this plan.

The Texas TIG received 60 project proposals that could be considered under the Nutrient Reduction Restoration Type. Given the limited amount of funding for the Nutrient Reduction Restoration Type, the Texas TIG is continuing to explore the most cost-effective restoration strategies and techniques that yield measureable benefits to coastal watersheds. The Texas TIG will evaluate the proposed projects with respect to the watershed selection criteria upon completion of additional restoration planning (See Section 2.6.1 for additional details).

Due to limited funds available for the Oyster Restoration Type and the need for additional institutional knowledge to facilitate project prioritization, the Texas TIG is proposing to fund a preliminary E&D phase of restoration. The Texas TIG would evaluate proposed oyster projects after completion of the E&D, if it is selected in the Final RP/EA.

Several projects that could be considered under the restore Wetland, Coastal, and Nearshore Habitat Restoration Type were considered but are not evaluated further in this RP/EA. These projects met the screening criteria; however, the projects 1) needed further technical development, 2) were not considered to be cost-effective in comparison to similar projects, and/or 3) did not demonstrate a strong nexus or restoration need. The Texas TIG considered the restoration goals and objectives, including cost-effectiveness and project readiness, and ultimately decided against inclusion of these projects in this RP/EA. However, these projects may be considered in future Texas TIG restoration plans.

2.5 Reasonable Range of Restoration Alternatives Considered

From the process described above, the Texas TIG developed a reasonable range of alternatives for further consideration and evaluation. The development of the reasonable range of alternatives proposed for the selected Restoration Types is discussed in the sections that follow. Figure 2-3 is a map of the location for each of the reasonable range of alternatives considered in this RP/EA. These alternatives are evaluated in Chapters 3 and 4 of this document under both OPA and NEPA, respectively.

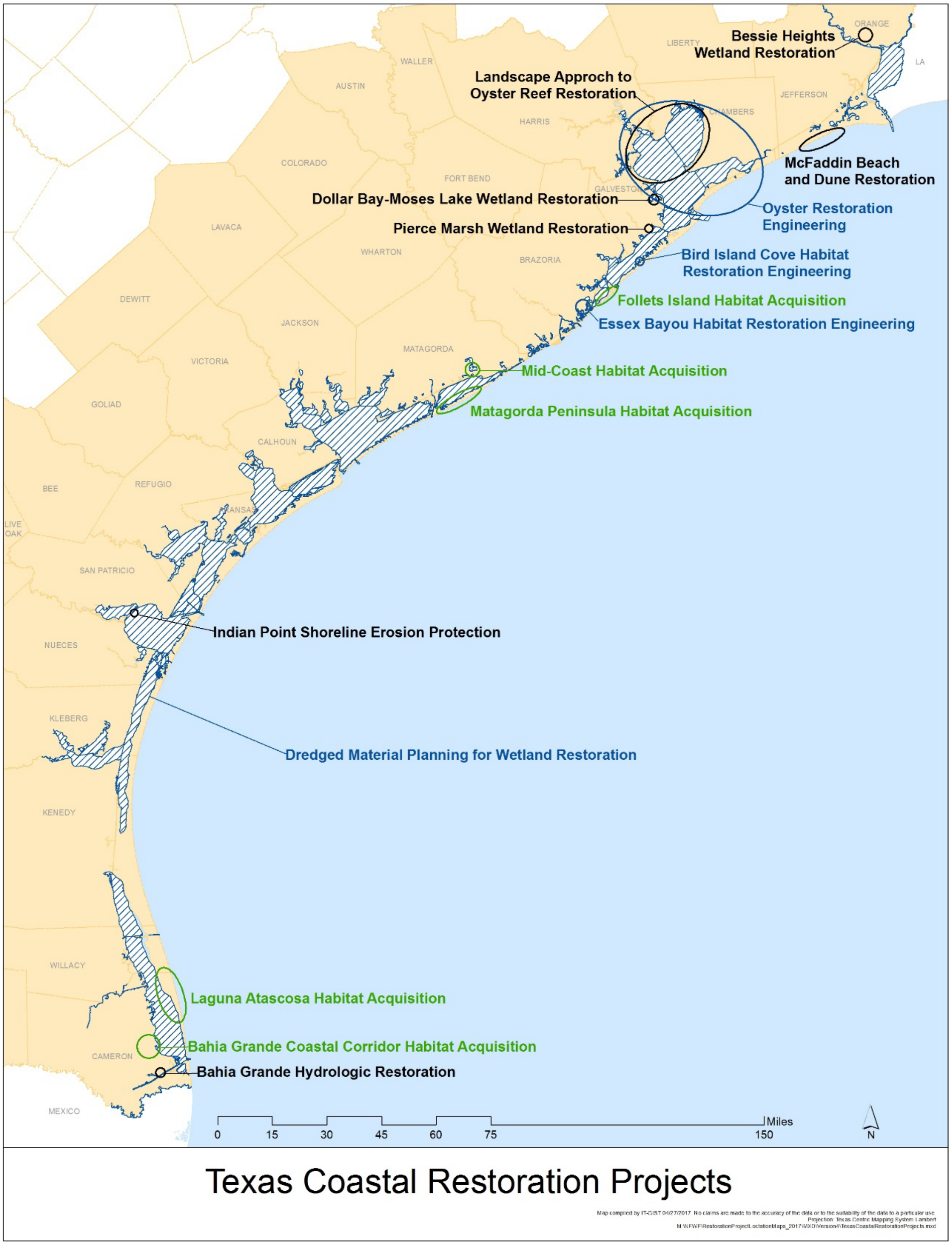

Figure 2-3. Locations of the reasonable range of alternatives evaluated in this RP/EA

2.5.1 Nutrient Reduction (Nonpoint Source)

After consideration of the nutrient reduction related projects submitted, the Texas TIG determined that coordinating the implementation of the Nutrient Reduction (nonpoint source) Restoration Type at a watershed level in conjunction with other habitat and resource Restoration Types would help provide ecosystem-scale benefits to the Texas Gulf Coast. As such, in advance of proposing the implementation of any specific project, the Texas TIG has decided to undertake a restoration planning effort to determine appropriate watershed selection criteria (consistent with the strategy in Section 5.5.4.2 of the Final PDARP/PEIS). The planning effort will also evaluate potential specific restoration actions that would have the greatest impact in reducing nutrients within the selected watershed to inform site and project selection prior to implementing any project within this Restoration Type. For more detail on the DWH Trustees' injury assessment as it relates to nutrient reduction (nonpoint source), see Sections 4.4 through 4.6 of the Final PDARP/PEIS.

2.5.2 Oysters

The screening of projects within the Oyster Restoration Type resulted in identification of two oyster projects as well as a No Action alternative for the reasonable range of alternatives. Table 2-4 presents the two projects: 1) Oyster Restoration Engineering and 2) Landscape Approach to Oyster Reef Restoration.

Table 2-4. Reasonable Range of Alternatives for the Oyster Restoration Type.

Reasonable Range of Alternatives	Project Cost
Oyster Restoration Engineering*	$309,000
Landscape Approach to Oyster Reef Restoration	$15,258,000

*Notes *Alternatives proposing only E&D activities.*

2.5.2.1 Oyster Restoration Engineering

The Oyster Restoration Engineering project would consist of an initial alternatives analysis to identify the best management practices (BMPs) for rehabilitating oyster reefs buried by sediment and for constructing intertidal oyster reefs within the Galveston Bay System. Results of this analysis would then be used to develop location-specific engineering, design, and environmental permitting documents for one or more oyster restoration projects that could be readily implemented. The estimated cost for the project is $309,000.

2.5.2.2 Landscape Approach to Oyster Reef Restoration

The goal of the Landscape Approach to Oyster Reef Restoration project is to restore up to 150 acres of degraded Galveston Bay oyster reefs using a landscape approach to create a network of oyster populations. A combination of source and harvestable sink oyster reefs would be created in Upper Galveston Bay to allow for increased oyster population sustainability and oyster habitat resiliency. The estimated cost for the project is $15,258,000.

2.5.3 Wetlands, Coastal, and Nearshore Habitat

The screening of projects within the Wetlands, Coastal, and Nearshore Habitat Restoration Type resulted in identification of 14 projects as well as a No Action alternative for the reasonable range of alternatives. There are 3 projects proposed for planning/E&D phases and 11 proposed for restoration implementation. Table 2-5 presents the 14 projects and associated project cost.

Table 2-5. Reasonable Range of Alternatives for the Wetlands, Coastal, and Nearshore Habitat Restoration Type

Reasonable Range of Alternatives	Project Cost
Bird Island Cove Habitat Restoration Engineering*	$206,000
Essex Bayou Habitat Restoration Engineering*	$372,000
Dredged Material Planning for Wetland Restoration*	$1,964,000
McFaddin Beach and Dune Restoration	$15,874,000
Bessie Heights Wetland Restoration	$4,905,000
Pierce Marsh Wetland Restoration	$3,095,000
Dollar Bay and Moses Lake Wetlands Restoration	$4,225,000
Indian Point Shoreline Erosion Protection	$2,199,000
Bahia Grande Hydrologic Restoration	$5,050,000
Follets Island Habitat Acquisition	$2,037,000
Mid-Coast Habitat Acquisition	$2,082,000
Matagorda Peninsula Habitat Acquisition	$3,012,000
Bahia Grande Coastal Corridor Habitat Acquisition	$2,271,000
Laguna Atascosa Habitat Acquisition	$5,397,000

*Note: *Alternatives proposing only E&D activities.*

2.5.3.1 Bird Island Cove Habitat Restoration Engineering

The Bird Island Cove Habitat Restoration project would conduct E&D necessary to restore and conserve wetlands and coastal habitats in Galveston Bay. This phase of the project (Phase I) would investigate ongoing issues associated with habitat degradation and develop strategies to protect and restore existing estuarine habitats with the goal of increasing the productivity and longevity of up to 170 acres of estuarine marsh complex (marsh, sand flat, and protected shallow water). The estimated cost for the project (Phase I) is $206,000.

2.5.3.2 Essex Bayou Habitat Restoration Engineering

The Essex Bayou Habitat Restoration Engineering project would include the E&D necessary to restore and conserve coastal and nearshore habitats. The E&D is necessary to understand the factors that contribute to high salinities within Essex Bayou and the Slop Bowl Marsh system and develop solutions that would create a more stable estuarine system. Subsequent phases, to be considered for funding at a later time, would implement restoration actions, such as improving tidal flow, closing man-made channels, enhancing watershed inflows, and/or planting marsh vegetation, to increase the stability and diversity of the estuarine habitats. The estimated cost for this phase of the project is $372,000.

2.5.3.3 Dredged Material Planning for Wetland Restoration

The Dredged Material Planning for Wetland Restoration project would identify priority locations, develop up to 60% design work, and prepare permit application packages for BUDM for marsh restoration at eight sites along the Texas coast. This project would coordinate efforts to prioritize sites and produce guidelines to restore currently degrading intertidal habitats. The estimated cost for the project is $1,964,000. Implementation of the BUDM to construct intertidal wetlands would take place in subsequent phases of the project.

2.5.3.4 McFaddin Beach and Dune Restoration

The McFaddin Beach and Dune Restoration project would include placement of sand along approximately 17 miles of shoreline in northeastern Texas. This project is proposing to fund about one-third of the estimated $45,000,000 total project cost. The Texas TIG would partner with other funding sources to complete construction implementation, monitoring, and/or planning activities. This project would provide important ecological benefits by restoring lost beach and dune habitat. The estimated cost of the Texas TIG proposed contribution towards this project is $15,874,000.

2.5.3.5 Bessie Heights Wetland Restoration

The Bessie Heights Wetland Restoration project would restore wetlands in Bessie Heights Marsh located within the Lower Neches Wildlife Management Area (WMA) in Orange County, Texas. The project would beneficially use sediment obtained from dredging of the federally managed Sabine-Neches Waterway (SNWW), and mining dredged material from dredged material placement areas (DMPAs) and private navigation channels and berths to restore coastal wetlands. The placement of dredged material, construction of containment levees, and associated planting would restore up to 900 acres of intertidal marsh. The estimated cost for the project is $4,905,000.

2.5.3.6 Pierce Marsh Wetland Restoration

The Pierce Marsh Wetland Restoration project would restore and conserve wetlands and coastal habitats by beneficially using dredged material to create a viable, vegetated, wetland habitat for a variety of plants, fish, birds, and other wildlife that frequent the area. The placement of dredged material and associated planting would restore up to 150 acres of marsh and contribute to an ongoing effort to restore the wetland complex in West Galveston Bay. The estimated cost for the project is $3,095,000.

2.5.3.7 Dollar Bay and Moses Lake Wetlands Restoration

The Dollar Bay and Moses Lake Wetlands Restoration (Phase IV) project would restore subsided marsh habitat in Dollar Bay and Moses Lake by creating about 15 acres of marsh terraces and protecting them with about 4,200 linear feet of rock breakwaters. This project would include construction implementation and the completion of planning documents which includes environmental reviews and final engineering designs. The estimated cost for the project is $4,225,000.

2.5.3.8 Indian Point Shoreline Erosion Protection

The Indian Point Shoreline Erosion Protection project would construct approximately 2,800 linear-feet of segmented breakwaters to protect 50 acres of critical seagrass, coastal marsh, lagoons and associated upland habitats within Indian Point on Corpus Christi Bay in San Patricio County. The project would protect the existing shoreline from wind and wave driven erosion and protect the remaining marsh and associated coastal habitats adjacent to the shoreline. The estimated cost for the project is $2,199,000.

2.5.3.9 Bahia Grande Hydrologic Restoration

The Bahia Grande Hydrologic Restoration project would restore and conserve the Bahia Grande wetland complex in the Laguna Atascosa National Wildlife Refuge (LANWR) near Brownsville, Texas. This project would enlarge and stabilize a pilot channel that would increase tidal flow into Bahia Grande, restoring the system's natural tidal exchange and creating habitat for a variety of fish, shellfish, and migratory waterfowl. The estimated cost for the project is $5,050,000.

2.5.3.10 Follets Island Habitat Acquisition

The Follets Island Habitat Acquisition project would include the acquisition and conservation of approximately 300 acres of wetland and coastal habitats on Follets Island between San Luis Pass and Drum Bay, Texas. The project would conserve dune, coastal strand prairie, and marsh habitat in perpetuity through fee-simple acquisition. Once acquired, the land would be transferred to and managed by the TPWD for the purpose of habitat preservation. The estimated cost for the project is about $2,037,000.

2.5.3.11 Mid-Coast Habitat Acquisition

The Mid-Coast Habitat Acquisition project would acquire a coastal estuarine land tract that would be conveyed to the USFWS to be managed as part of the Texas Mid-Coast National Wildlife Refuge Complex (Texas Mid-Coast NWR) in Matagorda County. The tract is around 800 acres, including 555 acres of mostly estuarine wetlands. The restoration action would protect the tract, thereby providing a protective buffer to estuarine and bay waters from future land use changes. The estimated cost for the project is $2,082,000.

2.5.3.12 Matagorda Peninsula Habitat Acquisition

The Matagorda Peninsula Habitat Acquisition project would acquire and conserve up to 3,000 acres of wetland and coastal habitats on Matagorda Peninsula east of the Colorado River between Driftwood Drive and property owned by TPWD in Matagorda County, Texas. The project would conserve beach to bay barrier island habitat in perpetuity through fee-simple acquisition. Once acquired, the land would be transferred to and managed by the TPWD for the purpose of habitat preservation. The estimated cost for the project is about $3,012,000.

2.5.3.13 Bahia Grande Coastal Corridor Habitat Acquisition

The Bahia Grande Coastal Corridor Habitat Acquisition project would include acquisition of important coastal habitat that would be conveyed to the USFWS to be managed as part of the LANWR. This tract includes 1,322 acres of tidal wetlands, thorn scrub, and coastal prairie with more than a mile of frontage on the Lower Laguna Madre and almost 2 miles frontage on a tidal inlet called Laguna Vista Cove. The estimated cost for the project is $6,900,000 of which the Texas TIG is providing $2,271,000.

2.5.3.14 Laguna Atascosa Habitat Acquisition

The Laguna Atascosa Habitat Acquisition project would include acquisition of important coastal habitat that would be conveyed to the USFWS to be managed as part of the LANWR. This tract includes 1,682 acres of beach, dune, and tidal habitats on South Padre Island, Texas. The estimated cost for the project is $5,397,000.

3 OPA Evaluation of Alternatives

This chapter provides project information and an OPA analysis of the proposed alternatives. The chapter is split into four sections: 1) section content overview, 2) OPA evaluation of Oyster Restoration Type alternatives; 3) OPA evaluation of Wetlands, Coastal, and Nearshore Habitat Restoration Type alternatives; and 4) summary and conclusions of the OPA evaluation of all project alternatives.

3.1 Chapter Content Overview

Each alternative-specific section begins with a general description of the project and relevant background information, including cost, followed by a discussion of the project's consistency with OPA project evaluation criteria and a description of planned monitoring. To avoid redundancy in each alternative-specific section, a summary of the OPA evaluation criteria, overview of monitoring requirements, and description of project costs is provided in the proceeding sections.

The Texas TIG is proposing to phase some restoration alternatives across multiple restoration plans. Four alternatives are being proposed for funding a planning phase (e.g., initial E&D and compliance). This would allow the Texas TIG to develop the alternatives to the extent needed to fully consider a subsequent implementation phase of that alternative in a future restoration plan.

3.1.1 Summary of OPA Evaluation Criteria

According to the NRDA regulations under OPA, trustees are responsible for identifying a reasonable range of alternatives (15 CFR §990.53(a)(2)) that can be evaluated according to the OPA evaluation standards (15 CFR §990.54). Chapter 2 describes the screening and identification of a reasonable range of alternatives for evaluation under OPA. Once a reasonable range of alternatives is developed, the OPA NRDA regulations (15 CFR §990.54) require trustees to identify preferred restoration alternatives based on certain criteria. These criteria are:

- The cost to carry out the alternative;
- 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 (the ability of the restoration project to provide comparable resources and services; that is, the nexus between the project and the injury);
- The likelihood of success of each alternative;
- The extent to which each alternative will prevent future injury as a result of the incident, and avoid collateral injury as a result of implementing the alternative;
- The extent to which each alternative benefits more than one natural resource and/or service; and
- The effect of each alternative on public health and safety.

If the trustees conclude that two or more alternatives are equally preferable, the most cost-effective alternative must be chosen (15 CFR §990.54(b)).

3.1.2 Monitoring Requirements

When developing a restoration plan trustees establish restoration objectives that are specific to the natural resource injuries (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 will be determined (15 CFR §990.55(b)(2)). The requirements for the monitoring component of a restoration plan are further described in 15 CFR §990.55(b)(3).

Monitoring, Adaptive Management, and Administrative Oversight was identified as one of the Trustee programmatic restoration goals in the Final PDARP/PEIS. As described in Chapter 5, Appendix E of the Final PDARP/PEIS, the Trustee Council has committed to a MAM Framework to support restoration activities by infusing best available science into project planning and design, identifying and reducing key uncertainties, tracking and evaluating progress toward restoration goals, determining the need for corrective actions, and supporting compliance monitoring. The DWH NRDA MAM Framework provides a flexible, science-based approach to effectively and efficiently implement restoration over several decades that provides long-term benefits to the resources and services injured by the Incident.

Trustees have developed MAM Plans for projects identified as preferred alternatives in this RP/EA. They are included in Appendix D. At a project level, MAM plans identify the monitoring needed to evaluate progress toward meeting site-specific objectives and to support corrective action and adaptive management of the restoration project where applicable. The plans are consistent with the requirements and guidelines set forth in the Final PDARP/PEIS and the Trustee Council SOP. They include descriptive information regarding monitoring goals, objectives, parameter details (e.g. methodology and timing/frequency), potential corrective actions, and monitoring schedules. The MAM plans are intended to be living documents and would be updated as needed to reflect changing conditions and/or to incorporate new information. For example, the plan may need to be revised if the project design changes, if initial data analysis indicates that the sampling design is inadequate, or if any uncertainties are resolved or new uncertainties are identified during project implementation and monitoring. Any future revisions to individual project MAM plans as well as updates and additional details concerning the status of monitoring activities would be made publicly available through the NOAA Restoration Portal (http://www.restoration.noaa.gov/dwh/storymap/). Consistent with Section 10 of the Trustee Council SOP (revised November 15, 2016), a MAM plan is not required for a project proposed only for E&D. Therefore, a MAM plan has not been developed for any of the E&D projects in this RP/EA.

3.1.3 Project Costs

The cost provided for each alternative is the estimated cost to implement the project alternative. This cost reflects current cost estimates developed from the most current designs and information available to the Texas TIG at the time of drafting this restoration plan. The estimated cost could include provisions for planning, E&D, construction, monitoring, trustee oversight, and contingencies. In instances where funding would be provided from additional sources, the total project cost as well as the proposed contribution using Texas TIG DWH NRDA funding is provided.

3.1.4 Best Management Practices

The federal regulatory agencies provide guidance as part of the environmental compliance process. Best practices generally include design criteria, BMPs, lessons learned, expert advice, tips from the field, and more. Trustees use appropriate best practices to avoid or minimize impacts to natural resources, including protected and listed species and their habitats. Specific project design for all project types must consider the potential impacts on these resources and include BMPs and other mitigation measures to avoid adversely affecting sensitive natural resources. Therefore, collateral injury to other natural resources and impacts to public health and safety are expected to be minimal, and BMPs would be used during construction for all techniques to avoid or minimize any collateral injury or risk to public health and safety. BMPs required in the permit, consultations, or environmental reviews would be followed. Additionally, BMPs described in Appendix 6.A of the Final PDARP/PEIS as well Appendix B of this document would be followed, as appropriate, to reduce or eliminate impacts to the environment.

3.2 OPA Evaluation of Oyster Alternatives

The Texas TIG screened a number of potential oyster restoration alternatives that resulted in the identification of two project alternatives and a No Action alternative. A description of each alternative followed by the OPA evaluation of that alternative is provided below.

3.2.1 Oyster Restoration Engineering

The Oyster Restoration Engineering project would consist of an initial alternatives analysis to identify the BMPs for rehabilitating oyster reefs buried by sediment and for constructing intertidal oyster reefs within the Galveston Bay System. Results of this analysis would then be used to develop location-specific engineering, design, and environmental permitting documents for one or more oyster restoration projects that could be readily implemented. The estimated cost for the project is $309,000.

3.2.1.1 Project Description

The Oyster Restoration Engineering project would provide for the planning, engineering, design, and permitting for rehabilitating and restoring oyster reef habitats in the Galveston Bay system, primarily in East Bay, Trinity Bay and Upper Galveston Bay (Figure 3-1). Hurricane Ike, which struck the Galveston Bay area in September 2008, buried approximately 8,000 acres of oyster reef under sediment deposits up to 1.5 meters thick (Freese and Nichols 2015). Reef areas that were covered with a relatively shallow layer of sediment were re-exposed through an effort of dragging bagless oyster dredges. However, oyster reef habitat in Galveston Bay has not recovered since Hurricane Ike to levels desired by resource managers to sustain a robust oyster fishery and provide the full range of ecosystem service benefits. The Texas TIG recognized the need to evaluate buried reefs in the Galveston Bay system as well as identify those areas within the Galveston Bay system that are currently in the greatest need of restoration. These areas include East Bay, Trinity Bay, and Upper Galveston Bay, generally east of the Houston Ship Channel.

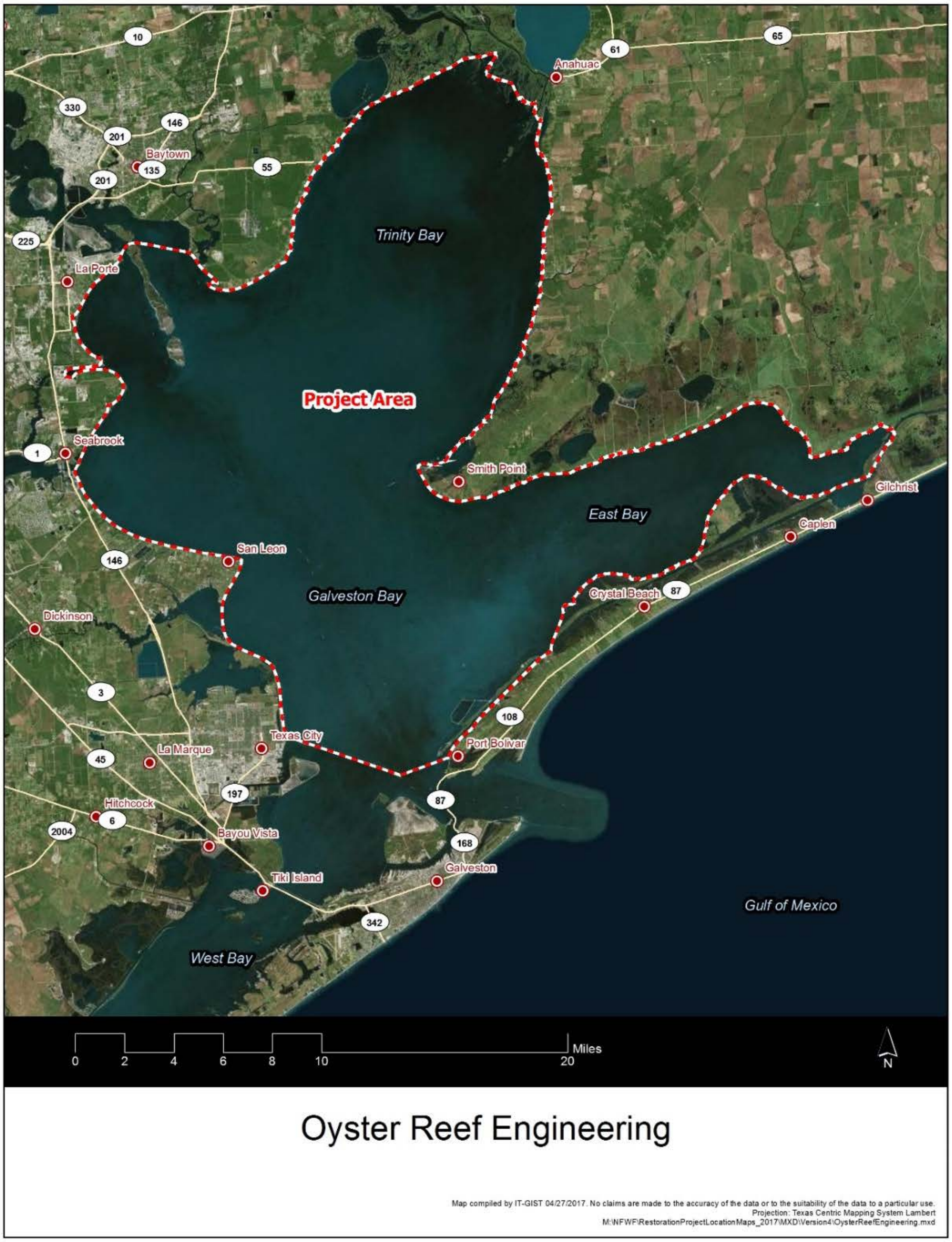

Figure 3-1. Map showing locations of the Oyster Restoration Engineering project area within Galveston Bay

The Oyster Restoration Engineering project would include an initial alternatives analysis designed to evaluate multiple oyster restoration techniques and explore novel approaches to identify the most cost-effective landscape-level application of oyster restoration within the target areas of Galveston Bay. The analysis would evaluate the most effective means of rehabilitating buried oyster reefs and constructing sustainable intertidal reefs that would provide ecosystem benefits and ongoing sources of larval material for surrounding reefs. The Texas TIG would procure the assistance of a qualified professional services provider (PSP) with expertise in the ecological and engineering aspects of oyster restoration and provide oversight of the alternatives analysis.

The Oyster Restoration Engineering project would also identify potential future restoration project sites within the targeted areas of the Galveston Bay System. The PSP would utilize existing literature and monitoring data from previously constructed oyster restoration projects and consult with the Texas TIG, TPWD resource managers, and oyster restoration experts to develop restoration site selection parameters. These parameters would then be used to identify the most appropriate restoration sites to rehabilitate buried reefs and restore intertidal oyster reefs using the restoration techniques identified in the alternatives analysis.

Using the results of the alternatives analysis and restoration site identification process, detailed engineering, design, and environmental permitting documents would be prepared for one or more projects. A PSP would be tasked with project design, engineering plans and specification development, and preparation of environmental compliance/permitting documents. Engineering tasks could include data collection, obtaining required permit(s) for later construction, development of E&D plans, and determining estimated construction costs associated with different management actions. The E&D component of this project may also involve the collection of field data, including topographic-bathymetric surveys, geophysical surveys, and geotechnical borings/samples.

Completion of the Oyster Restoration Engineering project would result in one or more shovel-ready oyster restoration projects that could be readily implemented at a later date. The implementation and construction of these projects would be presented to the public for consideration in a future restoration plan.

3.2.1.2 OPA Evaluation

The OPA evaluation of the proposed Oyster Restoration Engineering Project using the criteria established by the OPA regulations in 15 CFR §990.54(a) is described below.

3.2.1.2.1 Cost-Effectiveness

The cost of the proposed Oyster Restoration Engineering project is comparable to past projects of a similar scope and is cost-effective in comparison. The project includes a significant planning component focused on identifying the most cost-effective oyster restoration methodologies. Through the implementation of this project, the Texas TIG expects to increase the effectiveness and efficiency of the oyster restoration projects that are developed as a result of this engineering project as well as other subsequent actions to protect and restore oyster habitats in the Galveston Bay System.

3.2.1.2.2 Trustee Restoration Goals and Objectives

In the Final PDARP/PEIS, the DWH Trustees identified the restoration goal of replenishing and protecting oyster reefs to restore living coastal and marine resources injured as a result of the Incident. This project meets the Trustee programmatic restoration goals and Restoration Type-specific goals as described in the Final PDARP/PEIS because it will complete the planning activities necessary to restore oyster populations in a later phase of restoration. The Oyster Restoration Engineering project has a clear nexus to the injuries described in the Final PDARP/PEIS and the project would contribute directly to the established goals for oyster restoration. The project consists of a planning component for the restoration of oyster abundance and spawning stocks, which would restore resilience to oyster populations and provide a diversity of oyster reef habitats. Rehabilitation and restoration of oyster habitats within Galveston Bay would also benefit ecosystem-level resources by enhancing a variety of fauna injured by the Incident (e.g., crabs, birds, fish, etc.) that use the interconnected habitats (intertidal fringe marsh, salt marsh, sand flat, and protected shallow water) in the project area. The project is consistent with Texas TIG goals and objectives.

3.2.1.2.3 Likelihood of Success

The Texas Trustee agencies[10] have successfully implemented projects similar to the proposed Oyster Restoration Engineering project, such as contracting for the development of E&D for multiple wetland restoration projects and participating in the planning and design of several oyster restoration projects. These past projects often included the participation of restoration experts from federal, state, and non-profit entities, as well as the services of professional coastal engineers. This documented experience and successful completion of previous projects demonstrates that the project would have a high likelihood of success. The Oyster Restoration Engineering project uses proven techniques with established methods and documented results, and can be implemented with minimal delay. As a result, the project is considered feasible.

Additionally, the identification of BMPs resulting from the Oyster Restoration Engineering project would further increase the likelihood of success of future restoration actions. The project would also benefit from similar ongoing oyster restoration projects in Texas.

3.2.1.2.4 Prevent Future Injury and Avoid Collateral Injury

The Oyster Restoration Engineering project would minimize future and collateral injury through a focused evaluation of the environmental consequences of the restoration techniques identified within the project design. The identification of the BMPs in this project would further help to minimize injury during future construction activities.

3.2.1.2.5 Benefits Multiple Resources

The planning and design work in the Oyster Restoration Engineering project would incorporate specific design considerations intended to maximize the ecological benefits provided to multiple resources. This would include a consideration of the amount of interstitial space within a reef to provide habitat for aquatic organisms such as fish, crabs, and benthic invertebrates. Ideal elevations and the placement of reefs in appropriate intertidal areas would benefit avian species that would utilize the reefs for feeding and loafing habitat, as well as provide shoreline protection for surrounding intertidal marsh and other shorelines. Subsequent oyster restoration projects implemented from the design developed from this

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[10] DOI, NOAA, TCEQ, TGLO, and TPWD have decades of experience working together on NRDA cases and implementing restoration projects in Texas.

project would also provide recreational fishing and birdwatching opportunities, improvements in water quality, and a reduction in erosion of adjacent sediments.

3.2.1.2.6 Public Health and Safety

The Oyster Restoration Engineering project would not affect public health and safety during development of the project design and any field data collection. Future implementation of the restoration designs that are developed from this project would benefit health and safety by providing shoreline protection and abatement of storm surge to the surrounding estuarine wetland system by creating and expanding oyster reefs in intertidal areas.

3.2.1.3 Monitoring and Adaptive Management

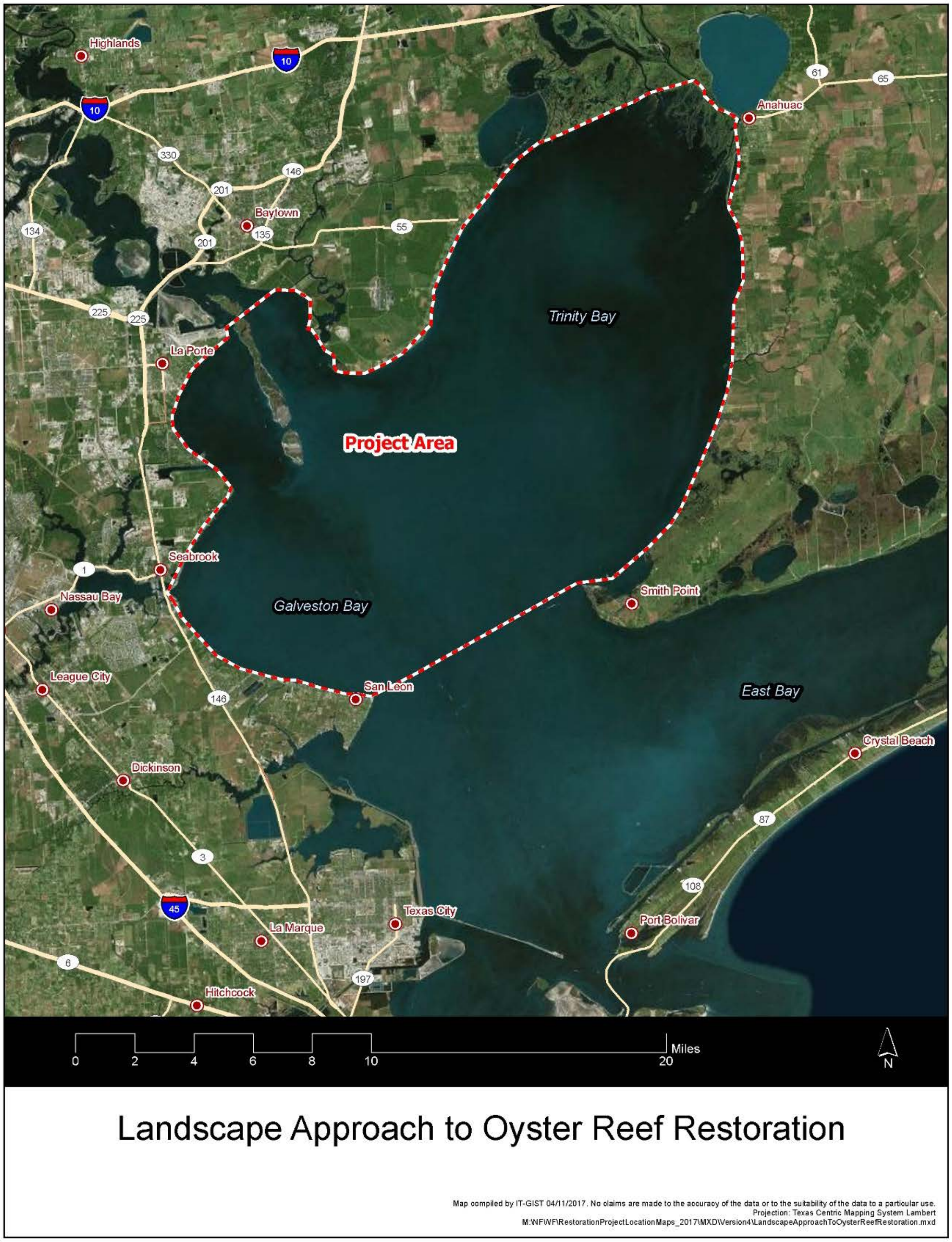
Consistent with Section 10 of the Trustee Council SOP (revised November 15, 2016), a MAM plan is not required for a project proposed only for E&D. Therefore, a MAM plan has not been developed for this project. A MAM plan would be developed if restoration actions are selected for implementation in a subsequent restoration plan. All such plans would be developed consistent with the requirements and guidelines set forth in the Final PDARP/PEIS and the Trustee Council SOP.

3.2.2 Landscape Approach to Oyster Reef Restoration in Upper Galveston

The goal of the Landscape Approach to Oyster Reef Restoration project is to restore up to 150 acres of degraded Galveston Bay oyster reefs using a landscape approach to create a network of oyster populations throughout the bay. A combination of source and harvestable sink oyster reefs would be created in Upper Galveston Bay to allow for increased oyster population sustainability and oyster habitat resiliency. The estimated cost for the project is $15,258,000.

3.2.2.1 Project Description

The Landscape Approach to Oyster Reef Restoration would restore 150 acres of oyster reef habitat in Upper Galveston Bay and Trinity Bay (Figure 3-2), including 50 acres designated as source reefs and 100 acres as harvestable sink reefs. Source reefs as defined for this project would be restricted-harvest oyster reefs with high density oyster populations that would supply planktonic oyster larvae via currents to nearby oyster habitats open to harvest (sink reefs).



Landscape Approach to Oyster Reef Restoration

Map compiled by IT-GIST 04/11/2017. No claims are made to the accuracy of the data or to the suitability of the data to a particular use.
Projection: Texas Centric Mapping System Lambert
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Figure 3-2. Map showing location of the Landscape Approach to Oyster Reef Restoration project area within Galveston Bay

The 100 acres of harvestable (sink) reefs would include approximately 4,850 mounds constructed of river rock as cultch material, and would be constructed with enough vertical relief to increase resiliency and longevity by protecting them from sedimentation and erosion from storm surges. The use of small diameter cultch at sink reefs would improve larval recruitment by increasing the surface area available for attachment when compared to larger materials, and also allow the reefs to be harvestable by both commercial and non-commercial oystermen. When not colonized by oysters, this small cultch would pass through the mesh bags of oyster dredges to maximize dredge efficiency and minimize cultch loss.

The 50 acres of source reefs would be constructed with a higher vertical relief than harvestable reefs, using larger-sized cultch materials to inhibit harvest, provide increased interstitial space for aquatic communities, and ensure long term resilience to sedimentation and storm surges.

3.2.2.2 Project Construction and Installation

The following section discusses details on project construction and installation of reef material.

3.2.2.2.1 Oyster Reef Restoration Site Location Selection

Specific reef restoration sites have not yet been determined. To aid in site selection and optimize the potential for connectivity among the reefs, the Texas Water Development Board (TWDB) would simulate bay circulation and salinity patterns using the Galveston Bay TxBLEND hydrodynamic and salinity transport model. The TxBLEND model is capable of producing high-resolution simulations of current velocity and direction over long-term periods and would include a particle-tracking subroutine to predict patterns of larval transport based on freshwater inflow and tidal variations.

3.2.2.2.2 Construction Methods and Schedule

Each acre of restored reef is estimated to require cultch material sufficient to distribute among 48 mounds that would be approximately 15 feet wide by 3 feet high. The dimensions of the restored reefs would first be surveyed and staked. Construction activities would include transporting the cultch material via transportation barges to the site locations, anchoring the barges in place adjacent to a work barge, and placing the cultch material on the selected locations using an excavator on a work barge. Following placement, any debris placed beyond the boundary of the reef would be removed by hand or excavator.

Total project time from implementation to completion would take about four years, including project development and planning, E&D, permitting and lease agreements, construction, and monitoring. In the event that construction activities occur adjacent to bird nesting locations, construction activities would be scheduled to avoid bird nesting season.

The project may require various permits and leases in order to proceed, including a permit from the U.S. Army Corps of Engineers (USACE), and coastal leases from the TGLO.

3.2.2.3 Operations and Maintenance

The project would be undertaken as a partnership between the TPWD, The Nature Conservancy (TNC), the Galveston Bay Foundation (GBF), and the TWDB.

3.2.2.4 OPA Evaluation

The OPA evaluation of the Landscape Approach to Oyster Reef Restoration using the criteria established by the OPA regulations in 15 CFR §990.54(a) is described below.

3.2.2.4.1 Cost Effectiveness

The estimated cost for the Landscape Approach to Oyster Reef Restoration project is similar to past oyster restoration projects. However, the cost effectiveness of this alternative to oyster restoration in Galveston Bay is not fully known at this time. Uncertainties remain with regard to the most cost-effective locations, materials, and techniques. The proposed methodologies have not been evaluated against other construction alternatives to determine whether more cost-effective methods are available and whether more productive outcomes could be achieved.

3.2.2.4.2 Trustee Restoration Goals and Objectives

In the Final PDARP/PEIS, the DWH Trustees identified the restoration goal of replenishing and protecting oyster reefs to restore living coastal and marine resources injured as a result of the Incident. This project meets the Trustee programmatic restoration goals and Restoration Type-specific goals as described in the Final PDARP/PEIS because it will restore oyster populations in Galveston Bay, Texas. In the Final PDARP/PEIS, the DWH Trustees also identified the goal of Replenishing and Protecting Living Coastal and Marine Resources, Oysters that were lost or injured across the region to restore oyster abundance and the ecological services that oysters provide. The Landscape Approach to Oyster Reef Restoration has a clear nexus to the injuries described in the Final PDARP/PEIS, and the project would contribute directly to the established goals for oyster restoration. The project is designed to restore oyster abundance and spawning stocks and restore resilience to oyster populations. Rehabilitation and restoration of oyster habitats within Galveston Bay would also benefit ecosystem-level resources by enhancing a variety of fauna injured by the Incident (e.g., crabs, birds, fish, etc.). The project is consistent with Texas TIG goals and objectives.

3.2.2.4.3 Likelihood of Success

The Landscape Approach to Oyster Reef Restoration is technically feasible, and uses proven techniques with established methods and documented results, and can be implemented with minimal delay. Texas Trustee agencies have successfully implemented restoration construction projects similar in scale and complexity to the Landscape Approach to Oyster Reef Restoration project, such as the Keller Bay Oyster Reef Restoration project and the Restoration of Buried Oyster Reefs in Galveston Bay project, and have participated in the planning, design, and oversight of several oyster restoration projects. Each of these past projects were reviewed by the public and met all environmental conditions and requirements.

The sink and source reef methodology proposed in this project has already been applied to modelling oyster restoration efforts in Virginia (Lipcius et al. 2008) and North Carolina (Haase et al. 2012) and has been demonstrated empirically in one case in Virginia (Schulte et al. 2009). The TWDB previously assisted TPWD in 2007 in modelling larval transport, survival, and travel time using the TxBLEND subroutine to successfully site and configure oyster mitigation reefs in Galveston and Matagorda bays.

The documented experience and successful completion of these previous projects demonstrates the project has the potential to succeed. However, a greater degree of certainty and likelihood of success could be achieved through an analysis of alternative construction methodologies and more detailed engineering plans. There is also a great deal of uncertainty in predicting the long term success and sustainability of the ecological services associated with the harvestable sink reefs. The longevity and nature of the ecological benefits derived from these reefs may vary significantly, depending upon the level of fishing intensity they receive.

3.2.2.4.4 Prevent Future Injury and Avoid Collateral Injury

The Landscape Approach to Oyster Reef Restoration would incorporate BMPs and measures to avoid and minimize impacts that are identified during the permitting process or during consultations and reviews with natural resource agencies. As a result, collateral injury would be avoided and minimized during project implementation (construction, operations, maintenance, and monitoring).

3.2.2.4.5 Benefits Multiple Resources

In addition to providing the ecological functions of oysters (water quality maintenance, food sources for predators, ecosystem engineering) the restored reefs would be expected to provide benefits to aquatic and avian resources and provide shoreline protection for surrounding areas. Restoration of oysters would also benefit the oyster fishery in Upper Galveston Bay.

3.2.2.4.6 Public Health and Safety

The Landscape Approach to Oyster Reef Restoration would minimize adverse impacts to public health and safety during development of the project design and any field data collection. Restoration of the oyster reefs would benefit health and safety for nearby communities and structures by dissipating wave and storm energy and preventing erosion of the shoreline and surrounding estuarine wetland system.

3.2.2.5 Monitoring and Adaptive Management

The objective of this project is to restore degraded oyster reefs. Construction monitoring would occur before, during, and after construction to ensure that project designs are correctly implemented. The performance of the project would be assessed using both qualitative and quantitative performance criteria related to the project objectives. Monitoring activities would include pre- and post-restoration surveys of reef area, height, oyster size, distribution, and density, fish abundance, and oyster larvae abundance. Fish abundance would be assessed using scientific echo sounder and high frequency sonar imaging systems. Oyster larvae abundance would be sampled using plankton nets in late spring/early summer prior to, and for three years following, restoration activities.

The need for corrective actions and/or adaptive management would be determined by evaluation of the project over time using the specified performance criteria. Potential corrective actions would include a reshaping of cultch mounds, adding more or different sized cultch material, and seeding oyster larvae. Successful implementation of this project would be determined by completed construction of the project according to design, including verification of targeted elevation of cultch materials, and a confirmation that oysters are colonizing the reefs.

3.2.3 Natural Recovery/No Action

Pursuant to the OPA regulations, the Final PDARP/PEIS considered a “natural recovery alternative in which no human intervention would be taken to directly restore injured natural resources and services to baseline” (40 CFR §990.53[b][2]). Under a natural recovery alternative, no additional restoration would be done by Trustees to accelerate the recovery of oysters in the Texas Restoration Area using DWH NRDA funding at this time. The Trustees 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. Although injured resources could presumably recover to or near baseline conditions under this scenario, recovery would take much longer compared to a scenario in which restoration actions were undertaken. Given that technically feasible restoration approaches are available to compensate for interim natural resource and service losses, the Trustees rejected this alternative from further OPA evaluation within the Final PDARP/PEIS. Based on this determination, tiering this RP/EA from the Final PDARP/PEIS, and incorporating that analysis by reference, the Texas TIG did not evaluate natural recovery as a viable alternative under OPA. Natural recovery is not considered further in this RP/EA[11].

3.3 OPA Evaluation of Alternatives for the Wetlands, Coastal, and Nearshore Habitat Restoration Type

The Texas TIG screened a number of potential alternatives for the Wetlands, Coastal, and Nearshore Habitat Restoration Type that resulted in the identification of 14 project alternatives and a No Action alternative. A description of each alternative followed by the OPA evaluation of that alternative is provided below.

3.3.1 Bird Island Cove Habitat Restoration Engineering

The Bird Island Cove Habitat Restoration Engineering project would conduct E&D necessary to restore and conserve wetlands and coastal habitats in Galveston Bay. This phase of the project (Phase I) would investigate ongoing issues associated with habitat degradation and develop strategies to protect and restore existing estuarine habitats with the goal of increasing the productivity and longevity of up to 170 acres of estuarine marsh complex (marsh, sand flat, and protected shallow water). The estimated cost for the project (Phase I) is $206,000.

3.3.1.1 Project Description

Bird Island Cove is part of an estuarine marsh complex within Galveston County, Texas. It is located on the bay side of Galveston Island within West Bay in the Galveston Bay System (Figure 3-3). West Bay and the larger Galveston Bay System have lost nearly 20% of their wetlands due to subsidence and erosion (White et al. 1993). The region’s reliance on groundwater beginning in the 1850s and peaking in the

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[11] NEPA requires evaluation of a “no action” alternative. This differs from the natural recovery alternative under OPA. The environmental consequences of the NEPA no action alternative are considered separately in Chapter 4.

1970s was a major contributor to the high degree of land surface subsidence (ranging from 1-10 feet) that occurred around Galveston Bay. The creation of the Harris-Galveston Subsidence District by the Texas Legislature in 1975 resulted in a significant reduction in groundwater withdrawals and, subsequently, a reduction in subsidence in the project region over the last twenty-plus years. Today, the issue of land surface subsidence in the project area has largely been abated. Unfortunately, historical subsidence experienced by this coastal region inundated thousands of acres of coastal marsh and exposed shorelines to greater wave activity, resulting in erosion and loss of additional marsh habitat. This project is intended to protect and/or restore estuarine habitats including marshes, and is consistent with the goals and objectives of The Galveston Bay Plan, a comprehensive conservation and management plan for the Galveston Bay system. Restoration of this area would provide benefits to water quality, coastal and migratory birds, fishery species, and recreational activities such as birding and fishing.

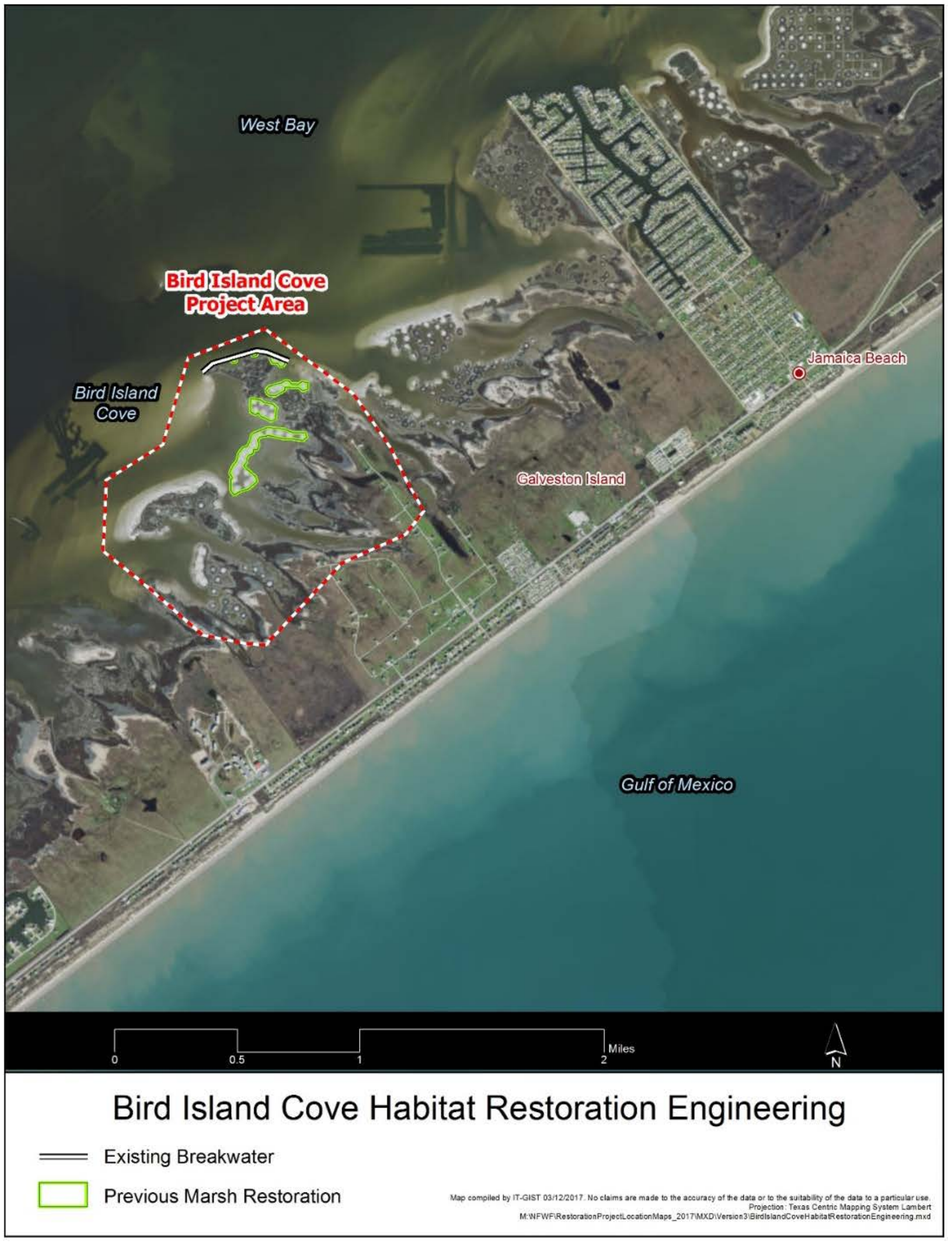

Figure 3-3. Map showing the project area and locations of existing breakwater and previous marsh restoration in Bird Island Cove on Galveston Island

A previous habitat restoration project (completed in 2015; not funded by the DWH Trustees) was implemented in the project area to enhance and restore an estuarine marsh complex. This project involved the construction of a breakwater and a series of marsh mounds that established elevations necessary to restore the estuarine marsh complex. A hydraulic dredge was used to pump sediments from a nearby designated borrow area to restore intertidal marsh elevations and to construct the geo-textile tube breakwater. The restored elevations were then planted with smooth cordgrass. Post-construction site visits revealed that the project was not progressing as expected compared to other restoration projects that have used the same restoration technique. Typical reasons for a project's slow progress, lack of progress, or even failure can often be attributed to deficiencies in the project E&D (e.g., not adequately protected with breakwaters), construction (e.g., not built to engineered specifications), or planting (e.g., low planting densities or low survival) or a combination of these deficiencies. One reason for the project's lack of progress may be the unexpected shifting of hydraulically dredged sediments in response to environmental conditions affecting the ability of the planted vegetation to take hold and thrive.

This project (Phase I) would evaluate the existing site conditions and determine appropriate corrective measures. The development of engineering plans would ensure the habitats are protected through a later phase of restoration (Phase II, not considered for funding in this RP/EA). Engineering tasks could include data collection (such as bathymetric/topographical survey, magnetometer survey, or soil borings in the potential borrow area); performance evaluation of the previous restoration project (completed in 2015); obtaining documents needed to receive USACE permit(s) for later construction; development of E&D plans; and determination of estimated construction costs. Sea level rise and other predicted changes in environmental conditions would be considered during the development of the E&D plans. Following completion of Phase I (E&D), Phase II of this project, which would implement the design developed in Phase I, may be evaluated for consideration in a later RP/EA.

3.3.1.2 OPA Evaluation

The OPA evaluation of the proposed Bird Island Cove Habitat Restoration Engineering project (Phase I) using the criteria established by the OPA regulations in 15 CFR §990.54(a) is described below.

3.3.1.2.1 Cost-Effectiveness

The cost for the project is based on similar past projects and is cost-effective in comparison. By implementing the restoration in phases, the Texas TIG expects to increase the effectiveness and efficiency of any subsequent actions to protect and restore the estuarine habitats, including wetlands, in Bird Island Cove.

3.3.1.2.2 Trustee Restoration Goals and Objectives

The Final PDARP/PEIS identified the restoration goal of restoring and conserving habitats to restore habitats injured as a result of the Incident. This project has a clear nexus to the injuries described in the Final PDARP/PEIS because it would provide the E&D needed to fully develop a restoration project to protect and restore estuarine wetland habitat types impacted by the Incident. Protection and restoration of wetland habitats within West Galveston Bay would also benefit fauna injured by the Incident (e.g., crabs, birds, fish, etc.) that use estuarine habitats (marshes, sand flats, mud flats, and protected shallow water) including the habitat types that would be engineered and designed and ultimately constructed in the project area. This project is consistent with Texas TIG goals and objectives and is consistent with the programmatic Trustee restoration goals and Restoration Type-specific goals outlined in the Final PDARP/PEIS.

3.3.1.2.3 Likelihood of Success

Texas Trustee agencies have successfully implemented projects similar to the project (contracting for the development of E&D for wetland restoration). This documented experience and successful completion of previous projects demonstrates that the project would have a high likelihood of success. The project is technically feasible, uses proven techniques with established methods and documented results, and can be implemented with minimal delay. The end result of this project would also increase the likelihood of success of Phase II (implementation of restoration actions for the project).

3.3.1.2.4 Prevent Future Injury and Avoid Collateral Injury

This project would minimize future and collateral injury by evaluating environmental consequences of techniques in the project design and by identifying the BMPs to minimize injury during Phase II. While there are no anticipated effects to cultural resources, listed species, or designated critical habitat as part of the proposed E&D, should any potential effects be identified, the Texas TIG would ensure proper coordination and protective measures are in place prior to beginning any activities.

3.3.1.2.5 Benefits Multiple Resources

The Bird Island Cove Habitat Restoration Engineering project would develop plans to benefit multiple resources including but not limited to birds, fish, crabs, and other wildlife; as well as recreational opportunities for fishing and birding; improvements in water quality; and a reduction in erosion through the eventual creation of wetland habitat.

3.3.1.2.6 Public Health and Safety

The Bird Island Cove Habitat Restoration Engineering project would not affect public health and safety. Implementation of a subsequent phase of restoration would benefit health and safety by protecting an estuarine wetland system that protects Galveston Island from erosion.

3.3.1.3 Monitoring and Adaptive Management

Consistent with Section 10 of the Trustee Council SOP (revised November 15, 2016), a MAM plan is not required for a project proposed only for E&D. Therefore, a MAM plan has not been developed for this project. A MAM plan would be developed if restoration actions are selected for implementation in a subsequent restoration plan. All such plans would be developed consistent with the requirements and guidelines set forth in the Final PDARP/PEIS and the Trustee Council SOP.

3.3.2 Essex Bayou Habitat Restoration Engineering

The Essex Bayou Habitat Restoration Engineering project would include the E&D necessary to restore and conserve coastal and nearshore habitats. The E&D is necessary to understand the factors that contribute to high salinities within Essex Bayou and the Slop Bowl Marsh system and develop solutions that would create a more stable estuarine system. Subsequent phases, to be considered for funding at a later time, would implement restoration actions, such as improving tidal flow, closing man-made channels, enhancing watershed inflows, and/or planting marsh vegetation to increase the stability and diversity of the estuarine habitats. The estimated cost for this phase of the project is $372,000.

3.3.2.1 Project Description

Essex Bayou and the Slop Bowl Marsh are part of the Brazoria NWR in Brazoria County, Texas. The project site is located in the southwestern portion of the refuge near the Gulf of Mexico and the community of Surfside (Figure 3-4). The tidal marsh systems associated within this region have historically high rates of relative sea level rise (sea level rise plus subsidence). The project site exhibits several geological growth faults that are likely associated with nearby salt domes but also activities related to oil and gas development. Additional hydrologic modifications associated with the marsh complex include man-made channels such as the Intracoastal Waterway and access channels which have modified natural hydrology and geomorphic processes of the area.

Figure 3-4. Map showing location of the Essex Bayou project area in Brazoria County

Essex Bayou and the Slop Bowl Marsh experience wide swings in salinity and tidal reach. Initial assessments suggest that modifications to the watershed, flow restrictions in Essex Bayou, and diversions of tidal flow are responsible for the extreme salinity conditions. Periods within these wide swings of salinity can produce high biological diversity and productivity, however swings into each extreme salinity condition causes changes to the existing vegetation that biologically and structurally destabilize the system. High salinities cause considerable vegetation damage and allow for only a few species of estuarine organisms to survive. These high salinity levels cause high mortality of wetland plants, invertebrates, and fish species. These conditions result in very poor foraging habitat for birds, fish, and other vertebrate species. In the drier summer months, salinities of 150 parts per thousand (ppt)—approximately five times that of full strength sea water—have been documented.

To identify the best method to protect and/or restore the wetland habitats, this project would build on previous lessons learned by evaluating existing site conditions. Previous investigative efforts have included an assessment of shoreline change as well as identification of pipeline rights-of-way, potential fault lines, grazing activity, tidal elevations, elevations at critical locations, and watershed diversions. Some monitoring data of tide levels and bird use of the site have been compiled. This project would further evaluate the conditions responsible and propose solutions to ameliorate extreme salinity conditions. The suite of potential corrective actions would be evaluated for feasibility, cost, and effectiveness. The most effective and appropriate corrective measures would then be selected for 30% E&D development. Scientific and engineering tasks could include data collection (such as bathymetric/topographical survey, growth fault analyses, hydrologic and tidal flow evaluations, magnetometer survey, or soil borings); performance evaluation of the previous efforts noted above; obtaining required permit(s) for later construction; development of E&D plans; and estimating construction costs associated with different management actions. Ultimately, restoration actions implemented in later phases would improve the stability and diversity of approximately 2,000 acres of estuarine habitats (intertidal marsh, salt marsh, sand flat, bayou stream channel and protected shallow water). Restoration of this area would provide secondary benefits to coastal and migratory birds, fishery species, water quality (salinity), and recreational activities such as birding and fishing. Designs developed in the Phase I E&D work would be undertaken in one or more implementation phases. Any subsequent phases proposed for implementation with DWH NRDA funds would be evaluated for consideration in a later restoration plan.

3.3.2.2 OPA Evaluation

The OPA evaluation of the proposed Essex Bayou Habitat Restoration Engineering project (Phase I) using the criteria established by the OPA regulations in 15 CFR §990.54(a) is described below.

3.3.2.2.1 Cost-Effectiveness

The cost for the project is based on similar past projects and is cost-effective in comparison. By implementing the restoration in phases, the Texas TIG expects to increase the effectiveness and efficiency of any subsequent actions to protect and restore the estuarine habitats, including wetlands, in in Essex Bayou and the Slop Bowl Marsh.

3.3.2.2.2 Trustee Restoration Goals and Objectives

The Final PDARP/PEIS identified the restoration goal of restoring and conserving habitats to restore habitats injured as a result of the Incident. This project has a clear nexus to the injuries described in the Final PDARP/PEIS because it would provide the E&D necessary for protecting and restoring estuarine wetland habitats affected by the Incident and plants and animals associated with those habitats. Protection and restoration of wetland habitats within the Brazoria NWR adjacent to Galveston Bay would benefit a variety of fauna injured by the Incident (e.g., crabs, birds, fish, etc.) that use the interconnected habitats (intertidal fringe marsh, salt marsh, sand flat, and protected shallow water) in the project area. This project is consistent with Texas TIG goals and objectives and meets the Trustee programmatic restoration goals and Restoration Type-specific goals as described in the Final PDARP/PEIS.

3.3.2.2.3 Likelihood of Success

Texas Trustee agencies have successfully implemented projects contracting for the development of E&D for wetland restoration. Projects that have considered stabilizing estuarine ecosystems include Magnolia Bayou, Port Aransas Birding Center, San Jacinto State Monument Marsh Restoration, and Scenic Galveston I-45 Marsh Restoration. These past projects included the participation of restoration experts from federal, state, business, academic, and non-profit entities, as well as the services of professional coastal engineers. The required coastal engineering and scientific methods for evaluation and assessment used in the above successful projects would be similar to those used for this project.

This documented experience and successful completion of previous projects demonstrates that the project would have a high likelihood of success.

The project is technically feasible, uses best available science, proven techniques and methods with documented results, and can be implemented with minimal delay. The end result of this project phase would increase certainty, efficiency, and likelihood of success for future implementation of restoration actions. This project is similar in methodology to previously implemented projects and is considered feasible.

3.3.2.2.4 Prevent Future Injury and Avoid Collateral Injury

This project would minimize future and collateral injury by collecting information needed to evaluate environmental consequences of techniques in the project design. Additionally, BMPs may be proposed to avoid, minimize, and mitigate possible injury during a subsequent phase (not part of this project). While there are no anticipated effects to cultural resources, listed species, or designated critical habitat as part of the proposed E&D, should any potential effects be identified, the Texas TIG would ensure proper coordination and protective measures are in place prior to beginning any activities.

3.3.2.2.5 Benefits Multiple Resources

This E&D project would develop plans to benefit multiple resources. If E&D plans are implemented in a subsequent phase of restoration, the restoration project would provide habitat for fauna such as birds, fish, crabs, wetland plants, etc.; improve recreational opportunities for fishing and birding; and improve water quality.

3.3.2.2.6 Public Health and Safety

The Essex Bayou Habitat Restoration Engineering project would not affect public health and safety. Conditions at the site would not be affected by activities associated with E&D activities. The public has navigable access to Essex Bayou via the Gulf Intracoastal Waterway (GIWW).

3.3.2.3 Monitoring and Adaptive Management

Consistent with Section 10 of the Trustee Council SOP (revised November 15, 2016), a MAM plan is not required for a project proposed only for E&D. Therefore, a MAM plan has not been developed for this project. A MAM plan would be developed if restoration actions are selected for implementation in a subsequent restoration plan. All such plans would be developed consistent with the requirements and guidelines set forth in the Final PDARP/PEIS and the Trustee Council SOP.

3.3.3 Dredged Material Planning for Wetland Restoration

The Dredged Material Planning for Wetland Restoration project would identify priority locations, develop up to 60% design work, and prepare permit application packages for BUDM for marsh restoration at eight sites along the Texas coast. This project would coordinate efforts to prioritize sites and produce guidelines to restore currently degrading intertidal habitats. The estimated cost for the project is $1,964,000. Implementation of the BUDM to construct intertidal wetlands would take place in subsequent phases of the project.

3.3.3.1 Project Description

This project would help facilitate the process of beneficially using dredged material to construct and enhance valuable habitats. Implementation of the project has the potential to restore degraded wetlands, reduce erosion, improve water quality, create habitat, provide land reclamation, and increase coastal resiliency in an effective and efficient manner. The geographic scope of this project includes the entire Texas coast and would consider sediments from the GIWW and other federal ship channels, private ship channels and berths, as well as and the mining of DMPAs currently used by the USACE and the Texas Department of Transportation (TxDOT).

The project is limited to planning and E&D, and would not include any construction activities. The Dredged Material Planning for Wetland Restoration project would develop up to 60% draft designs, cost estimates, and permit application packages for eight coastal habitat restoration sites that would beneficially use dredged material. The project scope would also include an environmental analysis of the construction effort that could potentially be incorporated into future DWH restoration plans. Project partners could include but are not limited to private contractors, NGOs, and the Implementing Trustee. Project partners would be responsible for coordinating with the TGLO and USACE, along with other local, state, and federal agencies, ports, NGOs, industry, and technical advisors. Alternative sites may be chosen, if possible, or necessary. Selection of sites would be based on overall beneficial use suitability, and support from project partners. Beneficial use suitability would be determined based on environmental, logistical, and economic variables which would be defined and quantified during the project implementation stage. For these sites, the project team would develop up to 60% design and cost estimates (draft designs), and would prepare permit application packages.

The development of draft designs would include:

- geotechnical analysis,
- bathymetric survey, and
- ecological/environmental analysis.

Following this field work, the project team's design staff would prepare the Master Plan, including:

- sediment sources and dredging schedules,
- options for containment and decanting of excess water,
- shoreline stabilization, and
- development of draft designs.

For these eight sites, the project team would arrange and participate in pre-application meetings with permitting authorities, and would prepare permit application packages. Permit applications would be submitted when funding is identified for restoration activities. Following completion of the Master Plan, subsequent phases would implement the actions described at the sites identified in the Master Plan. Any subsequent phases proposed for implementation with DWH NRDA funds would be evaluated for consideration in a future restoration plan.

3.3.3.2 OPA Evaluation

The OPA evaluation of the proposed Dredged Material Planning for Wetland Restoration project using the criteria established by the OPA regulations in 15 CFR §990.54(a) is described below.

3.3.3.2.1 Cost-Effectiveness

The cost for the project is based on similar past projects and is cost-effective in comparison. This process of habitat restoration accomplished through partnering with USACE to beneficially use sediments from USACE maintenance dredging is a widely used restoration technique and has proven to be very cost effective in application. In this restoration implementation partnership, the Texas TIG is responsible for the incremental costs of the project above that which the USACE would normally incur from placing dredged material in upland placement cells. There are also costs associated with seeking out and permitting candidate restoration sites that would benefit from BUDM. This project is designed to increase the efficiency of that process for eight restoration sites through development of a Master Plan for the Texas Coast. By developing the Master Plan, the Texas TIG expects to increase the effectiveness and efficiency of subsequent actions to protect and restore wetland habitats.

3.3.3.2.2 Trustee Restoration Goals and Objectives

The Final PDARP/PEIS identified the restoration goal of restoring and conserving habitats injured as a result of the Incident. This project meets the Trustee programmatic restoration goals and Restoration Type-specific goals as described in the Final PDARP/PEIS because this project would provide the E&D necessary to help redirect the placement of dredged material so it may be used to construct and enhance valuable habitats. This project has a clear nexus to the injuries described in the Final PDARP/PEIS because it would provide the planning required to protect and restore wetlands, coastal, and nearshore habitats. This project is consistent with Texas TIG goals and objectives in that it is anticipated to provide significant benefits to the resource type injured by the Incident.

3.3.3.2.3 Likelihood of Success

Texas Trustee agencies have successfully implemented projects similar to the project (contracting for the development of the Master Plan implementation). This documented experience and successful completion of previous projects demonstrates that the project would have a high likelihood of success. The project is technically feasible, uses proven techniques with established methods and documented results, and can be implemented with minimal delay. The end result of this project would also increase the likelihood of success of Phase II (implementation of proposed restoration actions).

3.3.3.2.4 Prevent Future Injury and Avoid Collateral Injury

This project would minimize future and collateral injury by evaluating environmental consequences of techniques in the project design and by identifying the BMPs to minimize injury during Phase II. While there are no anticipated effects to cultural resources, listed species, or designated critical habitat as part of the proposed E&D, should any potential effects be identified, the Texas TIG would ensure proper coordination and protective measures are in place prior to beginning any activities.

3.3.3.2.5 Benefits Multiple Resources

This E&D project would develop a Master Plan to benefit multiple resources. If the Master Plan is implemented in one or more subsequent phases of restoration, future restoration project(s) would provide habitat for fauna such as birds, fish, crabs, etc.; recreational opportunities for fishing and birding; improvements in water quality; reduction in erosion; and increased resiliency and storm protection.

3.3.3.2.6 Public Health and Safety

The Dredged Material Planning for Wetland Restoration project would not affect public health and safety. This project would identify and prioritize eight restoration sites that are candidates for BUDM, and execute all field investigations and permitting necessary for each of those sites to be implementation-ready. Ultimately, this project is laying the groundwork for restoration that would improve public health and safety through a reduction in erosion and increased resiliency and storm protection for nearby communities.

3.3.3.3 Monitoring and Adaptive Management

Consistent with Section 10 of the Trustee Council SOP (revised November 15, 2016), a MAM plan is not required for a project proposed only for E&D. Therefore, a MAM plan has not been developed for this project. A MAM plan would be developed if restoration actions are selected for implementation in a subsequent restoration plan. All such plans would be developed consistent with the requirements and guidelines set forth in the Final PDARP/PEIS and the Trustee Council SOP.

3.3.4 McFaddin Beach and Dune Restoration

The McFaddin Beach and Dune Restoration project would include placement of sand along approximately 17 miles of shoreline in northeastern Texas. This project is proposing to fund about one-third of the estimated $45,000,000 total project cost. The Texas TIG would partner with other funding sources to complete construction implementation, monitoring, and/or planning activities. This project would provide important ecological benefits by restoring lost beach and dune habitat. The estimated cost of the Texas TIG proposed contribution towards this project is $15,874,000.

3.3.4.1 Project Description

The project area is part of the Chenier Plain located within Jefferson and Chambers Counties, Texas. The project area is in the western gulf coastal plain – Texas/Louisiana coastal marshes ecoregion. The Chenier Plain was formed over many years by the reworking of riverine sediments. Higher ridges were comprised of the coarse, large-grained sediments while the mudflats and marshes were formed by the fine-grained materials. The project includes the construction of a dune ridge that borders and protects the largest contiguous estuarine marsh complex in Texas. The estuarine marsh complex includes freshwater to estuarine marsh, coastal prairie grasslands, oak ridges, tidal flats, lakes, creeks, basins, and associated aquatic vegetation. The project is located on the upper Texas coast, south of the JD Murphree WMA and Sea Rim State Park, along the beach face of McFaddin NWR (Figure 3-5).

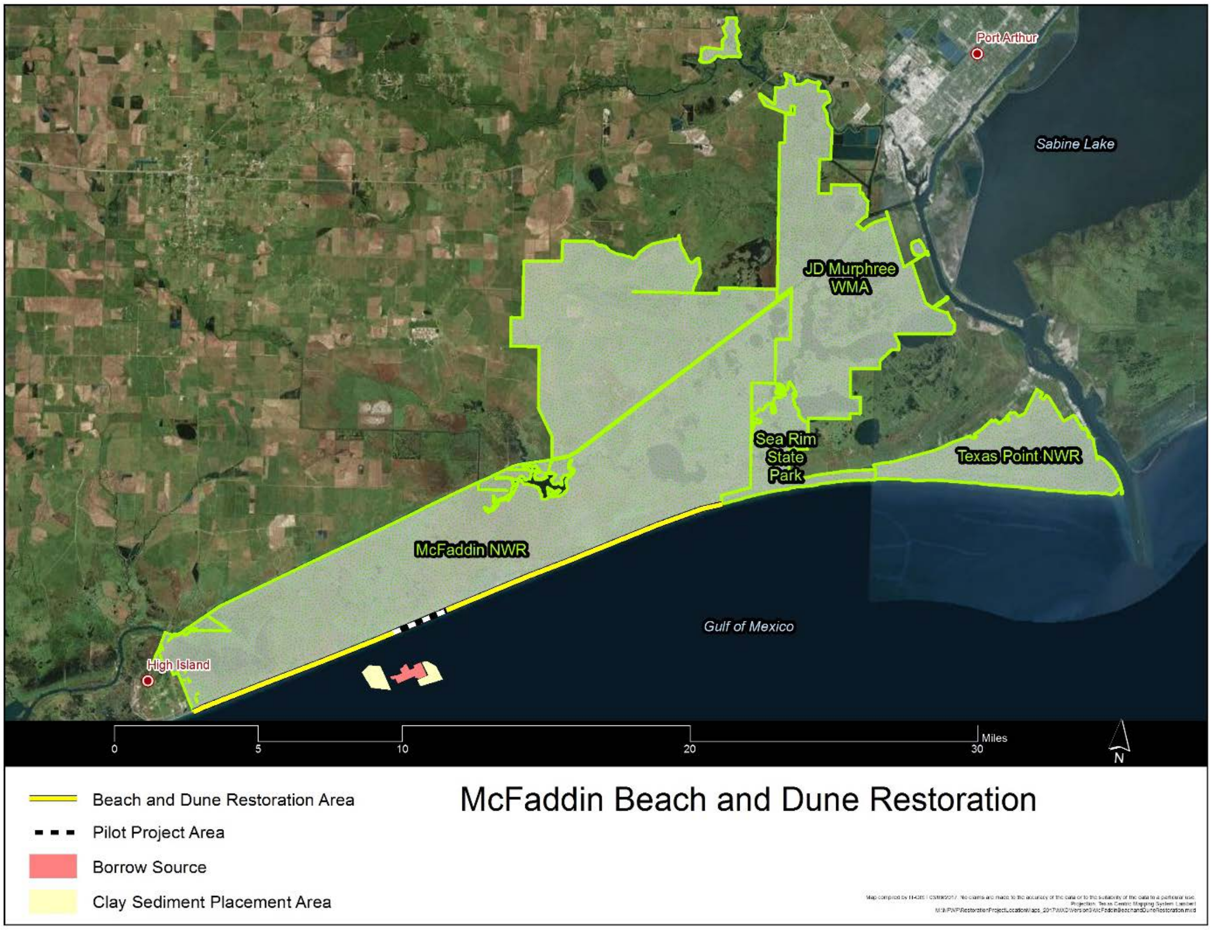

Figure 3-5. Map showing the location of the McFaddin Beach and Dune Restoration project area and borrow source area in Jefferson County

The dunes and beaches in or adjacent to McFaddin NWR have been impacted by human activities as well as natural processes. These activities and processes have resulted in the loss of the dunes, removal of sand from the beach face, and the lack of sandy sediments being transported into the project area. Currently, the project area consists of clay overlain at most by a thin sand veneer, which severely limits the presence of invertebrates and birds. The gulf facing shoreline of Jefferson County, which includes the project location, has retreated a net rate of 2.8 meters/year (Paine et al. 2011). This shoreline retreat has resulted in a change in habitat and a loss of foraging and nesting habitat along the shoreline.

Historically, the beach ridge separating the Gulf of Mexico from interior marshes was much higher in elevation than it is today and it prevented sea water inundation from the Gulf under normal tidal conditions. Waters from the Gulf would normally pass over the beach ridge and enter the interior marshes only during storm surges associated with significant storms or hurricanes. The frequency of such inundation was on the order of years to a decade or more. The loss of the beach ridge has decreased the ecological functioning and resiliency of the marsh system on McFaddin NWR. As recent as the late 1990s, McFaddin NWR supported fresh water and intermediate marsh plant communities near the western boundary of the NWR. However, over the last decade these plant communities and valuable submerged aquatic vegetation have been eliminated in this area by periodic catastrophic salinity increases due to loss of the beach ridge. The loss of the beach ridge led to more frequent beach overwash and dramatically increased salinities in the system. These episodic overwashes have trapped higher salinity water and increased marsh sulfide levels, both of which have caused die back of the intermediate marsh plant community creating an increase in open water areas. As these irregular but frequent doses of salt water increase, channels, bayous, and ditches that this water travels through continue to widen, marsh plant communities die off, and the highly erodible substrate is washed away. This continued increase in channel size exacerbates the issue further, ensuring that any freshwater stored in the system is removed at increasingly higher rates. This loss of peat material further leads to increased subsidence, which in turn allows saltwater to flow further into the system.

A clay berm was constructed in 2016 as a stop gap measure to prevent the regular influx of seawater into the interior marshes until a more permanent solution, the project proposed, could be implemented. The constructed clay berm is around 300-600 feet inland of the Gulf of Mexico shoreline. This berm would remain in place even after the proposed beach and dune restoration project has been completed and serve as a second line of defense to further prevent the intrusion of sea water.

Planning efforts for this project area are underway. Preliminary E&D has been completed and a USACE permit (SWG-2015-00444) has been issued for a 20-mile section of shoreline restoration adjacent to McFaddin NWR. Approximately 3 miles of the 20 miles has been restored in a pilot project that was completed August 2017. Information from this pilot project would be used to inform the final E&D documents for the remainder of the project area as well as other planning and monitoring documents. Other potential funding sources are currently being investigated. This project was on the draft RESTORE Act Bucket 1 project list in Texas. In addition, the NFWF GEBF has agreed to provide monies to complete the final E&D work for the entire project area and may be a source of additional project implementation funds. This project would only be implemented if funding through other sources is allocated so that the entire 20-mile section of beach described in the USACE permit can be completed.

This project is supported by NGOs as well as federal, state, and local governmental entities as part of the efforts to restore the greater salt bayou system. The salt bayou system includes marshes, creeks, lakes, and other associated habitats located landward of this beach and dune restoration project. Members of Ducks Unlimited, Jefferson County, NOAA, TGLO, TPWD, TWDB, USACE, and USFWS worked together to form the Salt Bayou Workgroup in order to "[conserve the] salt bayou system to ensure its continued benefits for wildlife, fisheries, and the communities." (TPWD 2013) This group recently updated the Salt Bayou Watershed Restoration Plan (TPWD 2013), which has been adopted by Jefferson County as its official restoration plan for its coastal marshes. The proposed beach and dune project is the last remaining component of the plan's major actions identified as necessary for the restoration of the Salt Bayou system.

3.3.4.2 Project Construction and Installation

The McFaddin Beach and Dune Restoration project would transport sediments from an identified offshore borrow area and place them along the shoreline. The sediments would then be sculpted to create dune and beach features. A pilot project to restore the sand beach and dune along approximately 3 miles of shoreline was completed in August 2017. Information from the pilot project will be used to inform the final designs of the remaining shoreline length. After construction is completed, approximately 1,004 acres of beaches and dunes along 20 miles of shoreline would be restored. Dune elevation would be increased and approximately 30-40 cubic yards of sandy sediments would be deposited per linear foot of shoreline.

3.3.4.2.1 Borrow Area

Only sand that meets the specification of the local beach quality (e.g., grain size, color, and mineralogy) would be used for beach and dune nourishment and maintenance activities. The borrow source area for this project contains roughly 4.1 million cubic yards of appropriate material and is located approximately 1.5 miles offshore of McFaddin NWR (Figure 3-5) in waters over 18 feet deep. Within the borrow area, underwater surveys identified well heads and a pipeline-like structure. Buffer zones ranging from 100 to 500 feet surrounding these features were mapped and would be avoided during construction. The likelihood of contamination is acceptably low and therefore the material from the borrow area does not require any additional evaluation.

A clay sediment layer overlaying the sandy sediment would be excavated from the borrow area in order to access sandy material that would be used for beach and dune nourishment. The clay sediments would be placed in one of two placement areas adjacent to the borrow area that have water depths ranging from 20-28 feet. The depth of the placement area minimizes the potential for re-suspension and therefore minimizes impacts from turbidity.

Sediments would be dredged from the borrow area using a rotating cutter-head dredge attached to a suction pipe that would be lowered to the seafloor to pick up material. As the material is depleted in each section of the borrow area, the dredge would be moved forward using a combination of spuds, mooring wires, and tender tugs. Material entering the suction pipe would pass through the dredge pump and be transported to the shoreline via a submerged pipeline. Depending on the distance between the dredge and the discharge point on the beach, booster pumps may be required. Uniform, soft bottom substrate, and open gulf waters are located between the borrow area and the shoreline nourishment. The area contains no sensitive habitat.

Slopes within the borrow area would not exceed (i.e. be steeper than) 5 horizontal: 1 vertical along the dredged boundaries to ensure integrity of the surrounding seabed (as cited in BOEM 2012).

NOTE**:** Immediately prior to the publication of this Final RP/EA, the Texas TIG learned that, based on the results of a recently completed pilot study, it may be necessary to expand the existing borrow area or identify an additional borrow area. However, the actual ridge construction is not expected to change. Therefore, even if an expanded/additional borrow area becomes necessary, the Texas TIG does not anticipate a change to its evaluation under OPA. However, if the Texas TIG learns of any factors that could affect its OPA analysis (e.g., significant change in project costs, etc.), the Texas TIG will revisit its OPA evaluation of this project.

3.3.4.2.2 Beach and Dune Construction

Once the pipeline reaches the shore, it would be run parallel to shore until it reaches the active construction area. The active construction area is anticipated to be up to 2,000 feet along the shore. The active construction area would shift approximately 0 - 1,000 feet per day as the project progresses.

The dredged material would be deposited at the beach as a slurry of sea water and sand. Machinery on the beach would distribute the dredged material and manage the pipe location and extensions. Heavy equipment would be used to create containment dikes which would channelize the flow exiting the dredge pipe to allow the maximum percentage of solids to settle within the construction corridor, thereby minimizing turbidity impacts to the adjacent Gulf of Mexico waters. As this slurry runs along the beach, sediment would settle out within the project area and water would return to the ocean. As the new sandy material builds up in front of the pipe, heavy equipment would grade the material to meet the design specifications of the beach and dunes. Heavy equipment including bulldozers, graders, and other small and large tracked and wheeled vehicles may be used.

3.3.4.2.3 Vegetation Planting

Once the beach nourishment and sediment sculpting activities have been completed, the dunes would be planted with native dune species. The planting plan for the pilot project includes vegetating the dune crest as well as the dune side slopes using a row sprigging method. Sprigs would be placed in rows spaced 5 feet apart to a minimum of 1-inch depth. Planted vegetation includes sprigs of native species including bitter panicum, sea oats, sea purslane, and beach morning glory. A vegetation planting plan modified from and based on results from the pilot project would be developed prior to implementation. This plan would provide specifications for the species of native vegetation to be used; acceptable source stock; planting densities and locations for planting; survival performance criteria and corrective actions.

3.3.4.2.4 Construction Schedule

Construction activities are planned to occur year-round due to the high cost of equipment mobilization associated with this project. The beach ridge would be restored in 2-mile sections, each taking around one month to complete.

This project will only be implemented if funding through other sources becomes available so that the entire 20-mile section of beach described in the USACE permit can be completed. If the entire remaining shoreline targeted for this restoration project is not funded though available sources within a reasonable timeframe, then this project would not be implemented and funding allocated per this RP/EA would go back into the Wetlands, Coastal, and Nearshore Habitat Restoration Type to fund other projects.[12]

3.3.4.3 Operations and Maintenance

Maintenance activities would be managed by the land manager. Habitat below mean high water would be managed by the TGLO and habitat above mean high water would be managed by USFWS in accordance with the Texas Chenier Plain Refuge Complex: Final Environmental Impact Statement, Comprehensive Conservation Plan (CCP), and Land Protection Plan, Volumes 1 and 2 (Texas Chenier Plain Refuge Complex and USFWS- Division of Planning 2008). Monitoring activities would be conducted by the Implementing Trustee(s) in coordination with USFWS, Jefferson County, and TGLO. While not funded through NRDA restoration funds from the Incident, this project may be incorporated into TGLO's Beach Monitoring and Maintenance Plan (TGLO 2010). If incorporated, any data from TGLO monitoring would be publicly available. Appropriate lease(s) or modifications to existing leases from TGLO would be obtained prior to implementing the proposed restoration actions.

3.3.4.4 OPA Evaluation

The OPA evaluation of the proposed McFaddin Beach Ridge Restoration project using the criteria established by the OPA regulations in 15 CFR §990.54(a) is described below.

3.3.4.4.1 Cost-Effectiveness

The estimated cost of this project is comparable to the pilot project as well as other beach renourishment projects in Texas. Habitat restoration through the placement of significant volumes of sediment by dredging from approved submerged sediment borrow sites is much more cost effective than trucking material from terrestrial sources, resulting in a lower unit cost for material. The cost for trucking material for shoreline restoration has been shown to be two to three times more costly than dredging for similar sized projects. Although the mobilization and demobilization costs for dredging projects can be up to twice the amount for a truck hauling project, the economy of scale of very large dredge placement projects typically results in exponentially lower total project costs. Information gained during the construction of the pilot project will be used to improve methods and cost-effectiveness, where applicable. Based on the information above, this project is considered cost effective.

This project would only be implemented if funding through other sources becomes available so that the entire 20-mile section of beach described in the USACE permit can be completed. The Texas TIG would implement this project as part of a coordinated effort of all funding sources so that the construction is

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[12] The 20 miles includes a pilot project (approximately 3 miles long) currently being constructed, which is expected to be completed by the summer of 2017.

one continuous effort. This increases cost-effectiveness by decreasing the need for multiple mobilization and demobilization efforts and their associated costs.

3.3.4.4.2 Trustee Restoration Goals and Objectives

The Final PDARP/PEIS identified the restoration goal of restoring and conserving habitats to restore habitats injured as a result of the Incident. This project has a clear nexus to the injuries described in the Final PDARP/PEIS because it would restore beach and dune habitat, which is a habitat that was injured as a result of the Incident. This project is consistent with Texas TIG goals and objectives and is consistent with the programmatic Trustee restoration goals and Restoration Type-specific goals outlined in the Final PDARP/PEIS.

3.3.4.4.3 Likelihood of Success

Texas Trustee agencies have successfully implemented projects similar to the project (e.g., McFaddin Beach Ridge pilot project, Surfside Beach Nourishment, and Rollover Beach Nourishment). This documented experience, use of similar construction techniques, and successful completion of previous projects demonstrates that the project would have a high likelihood of success. Additionally, the public as well as federal, state, and tribes previously had the opportunity to review and comment on this project through the USACE permitting process (USACE 2016a). Lessons learned during the pilot project which involved depositing sand along approximately 3 miles of beach will be valuable in undertaking the planning for the completion of the entire project and increase the likelihood of success. This project is technically feasible and uses proven techniques with established methods and documented results. This project would not be undertaken unless there is sufficient funding available from the various sources to ensure that the entire length of the project can be completed.

3.3.4.4.4 Prevent Future Injury and Avoid Collateral Injury

The project has been designed to prevent future injury and collateral damage to natural resources. The potential environmental effects of this project are analyzed in Section 4.4. That analysis indicates that adverse effects from the project would largely be minor, localized, and often of short duration. BMPs and measures to avoid and minimize impacts identified during the permitting process and during consultations and reviews with natural resource agencies would be implemented.

3.3.4.4.5 Benefits Multiple Resources

This project would benefit multiple resources. This project would restore the lost beach ridge and would directly benefit sand beach and dune habitat and its associated fauna, including birds, crabs, and potentially sea turtles. Indirectly, this project would benefit the entire Salt Bayou system (flora and fauna) by preventing regular influxes of salt water, which have caused a shift in species utilization and accelerated conversion of marsh to open water (i.e., land loss).

3.3.4.4.6 Public Health and Safety

This project would provide substantial benefits for public health and safety. Restoration of the beach ridge would ultimately help maintain the resiliency of the interior marshes that protect infrastructure including refineries, homes, and marine waterways from the impacts of severe storms. Areas under construction would be closed off to the public in order to maintain safety during construction. Much of the project area is on land managed by the federal refuge system. This system maintains the biological integrity, diversity, and environmental health of these natural resources for the benefit of present and future generations of Americans.

This project is not anticipated to generate hazardous waste or the need for disposal of hazardous waste. All occupational and marine safety regulations and laws would be followed to ensure safety of all workers and monitors.

3.3.4.5 Monitoring and Adaptive Management

The MAM Plan in Appendix D describes activities that would be conducted to demonstrate how the project is meeting its goals and objectives.

3.3.5 Bessie Heights Wetland Restoration

The Bessie Heights Wetland Restoration project would restore wetlands in Bessie Heights Marsh located within the Lower Neches WMA in Orange County, Texas. The project would beneficially use sediment obtained from dredging of the federally managed SNWW, and mining dredged material from DMPAs and private navigation channels and berths to restore coastal wetlands. The placement of dredged material, construction of containment levees, and associated planting would restore up to 900 acres of intertidal marsh. The estimated cost for the project is $4,905,000.

3.3.5.1 Project Description

The Nelda Stark Unit of the Lower Neches WMA in Orange County comprises approximately 3,375 acres located along the eastern bank of the Neches River approximately 5 miles north of the confluence of the Neches and Sabine Rivers at Sabine Lake (Figure 3-6). The area within and surrounding the Nelda Stark Unit is often referred to as the Bessie Heights Marsh and is also the site of the Port Neches oilfield.

Map compiled by IT-GIST 04/10/2017. No claims are made to the accuracy of the data or to the suitability of the data to a particular use.
Projection: Texas Centric Mapping System Lambert
M:\NFWF\RestorationProjectLocationMaps_2017\MXD\Version4\Bessie HeightsWetland Restoration.mxd

Figure 3-6. Map showing the location of the Bessie Heights Wetland Restoration project in Orange County

The predominant wetland habitats near the Lower Neches WMA are characterized as marsh and estuarine open water. For the lower Neches River, from Beaumont to Sabine Lake, significant systematic change occurred between the 1950s and the 2000s as palustrine marsh was lost (reduced from 10,184 hectares (ha) to 4,279 ha) and converted to estuarine open water (increased from 694 ha to 5,080 ha). The largest degree of loss of palustrine marsh was in the vicinity of the Lower Neches WMA where oil and gas production in the Port Neches Oil field caused subsidence via the activation of a pair of high-angle faults that promoted marsh flooding and conversion to open water (Tremblay and Calnan 2009). Many restoration efforts in Bessie Heights that have focused on restoring estuarine intertidal marsh by construction marsh terraces and through the BUDM. The project would be a continuation of those efforts.

Restoration of Texas coastal wetlands through beneficially using dredged material supports the needs or goals of several conservation plans. These plans include but are not limited to the following national, state, and regional planning documents:

- Texas Coastal Management Program Final Environmental Impact Statement (NOAA and State of Texas 1996); and
- Gulf of Mexico Regional Sediment Management Master Plan (Gulf of Mexico Alliance Habitat Conservation and Restoration Team 2009).

The Texas TIG would coordinate with the USACE on this project to beneficially use dredged material from maintenance dredging of the SNWW and DMPAs. Dredged material may also be obtained from the dredging of private industrial docks, berths, and channels. The Texas TIG would coordinate with the appropriate parties for each sediment source to ensure the material is not contaminated and is appropriate for marsh restoration. The project would fund the construction of containment levees as needed to contain and dewater the dredged sediments. Sediment would be placed within these containment areas to build bottom elevations suitable for marsh growth as determined from adjacent natural wetlands. This would allow the marshes to return to sustainable and productive intertidal wetlands.

Based on existing preliminary designs, the project would place up to 4.8 million cubic yards of material to restore up to 900 acres of intertidal wetland complex. Funding for the final E&D for this project has been awarded under the RESTORE Act Bucket 2. This project would not be implemented until that E&D has been completed. Final material volumes and acreage is dependent upon material available through adjacent dredge projects and selected contractor capabilities. It is anticipated that the next opportunity to partner with USACE to receive dredged material for restoration purposes would be between 2018 and 2020.

Much of the funding for this project would be used to fund USACE's incremental costs associated with BUDM. Incremental costs are those that are above the costs for the Federal Standard base plan defined in USACE regulations. These regulations mandate selection of the least costly dredged material disposal or placement alternative (or alternatives) identified by USACE that is consistent with sound engineering practices and meets all federal environmental compliance requirements. When BUDM is selected for a project and that beneficial use is not the Federal Standard option, the costs for the beneficial use option are divided into two categories: 1) the costs assigned to the navigational purpose of the project; and 2) the costs beyond the navigational purpose costs (termed "incremental costs"). A project sponsor other than the USACE must pay the Incremental costs (EPA 2007a). For this project, NRDA funds would be used to fund the incremental costs, construction of levees, and other marsh restoration activities. As such, the OPA and NEPA analyses presented in this document only pertain to the placement and restoration activities. NEPA analyses for dredging by the USACE and other parties are covered in analyses conducted by those entities.

3.3.5.2 Project Construction and Installation

Project proponents would engage the services of professional surveyors, coastal planners and coastal engineering firms to conduct site assessments and analyses, complete construction drawings, identify potential sources of dredged material, prepare permit applications to the USACE, and otherwise move the project to a shovel-ready state.

Construction may require temporary trenches and channels to provide equipment access and routing of dredge pipelines to the restoration sites. The need for and location of temporary channels would be determined in the final E&D. All temporary channels would be backfilled upon completion of construction work. All sources of borrow material would be assessed for suitability from an engineering perspective and would be evaluated for environmental conditions to ensure sediments are uncontaminated and there are no significant impacts to cultural and sensitive resources.

Hydraulic dredging utilizes in-situ water to mobilize the sediments through the pipeline. To achieve the target elevation for the restored wetlands, dredged material would be placed such that, after consolidation, elevations suitable to support intertidal marsh vegetation would be present. Mechanically excavated sediment from the existing substrates may be used to form temporary containment levees to contain the dredged material, facilitate dewatering and protect the restoration sites from erosion until vegetation is established. After dewatering, the site would be planted with native species such as smooth cordgrass. The plants would be propagated from upper Texas coast stocks.

Specific methods and equipment used would be approved by a professional engineer (PE) and the project team that includes Texas TIG representatives and TPWD land managers prior to construction. Environmental considerations, BMPs, land use approvals, and permit requirements must be met regardless of methods and equipment chosen. These would be outlined in the bid specification package developed by the PE and contracting officers. This specification package would ensure that the contractor is made aware of the engineering specifications as well as any additional obligations they would incur associated with federal and state laws governing activities associated with the project. It would also provide the project related approvals needed by the project manager and the PE to conduct the project.

In general, construction would require the use of barges, small watercraft, large track hoe excavators, earth moving equipment, cutterhead-hydraulic or clamshell dredges, and a dockside staging area. Equipment and materials for the construction activities would be transported via roads and marine waterways. Large equipment and materials moved by barges would use the established interconnected waterways. This may include the GIWW, SNWW, and/or other navigation channels.

3.3.5.2.1 Beneficial Use of Dredged Material

Uncontaminated earthen fill material would be used to raise elevations. Fill material would be sourced from the SNWW or private navigation channels. Another method of BUDM is to mine existing USACE DMPAs that are associated with federally maintained navigation channels. These placement areas are maintained and operated as part of the SNWW federal project. Material would be mined using hydraulic excavation techniques. Environmental compliance requirements for the dredging and placement of material from the SNWW projects are maintained by USACE separate from the BUDM alternative addressed in this section.

Screening for potential chemical contaminants would be conducted on a case-by-case basis. For sediments from federally maintained navigation channels or associated DMPAs, previously collected contaminant analysis and bioassay data would be obtained from the USACE Galveston District - Operations Branch records. For private industry docks and channels, state and federal resource agency personnel would be consulted to determine the amount of sampling and the type of chemical analyses that may be needed. All environmental reviews required for the placement of the material obtained as part of a beneficial use disposal process would be coordinated with the project (e.g. a navigation maintenance project) supplying the dredged material.

Measures to control turbidity caused by construction activities, decanting water, and sediment movement would be in place to ensure water quality standards are met. These measures may include appropriate water control structures to decant water, as well as the installation of silt fences, hay bales, filter-fabric, and/or temporary levees to control sediments and avoid negative impacts associated with the fill placement. No known oyster reefs, other hard structure reef resources, or seagrass beds are present within or adjacent to the restoration sites that would require the use of significant control measures during project implementation.

Either a hydraulic cutter-head dredge or clamshell dredge would be used, as these do not pose a risk to pelagic aquatic organisms such as sea turtles. Material would be transported to the placement area via a hydraulic dredge pipeline. The dredge pipeline would be routed to avoid disturbance to sensitive resource areas such as oyster reefs and seagrass beds if identified along the pipeline route. Any areas containing such resources in the construction area and pipeline route would be protected using BMPs such as hay bales, silt fences or other appropriate methods.

3.3.5.2.2 Levees

Temporary or permanent levees would be utilized in this project to contain dredged material and to facilitate dewatering of the dredged slurry. They also may serve to protect the restored habitat from erosion. In addition to construction of new levees, existing levees may be rehabilitated and utilized in this effort. The levees may be intentionally breached or lowered as needed after dredged material dewatering in order to establish adequate tidal circulation to the restored marsh.

The amount, grading, and size of material (such as rock) that may be used to stabilize the levees would be dependent on several factors determined in the final design. These include wave and current energy expected, as well as intended use of the levees.

3.3.5.2.3 Vegetation Planting

Planting of native vegetation would occur in two stages. First, once the earthen fill has dewatered and sediments have settled substantially enough, the marsh would be seeded and/or sprigged with native vegetation such as smooth cordgrass. This can help decrease the time it takes to dewater the sediments through evapotranspiration. During the second stage, once the material has settled to marsh elevations, unvegetated areas of the marsh would be planted with sprigs. Settlement could take between 1 to 5 years after initial construction. Colonization by invasive species is not likely, however there is potential for short- term growth of salt cedar. If encountered this plant and other invasive species would be removed by hand. In the long-term, these species would not survive inundation once the sediments compress to marsh elevation.

3.3.5.2.4 Construction Schedule

Final engineering, design, and permitting for the project is estimated to be completed in approximately 12 months. Dredged material placement done in coordination with the USACE would be dependent on the dredging schedule of the SNWW. The schedule for the use of dredged material from private industry sources would depend on the timing of construction and maintenance of those facilities.

3.3.5.3 Operations and Maintenance

Maintenance activities on the restored marsh sites would be managed by TPWD. TPWD has managed several similar projects to restore wetlands and marsh in the same area. As a member of the project team and the Texas TIG, TPWD would participate in final design development and be cognizant of obligations related to long-term management. A maintenance plan would be finalized concurrently with the final E&D phase of this project. Maintenance activities may include management of water control structures to facilitate dewatering, monitoring of levee height, and modifications to containment levees by breaching or lowering as needed after dredged material dewatering in order to establish adequate tidal circulation to the restored marsh.

3.3.5.4 OPA Evaluation

The OPA evaluation of the proposed Bessie Heights Wetland Restoration project using the criteria established by the OPA regulations in 15 CFR §990.54(a) is described below.

3.3.5.4.1 Cost-Effectiveness

The Texas TIG conducted an extensive screening process that included an evaluation of the cost effectiveness of the submitted projects. BUDM is a cost effective method for restoring intertidal marsh as the technique takes advantage of ongoing projects to provide the sediments needed for restoring marsh elevation. Using these sediments greatly reduces costs as the Texas TIG only proposes funding the sediment placement portion of the project. The estimated cost for the project is based on past projects that were completed in the same area utilizing the same methods. The cost-effectiveness of this project is further enhanced as the final E&D costs are being funded through RESTORE Act Bucket 2 funding.

3.3.5.4.2 Trustee Restoration Goals and Objectives

The Final PDARP/PEIS identified the restoration goal of restoring and conserving habitats to restore habitats injured as a result of the Incident. This project has a clear nexus to the injuries described in the Final PDARP/PEIS because it would restore up to 900 acres of wetland complex, which is a habitat that was injured as a result of the Incident. This project is consistent with Texas TIG goals and objectives and meets the Trustee programmatic restoration goals and Restoration Type-specific goals as described in the Final PDARP/PEIS.

3.3.5.4.3 Likelihood of Success

Texas Trustee agencies have successfully implemented marsh restoration projects in Bessie Heights using the same marsh restoration techniques proposed to be utilized in this project. This project would be built upon those previous efforts. The Texas TIG and WMA management staff have engaged with the USACE and built a partnership that would facilitate the completion of this project. TPWD WMA management have also coordinated with private industry in the vicinity and there is an interest in using sediment from private dredging projects for marsh restoration in Bessie Heights. The history of marsh restoration in Bessie Heights and the partnerships in place lead to a high probability of success for this project.

3.3.5.4.4 Prevent Future Injury and Avoid Collateral Injury

BMPs and measures to avoid and minimize impacts that are identified during the permitting process or during consultations and reviews with natural resource agencies would be implemented. As a result, collateral injury would be avoided and minimized during project implementation (construction, operations, maintenance, and monitoring).

3.3.5.4.5 Benefits Multiple Resources

This project provides benefits to multiple resources. Beyond restoring wetlands, coastal, and nearshore habitat within the Salt Bayou and Lower Neches River watersheds, this project would provide benefit to a variety of fauna injured by the Incident (e.g., crabs, birds, fish, etc.) that use the interconnected habitats (marsh, sand flat, and protected shallow water) in the project area.

3.3.5.4.6 Public Health and Safety

The final design of this project would include specifications to avoid negative impacts on public health and safety. Measures to maintain both commercial and recreational maritime safety would be coordinated with the USACE and the managers of the SNWW or other sources of dredged material. These measures would include routing the pipeline to avoid maritime traffic, marking the pipeline with signage and lighting as needed, submerging the pipeline in areas of high traffic and other measures as appropriate. The Texas TIG would work with the USACE and private industries to ensure that the sediments are free of contamination, including testing following the EPA Inland Testing Manual (EPA and USACE 1998). These measures and other identified during final design would be taken to avoid adversely impacting public health and safety. The creation of marsh can also benefit public safety by improving water quality and buffering storm surges.

3.3.5.5 *Monitoring and Adaptive Management*

The MAM Plan in Appendix D describes activities that would be conducted to demonstrate how the project is meeting its goals and objectives.

3.3.6 Pierce Marsh Wetland Restoration

The Pierce Marsh Wetland Restoration project would restore and conserve wetland and coastal habitats by beneficially using dredged material to create a viable, vegetated, wetland habitat for a variety of plants, fish, birds, and other wildlife that frequent the area. The placement of dredged material and associated planting would restore up to 150 acres of marsh and contribute to an ongoing effort to restore the wetland complex in West Galveston Bay. The estimated cost for the project is $3,095,000.

3.3.6.1 *Project Description*

Pierce Marsh is a subsided intertidal and high salt marsh complex adjacent to Highland Bayou in Hitchcock, Texas, on the north side of West Bay (Figure 3-7). The bay has been adversely affected by historical subsidence, which has led to the loss of much of the once-thriving marsh habitat in the system. This project would beneficially use dredged material to restore estuarine marsh complex (intertidal fringe marsh, salt flat marsh, sand flat, and protected shallow water) within a 364-acre area in Pierce Marsh.

The primary objective of this project is to continue ongoing efforts to return current open-water habitat in Pierce Marsh to historical marsh elevations to support habitat restoration and revegetation with smooth cordgrass. This project would route between 120,000 and 400,000 cubic yards of hydraulically dredged material excavated from USACE maintenance dredging at several stations along the GIWW to pre-existing sediment containment levees (cells) or newly constructed levees in Pierce Marsh.[13] This material would be used to raise the elevation of up to 47,050 linear feet of the existing levees and increase elevation of existing substrate to a height not to exceed historical marsh elevations.[14] Portions of the dredged material would be placed above intertidal elevation for restoration of salt flat marsh/sand flat habitat in addition to intertidal smooth cordgrass (i.e., *Spartina alterniflora*) marsh and would also allow for the migration of intertidal marsh to higher elevations in response to sea level rise. Project actions would restore up to 150 acres of marsh habitat.

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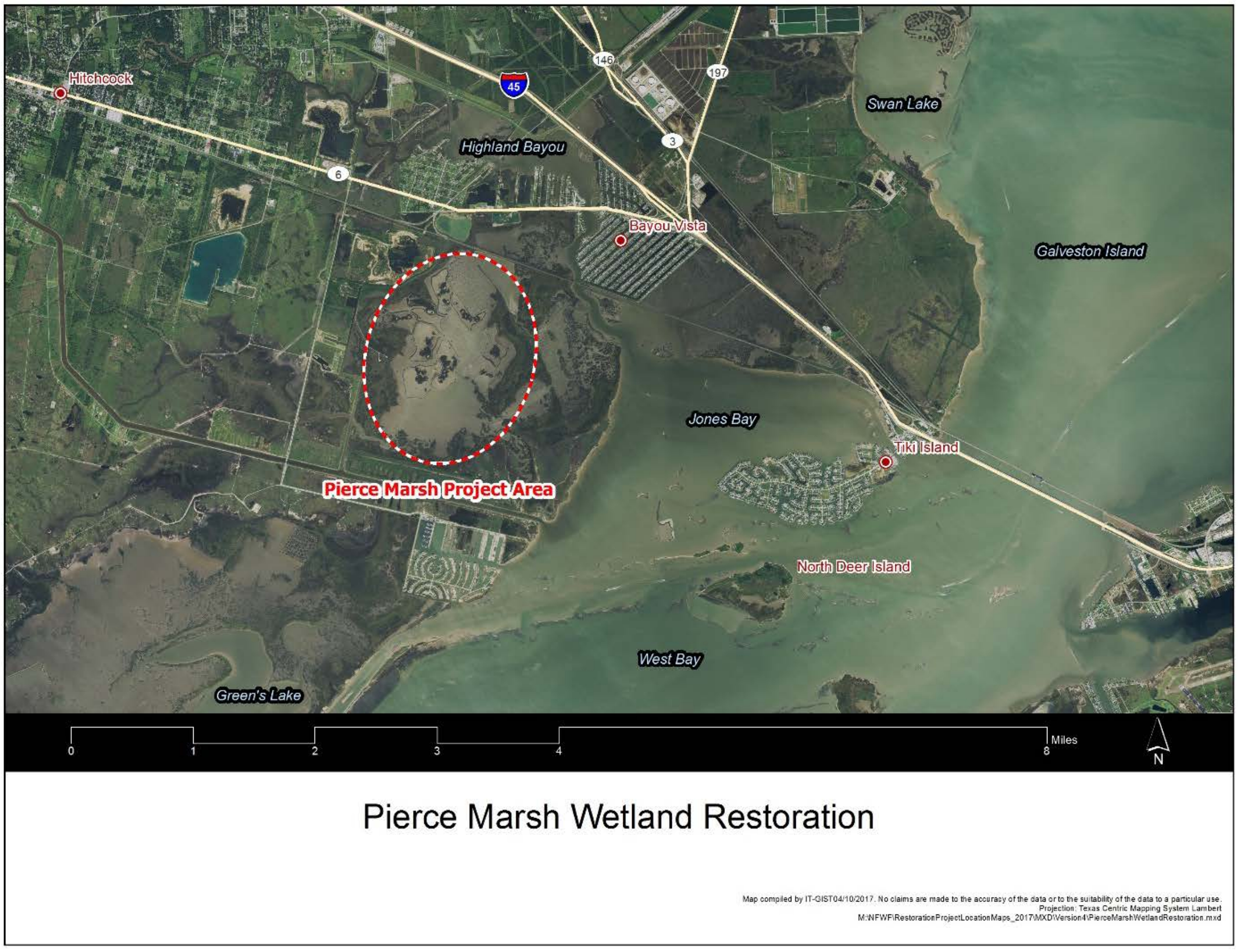
[13] Sediment containment levees were constructed as a part of a previous BUDM project in 2005.

[14] The selected elevation takes into consideration and allows for bulking (compaction of the dredged material as it dewaters) and sea level rise.



Map compiled by IT-GIST04/10/2017. No claims are made to the accuracy of the data or to the suitability of the data to a particular use.
Projection: Texas Centric Mapping System Lambert
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Figure 3-7. Map showing the location of the Pierce Marsh Wetland Restoration project in Galveston County

This project would contribute to an ongoing, large-scale conservation effort to restore marsh and wetland habitat in the Galveston Bay system. Historical subsidence in the Galveston Bay area has inundated thousands of acres of coastal marsh. Wetland loss in coastal Texas has been rated by the EPA as severe and is greater in the Galveston Bay system than other areas of the state (Moulton et al., 1997). It is estimated that between 1953 and 1989, Galveston Bay experienced a net loss of approximately 35,100 acres of wetlands (White et al. 1993). Subsidence in the greater Houston area has slowed considerably since groundwater pumping was severely limited beginning in 1975 (Holzer 1989).

Restoration of Pierce Marsh supports the needs or goals of several conservation plans. These plans include but are not limited to the following national, state, and regional planning documents:

- The Galveston Bay Plan: The Comprehensive Conservation and Management Plan for the Galveston Bay Ecosystem (Galveston Bay Estuary Program (GBEP) 1994);
- Galveston Bay Habitat Conservation Blueprint: A Plan to Restore the Habitats and Heritage of Galveston Bay Habitat (GBF 1998);
- Waterbird Conservation for the Americas: The North American Waterbird Conservation Plan, Version 1 (Kushlan et al. 2002);

- Southeast United States Regional Waterbird Conservation Plan (Hunter et al. 2006);
- Gulf Coast Joint Venture (GCJV): Texas Mid-Coast Initiative. North American Water Fowl Management Plan (Wilson and Esslinger 2002);
- Gulf Coast Joint Venture (GCJV): Mottled Duck Conservation Plan. North American Water Fowl Management Plan (Wilson 2007);
- Waterfowl Strategic Plan (TPWD 2011);
- Texas Coastal Management Program: Section 309 Assessment and Strategies Report, 2016 – 2020 (TGLO 2015);
- North American Waterfowl Management Plan: People Conserving Waterfowl and Wetlands (USFWS 2012);
- US Shorebird Conservation Plan: Lower Mississippi/Western Gulf Coast Shorebird Planning Region (USSCP 2000);
- Strategic Plan: The Coastal Program Stewardship of Fish and Wildlife Through Voluntary Conservation Regional Step-Down Plan Region 2 (Texas) Part 2 of 3 FY 2006-2010 (USFWS 2006);
- Texas Conservation Action Plan 2012 – 2016: Gulf Coast Prairies and Marshes Handbook (TPWD 2012); and
- Texas Coastal and Estuarine Land Conservation Program Plan (NOAA 2010).

Final E&D stages for this project have recently been funded but not implemented through the RESTORE Act Bucket 2 (GCERC 2015). This project would not be implemented until the final E&D funded under the RESTORE Act has been completed. Estimated material volume and restored acreage is currently based on existing preliminary designs. Final material volumes and acreage is dependent upon material available through adjacent USACE dredge projects and selected contractor capabilities.

To implement this project, the Texas TIG would partner with the USACE to use dredged material from the GIWW to increase elevations in leveed open water areas of Pierce Marsh and make them suitable for the establishment and long-term sustainability of a shallow intertidal wetland. It is anticipated that the next opportunity to partner with USACE to receive dredged material for restoration purposes would be between 2018 and 2020. Depending on availability of funding, this project may run more than one maintenance dredging cycle.

3.3.6.1.1 Project Construction and Installation

In general, construction would require the use of barges, small watercraft, large track hoe excavators, earth moving equipment, hydraulic dredges, and a dockside staging area. Equipment and materials for the construction activities would be transported via roads and marine waterways. Large equipment and materials moved by barges would use the established interconnected waterways. This may include the GIWW, the Houston Ship Channel and/or other navigation channels (NOAA navigational charts for Galveston/Houston: http://xpda.com/nauticalcharts/). The TGLO has identified places to access coastal waterways at http://www.glo.texas.gov/texas-beach-access/beach_bay.html. Information specific to Galveston County is located at http://www.glo.texas.gov/texas-beachaccess/pdf/beach-bay/Galveston.pdf.

Construction may require temporary trenches for pipeline access to the restoration and borrow sites. The number and length of temporary trenches would be determined during the E&D stage for the marsh. All temporary trenches would be backfilled upon completion of construction work.

Methods and tools would be approved by the PE and the project team that includes Texas TIG representatives prior to implementation. Environmental considerations, BMPs, and legal and permit requirements must be met regardless of methods and tools chosen. These would be outlined in the bid specification package developed by the PE and contracting officers. This specification package would ensure that the contractor is made aware of not only the engineering specifications but the additional obligations associated with federal and state laws governing the activities associated with the project. It would also provide the project-related approvals needed by the project manager and the PE to conduct the project.

3.3.6.1.2 Beneficial Use of Dredged Material

This project would utilize source material from ongoing federal dredging operations and/or material harvested from existing placement areas that are associated with federally-maintained navigation channels. These placement areas are maintained and operated as part of the GIWW federal project.[15] Uncontaminated earthen fill material would be mined using hydraulic excavation techniques and used to restore Pierce Marsh to historical marsh elevations. Material would be transported to the placement area via a hydraulic dredge pipeline. Pipeline or hydraulic dredges would be used, because they are not known to take sea turtles (NOAA 2007).

The Texas TIG would consider all current information to determine the appropriate level of contamination testing for sediments used in this project. For sediments from federally-maintained navigation channels or associated DMPAs, previously collected contaminant analysis and bioassay data would be obtained from the USACE Galveston District-Operations Branch records. Based upon this information, the USACE and state and federal resource agency personnel would be consulted to determine the amount of sampling and the type of chemical analyses that may be needed.

Measures to control turbidity caused by construction activities, decanting water, and sediment movement would be in place to ensure sensitive habitats are protected, water quality standards are met, and sensitive resources are not affected. These measures may include appropriate water control structures to decant water, as well as the installation of silt fences, hay bales, filter-fabric, and/or temporary levees to control sediments and avoid negative impacts associated with the fill placement.

3.3.6.1.3 Levees

Levees would be utilized in this project to contain earthen fill placement to support marsh elevation. They also may serve to protect the restored habitat from erosional forces. This project may utilize

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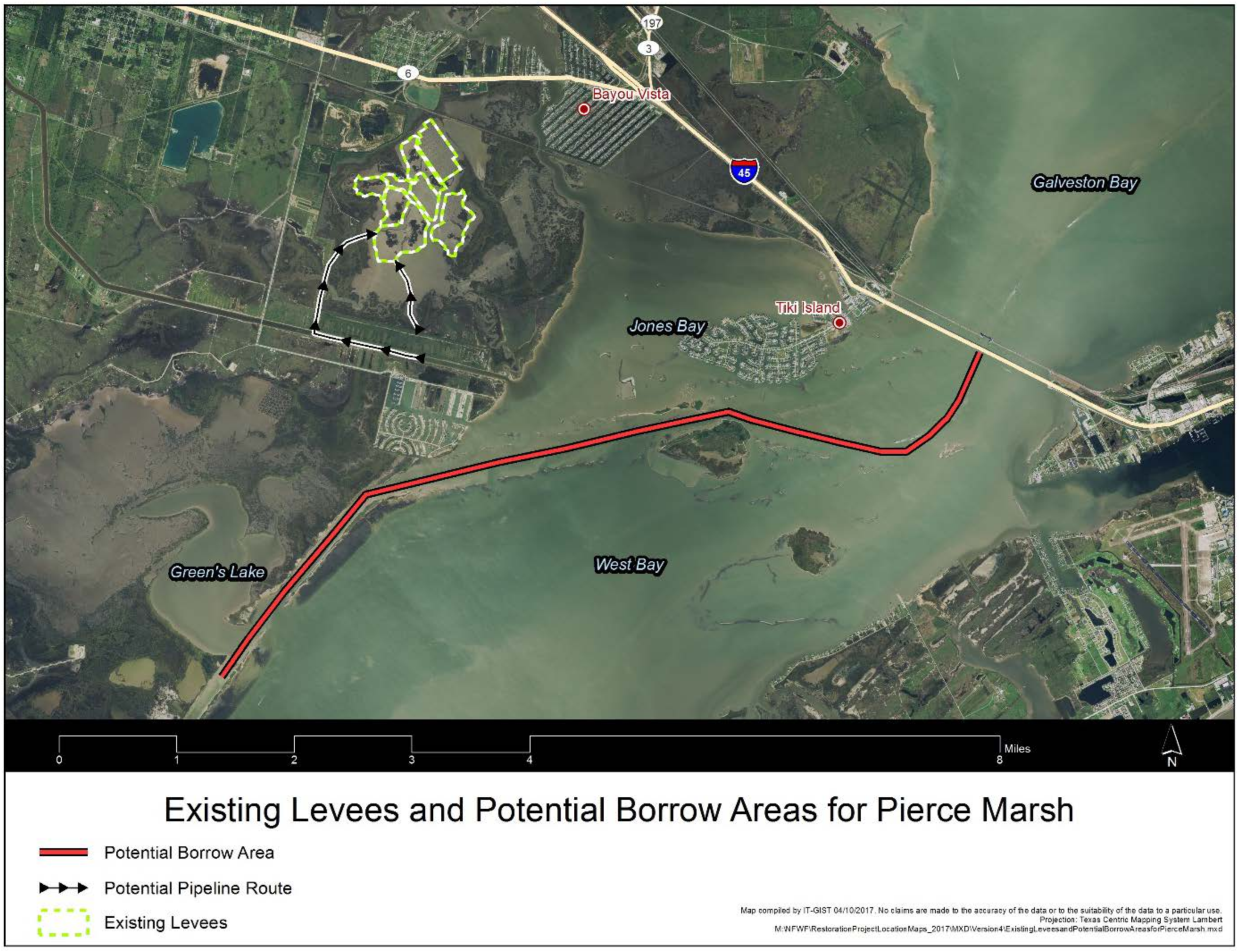
[15] While the Pierce Marsh Wetland Restoration project is utilizing material sourced from a USACE maintenance dredging operation, the actual dredging of the GIWW is outside of the scope of this project and would occur regardless of whether or not this project was implemented. This activity is not being funded through NRDA settlement money, and therefore is not included in the compliance discussion below.

existing dredged material containment levees or may include construction of new ones. Currently existing dredged material containment levees constructed as a part of an earlier project have sufficient capacity to support an additional 150 acres of BUDM-constructed intertidal marsh. Existing levees may be surveyed to obtain an accurate cross-section so that proper engineering can be done to incorporate or work around these features (Figure 3-8). Existing levees may also be surveyed to verify holding capacity and appropriate depth. The structures may require additional height or support through a construction method such as mechanical excavation. Mechanically excavated material may be used to raise the elevation of existing levees to a minimum height to get material to a depth that would settle to marsh elevation. Levees may be intentionally breached or lowered as needed after dredged material dewatering in order to establish adequate tidal circulation to the restored marsh.



Map compiled by IT-GIST 04/10/2017. No claims are made to the accuracy of the data or to the suitability of the data to a particular use.
Projection: Texas Centric Mapping System Lambert
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Figure 3-8. Map showing the existing levees, potential borrow area, and potential pipeline route

The amount, grading, and size of material that may be used as additional support would be dependent on several factors determined in the final design. These include wave and current energy expected, as well as intended use of the levees.

3.3.6.1.4 Vegetation Planting

Planting of native vegetation would occur in two stages. First, once the earthen fill has dewatered and sediments have settled substantially enough, the marsh would be seeded with smooth cordgrass in the spring season. This can help decrease the time it takes to dewater placement sediments through evapotranspiration. During the second stage, once the material has settled sufficiently to support vegetation, smooth cordgrass would be planted on elevated portions of marsh. This planting would likely be within 1 to 5 years after initial construction. Specific targeted number of acres for vegetative plantings for the marsh site would be developed concurrently with the E&D phase of this project. Vegetation success would be monitored as a part of the project's MAM plan.

3.3.6.1.5 Construction Schedule

Currently, the project area within Pierce Marsh is comprised of open water and unvegetated levees; therefore, there is no nesting habitat present and construction could occur anytime during the year. Construction and dredged material placement must be done in coordination with the USACE dredging schedule. It is estimated that the next window of availability for this coordination may be 2018. The E&D for this project was funded in 2017 through the RESTORE Act and is estimated to take 6 months to complete once these design activities have begun. Project construction may span either one or two USACE maintenance dredging cycles to gather sufficient material for marsh restoration. Project construction is not expected to take longer than 6 months if only one dredge cycle is needed for sufficient material. The timing of contracting awards and weather conditions could impact the construction schedule. To prevent disturbance to nearby residential communities, construction activities that produce significant noise or require precision, such as dredging and placing material, would be limited to daylight hours.

3.3.6.2 Operations and Maintenance

The project area would be secured through a lease from the TGLO. Appropriate lease(s) or modifications to existing leases would be obtained prior to implementing the proposed restoration actions. Maintenance activities in Pierce Marsh would likely be managed by the GBF. A maintenance plan would be finalized concurrently with final design phases of this project, which are funded through the RESTORE Act. Maintenance activities may include management of water control structures to facilitate dewatering and monitoring of levee heights.

3.3.6.3 OPA Evaluation

The OPA evaluation of the proposed Pierce Marsh Wetland Restoration project using the criteria established by the OPA regulations in 15 CFR §990.54(a) is described below.

3.3.6.3.1 Cost-Effectiveness

The cost for the project is based on similar projects that have been implemented to restore Pierce Marsh through the BUDM from the GIWW in the past and is cost-effective in comparison. Habitat restoration through the placement of significant volumes of sediment by way of beneficially reusing material from USACE maintenance dredging is much more cost effective than incorporating new dredging into the project activities. USACE maintenance dredging occurs year-round, and would occur regardless of the implementation of this project. Beneficially utilizing material that has been previously dredged is much more cost effective in comparison to contracting an independent dredging operation to harvest new material where the permitting, equipment, and mobilization/demobilization costs are much higher. Because this project is phased through different funding partners, the Texas TIG expects to increase the effectiveness and efficiency of the subsequent actions to protect and restore the intertidal marsh habitat of Pierce Marsh.

3.3.6.3.2 Trustee Restoration Goals and Objectives

The Final PDARP/PEIS identified the restoration goal of restoring and conserving habitats injured as a result of the Incident. This project has a clear nexus to the injuries described in the Final PDARP/PEIS because it would protect and restore estuarine wetland habitats, which is a habitat that was injured as a result of the Incident. Protection and restoration of wetland habitats within Galveston Bay would also benefit a variety of fauna injured by the Incident (e.g., crabs, birds, fish, etc.) that use the interconnected habitats (intertidal fringe marsh, salt marsh, sand flat, and protected shallow water) in the project area. Upon construction and planting with native marsh vegetation, this project would make a significant contribution to restoring the natural resources, ecosystems, fisheries, marine and wildlife habitats, and coastal wetlands of the Gulf Coast. This project is consistent with Texas TIG goals and objectives and meets the Trustee programmatic restoration goals and Restoration Type-specific goals as described in the Final PDARP/PEIS.

3.3.6.3.3 Likelihood of Success

The proposed marsh restoration technique has been successfully used in previous restoration projects within the project area. The GBF has spent the last 15 years restoring wetlands within Pierce Marsh. Since the late 1990s, GBF has restored 425 acres of emergent estuarine marsh at the site through five projects: a 53-acre terracing project in 1999; a 45-acre terracing project in 2001; a 25-acre terracing project in 2003; a 280-acre BUDM marsh restoration project in 2005-08; and a 22-acre terracing project in 2010. The most recent project to utilize beneficial use material at the site was completed in 2016 and consisted of a partnership and coordination between the GBF, USACE, and Texas Trustees. The project would build upon the success of the 2016 project, taking advantage of the ongoing and similar work in this and nearby areas.

This documented experience and successful completion of previous projects demonstrates that the project would have a high likelihood of success. The project is technically feasible, uses proven techniques with established methods and documented results, and can be implemented with minimal delay. The project is organizationally feasible in that the Texas Trustees have implemented similar projects successfully in the past.

3.3.6.3.4 Prevent Future Injury and Avoid Collateral Injury

The potential environmental effects of this project are analyzed in Section 4.4.4. That analysis indicates that adverse effects from the project would largely be minor, localized, and often of short duration. In addition, any BMPs and measures to avoid and minimize impacts that are identified during the permitting process or during consultations and reviews with natural resource agencies would be implemented. As a result, collateral injury would be avoided and minimized during project implementation (construction, operations, maintenance, and monitoring).

3.3.6.3.5 Benefits Multiple Resources

This project provides benefits to multiple resources. Beyond restoring and conserving wetlands, coastal, and nearshore habitat, this restoration project would provide habitat for a variety of ecologically and economically important fauna such as birds, fish, crabs, and many other benthic species. The Galveston Bay watershed provides important habitat for wildlife, including migratory waterfowl, ducks, and wading birds and also serves as a valuable nursery and breeding habitat for numerous estuarine-dependent sport and commercial fish and shellfish. The principal commercial and recreational fishery species of Galveston Bay rely on estuarine marsh during at least some part of their life cycle. The marsh edge is a particularly important habitat for white and brown shrimp (Whaley and Minello 2002). Other marsh dwelling species include blue crab, red drum, spotted seatrout, Southern flounder, and Gulf menhaden. Estuarine marsh acts a nursery to hundreds of non-commercial species that comprise a large part of the bay food web. Bird species, such as snowy egrets, great egrets, roseate spoonbills, tri-colored herons, black-crowned night herons and great blue herons use marsh as feeding habitat. All of these resources would benefit from the creation of additional useable habitat in Pierce Marsh.

3.3.6.3.6 Public Health and Safety

This project would minimize adverse impacts to public health and safety during development of the project design. Anticipated project outcomes (marsh creation) would increase the ability of the coastline to mitigate storm surges, which would benefit public safety.

3.3.6.4 Monitoring and Adaptive Management

The MAM Plan in Appendix D describes activities that would be conducted to demonstrate how the project is meeting its goals and objectives.

3.3.7 Dollar Bay and Moses Lake Wetlands Restoration

The Dollar Bay and Moses Lake Wetlands Restoration (Phase IV) project would restore subsided marsh habitat in Dollar Bay and Moses Lake by creating about 15 acres of marsh terraces and protecting them with about 4,200 linear feet of rock breakwaters. This project would include construction implementation and the completion of planning documents which includes environmental reviews and final engineering designs. The estimated cost for the project is $4,225,000.

3.3.7.1 Project Description

The Dollar Bay-Moses Lake Wetlands Restoration (Phase IV) project intends to protect and restore coastal wetlands within the Moses Lake and Dollar Bay complex, a 2-mile by 4-mile tidally influenced waterbody on the west side of Galveston Bay in Galveston County, Texas (Figure 3-9). The Nature Conservancy's Texas City Prairie Preserve lies on the western and northern shores of Moses Lake. Historically, much of the perimeter and interior of the project area consisted of estuarine emergent marsh. However, historical subsidence coupled with shoreline erosion greatly impacted these areas, converting marsh to open water.

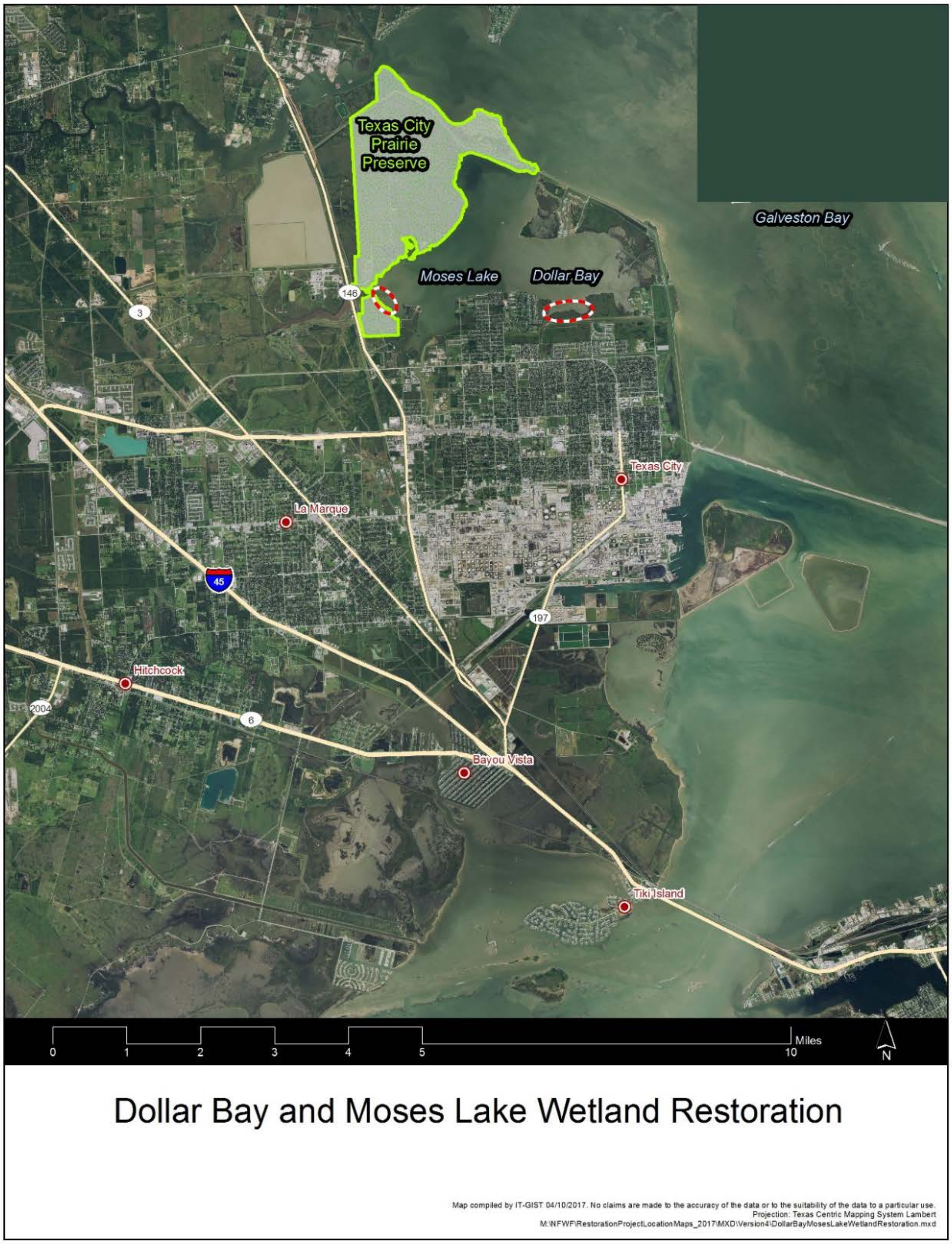

Figure 3-9. Location of the Dollar Bay-Moses Lake Wetlands Restoration project in Galveston County

Rapid development around the Houston metropolitan area has resulted in loss of important coastal habitats, either directly, through transition of natural areas to developed properties, or indirectly, through land surface subsidence, shoreline erosion, and other factors. Historically, the reliance on groundwater beginning in the 1850s and peaking in the 1970s was a major contributor to the high degree of land surface subsidence that occurred around Galveston Bay--anywhere from 1 to up to 10 feet in some areas. The creation of the Harris-Galveston Subsidence District by the Texas Legislature in 1975 resulted in a significant reduction in groundwater withdrawal and, subsequently, subsidence in the project region over the last twenty-plus years. Today, the issue of land surface subsidence in the project area has largely been abated. Unfortunately, historical subsidence experienced by this coastal region inundated thousands of acres of coastal marsh and exposed shorelines to greater wave activity, resulting in erosion of even more marsh habitat. Erosion rates of up to ten feet per year have been documented on some Galveston Bay shorelines. Wetland loss in coastal Texas has been rated by the Environmental Protection Agency (EPA) as severe (EPA 1999) and is greater in the Galveston Bay system than other areas of the state. It is estimated that between 1953 and 1989, Galveston Bay experienced a net loss of approximately 35,100 acres of wetlands (White et al. 1993).

Restoration and protection of the project area from erosion is necessary to ensure the future success and longevity of marsh conservation efforts. This project would restore, enhance, and protect the foraging and nesting habitats of many bird species as well as environmentally and economically crucial estuarine species such as penaeid shrimp, red drum, and blue crab. The hard breakwater structures associated with the project would provide substrate on which oyster spat can attach and develop, benefitting the oyster population. The project would also restore and enhance the foraging and wintering habitat of several coastal-dependent bird species.

The Habitat Conservation Blueprint (Blueprint), developed in 1998 by GBF and updated in 2007 by the Environmental Institute of Houston (Biggs et al. 2007), provides a resource document with background information on Galveston Bay habitats and what is happening to them, an inventory of sites with proposed habitat restoration and/or conservation strategies, and a listing of potential funding and technical assistance resources. It specifically recommends restoring marshes within the project area. Furthermore, the protection and restoration of this coastal habitat would contribute to the larger body of established and ongoing conservation efforts in West Galveston Bay. The project would build off of efforts to protect the shoreline of TNC’s Texas City Prairie Preserve and complement ongoing conservation efforts such as the West Galveston Bay Conservation Corridor Habitat Preservation, the Gulf Coast Migratory Waterfowl Habitat Enhancement, the North American Waterbird Conservation Plan, as well as other Galveston Bay-area conservation efforts.

This project would build upon three other phases of work that, when combined, would restore marsh habitat and help prevent continued erosion in Dollar-Bay and Moses Lake. Phase I was completed during the first half of 2017, which developed the planning, engineering, design, permitting, and budget development required to implement Phase II of the Dollar Bay-Moses Lake Wetlands Restoration project. Phase II, to begin in 2017, will complete construction of breakwaters along TNC’s Texas City Prairie Preserve, located along the northwest shoreline of Moses Lake, to protect up to 6,800 linear feet of vulnerable shoreline and adjacent habitat from continued erosion and habitat conversion (Figure 3-10). Phase II will also restore at least 30 acres of degraded estuarine marsh habitat in Dollar Bay by raising elevations suitable for the creation of emergent and high marsh. As part of Phase III, an alternatives analysis and 50% engineering drawings were completed and a USACE permit application for the project was submitted for consideration. An environmental analysis of the benthic and bottom conditions report has been completed and included in the USACE permit application. Information from this investigation was used to determine the project location and to help create project designs that avoid and/or minimize impacts to sensitive resources. Phase IV, the project proposed herein, would build from planning information generated during Phases I, II, and III to finalize planning activities. Implementation of Phase IV in conjunction with the other three phases would work together to protect and restore estuarine marsh in Moses Lake and Dollar Bay, which is important for migratory and non-migratory birds, fish, and shellfish species of the Gulf of Mexico.

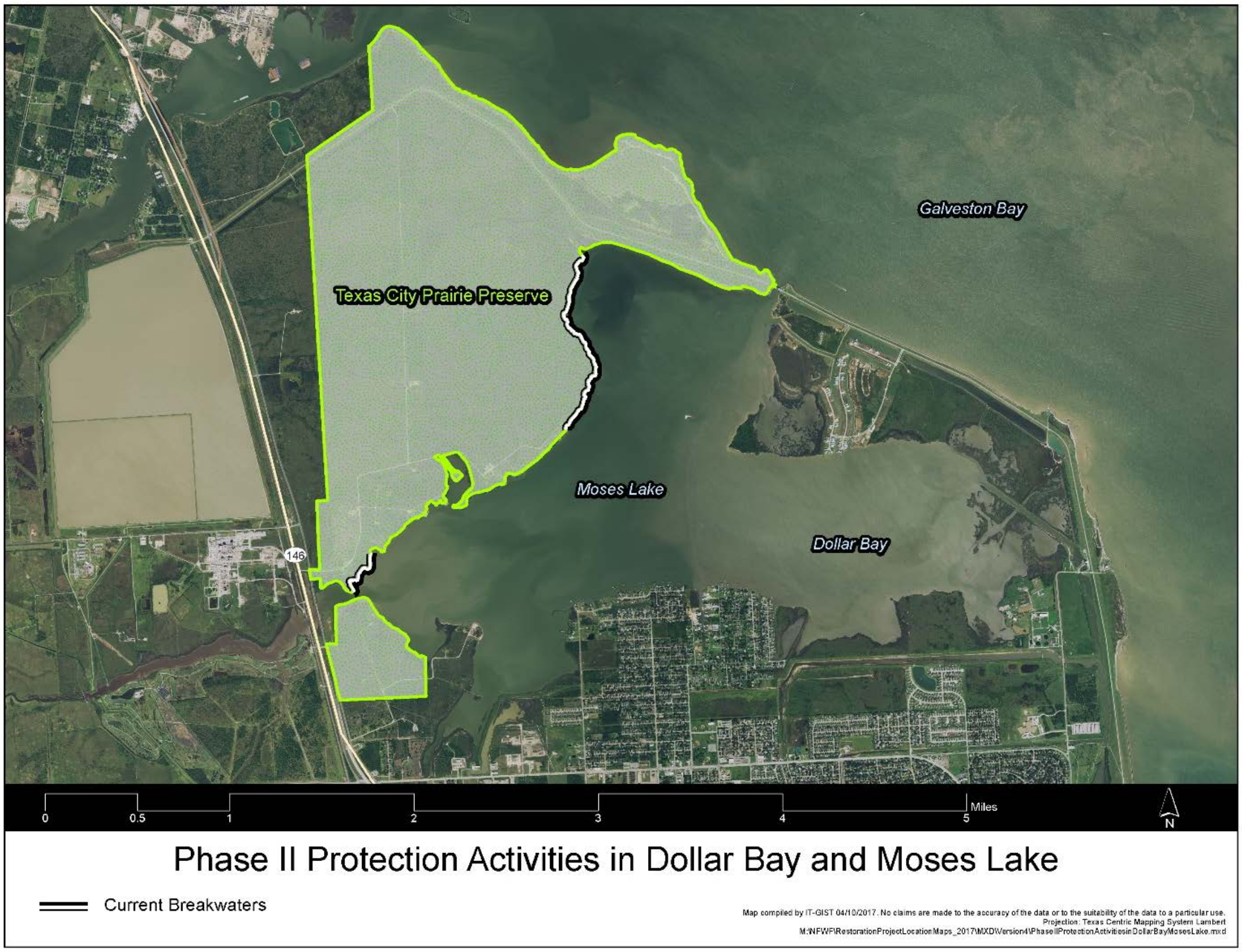

Figure 3-10. Phase II restoration actions in Dollar Bay-Moses Lake

3.3.7.2 Project Construction and Installation

To implement planned restoration activities, this project would 1) construct segmented breakwater structures to decrease wave energy, halt shoreline erosion, and accrete sediments shoreward of the structures; and 2) construct marsh terraces to restore elevations suitable to support estuarine emergent marsh vegetation and maximize edge habitat, which is important for aquatic species. The target elevation for the marsh restoration area would take into account relative-sea level rise and would be sufficient to support emergent vegetation. Post-construction, the project area would be planted with native marsh vegetation (e.g., smooth cordgrass).

Environmental considerations, BMPs, and legal and permit requirements would be used and followed regardless of methods and tools chosen for construction implementation. These would be outlined in the bid specification package developed by the project engineer and contracting officers. This specification package would ensure that the contractor is made aware of not only the engineering specifications but the additional obligations they would incur associated with federal and state laws governing the activities associated with the project. It would also provide the project related approvals needed by the project manager and the project engineer to conduct the project.

Construction may require temporary channels for heavy equipment to access the restoration area. The need for temporary channels would be determined during the E&D stage. All temporary channels would be backfilled upon completion of construction work. In general, construction would require the use of barges, small watercraft, large track hoe excavators, earth moving equipment, potentially hydraulic or clamshell dredges, and a dockside staging area. Equipment and materials for the construction activities would be transported via roads and marine waterways. Large equipment and materials moved by barges would use the established interconnected waterways, where possible. This may include the GIWW, the Houston Ship Channel and/or other navigation channels (NOAA navigational charts for Galveston/Houston: http://xpda.com/nauticalcharts/). The TGLO has identified places to access coastal waterways at http://www.glo.texas.gov/texas-beach-access/beach_bay.html. Information specific to Galveston County is located at http://www.glo.texas.gov/texas-beachaccess/pdf/beach-bay/Galveston.pdf.

3.3.7.2.1 Borrow Area

Uncontaminated earthen fill material would be used to raise elevations. Terrace material would be sourced from the project area. The marsh terraces would be created by excavating adjacent material and piling it into a terrace per design specifications. The borrow areas would be offset a minimum of 20 feet from the toe of the terraces. All sources of borrow material would be assessed for suitability from an engineering perspective and would be evaluated for environmental conditions to ensure there are no significant impacts to cultural and sensitive resources. Additionally, borrow sites would be evaluated for environmental conditions to ensure that any cultural and/or sensitive resources are avoided or properly addressed. The project location and design was based on several factors including the absence of sensitive resources (e.g. oyster reef, seagrasses), geotechnical and sediment quality, and nearby commercial and/or recreational activities. Excavation of material would occur as shallow as possible in order to prevent impacts to water quality, scouring, or the development of deep pockets in a naturally shallow bay system.

Screening for potential chemical contaminants would be conducted if needed as part of the USACE permitting process. Local and regional knowledge of historical industrial activities as well as regulatory documentation on past and existing facilities in the vicinity of potential sediment borrow sources would be used to determine the likelihood and type of contaminants that might be expected to be encountered during construction. Based upon this information, USACE and state and federal resource agency personnel would be consulted to determine the amount of sampling and the type of chemical analyses that may be needed.

Measures to control turbidity caused by construction activities, decant water, and sediment movement would be in place to ensure sensitive habitats are protected, water quality standards are met, and sensitive resources are not affected. These measures may include appropriate water control structures to decant water, as well as the installation of silt fences, hay bales, filter-fabric, and/or temporary levees to control sediments and avoid negative impacts associated with the fill placement.

3.3.7.2.2 Breakwater/Armored Levee

Breakwaters or armored levees would be installed to protect the shoreline from erosional forces. Graded stone, typically limestone, would be used to construct the breakwaters or armoring. The amount, grading, and size of rock used would be dependent on several factors determined in the final design. It is anticipated that the breakwaters would have a terrace crest width of 3 feet and a side slope of 2:1. Crest elevation is anticipated to be 2 feet above average water level. It is anticipated that a geotextile fabric would be placed under the breakwater structures to help limit scouring and settling. The source of the material is expected to be from known and existing limestone quarries used for coastal construction projects across the western Gulf of Mexico meeting standards specified for the project.

3.3.7.2.3 Vegetation Planting

The target elevation for the marsh restoration area would take into account relative-sea level rise and would be sufficient to support emergent or high marsh vegetation. The marsh restoration area would be planted with smooth cordgrass. A Vegetation Planting Plan modified from and based on the Natural Resources Conservation Service (NRCS) Publication NRCS-TX-612 would be developed prior to implementation (NRCS 2013). This plan would provide acceptable source stock; planting densities and locations for planting; survival targets; and adaptive management strategies. Expected plant cover is approximately 60% at the end of the 5-year monitoring period. Time of year as well as substrate salinity would determine the timing for planting.

3.3.7.2.4 Construction Schedule

Activities associated with construction are not expected to take longer than 1 year. It is expected to take at least 12 months to finalize all planning documents such as E&D documents, leases, permits, and environmental reviews. The timing of contracting awards and weather conditions could impact the construction schedule. To prevent disturbance to nearby residential communities, construction activities that produce significant noise, such as moving or placing rock, would be limited to daylight hours. Since planning documents (e.g., permitting, environmental reviews, leases, etc.) have not yet been completed, the timing for construction implementation is unknown.

3.3.7.3 Operations and Maintenance

Appropriate lease(s) or modifications to existing leases would be obtained prior to implementing the proposed restoration actions. Maintenance activities would likely be managed by the GBF or another stakeholder.

3.3.7.4 OPA Evaluation

The OPA evaluation of the proposed Dollar Bay and Moses Lake Wetlands Restoration (Phase IV) project using the criteria established by the OPA regulations in 15 CFR §990.54(a) is described below.

3.3.7.4.1 Cost-Effectiveness

Estimated costs for this project are significantly higher than similar restoration projects which provide comparable levels of ecological improvements proposed in this RP/EA. The inclusion of breakwaters as part of this project is needed to help slow erosion of the marsh terraces, but it greatly increases the average cost for each acre of marsh restored. For example, the Pierce Marsh Wetland Restoration project is expected to restore marsh at a cost of about $21,000 per acre while Dollar Bay and Moses Lake Wetlands Restoration project would restore marsh at a cost of about $282,000 per acre. Additionally, the longevity of marsh terraces is not expected to be as great as the other restoration projects, leading to the need for protective breakwaters and the high cost per acre.

3.3.7.4.2 Trustee Restoration Goals and Objectives

The Final PDARP/PEIS identified the restoration goal of restoring and conserving habitats to restore habitats injured as a result of the Incident. This project meets the Trustee programmatic restoration goals and Restoration Type-specific goals as described in the Final PDARP/PEIS because it would remedy harm to natural resources of types affected by the Incident, including estuarine marsh as well as the resident and migratory species that depend on them. This project has a clear nexus to the injuries described in the Final PDARP/PEIS because it would protect and restore estuarine wetland habitats. This project is consistent with Texas TIG goals and objectives.

3.3.7.4.3 Likelihood of Success

This project uses methods successfully employed at many other habitat restoration sites around Galveston Bay to raise elevations and reestablish estuarine intertidal marsh. The methods and technology applied to estuarine marsh protection and restoration in Galveston Bay have been tried and developed over the past several decades. Marsh terraces have been successfully constructed within the northern Texas coastal area. Shoreline protection work has been demonstrated at numerous high wave energy project sites around Galveston Bay with successful results in reducing erosion, accreting sediments, reestablishing fringing marsh, and providing hard substrate suitable for oyster development. Prior shoreline erosion protection work along portions of the Moses Lake and Dollar Bay shorelines has been successfully implemented over the past 10+ years and has resulted in abatement of erosion issues and reestablishment of fringing marsh along portions of the project shoreline. This documented experience and successful completion of previous projects demonstrates that the project would have a high likelihood of success. The project is technically feasible, takes advantage of similar ongoing work in this and nearby areas, and uses proven techniques with established methods and documented results.

3.3.7.4.4 Prevent Future Injury and Avoid Collateral Injury

This project would minimize future and collateral injury by using information gathered in Phases I, II, and III to improve upon the design in order to minimize environmental consequences. Benthic surveys have identified sensitive resources and project designs have been modified to prevent or reduce the potential for adverse impacts to these resources. Throughout the design process, every practical attempt would be made to avoid and minimize potentially adverse environmental and cultural resource impacts. BMPs and measures to avoid and minimize impacts that are identified during the permitting process or during consultations and reviews with natural resource agencies would be implemented. As a result, collateral injury would be avoided and minimized during project implementation (construction, operations, and maintenance).

3.3.7.4.5 Benefits Multiple Resources

This project would benefit multiple resources including marsh habitat, hard bottom substrate, protected shallow waters, and associated wildlife including birds, fish, crabs, and oysters. Protection and restoration of wetland habitats within the Galveston Bay System would also benefit a variety of fauna injured by the Incident (e.g., crabs, birds, fish, etc.) that use the interconnected habitats (marsh, hard structure, and protected shallow water) in the project area. This project would also improve water quality by reducing erosion and turbidity.

3.3.7.4.6 Public Health and Safety

This project would improve health and safety by restoring marshes and creating breakwaters, which would help decrease wave energy, abate storm impacts, and preserve the nearby public and private infrastructure. Implementation of this project would be managed to prevent impacts to health and safety.

3.3.7.5 Monitoring and Adaptive Management

The objective of this project is to restore and protect coastal marsh habitat. Construction monitoring would occur before, during, and after construction to ensure that project designs are correctly implemented. Monitoring parameters are expected to include vegetation percent cover, rate of erosion, and an assessment of the structural integrity of the breakwater. The performance of the project would be assessed using both qualitative and quantitative performance criteria related to the project objectives. The need for corrective actions and/or adaptive management would be determined by evaluation of the project over time using the specified performance criteria. Potential corrective actions would include replanting and increases in elevation. Successful implementation of this project would be determined by completed construction of the project according to design and a confirmation that vegetation is colonizing the constructed marsh habitat. Performance criteria would also confirm a reduction in the rate of erosion along the protected shorelines. Monitoring would take place annually for 5 years post construction completion.

3.3.8 Indian Point Shoreline Erosion Protection

The Indian Point Shoreline Erosion Protection project would construct approximately 2,800 linear-feet of segmented breakwaters to protect 50 acres of critical seagrass, coastal marsh, lagoons and associated upland habitats within Indian Point on Corpus Christi Bay in San Patricio County. The project would protect the existing shoreline from wind and wave driven erosion and protect the remaining marsh and associated coastal habitats adjacent to the shoreline. The estimated cost for the project is $2,199,000.

3.3.8.1 Project Description

This project would construct approximately 2,800 linear feet of graded rip-rap breakwaters at Indian Point Park in Portland, Nueces County, Texas. The breakwaters would protect adjacent seagrass beds and stabilize the shoreline which would lead to a reduction in the loss of valuable wetland habitats. The project would significantly reduce wind driven wave action from Corpus Christi Bay by breaking and dissipating the energy. The project proposal consists of six segmented breakwaters that would extend from a previously constructed shoreline revetment and two breakwaters. The initial structures were completed in the spring of 2015 with a TGLO Coastal Erosion Planning and Response Grant in partnership with Coastal Bend Bays and Estuaries Program. The E&D, permitting, and easement included eight breakwaters; however, due to lack of funding only two were constructed. Without the additional six breakwaters, the sensitive marsh and lagoon habitats within Indian Point Park are susceptible to continued erosion and saltwater intrusion. The park is owned by the City of Portland and the surrounding submerged lands are owned by the Port of Corpus Christi. Coastal Bend Bays and Estuary Program and the TGLO are authorized to complete the construction of the breakwaters through a current easement with the Port of Corpus Christi on the southeastern side of the peninsula, within the current project footprint.

The six segmented breakwaters would be about 200-500 feet in length with approximately 30-foot gaps between each segment. The breakwaters would be placed at a minimum of 20 feet away from the nearest seagrasses. The structures would impact approximately 2 acres of non-vegetated bay-bottom. Breakwaters would be constructed with approximately three to four cubic yards of rock fill per linear foot of breakwater.

Indian Point is located within the Nueces Estuary system which is one of the major estuary systems in Texas (Figure 3-11). The estuary spans 106,990 acres and is separated from the Gulf of Mexico by a barrier island system. The estuary has two direct connections to the Gulf through Packery Channel and Aransas Pass and receives about 378,000 acre-feet of freshwater inflow each year from the Nueces River Basin and Oso Creek (Asquith et al. 1997).

Indian Point Shoreline Erosion Protection

Map compiled by IT-GIST 04/10/2017. No claims are made to the accuracy of the data or to the suitability of the data to a particular use.
Projection: Texas Centric Mapping System Lambert
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Figure 3-11. Map showing the location of the Indian Point Shoreline Erosion Protection project at Indian Point Park in Nueces County

The typical habitats that occur in the Nueces Estuary are riverine, salt marshes, algal flats, seagrass beds, open bays, scrub/shrub uplands, oyster reefs, and sand and shell beaches. The project area is at the southwestern end of a peninsula that separates Nueces Bay (west-northwest) from the upper part of Corpus Christi Bay (south-southeast). Adjacent to the project area is a very productive and complex mosaic of habitats that include sand and shell beaches, dunes, seagrass beds, tidal flats, scrub/shrub uplands, intertidal and high saltmarsh, and lagoons. The area supports a highly diverse community of flora and fauna.

The estuarine subtidal habitats and intertidal and high marsh on Indian Point are sustained by tidal exchange. The palustrine wetlands are dependent on rainfall. The predominant vegetation in these areas includes bushy seaside tansy, Virginia glasswort and dwarf saltwort. The estuarine-emergent marshes are fringe areas along open water lagoons and support smooth cordgrass. These lower mashes occur within the normal tidal range and then transition to higher elevations that support high marsh species such as turtle weed, Virginia glasswort, dwarf saltwort, and shoregrass. As the elevation transitions to uplands, it is dominated by shoregrass which forms thick mats. The adjacent 20-acre subtidal seagrass beds include species such as shoal grass and widgeon grass.

The project would protect a mosaic of estuarine marsh, tidal lagoons, and sand/shell water interfaces that are crucial habitat to numerous commercial and recreational inter-jurisdictional estuarine fishery species. These species include brown and white shrimp, blue crab, Gulf menhaden, sand seatrout, southern flounder, red drum, bay anchovy, and other marine organisms. Juvenile penaeid shrimp, blue crabs, and other nekton are abundant in coastal salt marshes of Corpus Christi Bay. Estuarine marsh habitat is critical for larval, post-larval, and juvenile stages of many species. For example, the brown shrimp is dependent on marsh-surface habitat during its post-larval and early juvenile stages (Minello and Zimmerman 1991). The recognition of estuarine emergent marsh as critical to fishery species is reflected by its designation as essential fish habitat (EFH) by the National Marine Fisheries Service (NMFS) in accordance with the Magnuson-Stevens Fishery Conservation and Management Act of 1996 (Magnuson-Stevens Act). This project would protect habitat types that are classified as EFH for species under federal fishery management plans (FMPs) such as brown shrimp, white shrimp and pink shrimp, Gulf stone crab, red drum, gray snapper, and blue fish. These species spend a portion of their juvenile life stages in estuarine nurseries. These estuarine habitats also benefit numerous other fishery species not under FMPs.

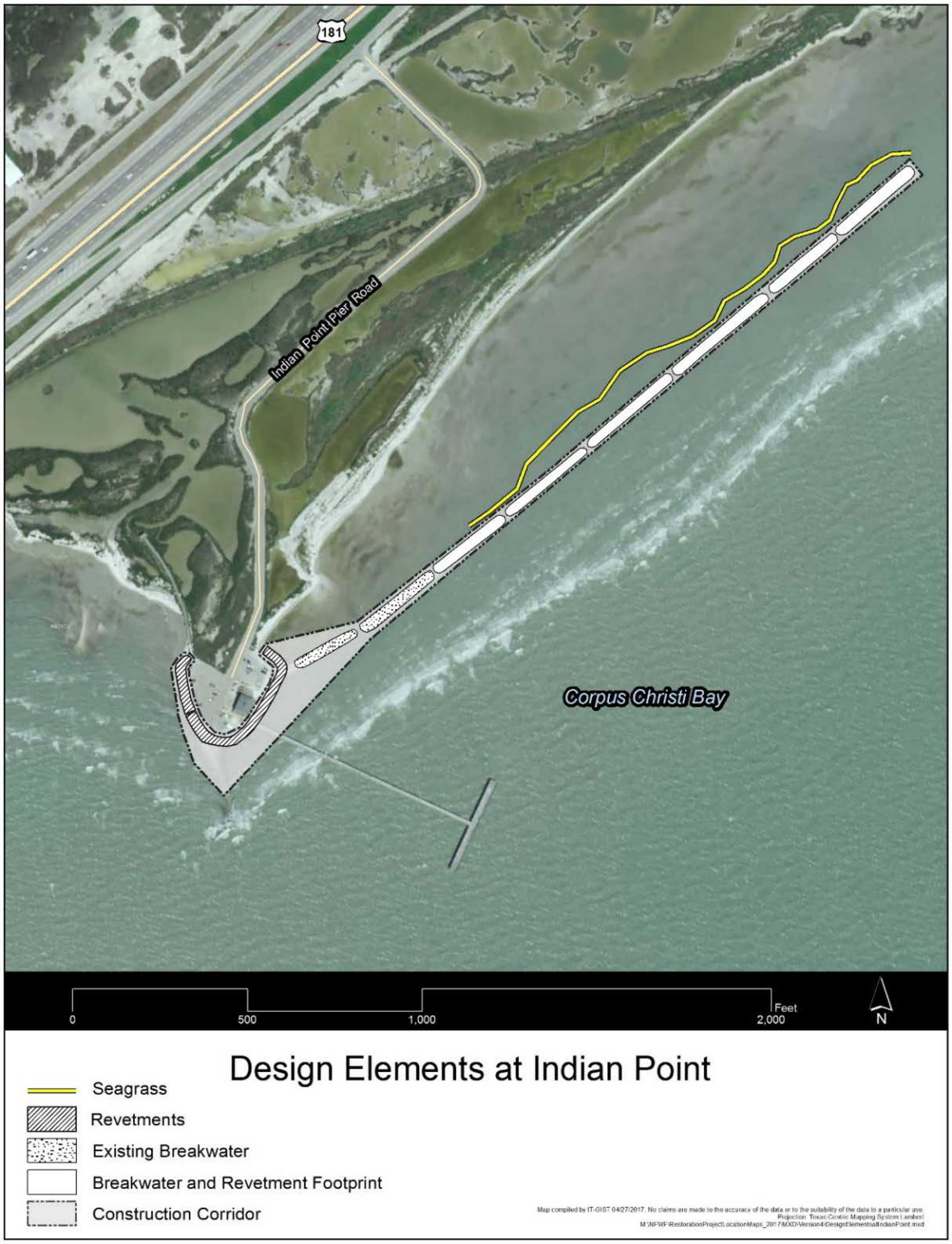
The construction of 2,800 linear feet of segmented rock breakwater would also create hard substrate habitat that would be similar to oyster reef habitat. While rock breakwaters differ from oyster reefs in their structure and formation, they are similar in habitat type and provide some of the same ecological services as reefs. The interstitial spaces between the rocks provide cover for many of the same crustacean and finfish species utilizing oyster reefs. In addition, rock breakwaters provide hard substrate for encrusting species of bivalves, bryozoans, polychaete worms, and barnacles. Avian species also utilize aerial portions of the breakwaters for foraging and resting areas. The proposed breakwater would provide hard substrate habitat as well as protect other natural habitats (estuarine marsh and seagrass beds) that support estuarine species.

This project supports goals of the following coastal ecosystem and watershed management plans:

- Coastal Management Program,
- Nueces Estuary Ecosystem Initiative,
- Texas Wetlands Conservation Plan,
- Texas State-Owned Coastal Wetlands Conservation Plan,
- Coastal Bend Bays Plan / Comprehensive Conservation and Management Plan,
- Texas Comprehensive Wildlife Conservation Strategy 2005-2010, and
- U.S. Shorebird Conservation Plan Lower Mississippi/Western Gulf Coast Shorebird Planning Region.

3.3.8.2 Project Construction and Installation

Construction would include the placement of 2,800 linear feet of graded riprap segmented breakwaters in shallow water to protect existing seagrass and coastal wetlands (Figure 3-12). The work includes mobilization/demobilization, surface preparation, placement of geotextile fabric, multiple hydrographic and topographic surveys for measurement and acceptances of placement, aerial photography, and other subsidiary work needed to facilitate the placement of the breakwaters. The project site has direct access through an improved road. The contractor would access the breakwater construction corridor from the shore by utilizing the existing breakwaters, placing the geotextile fabric, and then placing the rock along the corridor until reaching the full extent of the project area. The contractor would then back out of the project area and remove sections of the riprap to create the gaps between the segmented breakwaters. This approach would limit the impacts to surrounding sensitive seagrass beds and fringe marsh. The final elevation for the breakwaters would have a still water elevation of 1 to 2 feet above the water line.



Map compiled by IT-GIST 04/27/2017. No claims are made to the accuracy of the data or to the suitability of the data to a particular use.
Projection: Texas Centric Mapping System Lambert
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Figure 3-12. Breakwater structure for protection of the Indian Point shoreline

Methods and tools would be approved by the PE and the project team that includes Texas TIG representatives prior to implementation. Environmental considerations, BMPs, and legal and permit requirements must be met regardless of methods and tools chosen. These would be outlined in the bid specification package developed by the PE and contracting officers. This specification package would ensure that the contractor is made aware of not only the engineering specifications but the additional obligations they would incur associated with federal and state laws governing the activities associated with the project. The specification package would also provide the project-related approvals needed by the project manager and the PE to conduct the project.

In general, construction would require the use of small watercraft, large track hoe excavators, earth moving equipment, and a project site staging area within the existing parking lot of the park. Equipment and materials for the construction activities would be transported via existing roads. Similar to past projects, it is anticipated that the contractor would use the parking lot adjacent to the pier as a staging area.

3.3.8.2.1 Breakwater/Armored Levee

Breakwaters or armored levees would be installed to protect the sand beach, seagrass beds and wetlands from erosional forces. Graded stone, typically limestone, would be used to construct the breakwaters or armoring. The amount, grading, and size of rock used would be reviewed by the contracted engineer to ensure that the materials meet the specifications outlined in the engineer's project manual (TGLO 2014) developed for the breakwaters that were constructed in 2015. The project manual and engineering documents include the proposed six breakwaters that were not constructed during the previous phase of the project. These considerations, along with physical data collected since the construction of the previous revetment and two breakwaters, would be evaluated by a qualified coastal PE and the project team prior to placement of the additional stone materials. The project team would include individuals from TPWD, USFWS, and participating partners. The source of the material is expected to be from known and existing limestone quarries used for coastal construction projects across the western Gulf of Mexico meeting standards specified for the project.

3.3.8.2.2 Construction Schedule

The final E&D for the breakwaters has been completed. Activities associated with construction are not expected to take longer than 6 months. The timing of contracting awards and weather conditions could impact the construction schedule. To prevent disturbance to residential communities near Indian Point Park, construction activities that produce significant noise or require precision, such as moving or placing rock, would be limited to daylight hours.

3.3.8.3 Operations and Maintenance

The City of Portland, Texas currently has an easement to construct the breakwaters in the project area from the Port of Corpus Christi Authority. The existing easement includes the additional six breakwaters. Maintenance activities of the breakwaters would likely be managed by the City of Portland who owns and maintains the park and adjacent wetlands.

3.3.8.4 OPA Evaluation

The OPA evaluation of the proposed Indian Point Shore Erosion Protection project using the criteria established by the OPA regulations in 15 CFR §990.54(a) is described below.

3.3.8.4.1 Cost-Effectiveness

The cost for the proposed breakwaters is based on a similar project that was constructed directly adjacent to the project area and is cost-effective in comparison to reconstructing each of the high functioning existing habitats (seagrass beds, tidal pools, sand/shell beaches, and wetlands), which would be lost to erosion if the project is not constructed. In addition, the multiple ecosystem services provided along Indian Point would be difficult to replicate in a cost effective manner compared to the actual cost to construct the breakwaters to protect the current services within the project area.

3.3.8.4.2 Trustee Restoration Goals and Objectives

The Final PDARP/PEIS identified the restoration goal of restoring and conserving habitats injured as a result of the Incident. This project has a clear nexus to the injuries described in the Final PDARP/PEIS because it would protect and restore estuarine wetland habitat, which is a habitat that was injured as a result of the Incident. Protection and restoration of wetland habitats within Corpus Christi Bay would also benefit a variety of fauna injured by the Incident (e.g., crabs, birds, fish, etc.) that use the interconnected habitats (intertidal fringe marsh, sand beaches, sand flats, seagrass beds, and protected shallow water tidal pools) in the project area. This project is consistent with Texas TIG goals and objectives and meets the Trustee programmatic restoration goals and Restoration Type-specific goals as described in the Final PDARP/PEIS.

3.3.8.4.3 Likelihood of Success

Texas Trustee agencies have successfully implemented projects similar to the project (construction of rock breakwaters). This documented experience and successful completion of previous projects demonstrates that the project would have a high likelihood of success. The project is technically feasible, uses proven techniques with established methods and documented results, and can be implemented with minimal delay because the permits, engineering, and easements have been obtained or completed.

3.3.8.4.4 Prevent Future Injury and Avoid Collateral Injury

This project would minimize future and collateral injury by implementing techniques as defined in the existing project manual and utilizing BMPs to minimize injury during construction. The initial two breakwater structures were completed in the spring of 2015. However, due to lack of funding, the remaining six breakwaters were not constructed, leaving the sensitive marsh and lagoon habitats susceptible to continued erosion and saltwater intrusion. The TGLO and CBBEP are currently monitoring the performance of these structures and would use this information to inform the design and construction methodologies for the next phase of breakwaters.

3.3.8.4.5 Benefits Multiple Resources

This project would implement construction of a series of breakwaters that would benefit multiple resources. The project would protect habitat for fauna such as birds, fish, crabs, etc.; recreational opportunities for fishing and birding; improve water quality; and reduce erosion.

The construction of approximately 2,800 linear feet of rock breakwater would also create hard substrate habitat that would be similar to oyster reef habitat. While rock breakwaters differ from oyster reefs in their structure and formation, they are similar in habitat type and provide some of the same ecological services as reefs. The interstitial spaces between the rocks provide cover for many of the same crustacean and finfish species utilizing oyster reefs. In addition, rock breakwaters provide hard substrate for encrusting species of bivalves, bryozoans, polychaete worms, and barnacles. Avian species also utilize subaerial portions of the breakwaters for foraging and resting areas. The proposed breakwater would provide hard substrate habitat as well as protect other natural habitats (estuarine marsh and seagrass beds) that are rich and abundant in estuarine species.

3.3.8.4.6 Public Health and Safety

This project would minimize adverse impacts to public health and safety during construction of the project by following specific BMPs in the Project Manual. In addition, construction of the breakwaters would benefit health and safety by protecting estuarine marsh systems that shield public infrastructure and residential areas from wave action and erosion. This project would improve coastal resiliency.

3.3.8.5 Monitoring and Adaptive Management

The MAM Plan in Appendix D describes activities that would be conducted to demonstrate how the project is meeting its goals and objectives.

3.3.9 Bahia Grande Hydrologic Restoration

The Bahia Grande Hydrologic Restoration project would restore and conserve the Bahia Grande wetland complex in the LANWR near Brownsville, Texas. This project would enlarge and stabilize a pilot channel that would increase tidal flow into Bahia Grande, restoring the system’s natural tidal exchange and creating habitat for a variety of fish, shellfish, and migratory waterfowl. The estimated cost for the project is $5,050,000.

3.3.9.1 Project Description

The Bahia Grande is a federally protected 10,000-acre coastal ecosystem estuary and wetland complex, consisting of three shallow water basins (Bahia Grande, Little Laguna Madre, Laguna Larga) located within the LANWR near Port Isabel, Texas (Figure 3-13). The Bahia Grande was naturally formed and frequently inundated with tidal waters from the nearby Gulf of Mexico, making the Bahia Grande an ecologically rich wetland. It served as a natural nursery for fish, shellfish, wildlife, and waterfowl in the South Texas coastal region until the basin was modified by the placement of dredged sediments from the construction of the Brownsville Ship Channel in the mid-1930s and subsequently by the construction of State Highway (SH) 48 in the mid-1950s.

Figure 3-13. Map showing the location of the channel project area in Cameron County that would be improved by the Bahia Grande Hydrologic Restoration

The dredged material and constructed highway essentially cut-off and removed the historic tidal connections, resulting in rapid evaporation of the saline water from the Bahia Grande that eventually led to the formation of a near-permanently dry salt basin, which no longer supported coastal wetlands and is currently characterized by reduced biodiversity. Occasionally heavy rain fills the basin, but the area has been essentially dry and barren for almost 70 years due to strong evaporation and lack of regular tidal exchange with the Laguna Madre. Since becoming tidally isolated, strong coastal winds common to the area swept across the basin and raised dense clouds of salty, clay dust that blanketed area towns causing health problems, clogging air conditioners, shorting power lines, lowering land values, and restricting visibility on SH 48 and 100.

Since the Bahia Grande lost tidal exchange in the 1930s, the once thriving ecosystem has been severely degraded. In the early 2000s, the USFWS proposed to flood Bahia Grande by cutting in a channel from the Brownsville Ship Channel. The intention was to create a biologically viable (productive) shallow-water bay that could potentially support seagrass beds and/or black mangroves and provide a nursery for a variety of marine organisms as well as habitat for wading and shore birds. The pilot channel was constructed in 2005 and flooded Bahia Grande, eliminating persistent dust from the main basin. Further, a bridge constructed on SH 48 in 2007 improved water exchange between the ship channel and Bahia Grande via the pilot channel (Coast & Harbor Engineering 2011). The Texas General Land Office, in partnership with Cameron County, developed engineering and construction plans and attempted to construct the Bahia Grande Hydrologic Restoration (Bahia Grande) project in 2016. However, due to higher than anticipated bid prices exceeding the available construction budget and the expiration of Coastal Impact Assistance Program funds, construction was cancelled.

While the pilot channel has improved conditions in Bahia Grande, tidal fluctuations through the pilot channel only provide approximately 2.5% tidal exchange (i.e., approximately 2.5% of the water in Bahia Grande is exchanged in one tidal cycle) (Ocean Trust 2009). Consistent with predictive models (Van Valkenburg and Edge 2003), this limited tidal exchange has not been able to regulate salinity in the basin, leading to increased salinity from evaporation (Ocean Trust 2009). High salinity in much of the basin due to insufficient water exchange has prevented full restoration of Bahia Grande to coastal estuary conditions (Ocean Trust 2009). The project would allow for increased tidal exchange and result in decreased salinity in Bahia Grande.

The proposed Bahia Grande Hydrologic Restoration project would restore this area by widening and deepening the existing pilot channel between Bahia Grande and the Brownsville Ship Channel, depositing the dredged material in placement areas adjacent to the proposed channel, and installing rip rap scour protection along portions of the channel and the Bahia Grande shoreline. The project would reestablish a higher tidal exchange between Laguna Madre/Gulf of Mexico and the Bahia Grande by dredging, enlarging, and stabilizing the pilot channel. The width of the pilot channel would be increased from 34 feet to 250 feet. The construction of the channel would provide tidal exchange of 32% of total water volume into Bahia Grande and restore its ecosystem functions as a major fish, wildlife, and waterfowl nursery and habitat for the South Texas Coast. Preliminary engineering, design, and permitting for this project has been completed and this project would implement the existing E&D plan to widen the channel. The project would result in a conversion of about 8 acres of non-open water features to open water.

Project activities would build upon the progress and efforts of numerous organizations including public and private groups, and state and federal agencies. This project is part of larger initiative to preserve and restore critical habitats within the Bahia Grande ecosystem corridor in South Texas. In addition to the pilot channel, several smaller channel projects within the Bahia Grande were constructed to restore hydrological connections within the estuary. This project is critical to the overall success of the restoration of the Bahia Grande estuary because the channel is the basin’s main hydrological connection to the Gulf of Mexico and would enhance the tidal exchange throughout the system. The restoration of the Bahia Grande system supports the needs or goals of several conservation plans. These plans include but are not limited to the following national, state, and regional planning documents:

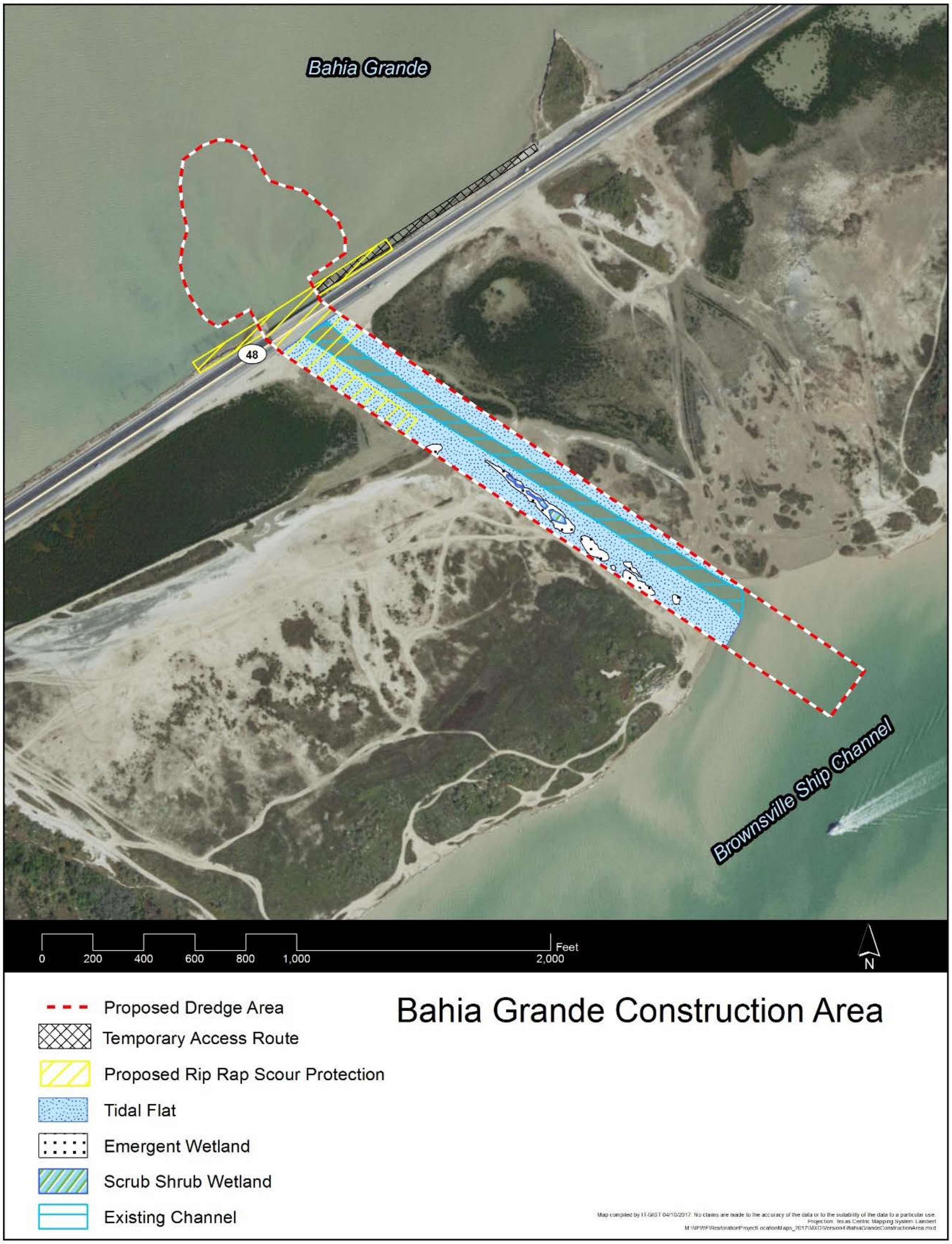
- Waterbird Conservation for the Americas: The North American Waterbird Conservation Plan, Version 1 (Kushlan et al. 2002);
- Ducks Unlimited’s International Conservation Plan (DU 2005);
- Southeast United States Regional Waterbird Conservation Plan (Hunter et al. 2006);

- Strategic Plan: The Coastal Program Stewardship of Fish and Wildlife Through Voluntary Conservation Regional Step-Down Plan Region 2 (Texas) Part 2 of 3 FY 2006-2010 (USFWS 2006); Texas Coastal and Estuarine Land Conservation Program Plan (NOAA 2010);
- Waterfowl Strategic Plan (TPWD 2011);
- North American Waterfowl Management Plan: People Conserving Waterfowl and Wetlands (USFWS 2012);
- Texas Conservation Action Plan 2012 – 2016: Gulf Coast Prairies and Marshes Handbook (TPWD 2012); and
- Texas Coastal Management Program (TGLO 2015).

The Bahia Grande Hydrologic Restoration project would restore the natural hydrology to a once healthy wetland ecosystem and would contribute to the ongoing landscape-scale effort to restore the Bahia Grande Unit of LANWR. Project actions would create a viable wetland habitat for a variety of plants, fish, birds, and other wildlife that frequent the area.

3.3.9.2 Project Construction and Installation

This project would enlarge and stabilize the pilot channel created in 2005. The existing pilot channel is 34 feet wide at the top, 15 feet wide at the bottom, approximately 4 feet deep, and 2,200 feet long (Figure 3-14). The proposed channel would follow the same general alignment as the existing pilot channel and would be 250 feet wide at the top, 150 feet wide at the bottom, 9 feet deep, and 2,200 feet long. Approximately 220,000 cubic yards of fill would be excavated from the existing pilot channel, adjacent land, the Brownsville Ship Channel, and Bahia Grande.



Map compiled by IT-GIST 04/10/2017. No claims are made to the accuracy of the data or to the suitability of the data to a particular use.
Projection: Texas Centric Mapping System Lambert
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Figure 3-14. Map showing the existing pilot channel and planned expansion of the channel

The channel to be constructed would run under the existing SH 48 Bridge between Brownsville and Port Isabel, Texas. It would serve as the main mechanism for tidal exchange between the Laguna Madre and the Bahia Grande via the Brownsville Ship Channel. Post construction, this channel and its shoreline would be stabilized with rip rap for scour protection. Methods and tools would be approved by the PE and the project team that includes Texas TIG representatives prior to implementation. Environmental considerations, BMPs, and legal and permit requirements must be met regardless of methods and tools chosen. These would be outlined in the bid specification package developed by the PE and contracting officers. This specification package would ensure that the contractor is made aware of not only the engineering specifications but the additional obligations they would incur associated with federal and state laws governing the activities associated with the project. It would also provide the project related approvals needed by the project manager and the PE to conduct the project.

In general, construction would require the use of barges, small watercraft, large track hoe excavators, earth moving equipment, hydraulic or clamshell dredges, and a dockside staging area. Equipment and materials for the construction activities would be transported via roads and marine waterways. Large equipment and materials moved by barges would use the established interconnected waterways. This may include the GIWW, the Brownsville Ship Channel and/or other navigation channels.

3.3.9.2.1 Channel Excavation

Approximately 220,000 cubic yards of fill would be excavated from the existing pilot channel, adjacent land, the Brownsville Ship Channel, and Bahia Grande. The material would be transported via pipeline, barge, or other method across the Brownsville Ship Channel or by land to one of the USACE’s existing DMPAs in the vicinity of the project site where the material would be de-watered and placed using appropriate BMPs. If a pipeline is used it would be submerged to avoid impeding vessel traffic and impacts to marine mammals. Approximately 25,000 feet of pipeline may be used to transport the dredged material to the DMPAs.

BMPs to control turbidity caused by construction activities, decant water, and sediment movement would be in place to ensure sensitive habitats are protected, water quality standards are met, and sensitive resources are not affected. These measures may include appropriate water control structures to decant water, as well as the installation of silt fences, hay bales, filter-fabric, and/or temporary levees to control sediments and avoid negative impacts associated with the fill placement.

3.3.9.2.2 Rip Rap Scour Protection

As part of this project, rip rap scour protection would be permanently installed over approximately 4.3 acres of the proposed channel and the Bahia Grande shoreline. The proposed bank stabilization along the channel would be at the northwestern end of the channel, extending under the SH 48 Bridge. From the SH 48 Bridge, approximately 400 feet of shoreline of Bahia Grande would be stabilized in both directions. In addition, a temporary access route area would be utilized during construction. This area is approximately 1 acre and is located along the shore of Bahia Grande north of the SH 48 Bridge.

3.3.9.2.3 Construction Schedule

It is possible that birds may nest in the project area that are protected under the Migratory Bird Treaty Act and Texas Parks and Wildlife Code. Efforts will be made to avoid construction activities during the nesting season (Feb 15 through Jul 31). However, if construction activities occur during the nesting season, the area affected by project activities will be surveyed for the presence of nesting birds by a qualified biologist. Piping Plover and Northern Aplomado Falcon are known to occur in the project area (USFWS 2014). Activities associated with construction are not expected to take longer than 6 months. The timing of contracting awards and weather conditions could impact the construction schedule. To prevent disturbance to nearby residential communities, construction activities that produce significant noise or require precision, such as moving or placing rock, would be limited to daylight hours.

3.3.9.3 Operations and Maintenance

The project site, Bahia Grande, is owned by the USFWS as part of the LANWR. The USFWS formulated a CCP (USFWS 2010a) that serves as a management tool to be used by refuge staff and its partners in the overall conservation, development, and restoration of the ecosystem's natural resources. In accordance with the National Wildlife Refuge System Improvement Act of 1997, wildlife has first priority in the management of refuges. In terms of public access wildlife-dependent recreation involving compatible hunting, fishing, wildlife observation and photography, and environmental education and interpretation are also designated as priority public uses. The channel would be monitored with flow meters. Any required maintenance to the shoreline protection, width, or depth of the channel would be conducted through a partnership established as a part of this project with local, state, and federal entities.

3.3.9.4 OPA Evaluation

The OPA evaluation of the proposed Bahia Grande Hydrologic Restoration project using the criteria established by the OPA regulations in 15 CFR §990.54(a) is described below.

3.3.9.4.1 Cost-Effectiveness

The cost for this project is based on initial E&D of project activities. This project presents a unique restoration alternative for the state of Texas; no similar project at this scale has yet been implemented. However, the Texas Trustee agencies have undertaken similarly-scaled efforts to restore 10,000 acres of wetland habitat with different restoration techniques, including acquisition, wetland construction, or installation of water control structures. In comparison, the Bahia Grande Hydrologic Restoration project presents a very cost-effective way of restoring such a large acreage of habitat while simultaneously working within a relatively small footprint for construction.

Moreover, a pilot-scale version of this project was implemented in 2005. The Texas TIG expects an increase of the effectiveness and efficiency of this subsequent action to protect and restore the estuarine wetland habitats of Bahia Grande.

3.3.9.4.2 Trustee Restoration Goals and Objectives

The Final PDARP/PEIS identified the restoration goal of restoring and conserving habitats to restore habitats injured as a result of the Incident. This project has a clear nexus to the injuries described in the Final PDARP/PEIS because it would protect and restore estuarine wetland habitats, which are habitat types impacted by the Incident. Protection and restoration of wetland habitats within Bahia Grande would also benefit a variety of fauna injured by the Incident (e.g., crabs, birds, fish, etc.) that use the interconnected habitats (intertidal fringe marsh, salt marsh, sand flat, and protected shallow water) in the project area. This project is consistent with Texas TIG goals and objectives and is consistent with Trustee programmatic restoration goals and Restoration Type-specific goals outlined in the Final PDARP/PEIS. The project would enhance habitat and restore estuary functions, which are important for migratory and non-migratory birds and fish and shellfish species of the Gulf of Mexico that were directly impacted by the Incident.

3.3.9.4.3 Likelihood of Success

This project is part of an ongoing effort in the area to restore the Bahia Grande Unit of the LANWR. An initial pilot channel was successfully constructed in 2005 and resulted in a 2.5% tidal exchange between Bahia Grande and the ship channel. This project would build on the success of the earlier pilot channel, following the same alignment as the existing channel footprint.

This project is already permitted through USACE (USACE 2016b). Initial E&D efforts included extensive modelling of channel width relative to anticipated tidal inflow into the system. As a part of this exercise, historical wind and water level data were acquired from monitoring stations around Bahia Grande (CHE 2011). Bathymetry, topography, and geotechnical data were also collected to assist in understanding project site conditions and numerical modeling of coastal processes. The engineering study calculated the maximum possible average flow rate through the channel, developed potential project alternatives, and concluded that the project represents the most efficient design maximizing potential flow rate from the navigation channel to the Bahia Grande Unit.

After the RP/EA was released to the public and the project was identified as a possible alternative, the Trustees were made aware that on June 7, 2017 the Port of Brownsville (the Port) executed a Memorandum of Understanding (MOU) with NextDecade Corporation and its subsidiary, Rio Grande LNG, LLC (together, NextDecade) that gave NextDecade exclusive rights to implement this project to generate mitigation credits for construction of a proposed liquid natural gas (LNG) facility within the Port of Brownsville. However, after execution of the MOU, the Port's Board of Directors indicated to the TX TIG that if the Bahia Grande Project were selected in the Final RP/EA, the Port's preference would be to have the Texas TIG move forward with construction of the project. On October 3, 2017, the Texas TIG received letters from the Port and NextDecade wherein the Port and NextDecade agreed to amend the exclusivity clause in their MOU to allow the Trustees to construct the project. In addition, the letters stated that the MOU will be modified to expire upon the date that the Trustees initiate construction of the project. The Port and Next Decade agreed that neither would seek to obtain mitigation credits for any part of the project implemented by the Texas TIG as part of NRDA restoration. The letters acknowledged that if the Port and NextDecade are not able to modify the MOU to the satisfaction of the Texas TIG, the Texas TIG may not implement the project, and the funds dedicated to the project would be utilized for a future NRDA restoration project.

3.3.9.4.4 Prevent Future Injury and Avoid Collateral Injury

Initial E&D geotechnical studies evaluated environmental consequences of several different project design techniques and identified BMPs to minimize injury during implementation (CHE 2011). That analysis indicated that adverse effects from the project would largely be minor, localized, and often of short duration. In addition, any BMPs and measures to avoid and minimize impacts that have been identified during the permitting process or during consultations and reviews with natural resource agencies would be implemented. Because of this existing extensive analysis that was completed prior to USACE permitting in 2016, the Texas TIG is confident that this project would minimize future and collateral injury to other resources and projects in the area.

3.3.9.4.5 Benefits Multiple Resources

This project would have benefits for multiple natural resources. With the restoration of historical tidal flooding to the basin, marine life including crabs, shellfish, various other invertebrates, and finfish would recolonize the bay. The uplands likewise should support more species than are presently there, and denser populations of native wildlife are an expected result. Not only would the project restore the hydrology and habitat of Bahia Grande, it would also contribute to a landscape-scale restoration effort in the Laguna Madre region and provide vital habitat for a variety of fauna; recreational opportunities for fishing and birding; improvements in water quality; and a reduction in erosion.

3.3.9.4.6 Public Health and Safety

This project would have benefits to public health and safety. Currently, the Bahia Grande Unit of the LANWR is essentially dry and barren, despite some tidal benefits from the 2005 pilot project. Prior to the 2005 project, strong coastal winds regularly swept across the basin and raised dense clouds of salty, clay dust which blanket nearby communities (Ocean Trust 2009). By reestablishing tidal inflow to the area, the 2005 project helped to ameliorate the dust issue. This project would further reinforce the public health and safety benefits to nearby communities realized in this earlier project.

3.3.9.5 Monitoring and Adaptive Management

The MAM Plan in Appendix D describes activities that would be conducted to demonstrate how the project is meeting its goals and objectives.

3.3.10 Follets Island Habitat Acquisition

The Follets Island Habitat Acquisition project would acquire and conserve approximately 300 acres of wetland and coastal habitats on Follets Island between San Luis Pass and Drum Bay in Brazoria County, Texas. The project would conserve dune, coastal strand prairie, and marsh habitat in perpetuity through fee-simple acquisition. Once acquired, the land would be transferred to and managed by the TPWD for the purpose of habitat preservation. The estimated cost for the project is about $2,037,000.

3.3.10.1 Project Description

The project area is located on Follets Island and is bordered to the northwest by Drum Bay and Christmas Bay and to the southeast by the Gulf of Mexico (Figure 3-15). Follets Island is situated within the Gulf Prairies and Marshes ecological region and recognized by the USFWS as a nationally significant coastal barrier ecosystem. The entire northern shoreline of Christmas Bay is protected within the

Brazoria NWR, and Christmas Bay is designated as a coastal preserve. This project would increase protection for the coastal ecosystem and it would complement the existing Follets Island Conservation Initiative (property owned and managed by TPWD), the Christmas Bay Coastal Preserve (jointly managed by TPWD and TGLO), and other adjacent coastal preservation activities.

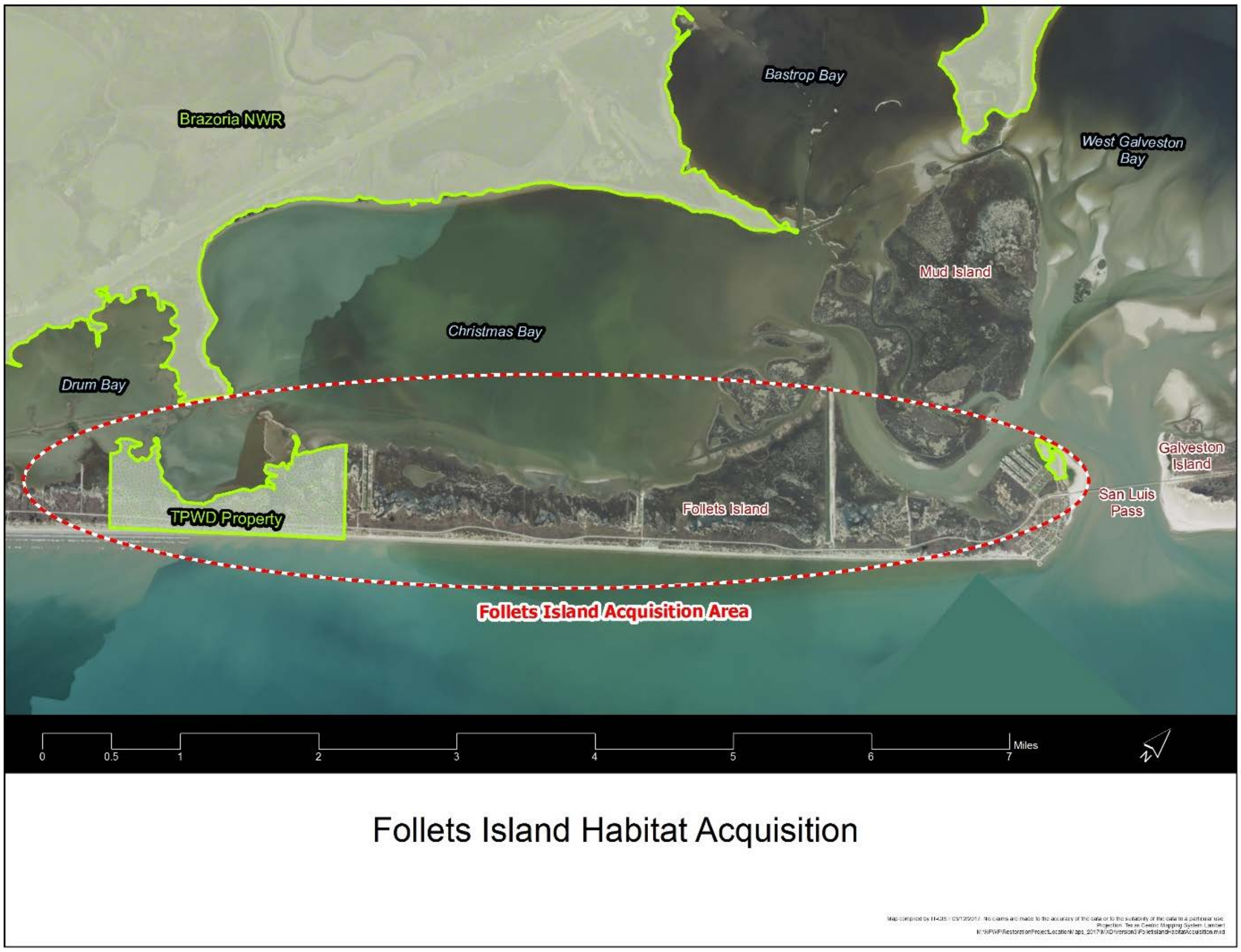

Figure 3-15. Map showing the general location of the Follets Island Habitat Acquisition project area in Brazoria County

Follets Island is under significant development pressure. It is one of two barrier islands on the northern Texas coast that has improved infrastructure including roads, electricity, drinking water, and homes. The number of beach development permits on Follets Island has steadily increased from 20 to 115 in less than 5 years (2011-2015) (R. Newby, TGLO, personal communication, 2017). Acquisition and preservation of this property would prevent subdivision and development of the property, eliminate the threat of future developmental degradation of the ecological values of the property, and maintain its current ecological services into the future.

Preservation of beach to bay habitat on Follets Island would remedy harm to a wide range of natural resources of types affected by the Incident. The beaches, dunes, prairie, marshes, mud flats, and other habitats on Follets Island provide habitat for a diversity of wildlife including butterflies, neo-tropical song birds, grassland birds, raptors, waterfowl, fish species, and many other types of wildlife found in the coastal region. The island also provides nesting habitat for threatened and endangered sea turtles as well as foraging and roosting habitat for a number of shorebirds, including the wintering piping plover and red knot, both federally threatened species. This project would also provide protection to the local watershed by preventing any future development that would increase sewage discharges into Christmas Bay, which TGLO identifies as one of the main threats to this bay system.

Steps to acquiring the property include: 1) complete due diligence including appraisal, environmental assessment, survey and title search to ensure that the purchase costs are consistent with market values, that the property is not contaminated, that property boundaries are certain and clear, and that the tract's title is free and clear of objectionable encumbrances, 2) secure the property with a purchase contract, and 3) convey the land to TPWD. Due diligence for the land is already underway.

3.3.10.2 Operations and Maintenance

Once acquired, the land would be protected in perpetuity by a governmental agency. Initially the land would be transferred to TPWD and access to and through the property would be administered through current state regulations and laws. The land would be protected from development long-term by imposition of restrictions on development and subdivision of the property and by designation as a conserved area. TPWD would also work with the Texas TIG to develop an appropriate formal management plan for the tracts that would be protective of existing ecological services. TPWD anticipates leveraging existing agreements and relationships with private and public organizations in the area. For example, TPWD currently has an agreement with Brazoria County to provide trash haul-off on lands owned by TPWD that are part of the Follets Island Conservation Initiative.

Passive recreation activities such as fishing from the shore and wildlife viewing would be allowed on the property. There would be clear signs to designate the appropriate use of vehicles and other activities on the land, restricting vehicles to appropriate designated roads and access easements. Utilization of the area by the public is not anticipated to be heavy; however, if necessary, TPWD would provide designated alternative pedestrian access and pedestrian trails to allow access but ensure impacts on the island habitats are minimized. Other management activities such as the installation of bollards may occur to preserve habitat quality.

The area would also be patrolled by law enforcement professionals to enforce regulations that prevent illegal vehicular activity, which damages ecological resources. No off-road access would be allowed except through current legal beach access easements. Under current Texas laws and regulations the "wet" beach is a public access area open to vehicular travel. Any changes to these laws and regulations are subject to the Texas Open Beaches Act, as administered by the TGLO.

3.3.10.3 OPA Evaluation

The OPA evaluation of the proposed Follets Island Habitat Acquisition project using the criteria established by the OPA regulations in 15 CFR §990.54(a) is described below.

3.3.10.3.1 Cost-Effectiveness

This proposed acquisition focused project is a cost effective way to conserve and protect habitat. This project would prevent development on coastal barrier island habitat that would degrade the ecological services provided within the boundaries of the specific tracts acquired as well as adjacent habitat. Habitat preservation is sometimes more effective than restoration at providing high quality natural habitat as other options such as habitat construction require a significant period of time to mature, provide a full suite of services, and reach the same level of services provided by existing natural wetland systems. That is certainly the case with respect to the Follets Island tracts given the expense that would be incurred trying to replicate the beach to bay habitats on site. The purchase price of the land would be based on a recent appraisal, so that the Texas TIG can be assured of not expending more than the current market value to acquire the tracts. As part of the screening process, this project budget was determined to be reasonable and relatively cost-effective considering benefits of the project relative to its cost and also considering the timeline provided to complete the project activities. Compared to other barrier island habitat parcels available for purchase along the upper Texas coast, this project is more cost-effective. In general, other available similar tracts that stretch from the beachfront to the bay on nearby Galveston Island are much more expensive than land on Follets Island due to market forces.

3.3.10.3.2 Trustee Restoration Goals and Objectives

The Final PDARP/PEIS identified the restoration goal of restoring and conserving habitats to restore habitats injured as a result of the Incident. This project has a clear nexus to the injuries described in the Final PDARP/PEIS because it would preserve habitat types (barrier islands including coastal marsh, beach, and dune) impacted by the spill. Protection of coastal islands would also benefit a variety of fauna injured by the Incident (e.g., sea turtles, birds, fish, etc.) that use the interconnected habitats (beach, dune, marsh, prairie, etc.) in the project area. This project is consistent with Texas TIG goals and objectives and meets the Trustee programmatic restoration goals and Restoration Type-specific goals as described in the Final PDARP/PEIS.

3.3.10.3.3 Likelihood of Success

The Texas Trustee agencies have successfully implemented projects similar to the project (acquiring and preserving coastal lands). This documented experience (e.g., purchase and maintenance of land per the Follets Island Conservation Initiative by TPWD) and successful completion of previous projects demonstrate that the project would have a high likelihood of success. The project is technically feasible, uses proven techniques with established methods and documented results, and can be implemented with minimal delay.

3.3.10.3.4 Prevent Future Injury and Avoid Collateral Injury

This project would avoid collateral injury. The acquisition of the property and preservation of the property would prevent future development, thereby preventing any habitat loss or injury, species loss or displacement, or other potential impact that would result from unabated developed of this property. Additionally, under TPWD management, future injury to habitats and wildlife would be reduced through increased conservation management and subsequent reduction of issues caused by unauthorized public access.

3.3.10.3.5 Benefits Multiple Resources

By acquiring and preserving land on a coastal island, this project would benefit multiple resources such as sea turtles, shorebirds, coastal marshes, dunes, and beaches. This project, if implemented, would benefit flora and fauna by enlarging the amount of protected habitat adjacent to Christmas Bay. This acquisition would protect existing habitat corridors and prevent any future development. This project would also enhance the human experience by providing access to passive recreational activities.

3.3.10.3.6 Public Health and Safety

This project would benefit health and safety by preserving barrier island habitat that protects public resources and infrastructure further inland from storm impacts and by maintaining marshes that help improve water quality. Additionally, this project would provide access to lands for public enjoyment.

3.3.10.4 Monitoring and Adaptive Management

The MAM Plan in Appendix D describes activities that would be conducted to demonstrate how the project is meeting its goals and objectives.

3.3.11 Mid-Coast Habitat Acquisition

The Mid-Coast Habitat Acquisition project would acquire a coastal estuarine land tract that would be conveyed to the USFWS to be managed as part of the Texas Mid-Coast NWR in Matagorda County. The proposed tract is around 800 acres, including 555 acres of mostly estuarine wetlands. The restoration action would protect the tract, thereby providing a protective buffer to estuarine and bay waters from future land use changes. The estimated cost for the project is $2,082,000.

3.3.11.1 Project Description

This project would acquire a parcel of land that would be conveyed to the USFWS as a part of the Mid-Coast NWR Complex. The proposed land tract is located in Matagorda County near East Matagorda Bay (Figure 3-16). The project area is composed of several coastal habitat types that include 245 acres of saline coastal prairie dominated by gulf cordgrass, 525 acres of estuarine intertidal emergent wetlands dominated by marshhay cordgrass and smooth cordgrass, and 30 acres of palustrine emergent wetlands dominated by spike rush and rushes. The area is able to support a diverse and abundant estuarine assemblage of plants and animals including secretive marsh birds, wading birds, invertebrates such as shrimp and crabs, as well as juvenile and adult estuarine fish. The tract is adjacent to estuarine waters, a county road, and nearby electrical service and has the potential for subdivision for recreational home site development. The tract is within the San Bernard NWR acquisition boundary. Big Boggy, San Bernard, and Brazoria NWRs are all managed by the USFWS under the Texas Mid-Coast NWR.

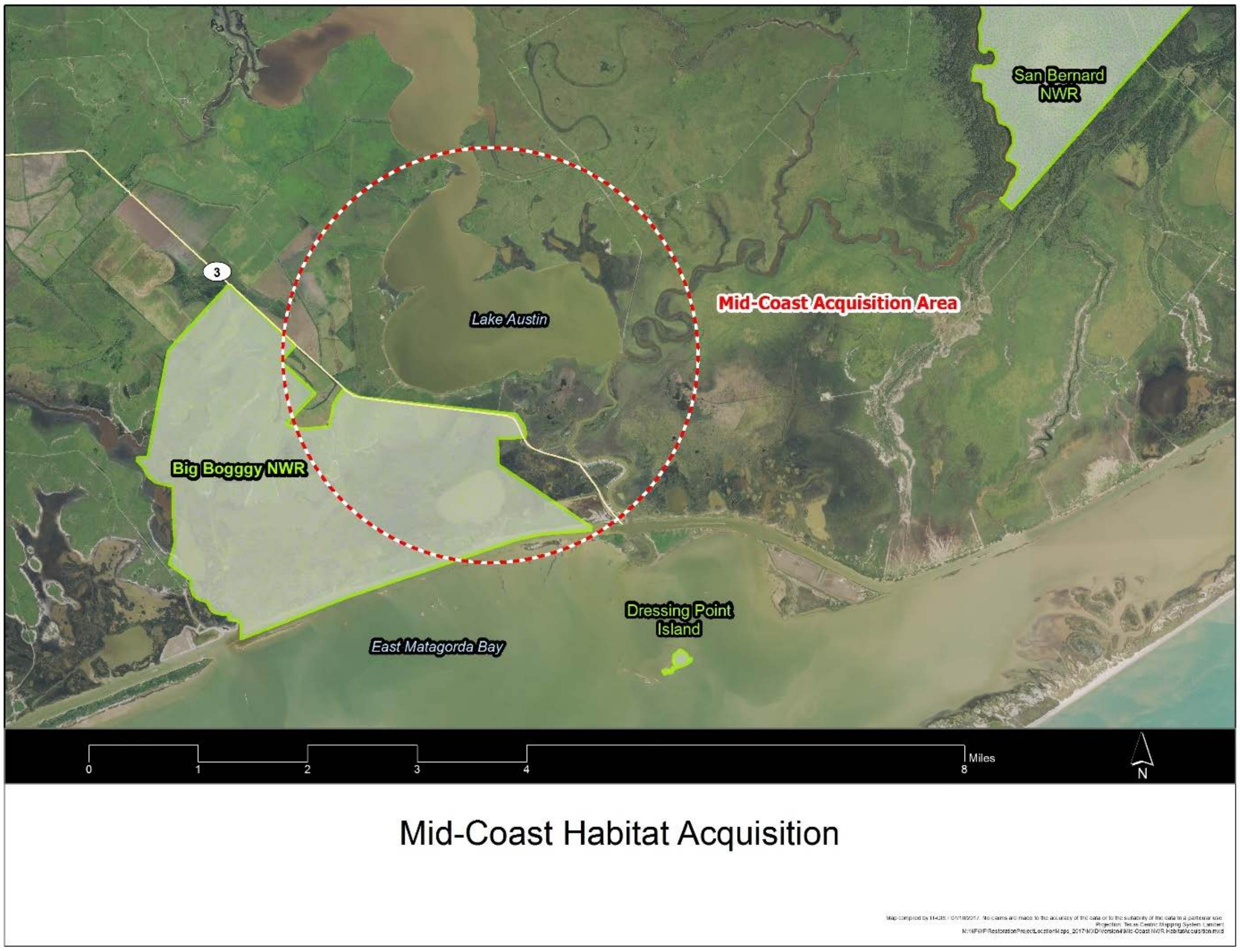

Figure 3-16. Map showing the general location of the Mid-Coast Habitat Acquisition project area in Matagorda County

Protection of the proposed Texas Mid-Coast NWR tract supports the needs or goals of several conservation plans. These plans include but are not limited to the following national, state and regional planning documents:

- U.S. Shorebird Conservation Plan (USSCP 2000);
- Gulf Coast Prairies and Marshes Ecoregional Conservation Plan (TNC 2002);
- Waterbird Conservation for the Americas: The North American Waterbird Conservation Plan, Version 1 (Kushlan et al. 2002);
- U.S. Ocean Action Plan (U.S. Commission on Ocean Policy 2004);
- North American Landbird Conservation Plan (Rich, et al. 2004) and Gulf Coast Prairie Bird Conservation Region (Vermillion, et al. 2008) – Partners in Flight;
- Strategic Plan: The Coastal Program Stewardship of Fish and Wildlife Through Voluntary Conservation Regional Step-Down Plan Region 2 (Texas) Part 2 of 3 FY 2006-2010 (USFWS 2006);
- Mottled Duck Conservation Plan, Gulf Coast Joint Venture (Wilson 2007);
- National Marine Protected Areas Center Strategic Plan 2010-2015 (NOAA 2009);

- North American Waterfowl Management Plan (USFWS 2012);
- Texas Conservation Action Plan 2012 – 2016: Gulf Coast Prairies and Marshes Handbook (TPWD 2012); and
- Texas Mid-Coast NWR, CCP and EA (USFWS 2013).

Steps to acquiring the property include: 1) complete due diligence including appraisal, environmental assessment, survey and title search to ensure that the purchase costs are consistent with market values, that the property is not contaminated, that property boundaries are certain and clear, and that the tract's title is free and clear of objectionable encumbrances, 2) secure the property with a purchase contract, and 3) convey the tract to USFWS for the Texas Mid-Coast NWR.

3.3.11.2 Texas Mid-Coast Operations and Maintenance

Once the tract is in USFWS ownership, the agency would manage the tract and monitor wildlife populations as well as habitat conditions at the site. The goal is to create stable to increasing populations of coastal grassland- and wetland-dependent birds as well as protect estuarine and fresh marsh habitats that provide nursery habitat for commercially and recreationally important fisheries species, as well as improved habitat for shorebirds, wading birds, and waterfowl. These conditions would help meet habitat and/or population objectives of conservation plans listed above and the Texas Mid-Coast NWR CCP (USFWS 2013). Through the development of goals, objectives, and strategies, this CCP describes how the Complex contributes to the overall mission of the Refuge System, fulfills the purposes designated for the refuges, and uses the best available science for adaptive management.

The USFWS refuge objectives, consistent with the approved practices in the 2013 CCP, that would be met by this acquisition include:

- To contribute to conservation efforts and to foster the ecological integrity of the Gulf Coast Prairies and Marshes Ecoregion through proven and innovative management practices across the Complex.
- To conserve, restore, enhance, and protect Complex habitats by implementing appropriate management programs to benefit native flora and fauna, including threatened and endangered species and other species of concern.
- To protect, maintain, and enhance populations of migratory birds and resident fish and wildlife, including federal and state threatened and endangered species.

The USFWS completed a Management Plan with the establishment of the Mid-Coast NWR. The purposes of the NWR as defined in the Management Plan are to: (1) protect nesting, wintering and migratory habitat for migratory birds of the Central Flyway; (2) protect the bottomland hardwood forests for their diverse biological values and wetland functions of water quality improvement and flood control assistance; and (3) provide for compatible wildlife-dependent recreation opportunities in accordance with the National Wildlife Refuge System Improvement Act of 1997. Any changes to the purposes of the NWR would be subject to public and congressional review. Management of the project must be consistent with the Management Plan and goals defined in the Land Protection Plan and Conceptual Management Plan, all of which must be consistent with refuge purpose and requirements of the

Migratory Bird Conservation Act, Emergency Wetlands Resources Act of 1986 and the Fish and Wildlife Act of 1956. Longer term management and planning are addressed in the development of a CCP for the NWR. The USFWS must develop a CCP within 10 years of the establishment of the NWR and then review the CCP every 10-15 years after initial completion (16 U.S.C. §668dd(e)). The USFWS is required to ensure an opportunity for active public involvement in the preparation and revision of the CCP, including notice and an opportunity for public comment on the draft proposed plan, publication of comments, including the state's; summarization of all comments received, and disposition of concerns raised in comments (16 U.S.C. §668dd(e)).

The USFWS would coordinate and provide opportunity for the Texas TIG to provide input into management changes that may affect the conservation values of the project. Prior to conveyance of the property, the Texas TIG would enter into agreement with USFWS that includes the expectations of the Texas TIG for management of the property.

3.3.11.3 OPA Evaluation

The OPA evaluation of the proposed Mid-Coast Habitat Acquisition project using the criteria established by the OPA regulations in 15 CFR §990.54(a) is described below.

3.3.11.3.1 Cost-Effectiveness

The estimated cost of the proposed land acquisition ($2,082,000) is similar to past projects and cost-effective in comparison. The cost for the project is based on similar past projects and reflects comparable costs associated with land realty sales regionally. Most of the project area contains both low marsh and high marsh habitats, which would allow for marsh migration and support resources that depend on either habitat type or both during their life cycle. Substantial shoreline habitat is associated with the tract and the acquisition of this parcel would protect important shallow water habitats from threats associated with land development. This proposed acquisition project is a cost effective way to conserve and protect habitat by preventing development on coastal habitat that would degrade the ecological services provided within the boundaries of the specific tract acquired as well as adjacent habitat. Habitat preservation is sometimes more effective than restoration at providing high quality natural habitat as other options such as habitat construction require a significant period of time to mature, provide a full suite of services, and reach the same level of services provided by existing natural systems. That is certainly the case with respect to the Texas Mid-Coast Habitat Acquisition given the expense that would be incurred trying to create or replicate the habitats present. The purchase price of the land would be based on a recent appraisal to ensure the acquisition would be in line with current market value. As part of the screening process, this project budget was determined to be reasonable and relatively cost-effective considering benefits of the project relative to its cost and also considering the timeline provided to complete the project activities.

3.3.11.3.2 Trustee Restoration Goals and Objectives

The Final PDARP/PEIS identified the restoration goal of restoring and conserving habitats to restore habitats injured as a result of the Incident. This project has a clear nexus to the injuries described in the Final PDARP/PEIS because it would protect habitat types (estuarine wetland and nearby saline coastal prairie) impacted by the spill. Protection and restoration of these habitats would also benefit a variety of fauna injured by the Incident (e.g., crabs, birds, fish, etc.) that use the interconnected habitats (intertidal fringe marsh, salt marsh, sand flat, and protected shallow water) in the project area. This project is consistent with Texas TIG goals and objectives and meets the Trustee programmatic restoration goals and Restoration Type-specific goals as described in the Final PDARP/PEIS.

3.3.11.3.3 Likelihood of Success

Given documented success of previous land acquisition projects and subsequent transfer of those tracts to the USFWS, the project would have a high likelihood of success. Texas Trustee agencies and associated conservation partners have successfully implemented projects similar to the project. These include land acquisition projects that were ultimately deeded to non-profits, state or federal government agencies. Some of these include TNC, TPWD, GBF, USFWS, CBBEP, and the National Park Service. Conservation of this tract would not only directly ensure long-term benefits from the tract, it would also indirectly protect adjacent estuarine shallow water areas from the impacts of land development.

3.3.11.3.4 Prevent Future Injury and Avoid Collateral Injury

This project would avoid collateral injury. The acquisition and preservation of the property would prevent future development, thereby preventing any habitat loss or injury, species loss or displacement, or other potential impact that would result from unabated development of this property. Additionally, under USFWS management, future injury to habitats and wildlife would be reduced through increased law enforcement jurisdiction and subsequent reduction of issues caused by unauthorized public access.

3.3.11.3.5 Benefits to Multiple Resources

The acquisition of this tract would benefit multiple resources as the project would ensure protection of multiple diverse habitats and the fauna they support such as avian, invertebrates, and fish. Placement of the tract into perpetual conservation would protect habitats from impacts associated with agriculture or development. This protection would enhance long-term requirements for many species of plants and animals, and would help meet habitat and population objectives of endangered species recovery plans. Additionally, under USFWS management, Federal Wildlife Officers and State Game Wardens would have jurisdiction over the property and could monitor and reduce non-compatible, destructive uses, such as off-road and all-terrain vehicle activity, on the habitats.

3.3.11.3.6 Public Health and Safety

This proposed acquisition would have a benefit to public health and safety by preventing future development in an area that is at high risk of flooding from high tide events. The tract has a very low elevation and is subject to high and storm tide over wash events. Most of the tract is within the 100-year floodplain and is at risk from flooding or flooding and storm surge wave impacts (FEMA 2015). Development on the tract would be placed at a high risk level from damage during flood events.

3.3.11.4 Monitoring and Adaptive Management

The MAM Plan in Appendix D describes activities that would be conducted to demonstrate how the project is meeting its goals and objectives.

3.3.12 Matagorda Peninsula Habitat Acquisition

The Matagorda Peninsula Habitat Acquisition project would acquire and conserve up to 3,000 acres of wetland and coastal habitats on Matagorda Peninsula east of the Colorado River between Driftwood Drive and property owned by TPWD in Matagorda County, Texas. The project would conserve beach to bay barrier island habitat in perpetuity through fee-simple acquisition. Once acquired, the land would be transferred to and managed by the TPWD for the purpose of habitat preservation. The estimated cost for the project is about $3,012,000.

3.3.12.1 Project Description

The project area is located on Matagorda Peninsula and is bordered to the north by East Matagorda Bay, to the south the Gulf of Mexico, to the west by the Colorado River, and to the east by TPWD properties (Figure 3-17). Matagorda Peninsula is situated within the Gulf Prairies and Marshes ecological region. The land surrounding East Matagorda Bay is mostly in private ownership but is relatively undeveloped. Much of the land north of East Matagorda Bay is within large ranches or is protected as part of Big Boggy NWR. Eastern portions of the peninsula adjacent to the project area were acquired by TPWD largely through RESTORE Act Bucket 2 funding, though some portions remain in private ownership. Areas to the west of the proposed acquisition area contains a Lower Colorado River Authority park recently enhanced in size through a NFWF GEBF grant, as well as limited residential dwellings.

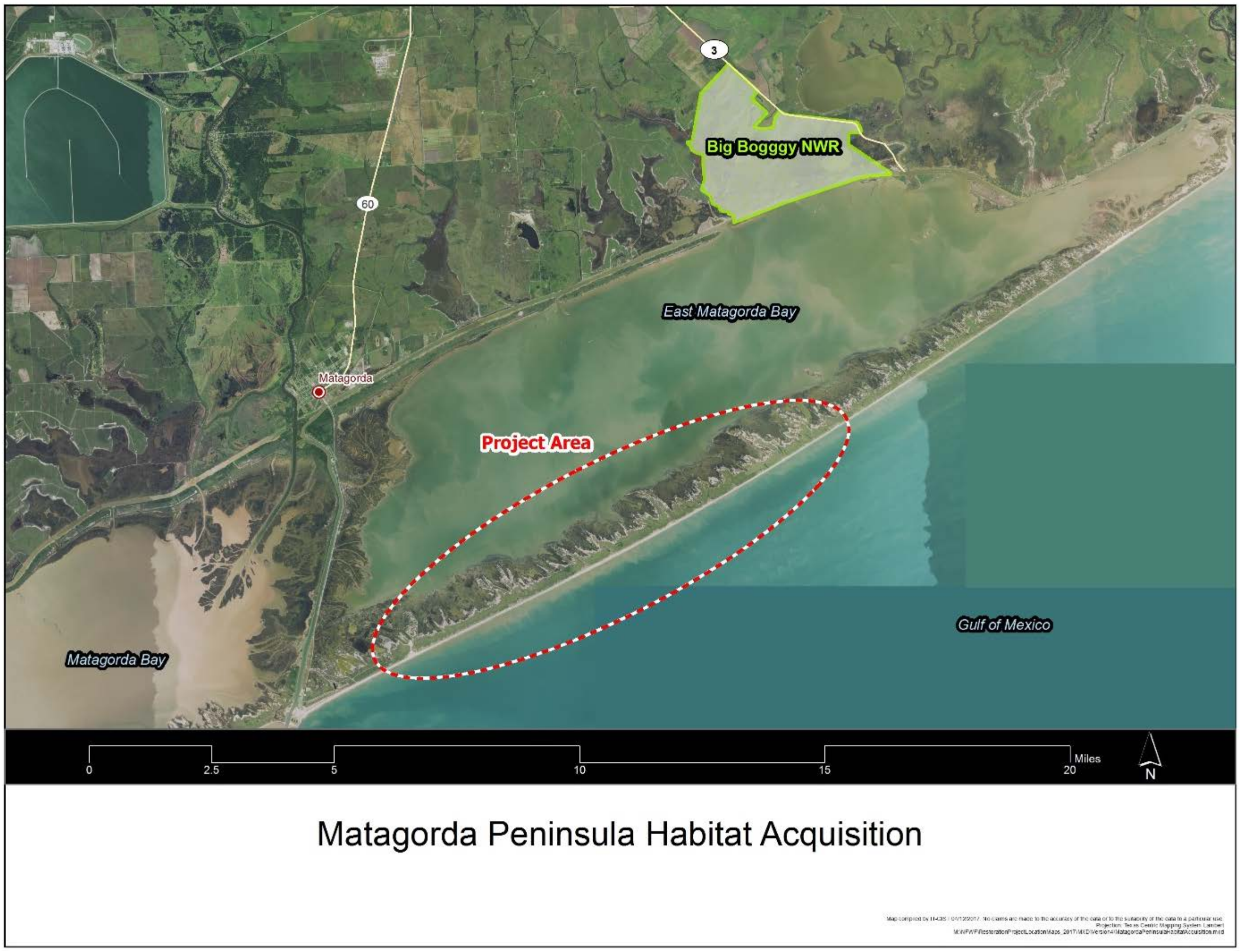

Figure 3-17. Map showing the general location of the Matagorda Peninsula Habitat Acquisition project area in Matagorda County

Preservation of beach to bay habitat on the peninsula would remedy harm to a wide range of natural resources of types affected by the Incident. The project area has high quality habitat consisting of beaches, dunes, marshes, tidal flats, salt prairie, as well as other habitats. These areas would provide habitat for a diversity of wildlife including butterflies, neo-tropical song birds, grassland birds, raptors, waterfowl, fish species, and many other types of wildlife found in the coastal region. The peninsula also provides nesting habitat for threatened and endangered sea turtles as well as foraging and roosting habitat for the endangered whooping crane and for shorebirds, including the wintering piping plover and red knot, both federally threatened species. This project would also provide protection to the local watershed by preventing any future development that would increase discharges into East Matagorda Bay.

Development pressure would continue to increase as the Galveston area continues to expand and increase in population. Land just west of the project area has already been converted to residential dwellings. Acquisition and preservation of this property would prevent subdivision and development of the property, eliminate the threat of future development and associated degradation of the ecological values of the property, and maintain its existing current ecological services into the future.

Steps to acquiring the property include: 1) complete due diligence including appraisal, environmental assessment, survey and title search to ensure that the purchase costs are consistent with market values, that the property is not contaminated, that property boundaries are certain and clear, and that the tract's title is free and clear of objectionable encumbrances, 2) secure the property with a purchase option to ensure the owner would not sell it during negotiations, and 3) convey the land to TPWD.

3.3.12.2 Operations and Maintenance

Once acquired, the land would be protected in perpetuity by TPWD. Initially the land would be transferred to TPWD and access to and through the property would be administered through current state regulations and laws. The land would be protected from development long term by imposition of restrictions on development and subdivision of the property and by designation as a conserved area. TPWD would also work with the Texas TIG to develop an appropriate formal management plan for the tracts that would be protective of existing ecological services.

As there are no paved roads in the area proposed for acquisition, access by the public would be limited. However, passive recreation activities such as fishing from the shoreline and wildlife viewing would be allowed and managed appropriately on the property. There would be clear signs to designate the appropriate use of vehicles and other activities on the land, restricting vehicles to appropriate designated roads and access easements. Over the long-term, if necessary, TPWD would provide alternative pedestrian access and pedestrian trails designed in a manner to allow access but reduce impacts on habitats. Other management activities such as the installation of bollards may occur to preserve habitat quality.

The area would also be patrolled by law enforcement professionals and TPWD staff to enforce regulations to prevent damage to ecological resources from illegal vehicular activity. No off-road access would be allowed except through current legal beach access easements. Under current Texas laws and regulations the "wet" beach is a public access area open to vehicular travel. Any changes to these laws and regulations are subject to the Texas Open Beaches Act, as administered by the TGLO.

3.3.12.3 OPA Evaluation

The OPA evaluation of the proposed Matagorda Peninsula Habitat Acquisition project using the criteria established by the OPA regulations in 15 CFR §990.54(a) is described below.

3.3.12.3.1 Cost-Effectiveness

This proposed acquisition focused project is a cost effective way to conserve and protect habitat by preventing development on coastal habitat that would degrade the ecological services provided within the boundaries of the specific tracts acquired as well as adjacent habitat. Habitat preservation is sometimes more effective than restoration at providing high quality natural habitat as other options such as habitat construction require a significant period of time to mature, provide a full suite of services, and reach the same level of services provided by existing natural wetland systems. That is certainly the case with respect to the Matagorda Peninsula land acquisition given the expense that would be incurred trying to replicate the beach to bay habitats present. The purchase price of the land would be based on a recent appraisal, so the Texas TIG can be assured of not spending more than the current market value to acquire the land. As part of the screening process, this project budget was determined to be reasonable and relatively cost-effective considering the benefits of the project relative to its cost and also considering the timeline provided to complete the project activities. Compared to other beach to bay parcels available for purchase along the Texas coast, this project is more cost-effective. In general, other available similar tracts that stretch from the beachfront to the bay on nearby Galveston Island are much more expensive than land on Matagorda Peninsula due to market forces.

3.3.12.3.2 Trustee Restoration Goals and Objectives

The Final PDARP/PEIS identified the restoration goal of restoring and conserving habitats to restore habitats injured as a result of the Incident. This project has a clear nexus to the injuries described in the Final PDARP/PEIS because it would preserve habitat types (beach to bay habitat including coastal marsh, beach, and dune) impacted by the spill. Protection of coastal habitat would also benefit a variety of fauna injured by the Incident (e.g., sea turtles, birds, fish, etc.) that use the interconnected habitats (beach, dune, marsh, tidal flats, etc.) in the project area. This project is consistent with Texas TIG goals and objectives and meets the Trustee programmatic restoration goals and Restoration Type-specific goals as described in the Final PDARP/PEIS.

3.3.12.3.3 Likelihood of Success

Texas Trustee agencies have successfully implemented projects similar to the project (acquiring and preserving coastal lands). This documented experience, such as purchase and maintenance of land per the Follets Island Conservation Initiative by TPWD as well as other lands on Matagorda Peninsula and in the larger Matagorda Bay watershed (e.g., Powderhorn Ranch). Successful completion of previous projects demonstrates that the project would have a high likelihood of success. Because willing sellers have not been identified and there are no properties under contract, however, the alternative is not technically feasible at this time.

3.3.12.3.4 Prevent Future Injury and Avoid Collateral Injury

This project would avoid collateral injury. The acquisition of the property and preservation of the property would prevent future development, thereby preventing any habitat loss or injury, species loss or displacement, or other potential impact that would result from unabated developed of this property. Additionally, under TPWD management, future injury to habitats and wildlife would be reduced through increased conservation management and subsequent reduction of issues caused by unauthorized public access.

3.3.12.3.5 Benefits Multiple Resources

By acquiring and preserving land on a coastal island, this project would benefit multiple resources such as sea turtles, shorebirds, seagrasses, coastal marshes, dunes, beaches, and water quality. This project, if implemented, would benefit flora and fauna by enlarging the amount of protected habitat adjacent to East Matagorda Bay. This acquisition would protect existing habitat corridors and prevent any future development. This project would also enhance the human experience by providing access to passive recreational activities.

3.3.12.3.6 Public Health and Safety

This project would benefit health and safety by preserving coastal habitat that protects public resources and infrastructure further inland from storm impacts and by maintaining marshes that help improve water quality. The preservation of natural habitat would also help improve coastal resiliency. Additionally, this project would provide access to lands for public enjoyment.

3.3.12.4 Monitoring and Adaptive Management

The objective of this project is to protect and conserve marine, coastal, and estuarine habitats. Monitoring parameters would include documentation of the transfer of the property, habitat types, and acres protected. Successful implementation of this project would be determined by documenting the land acquisition and transfer of the property to TPWD for management.

3.3.13 Bahia Grande Coastal Corridor Habitat Acquisition

The Bahia Grande Coastal Corridor Habitat Acquisition project would include acquisition of important coastal habitat that would be conveyed to the USFWS to be managed as part of the LANWR. This tract includes 1,322 acres of tidal wetlands, thorn scrub, and coastal prairie with more than a mile of frontage on the Lower Laguna Madre and almost 2 miles frontage on a tidal inlet called Laguna Vista Cove. The estimated cost for the project is $6,900,000 of which the Texas TIG proposes providing $2,271,000.

3.3.13.1 Project Description

This project would acquire a parcel of land that would be conveyed to the USFWS as a part of the LANWR. This tract is part of the larger Bahia Grande Coastal Corridor, which consists of 105,000 acres that link the globally significant Laguna Madre (one of seven hypersaline lagoons in the world) region of South Texas and the northern coast of the Gulf of Mexico. The USFWS and its partners have identified 7,000 acres within the Corridor that it has prioritized for acquisition to reduce development risk to the habitat. The corridor itself includes the LANWR, Boca Chica State Park, and the Lower Rio Grande Valley NWR. The proposed tract is located north of Bahia Grande and west of the Lower Laguna Madre (Figure 3-18). This tract would add considerable water frontage, emergent and submergent wetlands, and transitional habitats to the habitat complex along with another tract recently acquired through funds from the Migratory Bird Conservation Act and NFWF GEBF awards.

Map compiled by IT-GIST03/08/2017. No claims are made to the accuracy of the data or to the suitability of the data to a particular use.
Projection: Texas Centric Mapping System Lambert
M:\NFWF\RestorationProjectLocationMaps_2017\MXD\Version3\BahiaGrandeCoastal Corridor Habitat Acquisition.mxd

Figure 3-18. Map showing the general location of the Bahia Grande Coastal Corridor Habitat Acquisition project area in Cameron County, Texas

Over time, increased population growth and associated development along the coast have fragmented land, converted prairies, changed river flows, decreased water quality, and increased sediment loads and pollutants within marsh and estuarine systems of the Lower Rio Grande Valley. Specifically, threats to wildlife habitat include land fragmentation driven by rising land prices, roads, industrial facilities, and proposed wind power development. The tract is currently vacant land and proposed for residential development by nearby communities. As a result of the proposed use, TPWD, USFWS, and the many conservation partners are concerned about the fragmentation of large tracts of shore land, wetlands, and thorn scrub in the area, and the impacts that development would have on these fragile areas. Because this property is in imminent threat of being developed, this tract has been identified as a necessary acquisition needed to protect the corridor.

This tract is considered by the USFWS and the south Texas conservation community to be a top priority for conservation of the unique Cameron County coastal habitat complex and meeting the mission of the Bahia Grande Unit of the LANWR. According to the 2006 Texas Wildlife Action Plan Summary Report, "All factors considered, [South Texas] is among the most threatened of the 10 [Texas] ecoregions and the more threatened of the two high diversity ecoregions." Protection and management of the tract would help meet habitat and population objectives of endangered species recovery plans for nine endangered animals. Acquisition of the property also supports the objectives and goals of the following plans: Gulf Coast Joint Venture plans , Rio Grande Joint Venture plans[16], the Texas State Wildlife Action Plan (TPWD 2005), the LANWR Expansion Plan (USFWS 1999), and the LANWR CCP (USFWS 2010). The American Bird Conservancy has designated the area as a "globally important bird area" for its variety of migratory, winter and resident birds and habitats. Several tropical species reach their northernmost range in south Texas, which is also part of the convergence of the Central and Mississippi Flyways. Millions of migratory shorebirds, raptors, songbirds and waterfowl touch down here each year on their journeys between winter homes in Mexico, Central and South America and nesting habitats as far north as the tundra above the Arctic Circle.

The most significant outcome of this proposal is the acquisition and permanent protection of over 1,300 acres of habitat for an abundance of flora and fauna and the creation of a permanent travel corridor for animals, including the critically endangered ocelot. Protecting this property from development would provide a buffer to disturbance for wildlife, protect water quality and quantity and allow for large scale hydrologic restoration within the Laguna Madre and Bahia Grande that would be precluded if it were developed.

Steps to acquiring the property include: 1) complete due diligence including appraisal, environmental assessment, survey and title search to ensure that the Texas TIG is not paying above market value, that the property is not contaminated, that property boundaries are certain and clear, and that the tract's title is free and clear of objectionable encumbrances, 2) secure the property with a purchase contract,

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[16] The Laguna Madre, Texas Mid-Coast, and Chenier Plain Initiative Area Implementation Plans are available here: http://www.gcjv.org/documents.php

and 3) convey the tract to USFWS for the LANWR. Due diligence for the tract is already underway and a purchase option on the property has been secured.

3.3.13.2 Operations and Maintenance

Once the tract is in USFWS ownership, the agency would monitor wildlife populations as well as habitat conditions at the site. Their goal is to create stable to increasing populations of coastal grassland birds and protect estuarine and fresh marsh environments. These marshes provide nursery habitat for commercially and recreationally important fisheries species, as well as improved habitat for shorebirds, wading birds and waterfowl. These conditions would help meet habitat and/or population objectives of species recovery plans, Gulf Coast Joint Venture plans, Rio Grande Joint Venture plans, the Texas State Wildlife Action Plan, and LANWR CCP.

The USFWS' project objectives, consistent with the approved practices in the 2010 CCP (USFWS 2010), for the larger Bahia Grande project that would be met by this acquisition include:

- Protect and restore 7000 acres of important coastal habitats adjacent to the Laguna Madre,
- Leverage and increase diversity of habitats by connecting the main unit of LANWR with the Bahia Grande Unit, and
- Create a functioning coastal corridor linking millions of acres of significant habitat in South Texas and Mexico.

The USFWS completed a Management Plan with the establishment of the NWR. The purposes of the NWR as defined in the Management Plan are to: (1) Protect, restore, enhance, and maintain the ecological integrity and diversity of native habitats with an emphasis on wetlands, brushlands, coastal prairies, and barrier island habitats, and (2) Protect, conserve, and manage for native wildlife such as endangered species, other federal trust species, and priority species with an emphasis on Refuge focal species (USFWS 2010). Any changes to the purposes of the NWR would be subject to public and congressional review. Management of the project must be consistent with the Management Plan and goals defined in the Land Protection Plan and Conceptual Management Plan all of which must be consistent with refuge purpose and requirements of the Migratory Bird Conservation Act, Emergency Wetlands Resources Act of 1986 and the Fish and Wildlife Act of 1956. Longer term management and planning are addressed in the development of a CCP for the NWR. The USFWS must develop a CCP within 10 years of the establishment of the NWR and then review the CCP every 10-15 years after initial completion (16 U.S.C. §668dd(e)). The USFWS is required to ensure an opportunity for active public involvement in the preparation and revision of the CCP, including notice and an opportunity for public comment on the draft proposed plan, publication of comments, including the state's; summarization of all comments received, and disposition of concerns raised in comments (16 U.S.C. §668dd(e)).

The USFWS would coordinate and provide opportunity for the Texas TIG to provide input into management changes that may affect the conservation values of the project. Prior to conveyance of the property, the Texas TIG would enter into agreement with USFWS that includes the expectations of the Texas TIG for management of the property.

3.3.13.3 OPA Evaluation

The OPA evaluation of the proposed Bahia Grande Coastal Corridor Habitat Acquisition project using the criteria established by the OPA regulations in 15 CFR §990.54(a) is described below.

3.3.13.3.1 Cost-Effectiveness

The estimated cost of the Texas TIG portion of the proposed land acquisition ($2,271,000) is similar to past projects and cost-effective in comparison. Remaining project costs are expected to be borne by mitigation funds, and private and public grants. The cost for the project is based on similar past projects and reflects comparable costs associated with land sales regionally. This proposed acquisition project is a cost effective way to conserve and protect habitat. This is accomplished by preventing development on coastal habitat that would degrade the ecological services provided within the boundaries of the specific tract acquired as well as adjacent habitat. Habitat preservation is sometimes more effective than restoration at providing high quality natural habitat as other options such as habitat construction require a significant period of time to mature, provide a full suite of services, and reach the same level of services provided by existing natural systems. That is certainly the case with respect to the Bahia Grande Coastal Corridor Habitat Acquisition given the expense that would be incurred trying to create or replicate the habitats present. The purchase price of the land would be based on a recent appraisal to ensure the acquisition would be in line with current market value. As part of the screening process, this project budget was determined to be reasonable and relatively cost-effective considering the benefits of the project relative to its cost and also considering the timeline provided to complete the project activities. The acquisition would be a cost-effective approach to protect and conserve marine, coastal, estuarine, and riparian habitats. Through acquiring the tract, the Texas TIG expects to increase protected lands in the Bahia Grande Coastal Corridor, which would be maintained and protected by the USFWS, specifically the LANWR.

3.3.13.3.2 Trustee Restoration Goals and Objectives

The Final PDARP/PEIS identified the restoration goal of restoring and conserving habitats to restore habitats injured as a result of the Incident. This project has a clear nexus to the injuries described in the Final PDARP/PEIS because it would acquire property to protect and conserve habitat types (marine, coastal, and estuarine) impacted by the spill. Implementation of this project would protect and conserve tidal wetlands, thorn scrub, and coastal prairie habitats. This project is consistent with Texas TIG goals and objectives and meets the Trustee programmatic restoration goals and Restoration Type-specific goals as described in the Final PDARP/PEIS.

3.3.13.3.3 Likelihood of Success

Given documented success of previous land acquisition projects and subsequent transfer of those tracts to the USFWS, the project would have a high likelihood of success. USFWS already successfully manages the LANWR. This documented experience and successful completion of previous projects demonstrates that the project would have a high likelihood of success. While the Texas TIG is not providing sufficient funding to purchase the tract entirely, it is likely that additional funds required to complete the purchase would be amassed. Alternatively, bridge funding would likely be secured, enabling the purchase of the tract to move forward. The project is technically feasible, takes advantage of similar ongoing work in this and nearby areas, uses proven techniques with established methods and documented results, and can be implemented with minimal delay.

3.3.13.3.4 Prevent Future Injury and Avoid Collateral Injury

This project would avoid collateral injury. The acquisition and preservation of the property would prevent future development, thereby preventing any habitat loss or injury, species loss or displacement, or other potential impact that would result from unabated development of this property. Additionally, under USFWS management, future injury to habitats and wildlife would be reduced through increased law enforcement jurisdiction and subsequent reduction of issues caused by unauthorized public access.

3.3.13.3.5 Benefits Multiple Resources

The acquisition of the tract would benefit multiple resources as the project would ensure protection of multiple diverse habitats and the fauna that they support such as wading and shore birds and aquatic resources. Protection and management of the tract would also help meet habitat and population objectives of endangered species recovery plans. Additionally, under USFWS management, Federal Wildlife Officers and State Game Wardens would have jurisdiction over the property and could monitor and reduce non-compatible, destructive uses, such as off-road and all-terrain vehicle activity, on the habitats.

3.3.13.3.6 Public Health and Safety

This proposed acquisition would have a benefit to public health and safety. In addition to habitat linkages, this acquisition project would improve flood control and protect the towns of Laguna Vista and Port Isabel from dust and tropical weather related flooding. Protection of this parcel of land from development would also help mitigate impacts from storm surges.

3.3.13.4 Monitoring and Adaptive Management

The MAM Plan in Appendix D describes activities that would be conducted to demonstrate how the project is meeting its goals and objectives.

3.3.14 Laguna Atascosa Habitat Acquisition

The Laguna Atascosa Habitat Acquisition project would include acquisition of important coastal habitat that would be conveyed to the USFWS to be managed as part of the LANWR. This tract includes 1,682 acres of beach, dune, and tidal habitats on South Padre Island, Texas. The estimated cost for the project is $5,397,000.

3.3.14.1 Project Description

This project would acquire a parcel of coastal property on South Padre Island that would be conveyed to the USFWS to be held as a part of the LANWR. The 1,682-acre tract is located on South Padre Island, Texas and is located within the approved expansion boundary of the LANWR. The tract straddles the island and includes healthy, intact examples of all the island's habitats, including Gulf beach, dunes, vegetated and unvegetated flats, and bayside marshes on the Laguna Madre that protect significant shallow water habitats including seagrass beds. The tract includes three-quarters of a mile of Gulf beach in an area known to be used for nesting by threatened and endangered sea turtles, including the Kemps

Ridley sea turtle, and is critical habitat for the endangered Piping Plover, Aplomado Falcon, Red Knot, and Snowy and Wilsons Plovers. This tract is adjacent to and has roughly a mile and a half of boundary in common with the LANWR (Figure 3-19). Under this project, the land would be conveyed to LANWR for management and protection for habitat and wildlife conservation in perpetuity. The proposed acquisition lies within the area outlined in the LANWR Expansion and Conceptual Management Plan (referenced in the LANWR CCP) which limits expansion of the Refuge to areas in eastern Cameron County (around the Laguna Atascosa Unit and on South Padre Island north of Park Road 100) and Willacy County (South Padre Island). In addition, this parcel and adjacent parcels fall within a landscape boundary that has been identified as a priority area for acquisition by the LANWR (USFWS 1999 and USFWS 2010). The acquisition of this tract would not only add to the conservation value of the NWR, but would prevent incompatible development and uses that might compromise the values of the portions of the island already in conservation.

Figure 3-19. Map showing the general location of the Laguna Atascosa Habitat Acquisition project area in Willacy and Cameron Counties

The proposed tract acquisition supports the needs or goals of several conservation plans. These plans include but are not limited to the following national, state and regional planning documents:

- National Wildlife Refuge System Improvement Act of 1977;
- LANWR Refuge Expansion and Conceptual Management Plan (USFWS 1999);
- Waterbird Conservation for the Americas: The North American Waterbird Conservation Plan, Version 1 (Kushlan et al. 2002);
- Southeast United States Regional Waterbird Conservation Plan (Hunter et al. 2006);

- Strategic Plan: The Coastal Program Stewardship of Fish and Wildlife Through Voluntary Conservation Regional Step-Down Plan Region 2 (Texas) Part 2 of 3 FY 2006-2010 (USFWS 2006);
- Gulf Coast Joint Venture Conservation Planning for Reddish Egret (Vermillion and Wilson 2009);
- LANWR CCP (USFWS 2010);
- Texas Conservation Action Plan 2012 – 2016: Gulf Coast Prairies and Marshes Handbook (TPWD 2012); and
- Reddish Egret Conservation Action Plan (Wilson et al. 2014).

Steps to acquiring the property include: 1) complete due diligence, including appraisal, environmental assessment, survey, and title search to ensure that the Texas TIG is not paying above market value, that the property is not contaminated, that property boundaries are certain and clear, and that the tract's title is free and clear of encumbrances, 2) secure the property with a purchase contract, and 3) convey the tract to USFWS for the LANWR.

3.3.14.2 Operations and Maintenance

Once the tract is under USFWS ownership, specifically the LANWR, the agency would monitor wildlife populations and habitats, as well as attempt to reduce unauthorized access through increased law enforcement capabilities. Parcels acquired or managed by the LANWR are operated and maintained in accordance with the LANWR CCP and the LANWR Expansion and Conceptual Management Plan. One of the specific reasons for the Refuge Expansion and Conceptual Management Plan is to protect habitats on South Padre Island for species such as endangered sea turtles, peregrine falcons, piping plovers, other shorebirds, wading birds, waterfowl, and Neotropical migrants (LANWR CCP 2010).

The USFWS completed a Management Plan with the establishment of the NWR. The purposes of the NWR as defined in the Management Plan are to: (1) Protect, restore, enhance, and maintain the ecological integrity and diversity of native habitats with an emphasis on wetlands, brushlands, coastal prairies, and barrier island habitats, and (2) Protect, conserve, and manage for native wildlife such as endangered species, other federal trust species, and priority species with an emphasis on Refuge focal species (USFWS 2010). Any changes to the purposes of the NWR would be subject to public and congressional review. Management of the project must be consistent with the Management Plan and goals defined in the Land Protection Plan and Conceptual Management Plan, all of which must be consistent with refuge purpose and requirements of the Migratory Bird Conservation Act, Emergency Wetlands Resources Act of 1986 and the Fish and Wildlife Act of 1956. Longer term management and planning are addressed in the development of a CCP for the NWR. The USFWS must develop a CCP within 10 years of the establishment of the NWR and then review the CCP every 10-15 years after initial completion (16 U.S.C. §668dd(e)). The USFWS is required to ensure an opportunity for active public involvement in the preparation and revision of the CCP, including notice and an opportunity for public comment on the draft proposed plan, publication of comments, including the state's; summarization of all comments received, and disposition of concerns raised in comments (16 U.S.C. §668dd(e)).

The USFWS would coordinate and provide opportunity for the Texas TIG to provide input into management changes that may affect the conservation values of the project. Prior to conveyance of the property, the Texas TIG would enter into agreement with USFWS that includes the expectations of the Texas TIG for management of the property.

3.3.14.3 OPA Evaluation

The OPA evaluation of the proposed Laguna Atascosa Habitat Acquisition project using the criteria established by the OPA regulations in 15 CFR §990.54(a) is described below.

3.3.14.3.1 Cost-Effectiveness

The estimated cost of the proposed land acquisition ($5,397,000) is similar to past projects and cost-effective in comparison. The cost for the project is based on similar past projects and reflects comparable costs associated with land realty sales regionally. This proposed acquisition project is a cost effective way to conserve and protect habitat by preventing development on coastal habitat that would degrade the ecological services provided within the boundaries of the specific tract acquired as well as adjacent habitat. Habitat preservation is sometimes more effective than restoration at providing high quality natural habitat as other options such as habitat construction require a significant period of time to mature, provide a full suite of services, and reach the same level of services provided by existing natural systems. That is certainly the case with respect to the Laguna Atascosa Habitat Acquisition given the expense that would be incurred trying to create or replicate the habitats present. The purchase price of the land would be based on a recent appraisal to ensure the acquisition would be in line with current market value. As part of the screening process, this project budget was determined to be reasonable and relatively cost-effective considering benefits of the project relative to its cost and also considering the timeline provided to complete the project activities. The acquisition of this project would be a cost-effective approach to protect and conserve marine, coastal, and estuarine habitats. Through acquiring the tract, the Texas TIG expects to increase protected lands on South Padre Island, which would be maintained and protected by the USFWS, specifically the LANWR.

3.3.14.3.2 Trustee Restoration Goals and Objectives

The Final PDARP/PEIS identified the restoration goal of restoring and conserving habitats to restore habitats injured as a result of the Incident. This project has a clear nexus to the injuries described in the Final PDARP/PEIS because it would protect and conserve habitat types (marine, coastal, and estuarine) impacted by the spill. Acquisition of the tract would also benefit a variety of fauna injured by the incident (e.g. crabs, birds, sea turtles, etc.) that use these habitats in the project area. This project is consistent with Texas TIG goals and objectives and meets the Trustee programmatic restoration goals and Restoration Type-specific goals as described in the Final PDARP/PEIS.

3.3.14.3.3 Likelihood of Success

Given documented success of previous land acquisition projects and subsequent transfer of those tracts to the USFWS, the project would have a high likelihood of success. USFWS already successfully manages the LANWR, which upon completion of this project, would include this property. Ecologically significant tracts have been acquired and successfully incorporated into the LANWR in the past. This documented management experience and successful completion of previous projects further indicates that the project would have a high likelihood of success. The project is technically feasible, takes advantage of similar ongoing work in this and nearby areas, uses proven techniques with established methods and documented results, and can be implemented with minimal delay.

3.3.14.3.4 Prevent Future Injury and Avoid Collateral Injury

This project would avoid collateral injury. The acquisition and preservation of the property would prevent future development, thereby preventing any habitat loss or injury, species loss or displacement, or other potential impact that would result from unabated development of this property. Additionally, under USFWS management, future injury to habitats and wildlife would be reduced through increased law enforcement jurisdiction and subsequent reduction of issues caused by unauthorized public access.

3.3.14.3.5 Benefits Multiple Resources

The acquisition of the tract would benefit multiple resources as the project would ensure protection of multiple diverse habitats and the fauna that they support such as wading and shore birds, crabs, and sea turtles. Protection and management of the tract would also help meet habitat and population objectives of endangered species recovery plans. Additionally, under USFWS management, Federal Wildlife Officers and State Game Wardens would have jurisdiction over the property and could monitor and reduce non-compatible, destructive uses, such as off-road and all-terrain vehicle activity, on the habitats.

3.3.14.3.6 Public Health and Safety

This proposed acquisition would have a benefit to public health and safety. In addition to habitat linkages, acquisition of the tract would minimize adverse impacts to public health and safety by increasing coastal resiliency through protection of a portion of South Padre Island, a barrier island that buffers and reduces impacts of tropical storms and hurricanes on the mainland in south Texas.

3.3.14.4 Monitoring and Adaptive Management

The MAM Plan in Appendix D describes activities that would be conducted to demonstrate how the project is meeting its goals and objectives.

3.3.15 Natural Recovery/No Action

Pursuant to the OPA regulations, the Final PDARP/PEIS considered “a natural recovery alternative in which no human intervention would be taken to directly restore injured natural resources and services to baseline” (40 CFR §990.53[b][2]).[17]” Under a natural recovery alternative, no additional restoration would be done by Texas TIG to accelerate the recovery of Wetlands, Coastal, and Nearshore Habitat in the Texas Restoration Area using DWH NRDA funding at this time. The Texas 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. Although injured resources could presumably recover to or near baseline conditions under this scenario, recovery would take much longer compared to a scenario in which restoration actions were undertaken. Given that technically

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[17] NEPA requires evaluation of a “no action” alternative. This differs from the natural recovery alternative under OPA. The environmental consequences of the NEPA no action alternative are considered separately in Chapter 4.

feasible restoration approaches are available to compensate for interim natural resource and service losses, the DWH Trustees rejected this alternative from further OPA evaluation within the Final PDARP/PEIS. Based on this determination, tiering this RP/EA from the Final PDARP/PEIS, and incorporating that analysis by reference, the Texas TIG did not evaluate natural recovery as a viable alternative under OPA. Natural recovery is not considered further in this RP/EA.

As NEPA requires consideration of a No Action alternative as a basis for comparison of potential environmental consequences of the action alternative(s), a No Action alternative is evaluated in that sense within this EA. This analysis presents the conditions that would result if the Texas TIG did not plan to undertake any restoration for injured natural resources or to compensate for lost services at this time. The environmental consequences of such an alternative are evaluated in Section 4.4.14 for comparison with the remaining action alternatives.

This alternative would have no beneficial impacts to habitats because this alternative would largely result in a continuation of the conditions described in the Final PDARP/PEIS Chapters 3, Ecosystem Setting and 4, Injury to Natural Resources, and there would be no associated benefits to Wetlands, Coastal, and Nearshore Habitat. Under the No Action Alternative, some Wetlands, Coastal, and Nearshore Habitat recovery could result from other DWH funded projects that propose habitat acquisition or enhancement (RESTORE Act and NFWF GEBF), but not from the federal action being evaluated in this RP/EA. Even if funding and implementation of other DWH projects does occur in the restoration areas, the full suite of habitat restoration benefits would not be realized due to diminished funding and the lost opportunity for leveraged funding. The No Action Alternative does not meet the Texas TIG's goals and objectives and does not provide the restoration benefit to habitat that would occur through the proposed alternatives.

3.4 OPA Evaluation Conclusions

The Texas TIG completed the OPA evaluation of the reasonable range of alternatives (Table 3-1), which were determined by the screening criteria discussed in Chapter 2. In total, 16 alternatives were evaluated:

- Oyster Restoration Engineering and Design
- Landscape Approach to Oyster Reef Restoration
- Bird Island Cove Habitat Restoration Engineering
- Essex Bayou Habitat Restoration Engineering
- Dredged Material Planning for Wetland Restoration
- McFaddin Beach and Dune Restoration
- Bessie Heights Wetlands Restoration
- Pierce Marsh Wetlands Restoration
- Dollar Bay and Moses Lake Wetland Restoration
- Indian Point Shoreline Erosion Protection
- Bahia Grande Hydrologic Restoration
- Follets Island Habitat Acquisition
- Mid-Coast Habitat Acquisition

- Matagorda Peninsula Habitat Acquisition
- Bahia Grande Coastal Corridor Habitat Acquisition
- Laguna Atascosa Habitat Acquisition

The OPA analysis indicates that each of these 16 alternatives would provide benefits to the Oyster Restoration Type or the Wetlands, Coastal, and Nearshore Habitat Restoration Type. Four of the alternatives (Oyster Restoration Engineering, Bird Island Cove Habitat Restoration Engineering, Essex Bayou Habitat Restoration Engineering, and Dredged Material Planning for Wetland Restoration) are anticipated to be proposed in a phased approach, with the proposal in this document consisting only of planning activities including E&D. The planning activities associated with these projects would be cost-effective, meet Texas TIG goals and objectives, have a high likelihood of success, and would be used to prevent future and collateral injury and would also be used to benefit multiple resources. The proposed activities would have no effect on public health and safety.

All other alternatives would provide substantial benefits to multiple resources while avoiding future or collateral injury and impacts to public health and safety. These alternatives meet the Texas TIG restoration goals and objectives. The Oyster Restoration Engineering alternative would provide information that would be used to evaluate methods, techniques, and cost-effectiveness of other oyster projects. At this time the cost-effectiveness of the Landscape Approach to Oyster Reef Restoration is unknown. In comparison to alternatives that are restoring similar resources in this RP/EA, the Dollar Bay and Moses Lake Wetland Restoration alternative is not as cost-effective. The Matagorda Peninsula Habitat Acquisition alternative is not ready for implementation because willing sellers have not been identified.

The alternatives include provisions for both maintenance and monitoring to ensure these benefits would be available over the planned lives of the projects. In the case of alternatives that involve land acquisition, an appropriate land protection instrument (e.g., development restriction, management) would be included to ensure that the land is protected in perpetuity.

Table 3-1. Summary of OPA evaluation of all projects considered in the reasonable range of alternatives.

Alternative	Cost	Cost- Effective	Meets Trustee Restoration Goals & Objectives	High Likelihood of Success	Prevent Future Injury & Avoid Collateral Injury	Benefits Multiple Resources	Public Health & Safety
Restoration Type: Oysters							
Oyster Restoration Engineering*	$309,000	Yes	Yes	Yes	Yes	Yes	No effect
Landscape Approach to Oyster Reef Restoration	$15,258,000	Unknown	Yes	Yes	Yes	Yes	Benefits: improves water quality
Restoration Type: Wetlands, Coastal, and Nearshore Habitats							
Bird Island Cove Habitat Restoration Engineering*	$206,000	Yes	Yes	Yes	Yes	Yes	No effect
Essex Bayou Habitat Restoration Engineering*	$372,000	Yes	Yes	Yes	Yes	Yes	No effect
Dredged Material Planning for Wetland Restoration*	$1,964,000	Yes	Yes	Yes	Yes	Yes	No effect
McFaddin Beach and Dune Restoration	$15,874,000	Yes	Yes	Yes	Yes	Yes	Benefits: improves resiliency, protection from storms
Bessie Heights Wetland Restoration	$4,905,000	Yes	Yes	Yes	Yes	Yes	Benefits: improves resiliency, protection from storms

Alternative	Cost	Cost- Effective	Meets Trustee Restoration Goals & Objectives	High Likelihood of Success	Prevent Future Injury & Avoid Collateral Injury	Benefits Multiple Resources	Public Health & Safety
Pierce Marsh Wetland Restoration	$3,095,000	Yes	Yes	Yes	Yes	Yes	Benefits: improves resiliency, protection from storms
Dollar Bay-Moses Lake Wetland Restoration	$4,225,000	Not compared to other similar alternatives	Yes	Yes	Yes	Yes	Benefits: improves resiliency, protection from storms, and water quality
Indian Point Shoreline Erosion Protection	$2,199,000	Yes	Yes	Yes	Yes	Yes	Benefits: improves resiliency, protection from storms, and water quality
Bahia Grande Hydrologic Restoration	$5,050,000	Yes	Yes	Yes	Yes	Yes	Benefits: improves air quality
Follets Island Habitat Acquisition	$2,037,000	Yes	Yes	Yes	Yes	Yes	Benefits: protection from storms, improves water quality
Mid-Coast Habitat Acquisition	$2,082,000	Yes	Yes	Yes	Yes	Yes	Benefits: protection from storms, improves water quality
Matagorda Peninsula Habitat Acquisition	$3,012,000	Yes	Yes	Not at this time	Yes	Yes	Benefits: protection from storms, improves water quality

Alternative	Cost	Cost- Effective	Meets Trustee Restoration Goals & Objectives	High Likelihood of Success	Prevent Future Injury & Avoid Collateral Injury	Benefits Multiple Resources	Public Health & Safety
Bahia Grande Coastal Corridor Habitat Acquisition	$2,271,000	Yes	Yes	Yes	Yes	Yes	Benefits: protection from storms, improves water quality and air quality
Laguna Atascosa Habitat Acquisition	$5,397,000	Yes	Yes	Yes	Yes	Yes	Benefits: protection from storms, improves water quality

*Note: *Alternatives proposing only E&D activities.*

4 Environmental Assessment

Under NEPA, federal agencies must consider the environmental effects of their actions that include, among others, impacts on social, cultural, and economic resources, as well as natural resources.

Consistent with 15 CFR §990.23, this chapter presents NEPA evaluation of the suite of reasonable alternatives as determined by the OPA evaluation contained in Chapter 3. Accordingly, this chapter describes the affected environment and evaluates the environmental consequences specific to each alternative. This RP/EA tiers from the Final PDARP/PEIS and as such, its NEPA analysis re-focuses from the programmatic scale of the Final PDARP/PEIS to this subsequent restoration plan prepared by the Texas TIG (40 CFR §1502.4(b); 40 CFR §1508.28; 40 CFR §1502.20 and Final PDARP/PEIS, Chapter 6).

This RP/EA is consistent with the Final PDARP/PEIS and ROD and provides a NEPA analysis for each proposed alternative, tiering from the PEIS where appropriate. For this RP/EA, the Texas TIG considered the extent to which additional NEPA analyses may be necessary for the projects that tier their NEPA analyses from the Final PDARP/PEIS. These considerations include whether the analyses of relevant conditions and environmental effects described in the Final PDARP/PEIS are still valid and whether project impacts have already been fully analyzed in the Final PDARP/PEIS.

The analysis in this RP/EA incorporates by reference relevant evaluations of the environmental consequences from Sections 6.4.1.1 (Create, restore, and enhance coastal wetlands), 6.4.1.4 (Restore and enhance dunes and beaches), 6.4.1.5 (Protect and conserve marine, coastal, estuarine, and riparian habitats), and 6.4.12.1 (Restore oyster reef habitat), and 6.4.14 (Preliminary Phases of Restoration Planning) of the Final PDARP/PEIS. The Final PDARP/PEIS can be found at http://www.gulfspillrestoration.noaa.gov.

In addition to tiering from the Final PDARP/PEIS, where previous environmental analyses have been completed the Trustees evaluated that information and, as determined to be appropriate, incorporated by reference that information into this RP/EA in order to reduce repetition of information. However, the Trustees in this document are performing their own analysis of these projects.

4.1 Environmental Setting

The purpose of this section is to describe the environment of the area(s) to be affected by the proposed alternatives under consideration, with emphasis commensurate with the importance of the impact on those resources (40 CFR §1502.15).

The northern Gulf of Mexico comprises a vast regional ecosystem—an interactive, interdependent network of organisms (from microbes to plants to animals) and their chemical, biological, and physical environment. Ranging from the coastline itself, to its bays and estuaries, expansive continental shelf, and vast open ocean and deep sea, the northern Gulf of Mexico ecosystem contains some of the Nation’s most diverse and productive natural resources, as described in detail in Chapter 3 of the Final PDARP/PEIS, which is incorporated by reference here.

Focusing on the state of Texas, it too is comprised of a diverse set of ecosystems. The Texas Gulf Coast stretches along the Gulf of Mexico for 367 miles from the Louisiana border south to the Texas-Mexico border. Texas bays and Gulf waters are home to thousands of fish, shellfish, birds, and other animals, all of which depend on the coast's diverse habitats for food and shelter. The Texas coast is comprised of a diverse array of habitat types. The 21,000-square-mile region includes a wide variety of habitat types, including barrier islands along the coast, marshes surrounding bays and estuaries, remnant tallgrass prairies, shallow intertidal areas, tidal flats, estuarine to brackish wetlands, owing to the substantial variation in rainfall and hydrology across the coast. The amount of rainfall within Texas dramatically affects coastal habitats. Progressing westward, rainfall dramatically declines. Changes in the rainfall amounts affects freshwater inflows into the bays and estuaries as well as the habitat present long the Texas Coast. The northern Texas coast typically has rainfall amounts averaging over 55 inches a year, while the southern Texas coast has average rainfall totals averaging under 29 inches a year (TAMU 2017). As a result, habitats along the southern Texas coast have much higher salinities than those on the northern Texas Coast. For example, salinities in the Lower Laguna Madre (southern Texas coast) are historically hypersaline and have been as high as 120 ppt, whereas the northernmost bay in Texas, Sabine Lake is the least saline estuary in the state. NEPA requires a description of the existing environment that has the potential to be affected by the alternatives under consideration, with emphasis commensurate with the importance of the impact on those resources (40 CFR §1502.15). Because four project alternatives are being proposed for only E&D at this time, the NEPA compliance to address those four projects was previously evaluated in the Final PDARP/PEIS in Section 6.4.1.14, which is incorporated by reference, and the discussion of the affected environments for those projects is not included in this plan. If any of these projects are proposed for subsequent phases of restoration, the affected environment would be detailed in the associated NEPA compliance documents associated with that decision. The remaining 12 construction and acquisition project alternatives each include a description of the relevant affected environment with its evaluation of environmental consequences in Chapter 4.

Specific information on the affected environment is described in subsequent alternative-specific discussions in Section 4.5 in order to provide the level of detail needed to fully evaluate potential environmental consequences of future proposed actions. The alternative-specific environmental consequences evaluation in Section 4.5 is based on the specific project detail and location.

Between late August and early September of 2017, Hurricane Harvey impacted Texas. Based on preliminary investigations, Trustees re-evaluated the proposed preferred project sites and determined that environmental conditions did not change sufficiently to warrant a change in the suite of projects selected in this restoration plan. However, the Texas TIG will incorporate new site conditions if any exist into the final engineering and design plans of relevant projects.

4.2 Environmental Consequences

Under NEPA, federal agencies must consider the environmental effects of their actions that include, among others, impacts on social, cultural, and economic resources, as well as natural resources. The alternatives addressed in this section are proposed under OPA and thus meet the level of federal agency involvement to require review.

In order 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 area of impacts (local, state-wide, etc.) and their duration (e.g., whether they are short- or long-term impacts). Intensity refers to the severity of impact and could include the timing of the action (e.g., more intense impacts would occur during critical periods like high visitation or wildlife breeding/rearing, etc.). Intensity is also described in terms of whether the impact would be beneficial or adverse.

For purposes of this document, impacts are characterized as minor, moderate or major, and temporary or long-term. The analysis of beneficial impacts focuses on the duration (short- or long-term), without attempting to specify the intensity of the benefit. The definition of these characterizations is consistent with that used in the Final PDARP/PEIS, and can be found in Appendix C.

"Adverse" is used in this section 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 below, 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 under protected resources statutes. The results of any completed protected resource consultations are included in the Administrative Record.

This Environmental Consequences Section analyzes the beneficial and adverse impacts that would result from the implementation of any of the alternatives considered in this RP/EA. The resource categories presented in this chapter correspond to the descriptions of existing conditions in Chapter 3, Affected Environment of the Final PDARP/PEIS. This balance of this chapter is divided into two sections: Section 4.3 addresses alternatives that are only being considered in the RP/EA for funding of E&D at this time (i.e., Oyster Reef Restoration Engineering, Bird Island Cove Habitat Restoration, Essex Bayou Habitat Restoration, and Dredged Material Planning for Wetland Restoration), while Section 4.4 provides a detailed analysis of the alternatives that would be funded in their entirety, which could include E&D, construction, and or acquisition as applicable. Each of the 12 alternatives and the No Action alternative are evaluated against each resource category.

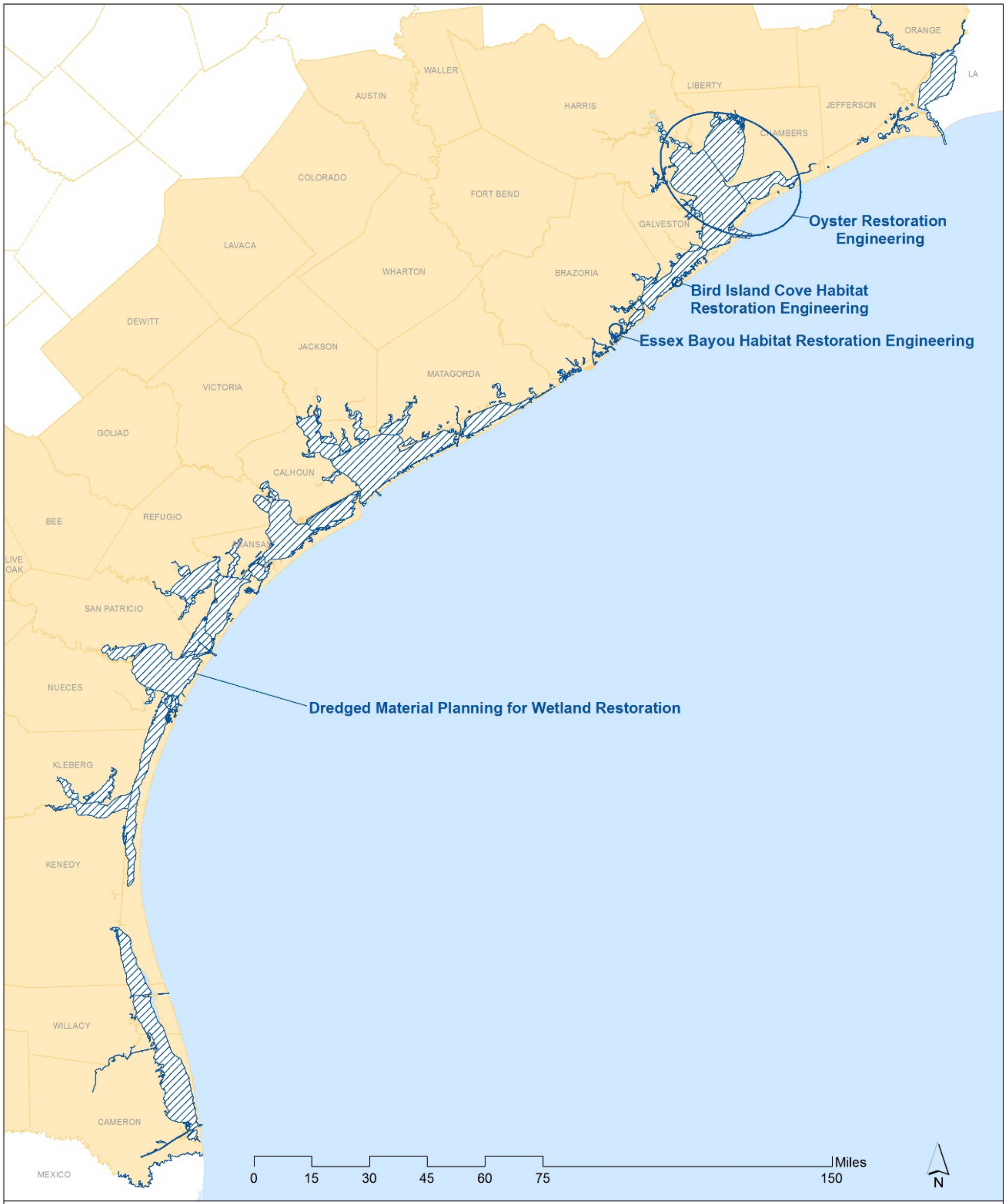
4.3 Environmental Consequences for Engineering and Design Alternatives

Engineering and design alternatives evaluated in this section include:

- Oyster Restoration Engineering and Design,
- Bird Island Cove Habitat Restoration Engineering,
- Essex Bayou Habitat Restoration Engineering, and
- Dredged Material Planning for Wetland Restoration.

For the E&D alternatives identified in Section 4.2 and described in detail in Chapter 3, each alternative would be developed given the scope of the project and allocated funding. Examples of activities that may be performed during the E&D development include: landowner and land rights investigation, identification of existing infrastructure, cultural resources investigation, delineation of borrow sources, identification of construction access and pipeline corridors, survey and geotechnical data acquisition/geotechnical engineering, delineation of earthen containment dikes, identification of construction marsh fill elevation, submission of permits, development of operations and maintenance plans, and development of bidding documents, among other activities. The purpose of the E&D alternatives is to develop sufficient information to fully evaluate a reasonable range of alternatives in a subsequent restoration plan. Although information gathered may inform future alternatives, the outcome of the preliminary phases does not commit the Texas TIG to future actions. If any other subsequent phases are later proposed for implementation with DWH NRDA funds, a NEPA analysis of the impacts from that project would be included in the associated restoration plan.

A brief environmental analysis of each of the proposed E&D alternatives is discussed below. An evaluation of environmental consequences related to E&D activities is discussed in Section 6.4.14 of the Final PDARP/PEIS, and is summarized in this section. The Final PDARP/PEIS determined that some preliminary phases of alternative planning would cause direct, short-term, minor impacts through associated fieldwork. These impacts would be very minor and localized to the alternative site. Temporary impacts to the biological and physical environment also could include short-term, temporary disturbance of habitats and species, minor emissions from vehicles, and minor disturbance to terrestrial, estuarine, and marine environments. The E&D alternatives proposed in this RP/EA (Figure 4-1) are consistent with the Final PDARP/PEIS and ROD and incorporate by reference the PEIS NEPA analysis for the E&D phase into this RP/EA. When the analyses of relevant conditions and environmental effects described in the Final PDARP/PEIS do not fully consider the conditions or effects of a project, the Texas TIG considered the extent to which supplemental NEPA analysis was necessary.



Texas Coastal Engineering and Design Projects

Map compiled by IT-GIST 04/27/2017. No claims are made to the accuracy of the data or to the suitability of the data to a particular use.
Projection: Texas Centric Mapping System Lambert
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Figure 4-1. Location of projects involving only engineering and design activities

4.3.1 Oyster Restoration Engineering

This proposed Restoration Engineering project includes activities that would characterize the affected environment of this project and determine the best approach for oyster restoration from an ecological and engineering standpoint. This would involve development of necessary permits and environmental consultations. Project-planning actions for this project fall within the scope of the evaluation of environmental consequences in the Final PDARP/PEIS. Any permits or environmental consultations required for E&D activities would be secured prior to starting those activities. Adherence to permit conditions and other requirements would minimize adverse impacts when construction is implemented in future phases. This project also includes activities that are not specifically addressed in the Final PDARP/PEIS. However, the environmental consequences caused by these activities fall within the range of impacts evaluated in the Final PDARP/PEIS and do not require any additional tiered NEPA analyses (see Section 6.17, NEPA Considerations and Tiering Future Restoration Planning).

If construction in subsequent phases is later proposed for implementation with DWH NRDA funds, a NEPA analysis of the impacts from that phase would be included in the associated restoration plan.

4.3.2 Bird Island Cove Habitat Restoration Engineering,

The proposed Bird Island Cove Habitat Restoration Engineering project (Phase I) includes activities that would characterize the environment, determine the best approach for restoration from an engineering standpoint, and involve permitting and environmental consultation activities. Project-planning actions in this RP/EA fall within the scope of the analysis in the Final PDARP/PEIS (e.g., survey and geotechnical data acquisition, researching historical conditions, drilling into the soil or sediment to remove samples for grain size or chemical analysis, and archaeology studies). Any permits or environmental consultations required for E&D activities would be secured prior to starting those activities Adherence to permit conditions and other requirements would minimize adverse impacts. The environmental consequences caused by the use of equipment or activities that are not specifically addressed in the Final PDARP/PEIS, but fall within the range of impacts evaluated in the Final PDARP/PEIS do not require any additional tiered NEPA analysis (see Section 6.17, NEPA Considerations and Tiering Future Restoration Planning).

If Phase II is later proposed for full implementation, a NEPA analysis of the impacts from Phase II (construction/implementation) would be included in a future Texas TIG restoration plan.

4.3.3 Essex Bayou Habitat Restoration Engineering

This proposed Essex Bayou Habitat Restoration Engineering project (Phase I) includes activities that would characterize the affected environment of this project and ultimately determine the best approaches for restoration. These activities would include measuring tidal flows and water quality parameters, surveying topography and bathymetry, collecting soil samples using hand-held coring devices to determine profiles and salinities, assessing ground faults, collecting water samples for water quality analyses, collecting benthic samples to assess invertebrates, and collecting vegetation samples to measure the vegetation community. Project-planning actions for this project fall within the scope of the evaluation of environmental consequences in the Final PDARP/PEIS. Any permits or environmental consultations required for E&D activities would be secured prior to starting those activities. Adherence to permit conditions and implementation of recommended BMPs would minimize adverse impacts.

If Phase II or any other subsequent phases are later proposed for implementation with DWH NRDA funds, a NEPA analysis of the impacts from that phase would be included in the associated restoration plan.

4.3.4 Dredged Material Planning for Wetland Restoration

This proposed Dredged Material Planning for Wetland Restoration project includes activities that would characterize the affected environment of this project and determine the best approach for restoration from an engineering standpoint. This would involve development of necessary permits and environmental consultations; and may also involve landowner and land rights investigation, identification of existing infrastructure, cultural resources investigation, delineation of borrow sources, identification of construction access and pipeline corridors, survey and geotechnical data acquisition/geotechnical engineering, delineation of earthen containment dikes, identification of construction marsh fill elevation, submission of permits, development of operations and maintenance plans, and development of bidding documents. Such activities may also include researching historical conditions, modeling hydrologic response to the project, and creating maps and scale drawings of the project site. This may also include minimally intrusive field activities such as drilling into the soil or sediment with a soil auger, vibra-core, drill rig, hand probe, or other tools to remove surface, subsurface, or core samples for grain size or chemical analysis; determining existing and predicted ground water levels and elevations; and performing geotechnical evaluation. E&D activities may also include archaeological studies at and around the project site, which often involve digging test pits, and collecting and documenting historic features. Project-planning actions for this project fall within the scope of the evaluation of environmental consequences in the Final PDARP/PEIS. Any permits or environmental consultations required for E&D activities would be secured prior to starting those activities. Adherence to permit conditions and other requirements would minimize adverse impacts.

If Phase II or any other subsequent phases are later proposed for implementation with DWH NRDA funds, a NEPA analysis of the impacts from that phase would be included in the associated restoration plan.

4.3.5 NEPA Discussion for E&D Projects

Within the four E&D projects proposed in this RP/EA, some preliminary phases of project planning would cause direct, short-term, minor impacts through associated fieldwork (e.g., including drilling into soil or sediment with an auger, drill rig, or other tools to remove surface, subsurface, or core samples). These impacts would be very minor and localized to the project site given how small such areas are in relation to an overall project area. Temporary impacts to the biological and physical environment also could include short-term, temporary disturbance of habitats and species; minor emissions from vehicles; and minor disturbance to terrestrial, estuarine, and marine environments. Permits for E&D activities will be secured when necessary. In cases where the appropriate permit or other environmental review has been secured (e.g., for photographing, handling, or disturbing listed species) or determined to be unnecessary (e.g., certain minor, temporary disturbance of marine mammals that does not constitute harassment), minor impacts to certain protected and managed resources also could occur and be considered minor.

Project-planning actions for the four projects proposed in this RP/EA fall within the scope of the analysis in the Final PDARP/PEIS. The use of vehicles and other equipment for bathymetric surveys or other field investigations would cause short-term, temporary impacts similar to those described above. Adherence to permit conditions and other requirements would minimize adverse impacts.

4.4 Affected Environment and Environmental Consequences for Construction and Acquisition Alternatives

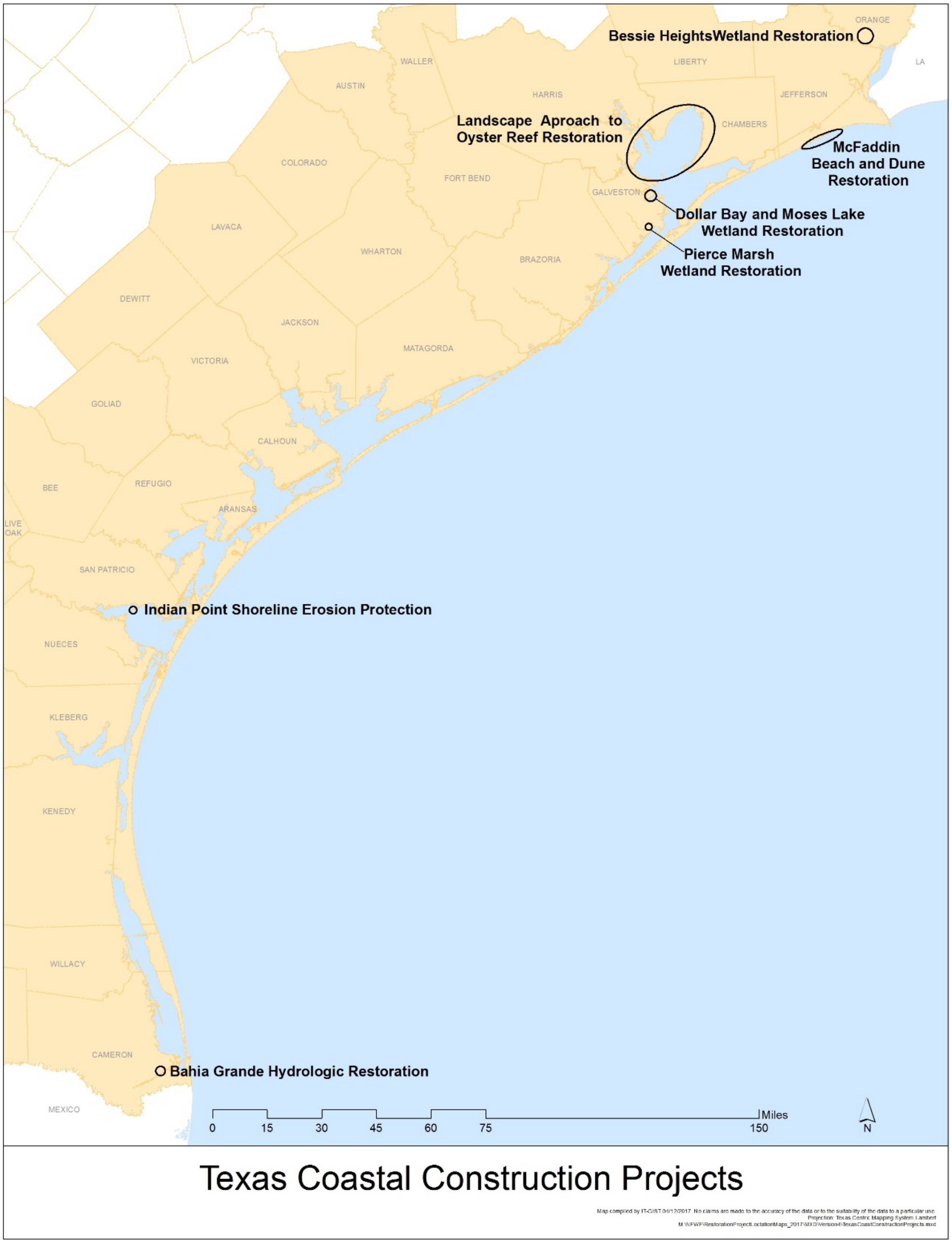
This section provides the affected environment and environmental consequences analysis for all alternatives that involve construction (Figure 4-2) or acquisition (Figure 4-3). Each project alternative describes the environmental consequences, or effects, of implementing the proposed alternative on the physical, biological, and human environment. The RP/EA provides information specific to each alternative's affected environment and analysis of anticipated environmental consequences for the individual, proposed alternatives. The RP/EA is consistent with the Final PDARP/PEIS and ROD and tiers from the PEIS where appropriate. Chapters 3, 4 and 7 of this document provide a synopsis that summarizes the overall impacts of all the proposed preferred alternatives and evaluates the cumulative impacts of these alternatives.

Alternatives involving construction or acquisition evaluated in this section include:

- Landscape Approach to Oyster Reef Restoration
- McFaddin Beach and Dune Restoration,
- Bessie Heights Wetland Restoration,
- Pierce Marsh Wetland Restoration,
- Dollar Bay and Moses Lake Habitat Restoration,
- Indian Point Shoreline Erosion Protection,
- Bahia Grande Hydrologic Restoration,
- Follets Island Habitat Acquisition,
- Mid-Coast Habitat Acquisition
- Matagorda Peninsula Habitat Acquisition
- Bahia Grande Coastal Corridor Habitat Acquisition, and
- Laguna Atascosa Habitat Acquisition.

The No Action alternative is addressed in Section 4.4.14

The following sections include resource-specific discussions on the affected environment and an analysis of the anticipated environmental consequences of each proposed construction and acquisition alternative. This discussion provides the overall physical, biological and socioeconomic context within which proposed alternatives occur.



Texas Coastal Construction Projects

Map compiled by IT-GIST 04/12/2017. No claims are made to the accuracy of the data or to the suitability of the data to a particular use.
Projection: Texas Centric Mapping System Lambert
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Figure 4-2. Location of projects involving construction activities

Texas Coastal Acquisition Projects

Map compiled by IT-GIST 04/12/2017. No claims are made to the accuracy of the data or to the suitability of the data to a particular use.
Projection: Texas Centric Mapping System Lambert
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Figure 4-3. Location of projects involving land acquisition

4.4.1 Landscape Approach to Oyster Reef Restoration

The goal of the Landscape Approach to Oyster Reef Restoration is to restore up to 150 acres of degraded Galveston Bay oyster reefs using a landscape approach to create a network of oyster populations. A combination of source and harvestable sink oyster reefs would be created in Upper Galveston Bay to allow for increased oyster population sustainability and oyster habitat resiliency. The estimated cost for the project is $15,258,000.

This analysis incorporates by reference the relevant portions of Section 6.4.12.1 of the Final PDARP/PEIS. The Final PDARP/PEIS provides programmatic evaluation of the environmental consequences of the Restoration Approach “Restore oyster reef habitat,” which are considered in this RP/EA and are incorporated by reference here. This section presents the Affected Environment of the Landscape Approach to Oyster Reef Restoration project area and the environmental consequences of the proposed actions in context of the project-specific affected environment.

The programmatic analysis looked at a series of resources as part of the biological, physical, and socioeconomic environment. The evaluation of each project focuses on the specific resources with a potential to be affected by the project. The impacts from the project are largely beneficial and adverse impacts are minor to moderate. Benefits to the physical, biological, and human uses and socioeconomics would result if this project was implemented. BMPs identified in required permits, consultations, or environmental reviews would be followed. Additionally, BMPs described in Appendix 6.A of the Final PDARP/PEIS as well as Appendix B of this document would be considered and applied where appropriate, to reduce or eliminate impacts to the environment. A summary of the conclusions of this analysis are in Table 4-1. Categories and terminology in the table follow a consistent format used for all projects in this RP/EA. Information from this EA was used to populate this table using the definitions provided in Appendix C.

Table 4-1. Summary of beneficial impacts as well as short-term and long-term adverse impacts from implementation of the Landscape Approach to Oyster Reef Restoration project

Resource Categories	Benefits	Adverse Short-Term	Adverse Long-Term
Physical Resources			
Geology and Substrates	Yes	Minor	NE
Hydrology and Water Quality	Yes	Minor	NE
Air Quality and GHG Emissions	NE	Minor	Minor
Noise	NE	Minor	Minor
Biological Resources			
Habitats	Yes	Minor	Minor
Living Coastal and Marine Resources	Yes	Moderate	Minor
Protected Species	Yes	Minor	NE

Resource Categories	Benefits	Adverse Short-Term	Adverse Long-Term
Human Uses and Socioeconomics			
Socioeconomics and Environmental Justice	Yes	NE	NE
Cultural Resources	NE	NE	NE
Infrastructure	NE	NE	NE
Land and Marine Management	NE	NE	NE
Tourism and Recreation Use	Yes	Minor	NE
Fisheries and Aquaculture	Yes	Minor	Minor
Land and Marine Transportation	NE	Minor	NE
Aesthetics and Visual Resources	Yes	Minor	NE
Public Health and Safety	Yes	Minor	NE

Notes: Yes – provides benefits
NE – no effect
Adverse short-term and long-term impacts are designated as minor, moderate, or major

4.4.1.1 Physical Environment

Galveston Bay is about 30 miles long, 17 miles wide, 6 to 12 feet deep, and has a surface area of 600 square miles. Galveston Bay was formed during the end of the last glacial period when world sea levels rose in response to melting glaciers (Anderson 2007). Formerly a river valley during the Pleistocene, sediments accumulated in the valley as the sea rose and formed the bay during the Holocene. The Galveston Bay geologic substrates are comprised of clay and silt with some sand. Most of the sand component is delivered from the Gulf by tidal forces. The main sources of sediments entering the system include the Trinity and San Jacinto River systems and to a lesser degree the many small streams and bayous that enter the system. Significant subsidence has occurred as the result of the withdrawal of underground fluids. This has resulted in significant changes to the shorelines of the bay as well as islands formed naturally or by man. Most of the islands in the bay system were created during the construction of waterways by the side casting of dredged material along the newly created channel. The description of the physical environment of Galveston Bay is divided into geology and substrates, hydrology and water quality, air quality and greenhouse gas (GHG) emissions, as well as noise characteristics of the area.

4.4.1.1.1 Geology and Substrates

Affected Resources

Substrate in the area where reef restoration would occur includes existing degraded oyster reefs (shell) and hard sediment in Upper Galveston Bay. The exact location of the reefs to be restored would be determined during the modelling and site selection process.

Environmental Consequences

Section 6.4.12.1.1 of the Final PDARP/PEIS, which describes the impacts to geology and substrates from restoration projects intended to restore oyster reef habitat, is incorporated here by reference. Impacts from projects intended to restore oyster reef habitat were described as causing short-term, minor adverse impacts.

The project is consistent with the impacts and activities described in the Final PDARP/PEIS. This project would have short-term, minor adverse impacts on geology and the substrate from the placement of anchoring buoys and the disturbance of surrounding sediment from the placement of cultch material onto the substrate. Restoring degraded oyster habitat would have a long-term benefit by providing additional substrate suitable for oyster recruitment. The reefs would also reduce wave energy and erosion of adjacent shorelines, and help to stabilize the underlying substrate.

4.4.1.1.2 Hydrology and Water Quality

Affected Resources

There are three tidal inlets into Galveston Bay, but only two are of major importance with regard to flow. Bolivar Roads (Houston Ship Channel), between Galveston Island and Bolivar Peninsula, accounts for the majority of the tidal exchange between the bay and the Gulf of Mexico. San Luis Pass, between the western end of Galveston Island and Follets Island, is an unaltered inlet that supplies a lesser amount of the bay’s tidal exchange. Rollover Pass is by comparison a small enhanced tidal connection through Bolivar Peninsula connecting East Bay with the Gulf of Mexico. Overall, the natural depth of the bay is relatively shallow, 6 to 12 feet. Tides in Galveston under normal conditions are very small in amplitude, usually less than 3 feet between low and high tide. Wind speed and direction within Galveston Bay plays an important role in affecting tide elevation. It can dampen or enhance the height of waves as well as their potential energy. Prevailing winds are from the southeast, with occasional strong northerly winds that are associated with passing cold fronts. Winds combined with seasonal tide events can greatly exacerbate the tidal range as well as move the range up or down by 1 or 2 feet. Tropical storm tides during Category 4 or 5 hurricanes could be as high as 23 feet above normal water levels (GBEP 2011).

According to the water quality index, Galveston Bay received a poor rating. Galveston Bay is rated fair for dissolved inorganic nitrogen concentrations and rated poor for dissolved inorganic phosphorus concentrations. Thirteen percent of the estuarine area was rated poor for dissolved inorganic nitrogen concentrations, whereas 68% of the estuarine area was rated poor for dissolved inorganic phosphorus concentrations. Expectations for water clarity are similar to those for normally turbid estuaries, with water clarity rated poor at a sampling site if light penetration at 1 meter was less than 10% of surface illumination. Dissolved oxygen conditions in Galveston Bay are rated good (EPA 2007b). As of August 2015, there are two human health consumption advisories in Galveston Bay for certain seafood species due to high levels of dioxins, polychlorinated biphenyls (PCBs) and organochlorine pesticides (http://www.dshs.state.tx.us/seafood/advisories-bans.aspx). Within the restoration project areas, the advisory is limited to all species of catfish due to high levels of dioxin and PCBs. Additional information can be found at: https://tpwd.texas.gov/regulations/outdoor-annual/fishing/general-rules-regulations/fish-consumption-bans-and-advisories.

Environmental Consequences

Section 6.4.12.1.1 of the Final PDARP/PEIS, which describes the impacts to hydrology and water quality from restoration projects intended to restore oyster reef habitat, is incorporated here by reference. Impacts from projects intended to restore oyster reef habitat were described as causing short-term, minor adverse impacts.

The project is consistent with the impacts and activities described in the Final PDARP/PEIS. This project would have short-term, minor adverse impacts on water quality. Activities such as anchoring marker buoys and signs, and placement of cultch materials during construction would temporarily increase turbidity. This project would have long-term benefits on water quality due to increased filter feeding by oysters.

4.4.1.1.3 Air Quality and GHG Emissions

Affected Resources

Air Quality

Galveston Bay is located in an area the EPA designates as the Houston-Galveston-Brazoria Intrastate Air Quality Control Region (HGB). The HGB is in attainment or unclassified with the National Ambient Air Quality Standards (NAAQS) for all criteria pollutants except ozone. The EPA currently lists the HGB as nonattainment for existing ozone standards (http://www.tceq.state.tx.us/airquality/sip/hgb/hgb-status).

GHG Emissions

GHGs are chemical compounds found in the Earth’s atmosphere that absorb and trap infrared radiation as heat. Global atmospheric GHG concentrations are a product of continuous emission (release) and removal (storage) of GHGs over time. In the natural environment, this release and storage is largely cyclical. For instance, through the process of photosynthesis, plants capture atmospheric carbon as they grow and store it in the form of sugars. Human activities such as deforestation, soil disturbance, and burning of fossil fuels disrupt the natural cycle by increasing the GHG emission rate over the storage rate, which results in a net increase of GHGs in the atmosphere. The principal GHGs emitted to the atmosphere through human activities are carbon dioxide, methane, nitrous oxide, and fluorinated gases, such as hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride, with carbon dioxide accounting for the largest quantity GHG emitted. Criteria air pollutants and GHG emissions are largely generated by electricity production, vehicular movements, and commercial and residential buildings using electricity.

GHG emissions would result from both the implementation and operation of the project from the use of vessels during construction and monitoring activities. Engine exhaust from barges, boats, excavators, and equipment would contribute to an increase in GHG emissions. BMPs would be considered and applied where appropriate and practical to reduce the release of GHGs during project implementation.

BMPs considered would include using energy efficient machinery and equipment; the incorporation of anti-idling procedures; and the use of gas as compared to diesel.

Environmental Consequences

Section 6.4.12.1.1 of the Final PDARP/PEIS, which describes the impacts to air quality from restoration projects intended to restore oyster reef habitat, is incorporated here by reference. Impacts from projects intended to restore oyster reef habitat were described as causing short- and long-term minor adverse impacts.

The project is consistent with the impacts and activities described in the Final PDARP/PEIS. Short-term, minor adverse impacts on air quality, such as engine exhaust from barges, boats, excavators, and other construction equipment, would be anticipated during cultch placement activities. BMPs would be employed to reduce the release of GHG during project implementation. To the extent possible, the project would consider resource conservation measures and technology to reduce energy use. Long-term, minor adverse impacts on air quality would be expected through emissions associated with increased recreational and commercial use of the restored oyster habitat.

4.4.1.1.4 Noise

Affected Resources

The project would generate construction noise associated with barges and excavator equipment during placement of the cultch material. Construction equipment noise is known to disturb fish, marine mammals, and nesting shorebirds. The timing of noise producing activities would be planned to minimize disturbance to nesting birds. Construction noise could also potentially create a nuisance to residents and visitors in shoreline areas near reef restoration activities. To prevent undue disturbance, construction activities would be limited to daylight hours. Construction noise would be temporary and not anticipated to last more than 12 months.

Environmental Consequences

Section 6.4.12.1.1 of the Final PDARP/PEIS, which describes the impacts to noise from restoration projects intended to restore oyster reef habitat, is incorporated here by reference. Impacts from projects intended to restore oyster reef habitat were described as causing short- and long-term minor adverse impacts.

The project would create a minor, localized, and short-term increase in noise during cultch placement activities. Increased noise from a greater amount of boat traffic resulting from increased recreational and commercial harvesting activities would create a long-term, minor, localized adverse impact.

4.4.1.2 Biological Environment

The Galveston Bay system contains a variety of habitat types, ranging from open water areas to wetlands to upland prairie. Wetlands, seagrass meadows, and oyster reefs are three important habitat types in Galveston Bay. A wide variety of fish, wildlife, plant, and invertebrate populations either reside in or periodically utilize Galveston Bay and its associated habitats, including oysters, finfish, shrimp, crabs, birds, sea turtles, and marine mammals (GBEP 2011). The biological environment is divided into three sections: habitats, living coastal and marine resources, and protected species.

4.4.1.2.1 Habitats

Affected Resources

Oysters are considered "ecosystem engineers" for their role in creating reefs that modify, through their physical presence, the surrounding environment while also providing habitat, refuge, and foraging areas for many other species including benthic organisms and fish (Coen and Luckenbach 2000; Powers et al. 2009; VanderKooy 2012; Wong et al. 2011). Oysters are most abundant in shallow, semi-enclosed water bodies (less than 12 meters in depth) in areas where salinity levels are between 15 and 30 ppt (VanderKooy 2012).

Habitat types affected by oyster reef restoration activities are existing degraded oyster reefs and shallow (6 to 12 feet) unvegetated open water.

Environmental Consequences

Section 6.4.12.1.2 of the Final PDARP/PEIS, which describes the impacts to habitat from restoration projects intended to restore oyster reef habitat, is incorporated here by reference. Impacts from projects intended to restore oyster reef habitat were described as causing long-term, minor adverse impacts.

Anchors installed for buoys or signs near restored oyster reefs would potentially create long-term, localized, and minor adverse impacts to habitat in the footprint of the anchor. Short and long-term minor impacts would also result from the conversion of sandy and firm benthic habitats to oyster reef habitats. Restoration of degraded oyster reef habitat would have a long-term benefit by creating higher quality habitat for oysters, and create protection, habitat, foraging, and propagation grounds for fish, shellfish, mollusks, encrusting benthic invertebrate communities and, when intertidal reefs are exposed, birds.

4.4.1.2.2 Living Coastal and Marine Resources

Affected Resources

<u>Oysters</u>

The eastern oyster forms an integral component of nearshore coastal ecosystems and local economies along the Gulf of Mexico. Oysters provide numerous ecological services to estuarine systems, including production of biomass, filtering water to remove organic and inorganic particles, and improving water quality and clarity. Oyster reefs provide habitat for numerous other shellfish, crabs, and finfish. Oysters are also a valuable commercial and recreational fishery resource. Oysters in the Gulf of Mexico are present in both intertidal and sub-tidal areas (NMFS 2007). Commercial oysters are harvested from sub-tidal areas, but intertidal oysters may be important as a source of larvae to maintain populations of both intertidal and sub-tidal oysters.

<u>Other Aquatic Species</u>

There are a number of aquatic species found in Galveston Bay. Fish species include sand seatrout, spotted or speckled seatrout, red drum, tonguefish, flounders, Atlantic bumper, and porgys. Benthic organisms include bivalves, gastropods and other mollusks, amphipods, annelids, and brown and white shrimp.

Aquatic Vegetation

Seagrasses are not expected to occur in Upper Galveston Bay, and seagrasses were not identified using the TPWD seagrass locator tool (http://tpwd.texas.gov/gis/seagrass/). However, any seagrasses found during the site selection process would be documented and measures would be taken to avoid and minimize any impacts.

Birds

The Texas coast is on the Central Flyway, a broad, hourglass-shaped migratory flight path that extends from Alaska to South America (http://tpwd.texas.gov/huntwild/wild/birding/migration/flyways/central/), and hundreds of species may stop near Galveston Island on their way north or south. Water dependent birds may use the open bay to forage and roost. These would include loons, bay ducks, gulls, terns, and pelicans.

Environmental Consequences

Section 6.4.12.1.2 of the Final PDARP/PEIS, which describes the impacts to biological resources from restoration projects intended to restore oyster reef habitat, is incorporated here by reference. Impacts from projects intended to restore oyster reef habitat were described as causing short-term minor adverse impacts.

Oyster habitat restoration activities would be expected to cause short-term increases in turbidity, reducing water clarity and photosynthetically available light, increasing crab predator abundance and subsequent predation on oyster spat. Cultch placement activities may also cause short-term, moderate adverse impacts to fish in the form of direct injury and/or mortality. Long-term minor impacts would result from the burial of existing benthic communities. Restored reef habitat would have a long term benefit on oyster populations in Upper Galveston Bay by providing improved, more resilient habitat.

Fish and other aquatic species present in the restoration sites could be subject to a temporary increase in sound pressure levels, a decrease in water quality, entrainment in cultch material, and removal of benthos in newly covered areas. Sound pressure level increases or entrainment could result in mortality of individuals. This would be a minor short-term adverse effect that would not be expected to reduce local populations overall. Restored reef habitat would have a long-term benefit on ecosystem-level resources in Upper Galveston Bay by enhancing the overall abundance and variety of fauna.

Birds using the restoration sites for foraging or roosting would be forced to other parts of the bay or other surrounding areas during construction activities. This would be temporary, however, and once the project was completed, the project would have long-term benefits to birds from increased food sources from fauna associated with reef habitat.

4.4.1.2.3 Protected Species

Protected species and their habitats include Endangered Species Act (ESA)-listed species and designated critical habitats, which are regulated by either the USFWS or the NMFS. Protected species and habitat also include marine mammals protected under the Marine Mammal Protection Act, EFH protected under the Magnuson-Stevens Act, migratory birds protected under the Migratory Bird Treaty Act and eagles protected under the Bald and Golden Eagle Protection Act.

Affected Resources

Threatened or Endangered Species

The seven endangered or threatened species that could be potentially affected in the project area are listed in Table 4-2. No activities related to implementation of the project would take place in any area designated as critical habitat.

Table 4-2. Federal Threatened and Endangered Species potentially affected in the Landscape Approach to Oyster Reef Restoration project area

Common Name	Status
Piping Plover	T
Red Knot	T
Loggerhead Sea Turtle	T
Green Sea Turtle	T
Atlantic Hawksbill Sea Turtle	E
Kemp's Ridley Sea Turtle	E
West Indian Manatee	T

Notes: E – federally endangered species
T – federally threatened species

Four species of endangered or threatened species of sea turtles were identified as possibly being affected in Galveston Bay: loggerhead, green, hawksbill, and Kemp's ridley sea turtles. Sea turtles nest on beaches, and most species use nearshore hard bottom reef complexes, shallow water habitat (including seagrasses), or other coastal areas with rocky bottoms to forage for food. Sea turtles could be encountered in the open water.

West Indian Manatee has been documented in Galveston Bay, although sightings are extremely rare. The manatee feeds on vegetation, is slow moving, and somewhat intolerant of cold water temperatures. There is the possibility that it may be affected during construction activities.

Two species of threatened bird species are identified as possibly affected in the project area: piping plover and red knot. The piping plover is a migrant and winter resident on the Texas coast and occurs in Galveston County. The red knot is primarily migratory in Galveston County.

Essential Fish Habitat

EFH in the project's area of effect is identified and described for various life stages of 12 managed fish and shellfish (Gulf of Mexico Fisheries Management Council 2005). Galveston Bay is located in an area that is designated as EFH under the Magnuson-Stevens Act for several species of shark, shrimp, coastal migratory pelagic species, and reef fish (Tables 4-3 and 4-4). No Habitat Areas of Particular Concern or EFH Areas Protected from Fishing were identified in Upper Galveston Bay (http://www.habitat.noaa.gov/protection/efh/efhmapper/index.html).

Table 4-3. EFH for estuarine habitats within the Landscape Approach to Oyster Reef Restoration project area

Species Common Name	Eggs	Larvae	Post Larvae	Early Juvenile	Late Juvenile	Adult	Spawning Adult
Estuarine Emergent Marsh							
Red Drum			●	●	·	●	
Gray Snapper						●	
Brown Shrimp				●			
White Shrimp				●			
Estuarine Oyster Reef							
Brown Shrimp				●			
Estuarine Sand and Shell Bottom							
Red Drum			●		·	●	
Gray Snapper						●	
Lane Snapper				●	●		
Brown Shrimp				●			
Estuarine Mud/Soft Bottom							
Red Drum		●	●	●	·	●	
Gray Snapper						●	
Lane Snapper				●	●		
Brown Shrimp				●			
White Shrimp				●			

Note: ● indicates habitat type designated as EFH for species' life stage

Table 4-4. Highly migratory species EFH designations within the Landscape Approach to Oyster Reef Restoration project area

Species Common Name	Life Stage Within Estuarine Waters
Scalloped Hammerhead Shark	Neonate & Juvenile
Blacktip Shark	Neonate, Juvenile & Adult
Bull Shark	Neonate, Juvenile & Adult
Lemon Shark	Neonate
Spinner Shark	Neonate & Juvenile
Bonnethead Shark	Neonate, Juvenile & Adult
Atlantic Sharpnose Shark	Neonate, Juvenile & Adult

Marine Mammals

The bottlenose dolphin and the West Indian Manatee (manatees are also protected under the ESA) are the only marine mammals known to occur in the Galveston Bay system. Manatees are extremely rare in Texas waters with sightings less than one per year on average across the entire Texas coast. Due to the relatively shallow depth of the bay (6 to 12 feet), and the established ranges and depths that the majority of the cetaceans occupy, additional marine mammals would not be expected to enter restoration areas.

Bald and Golden Eagles

There are Bald and Golden eagle home ranges or established territories within the project area. Bald eagles have been observed at fall migration Hawk Watches and their nests have been documented in near-inland sites surrounding Galveston Bay. Golden eagles have also been documented during fall migration but in limited numbers and their presence is temporary.

Migratory Birds

Open water in Galveston Bay provides habitat for migratory birds that use open water habitat for fishing, staging, and roosting purposes. For non-breeding migratory birds, open water habitat supports roosting and foraging use. The different bird taxonomic guilds and use activities are listed below:

Loons and Grebes – This group of birds may use waters surrounding the site locations during the fall, winter, and spring to forage. Presence in the area would be based on available forage fish and invertebrates. Construction activities may cause the birds to move to other foraging areas; however, no take is anticipated.

Waterfowl – Bay waters are used by several species of wintering waterfowl, primarily bay ducks. This group may be affected by construction activities. The temporary nature of construction and this bird group’s use of other available waters nearby would avoid take.

Pelicans and Cormorants – These would use the open bay to forage. Construction activities would cause the birds using the area to move to other locations in the bay. Acclimation to construction activities may take place.

Terns and Gulls – These species would use the open bay habitat to forage. These birds would move to other nearby sites in the bay system to forage.

Environmental Consequences

Section 6.4.12.1.2 of the Final PDARP/PEIS, which describes the impacts to biological resources from restoration projects intended to restore oyster reef habitat, is incorporated here by reference. Impacts from projects intended to restore oyster reef habitat were described as causing long-term, minor adverse impacts.

Cultch placement activities may cause short-term, minor adverse impacts to fish (including EFH), sea turtles, dolphins, and (albeit unlikely) manatees in the form of direct injury and/or mortality. Cultch placement activities would be halted immediately if sea turtles or marine mammals were spotted near work areas, and work would only resume after the animals had moved away.

This project has been designed to meet the PDCs described in NMFS's Framework Biological Opinion on *Deepwater Horizon* Oil Spill Final Programmatic Damage Assessment and Restoration Plan and Final Programmatic Impact Statement (SER-2015-17459). NMFS' PDCs consider where construction would occur, construction methodologies, BMPs that would be implemented, and reporting requirements (NMFS 2016). In addition, project implementation would follow NMFS' Sea Turtle and Smalltooth Sawfish Construction Conditions (NMFS 2006); and follow NMFS' Vessel Strike Avoidance Measures and Reporting for Mariners (NMFS 2008). The construction of oyster reef would result in a positive benefit for protected species. Additional habitat complexity and increased productivity associated with reef habitats provide for greater production of fisheries resources that benefit protected species directly or indirectly through the production additional food sources. All required consultations (EFH, ESA etc.) would be completed prior to project implementation.

4.4.1.3 Human Uses and Socioeconomics

Galveston Bay has supported economic growth in the region and is surrounded by intensive urban and industrial development. Resources in the Galveston Bay watershed have been utilized for construction, transportation, oil, gas and petrochemical production, water supply, fisheries, agriculture, and recreational uses. Projected growth in population and economic activity would result in increasing use of the bay resources. Major expansions and management changes are in progress or proposed for the ports and navigation channels in the Galveston Bay system. More people would place more demands on the water supply, roads and highways, and land for development (GBEP 2011). This section includes discussions of socioeconomics and environmental justice, cultural resources, infrastructure, land and marine management, tourism and recreational use, fisheries and aquaculture, land and marine transportation, aesthetic and visual resources, and public health and safety issues.

4.4.1.3.1 Socioeconomics/Environmental Justice

Affected Resources

In 2015, the population in Galveston County was estimated to be over 300,000, which accounted for just over 1% of the Texas population. Approximately 59% of the population in Galveston County is white (not Hispanic or Latino), 23% is Hispanic or Latino, 14% is black or African American, and 3% is Asian. Around 18% of the county population speaks a language other than English at home. Median household income (2011-2015) in Galveston County and the state is $62,313 and $53,207, respectively, with 14% of the county and 16% of the state estimated to be living below the poverty level (US Census Bureau 2015).

The Gulf of Mexico ecosystem is home to some of the largest oyster reef habitats in the world. Oysters support a valuable commercial fishery in Texas, being harvested from public reefs (22,760 acres) and private oyster leases (2,321 acres). Over 90% of the public reef areas utilized by commercial and recreational fishermen are found in Galveston, Matagorda, and San Antonio Bays. All of the oyster leases occur in Galveston Bay. Commercial landings in 2000 exceeded 6.1 million pounds of meat with an ex-vessel value of over $11.1 million (Robinson n.d).

Environmental Consequences

Section 6.4.12.1.3 of the Final PDARP/PEIS, which describes the impacts to socioeconomic resources from restoration projects intended to restore oyster reef habitat, is incorporated here by reference. Impacts from projects intended to restore oyster reef habitat were described as causing minor to moderate short- and long-term adverse impacts to human use within the areas designated as oyster reserves. Designation of some restored reefs as closed to harvest could result in a short- and long-term, minor adverse effect; oyster harvesters should benefit long term through increased oyster recruitment to fished reefs over the long term, due to the increased supply of oyster larvae to the system provided by the reserves.

This project would not adversely affect socioeconomics and or environmental justice. Existing reefs would not be closed as part of this restoration project. In consideration of Executive Order (EO) 12898, Environmental Justice, this restoration activity does not have the potential to adversely and/or disproportionately affect minority or low-income populations, including economically, socially, or in terms of conditions affecting their health. Restoration of the oyster reefs would not be directly affecting any residents. This restoration project would help restore an environment that is of benefit to all citizens, populations, and groups in Texas and beyond.

Long-term beneficial socioeconomic impacts would be expected from implementation of this restoration alternative by ultimately increasing recreational and commercial shellfish harvest opportunities. Restoration could increase the natural productivity of the shallow water area, thereby improving the quality of habitat and increasing oyster recruitment, potentially leading to increased revenue from commercial and recreational activities. The restoration of the reefs as a living shoreline could also provide long-term socioeconomic benefits by reducing the risk of potential hazards, such as storm surges, and improve shoreline integrity to areas near the restored reefs.

Short-term beneficial impacts to the local and regional economies would occur from increases in construction jobs and demand for workforce to support the restoration projects. These jobs would provide income, sales, and downstream economic activity in the region. Any non-local workers, brought in for a short period of time, would bring in additional spending as workers stay in local hotels and eat in local eating and drinking establishments. Project spending would include and contribute to support of the workforce needed to design, engineer, manage, and carry out the projects. Additionally, locally purchased (or rented) equipment and materials would also benefit regional economies. Commercial fishing (shrimp, crab and oyster fisheries) occur in Upper Galveston Bay and would benefit over the long term from this project.

4.4.1.3.2 Cultural Resources

Affected Resources

Since specific locations in Upper Galveston Bay for this project have not yet been chosen, the review under Section 106 of the National Historic Preservation Act (NHPA) has not been completed and no culturally or historically important resources have been identified that would be impacted by restoration activities. If any culturally or historically important resources are identified during the site selection process, such areas would be avoided during construction. A complete review of this project under Section 106 of the NHPA would be completed prior to any project activities that would restrict consideration of measures to avoid, minimize, or mitigate any adverse effects on historic properties located within the project area. This project would be implemented in accordance with all applicable laws and regulations concerning the protection of cultural and historic resources.

Environmental Consequences

Section 6.4.12.1.3 of the Final PDARP/PEIS, which describes the impacts to cultural resources from restoration projects intended to restore oyster reef habitat, is incorporated here by reference. Restoring oyster reef habitat could result in minor (temporary disturbance) to moderate (disturbance without loss of cultural information) impacts on cultural or historic resources that may be located in the area of the restoration.

No adverse impacts to cultural resources are anticipated as a result of this project. Coordination under Section 106 NHPA has been initiated for this project. If any culturally or historically important resources are identified during project preparations or pre- deployment surveys, such areas would be avoided during construction. A complete review of this project under Section 106 of the NHPA is ongoing and would be completed prior to any project activities that would restrict consideration of measures to avoid, minimize or mitigate any adverse effects on historic properties located within the project area. This project would be implemented in accordance with all applicable laws and regulations concerning the protection of cultural and historic resources.

4.4.1.3.3 Infrastructure

Affected Resources

Reef restoration activities would be limited to off-shore, shallow open water areas in Upper Galveston Bay. Active and plugged oil and gas wells and gas gathering and crude transmission lines are present in

Upper Galveston Bay (RRC 2017). These resources would be considered during the site selection process and avoided during construction.

Environmental Consequences

No adverse impacts to infrastructure are anticipated to occur since new infrastructure would not be built and existing infrastructure in the area would be avoided.

4.4.1.3.4 Land and Marine Management

Affected Resources

Uses of bay bottoms in the vicinity of the project are managed by the TGLO. Affected resources include the harvested oyster reefs in Galveston Bay, which are managed by Texas Parks and Wildlife through private oyster leases and public reefs.

Environmental Consequences

The project is not anticipated to adversely impact land and marine management, since the project would be consistent with the prevailing management, practices, plans, and direction governing the use of the areas where the oyster reef restoration would take place. A net enhancement of the managed oyster fishery is anticipated by the creation of additional oyster reefs within upper Galveston Bay.

4.4.1.3.5 Tourism and Recreational Use

Affected Resources

Approximately 5 million people live around Galveston Bay. The Bay is heavily used and attracts a substantial number of visitors, including a wide range of tourists and recreational users. Commercial and recreational fishing, boating, and potentially wildlife viewing occurs in the open water areas. Oystermen, fishermen, and other boaters may use some restoration areas (sink reefs) for recreational or commercial purposes. Oystermen and fishermen may wade fish, use motorized boats, or use paddling craft such as kayaks and/or canoes. Communities along the shore of Upper Galveston/Trinity Bay contain homes and structures, commercial facilities, recreational vehicle parks, docks and marinas, parks, and WMAs. The bay has a substantial number of recreational visitors participating in activities such as fishing, paddling, and bird/nature watching. Consideration would be provided to both established and occasional users through the use of public meetings and signage.

Efforts would be made to avoid or minimize impacts to public boat launch facilities. Appropriate signage and buoy markers at the restoration sites would be displayed. Postings in local media would also take place to ensure that efforts are made to inform both recreational and commercial users. Due to the potential increased barge and small boat traffic present during construction activities, appropriate safety measures would be employed to ensure that water related accidents and conflicts are minimized.

Environmental Consequences

Section 6.4.12.1.3 of the Final PDARP/PEIS, which describes the impacts to socioeconomic resources from restoration projects intended to restore oyster reef habitat, is incorporated here by reference. As stated in the Final PDARP/PEIS, long-term beneficial impacts would be expected from increasing recreational shellfish harvest opportunities.

This project would result in minor short-term adverse impacts to tourism and recreation in the vicinity of the project construction due to construction noise, equipment, and activities. Long-term beneficial impacts to tourism and recreational use would be expected from implementation of this restoration alternative by ultimately increasing recreational shellfish harvest opportunities as well as enhanced recreational fishing in the vicinity of the constructed reef structures. Restoration could increase the natural productivity of the shallow water area, thereby improving the quality of habitat and increasing oyster recruitment, potentially leading to increased revenue from recreational activities.

4.4.1.3.6 Fisheries and Aquaculture

Affected Resources

Commercial and recreational fishing occurs in the open water and oyster reef areas. Oystermen, fishermen, and other boaters may use some restoration areas (sink reefs) for recreational or commercial purposes. Oystermen and fishermen may wade fish, use motorized boats, or use paddling craft such as kayaks and/or canoes.

Environmental Consequences

This alternative could result in minor short-term and long-term adverse impacts to human use within the areas designated as oyster reserves; designation as a source reef would remove some areas from potential harvest. This is expected to be a short-term, minor adverse effect, as oyster harvesters should begin to see increased oyster recruitment to fished sink reefs over the long-term due to the increased supply of oyster larvae to the system provided by the source reefs.

Long-term beneficial impacts to fisheries and aquaculture would be expected from implementation of this restoration alternative by ultimately increasing recreational and commercial shellfish harvest opportunities. Restoration could increase the natural productivity of the shallow water area, thereby improving the quality of habitat and increasing oyster recruitment, potentially leading to increased revenue from commercial and recreational activities. Oyster reefs are designated as EFH for red drum and white and brown shrimp. An increase is the areal coverage of oyster reefs could lead to an increase in nursery and foraging habitat for those species.

4.4.1.3.7 Land and Marine Transportation

Affected Resources

Recreational and commercial interests use the Galveston Bay System for marine transportation. Major shipping channels include the GIWW and the Houston Ship Channel. The numerous docks surrounding the Bay may be used to access the waters. Specific information on the location of the docks is available through TGLO's Texas Beach and Bay Access Guide.

Environmental Consequences

Any adverse impacts would be minor and short-term associated with the temporary increases in road and water traffic resulting from the transportation of workers and equipment during construction activities.

Shipping routes would be identified prior to the selection of reef restoration sites to prevent any impacts to marine transportation. Activities related to construction would require coordination with the users of the waterway. Barges would be staged adjacent to the restoration sites and not within approved waterways. It is expected that activities would not interrupt traffic to any significant degree. Most commercial traffic would take place on a routine schedule, and construction activities would be timed to reduce any interference with commercial operators.

4.4.1.3.8 Aesthetics and Visual Resources

Affected Resources

The affected environment consists of open shallow water in Upper Galveston Bay. The landscape in Upper Galveston Bay is characterized by a mosaic of open water, coastline, and rookery islands. There are no designated protected viewsheds in the vicinity of the project area. Equipment and construction activities related to reef restoration would be visible from shore and those persons present in the bay on boats.

Environmental Consequences

Construction activities would be expected to have a minor, short-term adverse impact on aesthetics and visual resources in Upper Galveston Bay by the presence of barges, excavators, and workers on the water at restoration sites. Restoration of the oyster reefs would be expected to have a long-term benefit to the aesthetics and visual resources by improving wildlife variety and abundance.

4.4.1.3.9 Public Health and Safety

Affected Resources

Upper Galveston Bay is used by commercial fisheries, industrial, and recreational users. Recreational angling is significant and is primarily conducted from boats for areas near the potential site. Efforts would be made to avoid or minimize impacts to public boat launch facilities. Appropriate signage and buoys markers at the site and at boat ramps would be displayed. Postings in local media would also take place to ensure that efforts are made to inform recreational users. Due to the potential increase in small boat traffic (construction related) in the area, appropriate safety measures would be employed to ensure that risk to water related accidents and or conflicts are minimized.

Restoration of degraded oyster reefs in Upper Galveston Bay is not anticipated to generate hazardous waste or the need for disposal of hazardous waste. All occupational and marine safety regulations and laws would be followed to ensure safety of all workers and monitors. The project deployment would use mechanical equipment and marine vessels that use oil, lubricants, and fuels.

Environmental Consequences

Short-term minor indirect adverse impacts in the immediate area could occur during construction through limits on recreational activities near the construction areas to protect public safety. Construction activities could result in short-term minor adverse impacts to public health and safety as a result of the operation of heavy equipment and construction materials. In addition, if hazardous chemicals or other materials are unintentionally released into the environment, soils, groundwater, and surface waters would be adversely impacted. Similarly, construction projects involving the use of boats and barges, and associated equipment, for the placement of materials to create habitat could impact the public through construction activities and the potential to contaminate surface waters.

Any hazardous materials handled during construction would be contained and appropriate barriers would be in place to ensure the protection of adjacent water resources from potential spills and leaks. In the event of a discharge of oil or release of hazardous substances, the release would be reported to the National Response Center and Texas Emergency Oil Spill and Hazardous Substance Reporting line as required.

BMPs in accordance with Occupational Safety and Health Administration and state and local requirements would be incorporated into construction activities to ensure the proper handling, storage, transport and disposal of all hazardous substances. Personal protective equipment would be required for all construction personnel. Due to the potential increase in small boat traffic (construction related) in the area, appropriate safety measures would be employed to ensure water related accidents and conflicts are minimized.

Benefits to public health and safety would occur from the increased filtration of pollutants by oysters. This would benefit the public by having cleaner water and, thereby improving coastal resiliency.

4.4.2 McFaddin Beach and Dune Restoration

The McFaddin Beach and Dune Restoration project would include placement of sand along approximately 17 miles of shoreline in northeastern Texas. This project is proposing to fund about one-third of the estimated $45,000,000 total project cost. The Texas TIG would partner with other funding sources to complete construction implementation, monitoring, and/or planning activities. This project would provide important ecological benefits by restoring lost beach and dune habitat. The estimated cost of the Texas TIG proposed contribution towards this project is $15,874,000.

The environmental impacts analysis under NEPA in this RP/EA incorporates by reference two other previously-conducted NEPA analyses and conclusions: (1) The Environmental Assessment and Statement of Findings associated with USACE Permit SWG-2015-00444; and (2) NEPA analysis conducted by the USFWS in its September 2016 Environmental Assessment: Beach Ridge Restoration on McFaddin NWR. The findings of the USFWS NEPA analysis are summarized in USFWS's Environmental Action Statement.

The USACE Permit [Application] (SWG-2015-00444) included:

- Description of the project and project area, maps showing the project location (Exhibits A through C),
- Engineering designs (Exhibits D and E),
- Offshore information (Exhibits F and G),
- Alternatives analysis (Exhibit H),
- Biological assessment (Exhibit I),
- Cultural resources report for the offshore borrow area (Exhibit J),
- Final report for the phase I archaeology survey for McFaddin NWR beach (Exhibit K),
- Design phase geotechnical and geophysical investigation that identified sand sources for beach nourishment (Exhibit L),
- Photographs of the project area (Exhibit M),
- Map of the adjacent properties (Exhibit N),
- Application for consistency with the Texas Coastal Management Program (Exhibit O),
- TCEQ Tier II 401 Certification Questionnaire and Tier II Alternative Analysis Checklist (Exhibit P), and
- Spill control/contingency plan (Exhibit Q).

The alternatives analyzed in Exhibit H were related to the construction methods and potential borrow source locations. Construction alternatives were evaluated for potential environmental impacts, potential impacts to recreation and navigation, cost, and delivery time. Borrow source location alternatives were evaluated for proximity to the project site, material quality and similarity to native material at the project site, quantity available, accessibility, and cost. The selected alternatives are consistent with what is being proposed for implementation in this RP/EA.

The Individual Permit Application and its analysis are therefore incorporated by reference (per Council on Environmental Quality (CEQ)'s NEPA regulations at 40 CFR §1502.21) as applicable. This summation is not fully inclusive of the extensive information found in the Individual Permit Application. Readers should reference the Individual Permit Application for complete information.

The permit (SWG-2015-00444) for the McFaddin Beach and Dune Restoration project was approved by the USACE in November 2016. The USACE conducted an analysis pursuant to NEPA and developed an Environmental Assessment and Statement of Findings (EA and SOF) in response to the application for the beach ridge permit. The EA and SOF did not identify any significant environmental effects resulting from the proposed work. The USACE evaluated the impact of this activity on aspects affecting the quality of the human environment and determined that this action does not require an environmental impact statement (USACE 2016a).

USFWS also conducted an EA (LJA Engineering 2016), and made a determination pursuant to NEPA. For the purposes of this project, the Texas TIG incorporates by reference the USFWS EA. The Environmental Action Statement summarized (USFWS 2016b) findings from the EA:

> The proposed action would not constitute a major Federal action significantly affecting the quality of the human environment […] Temporary effects to water

> quality are expected to be minimal and short-term and are not expected to negatively affect any listed species. Ultimately, the project would enhance habitat in the area, which could potentially have a beneficial effect on species listed under the Endangered Species Act (ESA) […]
>
> The project is not expected to significantly contribute to cumulative effects of (sic) any ESA-listed species. There would be a significant net benefit to the McFaddin NWR and shoreline. All adverse impacts [such as excavation and burying of macrobenthos, turbidity, and disturbance] associated with the construction of the dune ridge/beach nourishment project are considered short-term and primarily restricted to the construction phase of the operation. No net cumulative impacts are expected as a result of sediment placement. Once sediments have been discharged and spread into associated configurations, new habitats are created for shorebirds and other wildlife. These actions would result in a wider and more stabilized beachhead that is intended to provide protection for the area infrastructure and wetlands for decades to come.

This EA is inclusive of the project activities described herein and the EA considers the Incident in the analysis of the affected environment. Adverse impacts would be caused by the dredging and placement of sediments. These actions could cause increases in turbidity, burial of organisms, generation of GHG emissions and noise from the temporary use of heavy equipment. Disturbance would cause protected species as well as other fauna to relocate from the project area and temporary closures of recreation areas (including driving on beaches) to maintain public safety. These actions would negatively affect the viewshed.

In addition to the habitats described in the USFWS EA (LJA Engineering 2016), the project area contains supratidal wetland marsh that is fairly uniform throughout the entire project area. The marsh is dominated by gulf cordgrass and bushy seaside tansy. For planning purposes, the Texas TIG is over estimated that there may be wetlands located along the entire project area (approximately 17 miles) and could extend 300 feet inland of the beach face. About 620 acres of wetland could potentially be present within the project area. Although there may be minor adverse impacts to wetlands from the restoration of the dunes and beaches (i.e., addition of material into the wetlands), the impacts would be offset by the protection that the restored dunes would provide to wetlands within McFaddin NWR. This project would benefit the 59,000 acres of wetlands within McFaddin NWR by providing a natural barrier to regular influxes of gulf waters that have caused marsh loss and erosion.

The impacts from the project are largely beneficial and the adverse impacts are minor to moderate. Benefits to the physical resources, biological resources, and to human uses and socioeconomics would result if this project was implemented. A TGLO Coastal Surface Lease would be acquired prior to initiation of activities on state owned submerged water bottom to allow for construction activities. BMPs required in the permit, consultations, or environmental reviews would be followed. Additionally, BMPs described in Appendix 6.A of the Final PDARP/PEIS as well as Appendix B of this document would be considered and applied where appropriate, to reduce or eliminate impacts to the environment. A summary of the conclusions of this analysis are in Table 4-5. Categories and terminology in the table follow a consistent format used for all projects in this RP/EA. Information from this EA was used to populate this table using the definitions provided in Appendix C.

NOTE: Immediately prior to the publication of this Final RP/EA, the Texas TIG learned that, based on the results of a recently completed pilot study, it may be necessary to expand the existing borrow area or identify an additional borrow area. The preceding environmental impacts analysis reflects the project as originally planned and is *not* inclusive of an expanded/additional borrow area. If that change becomes necessary, the Texas TIG will revisit its impacts analysis and determine whether any supplemental analysis or NEPA documentation is required.

Table 4-5. Summary of beneficial impacts as well as short-term and long-term adverse impacts from implementation of the McFaddin Beach and Dune Restoration project

Resource Categories	Benefits	Adverse Short-Term	Adverse Long-Term
Physical Resources			
Geology and Substrates	Yes	Minor	Minor
Hydrology and Water Quality	NE	Minor	NE
Air Quality and GHG Emissions	Yes	Minor	NE
Noise	NE	Minor	NE
Biological Resources			
Habitats	Yes	Minor	Minor
Living Coastal and Marine Resources	Yes	Moderate	NE
Protected Species	Yes	Minor	NE
Human Uses and Socioeconomics			
Socioeconomics and Environmental Justice	NE	NE	NE
Cultural Resources	NE	NE	NE
Infrastructure	NE	NE	NE
Land and Marine Management	NE	NE	NE
Tourism and Recreation Use	Yes	Minor	NE
Fisheries and Aquaculture	NE	Minor	NE
Land and Marine Transportation	NE	Minor	NE
Aesthetics and Visual Resources	Yes	Minor	Minor
Public Health and Safety	Yes	NE	NE

Notes: Yes – provides benefits
NE – no effect

Adverse short-term and long-term impacts are designated as minor, moderate, or major

4.4.3 Bessie Heights Wetland Restoration

The Bessie Heights Wetland Restoration project would restore wetlands in Bessie Heights Marsh located within the Lower Neches WMA in Orange County, Texas. The project would beneficially use sediment obtained from dredging of the federally managed SNWW, and mining dredged material from DMPAs and private navigation channels and berths to restore coastal wetlands. The placement of dredged material, construction of containment levees, and associated planting would restore up to 900 acres of intertidal marsh. The estimated cost for the project is $4,905,000.

This analysis tiers from the relevant portions of Section 6.4.1.1 of the Final PDARP/PEIS. The Final PDARP/PEIS provides programmatic evaluation of the environmental consequences of the Restoration Approach “Create, restore, and enhance coastal wetlands”, which are considered in this RP/EA and are incorporated by reference here. Tiering from that analysis, this section presents the Affected Resources of the Bessie Heights Wetland Restoration and the environmental consequences of the proposed actions in context of the project-specific affected environment.

The programmatic analysis looked at a series of resources as part of the biological, physical, and socioeconomic environment. As required in a tiered analysis, the evaluation of each project focuses on the specific resources with a potential to be affected by the project.

The description and analysis of the project below are based on a project-specific preliminary design concept rather than detailed engineering plans. Throughout the design process, every practical attempt would be made to avoid and minimize potentially adverse environmental and cultural resource impacts. The following descriptions for each of the construction elements are preliminary and based on current planning efforts and resource agency experience with similar projects. While the Texas TIG does not consider it likely, it is possible that the E&D process could generate a plan that has environmental impacts that are different in type or magnitude from those discussed in this document. If that is the case, the Texas TIG would consider whether further environmental impacts analysis would be necessary.

The impacts from the project are largely beneficial and the adverse impacts are minor. Benefits to the biological, physical, and human uses and socioeconomics environment would result if this project was implemented. BMPs required in the permit, consultations, or environmental reviews would be followed. Additionally, BMPs described in Appendix 6.A of the Final PDARP/PEIS as well Appendix B of this document would be considered and applied where appropriate, to reduce or eliminate impacts to the environment. A summary of the conclusions of this analysis are in Table 4-6. Categories and terminology in the table follow a consistent format used for all projects in this RP/EA. Information from this EA was used to populate this table using the definitions provided in Appendix C.

Table 4-6. Summary of beneficial impacts as well as short-term and long-term adverse impacts from implementation of the Bessie Heights Wetland Restoration project

Resource Categories	Benefits	Adverse Short-Term	Adverse Long-Term
Physical Resources			
Geology and Substrates	Yes	Minor	Minor
Hydrology and Water Quality	Yes	Minor	Minor
Air Quality and GHG Emissions	Yes	Minor	NE
Noise	NE	Minor	NE
Biological Resources			
Habitats	Yes	Minor	NE
Living Coastal and Marine Resources	Yes	Minor	NE
Protected Species	Yes	Minor	Minor
Human Uses and Socioeconomics			
Socioeconomics and Environmental Justice	Yes	NE	NE
Cultural Resources	NE	NE	NE
Infrastructure	NE	NE	NE
Land and Marine Management	NE	NE	NE
Tourism and Recreation Use	Yes	Minor	NE
Fisheries and Aquaculture	Yes	Minor	NE
Land and Marine Transportation	NE	NE	NE
Aesthetics and Visual Resources	Yes	Minor	Minor
Public Health and Safety	Yes	Minor	NE

Notes: *Yes – provides benefits*
NE – no effect
Adverse short-term and long-term impacts are designated as minor, moderate, or major

4.4.3.1 Physical Environment

The physical environment is divided into geology and substrates, hydrology and water quality, air quality and GHG emissions, as well as noise characteristics of the area.

4.4.3.1.1 Geology and Substrates

Affected Resources

The Orange County landscape is dominated by the broad flat valleys of the Sabine and Neches Rivers that are covered by coastal-type marsh vegetation. Geologic units exposed in the area include the Beaumont Clay, Deweyville Formation, and Quaternary alluvium. The surface topography of the project area is mainly flat to gently rolling and slopes to the southeast toward the Gulf. The coastal areas are barrier headlands consisting of beach or eroding marsh shores, dune and supratidal habitats that naturally decrease in elevation toward fringing intertidal marshes, lakes, and ponds. The coastal zone is underlain by sedimentary deposits that originated in ancient but similar coastal systems - Recent and Holocene-age alluvium containing thick deposits of clay, silt, sand, and gravel, overlying the Pleistocene Beaumont Formation (Barnes 1982, 1987; McGowen et al. 1976). These formations consist mainly of stream channel, point bar, natural levee, and backswamp deposits associated with former and current river channels and bayous. The substrate in the vicinity of the restoration sites is predominantly comprised of fine silts, clay alluvium, and peat overlying the Beaumont Clay. The Bessie Heights site would be restored over submerged sediments in subtidal/estuarine marsh habitat.

Environmental Consequences

Section 6.4.1.1 of the Final PDARP/PEIS, which describe the impacts to geology and substrates from restoration projects intended to create, restore, and enhance coastal wetlands, is incorporated here by reference. Impacts from projects intended to create, restore, and enhance coastal wetlands were described as having minor to moderate short-term adverse impacts on geology and substrates as well as beneficial impacts.

As explained in the 2011 USACE Final Environmental Impact Statement (FEIS) for the SNWW Channel Improvement Project, impacts on local geology during dredging and dredged material placement associated with the proposed BUDM construction would include redistribution of existing sediment, potential increase of local scouring and shoaling rates, and reduced erosion of inshore channel shorelines. While local changes would occur to bathymetry and topography during construction and operation of the project, these alterations would be expected to have negligible impacts on the regional physiography of the submerged and subaerial portions of the project area. No impacts associated with geologic hazards are expected, and impacts on local geology are expected to be minimal (USACE 2011). The project would have minor short-term adverse impacts to geology and substrates. Impacts from construction activities, use of heavy equipment, and trenching for sediment transport can cause direct localized and short-term, minor adverse impacts from sediment disturbance and compaction. Long-term, minor adverse indirect impacts on the physical environment could occur from the placement of dredged material, which may affect sediment dynamics. BMPs would be used where and when appropriate to minimize adverse impacts. Additionally, this project provides beneficial impacts to Bessie Heights by restoring the area to a suitable elevation to sustain historical marsh habitat.

Mitigation measures to minimize adverse impacts to geology and substrates could include employment of standard BMPs for construction to reduce erosion and loss of sediments.

4.4.3.1.2 Hydrology and Water Quality

Affected Resources

The Sabine region’s circulation and salinity patterns are complex. Fresh water enters the system through several tributaries, including the Sabine and Neches Rivers. The Sabine and Neches Rivers flow into Sabine Lake and into the Gulf of Mexico through Sabine Pass. The SNWW Navigation Channel system serves as a pathway for both freshwater from the inflowing rivers and the saltwater wedge coming up the deep draft channel through Sabine Pass. This combination results in highly stratified conditions in the navigation channel, bringing saltwater up the SNWW and into the northwest corner of Sabine Lake and the lower reaches of the Neches River. As a result, the observed salinity in Sabine Lake is highest at both the southern end, where the lake connects to Sabine Pass, and the northern end, where the lake connects to the SNWW. The lowest salinities are observed in the central and eastern portions of the lake, which are furthest from sources of salt water (USACE 2011).

Natural forces, which shape the system, include dominant south to southeast winds, tropical weather systems, and a substantial rainfall of over 60 inches per year. Flooding and freshwater inflows are key systemic processes, which buffer salinity and provide nutrients and sediments to extensive estuaries in the Sabine region.

The Sabine River has the largest water discharge at its mouth of any Texas river. The total basin drainage area is 9,756 square miles with 7,426 square miles within Texas borders (TCEQ n.d.). The tidal portion of the Sabine River, Texas river segment 0501, does not meet assigned water quality standards for bacteria and exceeds allowable concentrations of PCBs in fish tissue (TCEQ 2014). Sampling results of fish tissue in nearby Sabine Lake prompted the issuance of Texas Department of State Health Services Fish and Shellfish Consumption Advisory ADV-46 for Sabine Lake and all contiguous waters that recommended limited consumption of gafftopsail catfish (TDSHS 2011). The GIWW tidal portion, Neches-Trinity Coastal Basin segment 0702 adjacent to the J.D. Murphree WMA, was not found to be covered by any fish advisories and fully supported aquatic life, contact recreation, and general uses (TCEQ 2002).

The Neches River has a 10,011 square mile drainage basin that intersects the Sabine River at the north end of Sabine Lake. Similar to the Sabine River tidal portion, the Neches River tidal portion, Texas River segment 0601 adjacent to Bessie Heights, does not meet water quality standards for bacteria and allowable concentrations of PCBs in fish tissue (TCEQ 2015b). This portion of the Neches River discharges into Sabine Lake and is subject to the ADV-16 fish consumption advisory for gafftopsail catfish.

Environmental Consequences

Section 6.4.1.1 of the Final PDARP/PEIS, which describe the impacts to hydrology and water quality from restoration projects intended to create, restore, and enhance coastal wetlands, is incorporated here by reference. Impacts from projects intended to create, enhance, or restore coastal wetlands were described as having some short-term minor to moderate adverse impacts to turbidity with some long-term, minor impacts to existing substrate and hydrology. The Final PDARP/PEIS also describes beneficial impacts from this Restoration Approach on water quality and hydrology.

The project would have minor, short-term adverse impacts to water quality from increased turbidity during dredging activities and placement of fill material. Areas where dredged material would be placed for wetland restoration would be isolated from surrounding waters by temporary containment levees with weir structures to minimize the discharge of turbid water. These impacts would be localized to the project area and would be temporary in nature. The fill material would eventually settle in the placement area and the turbidity due to project activities would no longer occur. Similar impacts due to turbidity at the borrow site would occur regardless of the implementation of this project, as maintenance dredging of the GIWW and SNWW is an ongoing activity of USACE and is scheduled independently of this project.

Additional long-term, minor adverse impacts may occur to the existing substrate due to placement of dredged materials. This may in turn have long-term minor adverse impacts to hydrology where tidal connectivity is modified per the project design. However, long-term benefits would also occur from the restoration and levee protection of the marsh. This alternative would reconnect coastal marshes to tidal flooding, and would restore the natural hydrology of this habitat. This alternative also supports linkages within the broader coastal and nearshore ecosystem by restoring the natural movement of water, sediments, energy, and nutrients among habitats.

Measures to control turbidity and sediment movement would be in place to ensure water quality standards are met and sensitive resources are not affected. These measures may include appropriate water control structures to decant water, as well as the installation of silt fences or curtains, hay bales, filter-fabric, and/or temporary levees to control sediments and avoid negative impacts associated with the fill placement.

4.4.3.1.3 Air Quality and GHG Emissions

Affected Resources

Air Quality

Orange County is located in the Beaumont-Port Arthur (BPA) Air Quality Control Region. According to the EPA Region 6 (http://www.epa.gov/region6/6pd/air/pdl/non.htm), the BPA has been re-designated as attainment with the 1997 8-hour Ozone NAAQS. Further, the Sabine region is designated as attainment for all other criteria pollutants.

GHG Emissions

Criteria air pollutants and GHG emissions are largely generated by electricity production, vehicular movements, and commercial and residential buildings using electricity. GHG emissions would result from both the implementation and operation of the project from the use of vessels during construction and monitoring activities. Engine exhaust from barges, boats, excavators, and equipment would contribute to an increase in GHG emissions. BMPs would be considered and applied where appropriate and practical to reduce the release of GHGs during project implementation. BMPs considered would include using energy efficient machinery and equipment; the incorporation of anti-idling procedures; and the use of gas as compared to diesel.

Environmental Consequences

Section 6.4.1.1 of the Final PDARP/PEIS, which describe the impacts to air quality and GHG emissions from restoration projects intended to create, restore, and enhance coastal wetlands, is incorporated here by reference. Adverse impacts to air quality from projects intended to create, restore, and enhance coastal wetlands were described as being short-term and minor.

This project would have minor, short-term adverse impacts to air quality. Project implementation would require the use of equipment which would temporarily affect air quality in the project vicinity due to construction vehicle emissions. During dredging, excavation, or placement of materials to restore marshland elevations, there could be minor adverse impacts to air quality from the use of these heavy equipment and vehicles. The use of gasoline and diesel-powered construction vehicles and equipment could contribute to GHG emissions. Where applicable, electricity requirements would be met by local suppliers. To the extent possible, the project would consider resource conservation measures and technology to reduce energy use. Adverse impacts to air quality would be short-term, only occurring during active construction activities. Where appropriate, additional BMPs for minimizing impacts to air quality at the construction sites would be utilized (Appendix B).

Additionally, implementation of the project may have long-term benefits for air quality. Wetland and marsh soils are an important carbon sink. Reconstruction of marsh habitat and revegetation of newly deposited sediment would provide a means of carbon capture and a long-term benefit.

4.4.3.1.4 Noise

Affected Resources

The project location is adjacent to the SNWW, the third busiest waterway in terms of gross tonnage (American Association of Port Authorities 2013). Due to location, the Bessie Heights site experiences the ambient noise of marine transportation and the adjacent industry. Recreational and commercial waterborne traffic are common within Bessie Heights as the public accesses the natural resources and to support the Port Neches oil field.

Environmental Consequences

Section 6.4.1.1 of the Final PDARP/PEIS, which describe the impacts to noise from restoration projects intended to create, restore, and enhance coastal wetlands, is incorporated here by reference. Adverse impacts due to noise were described as being minor to moderate and short term.

The project would have minor, short-term adverse impacts due to noise from construction activities. Heavy equipment can cause direct localized and minor adverse impacts due to noise. This impact would be short-term and limited to the period of construction. Impacts on noise would be short-term because it would be limited to the construction period.

In order to mitigate some of the potential impacts from project activities due to noise, the timing of noise producing activities would be planned to minimize disturbance to nesting birds. To prevent disturbance to nearby residential communities, construction activities that produce significant noise would be limited to daylight hours.

4.4.3.2 Biological Environment

The wetland habitats on the upper Texas provide important wintering and migration stopover habitat for migratory birds, including Central Flyway waterfowl, shorebirds, wading birds, and marsh and waterbirds. A string of refuges and WMAs along the coast serve as critical staging areas for waterfowl migrating to and from Mexico. The Sabine Lake estuary is a vital habitat for fish and shellfish species found in the Gulf of Mexico. The biological environment discussion is divided into habitats, living coastal and marine resources, and protected species.

4.4.3.2.1 Habitats

Affected Resources

Large estuarine aquatic habitats are present in the Sabine system, including oyster reefs. Sabine Lake is currently closed to commercial oyster harvesting (USACE 2011). In addition to supporting a large commercial fishery, oyster reefs provide important habitats for numerous commercially and recreationally important fishery species, such as red drum and brown shrimp. Oysters are also vital to maintaining the water quality of estuarine systems. Through their filter-feeding activities, oysters remove nutrients, pollutants, and algae from the water column. The shallow Gulf of Mexico waters, tidal flats, and beaches provide important shallow water feeding, breeding and nesting habitat utilized by killdeer, black-necked stilt, and willet (USFWS 2008). This transition from land to sea contains a combination of salt-tolerant marsh and beach plants, which are adapted to shifting sands, high winds, and rising waters and help protect the dunes from erosion.

The Sabine Lake intertidal marshes consist of a continuum of vegetation communities comprised of plant species tolerant to the wide range of salinity in Sabine Lake. Salt marsh is located along the Gulf shoreline and higher salinity areas of the estuarine system. Subjected to regular tidal inundation, low saline marsh is dominated by smooth cordgrass and often accompanied by seashore saltgrass, blackrush, perennial saltmarsh aster, and marshhay cordgrass. Brackish marshes grade inland from salt marsh. The dominant species in low brackish marsh is saltmarsh bulrush; seashore saltgrass and marshhay cordgrass are co-dominant species in high brackish marsh. Intermediate marshes are subjected to periodic pulses of salt water and maintain a year-round salinity in the range of 3 to 4 ppt. The diversity and density of plant species are relatively high with marshhay cordgrass as the most dominant species. Co-dominant species in low marsh are seashore paspalum, Olney bulrush, California bulrush, and common reed; bulltongue and sand spikerush are also frequent.

Intertidal wetlands often exist as a mosaic of vegetated marsh and shallow sub-tidal flats. These shallow flats support diverse benthic communities that provide food sources for migratory waterfowl, estuarine depend fish and invertebrate species and other marsh fauna.

Environmental Consequences

Section 6.4.1.1 of the Final PDARP/PEIS describe the impacts to habitats from restoration projects intended to create, restore, and enhance coastal wetlands, is incorporated here by reference. Impacts from projects intended to create, restore, and enhance coastal wetlands were described as having short-term to long-term, minor to moderate adverse impacts on habitats.

The project would have short-term, minor adverse impacts to the habitat in the vicinity of the project area. The project would convert shallow open water to intertidal marsh. However, the project is anticipated to be an overall benefit to the local ecosystem. Mosaics of shallow open water and vegetated marsh have been shown to have higher ecologic function than either these habitats in isolation. Therefore, the final design would ensure adequate shallow open water would remain in Bessie Heights to maintain the synergies between these two habitats.

4.4.3.2.2 Living Coastal and Marine Resources

Affected Resources

Tidal marshes and shallow open water are the primary habitats within the Bessie Heights marsh. There are no seagrasses or oyster reefs/shell pads near the restoration site. These habitats are critical for many species of plants, fish, birds, and other wildlife. The wetland edge is a particularly important habitat for white and brown shrimp (Whaley and Minello 2002). Other marsh dwelling species include blue crab, red drum, spotted seatrout, Southern flounder and Gulf menhaden. Wetlands act as nurseries to hundreds of non-commercial species that comprise a large part of the bay food web. Bird species, such as snowy egrets, great egrets, roseate spoonbills, tri-colored herons, black-crowned night herons and great blue herons use marsh as feeding habitat.

The area also supports a large waterfowl population in the winter, as well as a variety of year-round bird species. Wading birds and shorebirds utilize the mudflats and shallow marsh ponds located throughout the area. Wintering waterfowl include gadwall, northern pintail, lesser scaup, American widgeon, and green winged and blue-winged teal. Other birds that utilize the marsh include king and clapper rails, seaside sparrow and other secretive marsh species.

Environmental Consequences

Section 6.4.1.1 of the Final PDARP/PEIS, which describe the impacts to living coastal and marine resources from restoration projects intended to create, restore, and enhance coastal wetlands, is incorporated here by reference. As explained in the Final PDARP/PEIS, short-term minor to moderate adverse impacts from construction could displace land-based or aquatic faunal species resulting from staging equipment and materials, as well as entrapment of marine mammals.

For this project, minor, adverse short-term impacts to living coastal marine resources would occur during project construction. However, the creation of additional highly-productive marsh habitat is anticipated to be largely ecologically beneficial. The creation of additional salt marsh habitat generates additional nursery habitat for many ecologically and economically important fish and invertebrate species.

It is possible that birds protected under the Migratory Bird Treaty Act and Texas Parks and Wildlife Code may nest in the project area. Efforts would be made to avoid construction activities during the nesting season (Feb 15 through Jul 31). However, if construction activities occur during the nesting season, the area affected by project activities would be surveyed for the presence of nesting birds by a qualified biologist. If nesting birds are present or indications of pre-nesting behavior are observed, appropriate BMPs would be employed to ensure that no incidental take of any individuals occurs. Example BMPs may include virtual fencing, signage, exclusion zones for workers and equipment, hazing, and deterrents. BMP activities would be coordinated with USFWS and TPWD biologists.

4.4.3.2.3 Protected Species

Protected species and their habitats include ESA-listed species and designated critical habitats, which are regulated by either the USFWS or the NMFS. Protected species and habitat also include marine mammals protected under the Marine Mammal Protection Act, EFH protected under the Magnuson-Stevens Act, migratory birds protected under the Migratory Bird Treaty Act and eagles protected under the Bald and Golden Eagle Protection Act.

Affected Resources

Threatened or Endangered Species

The eight endangered or threatened species that could potentially be affected are listed in Table 4-7. No activities related to implementation of the project would take place in any area designated as critical habitat.

Table 4-7. Federal Threatened and Endangered Species potentially affected in the Bessie Heights Wetland Habitat Restoration project area

Common Name	Status
Piping Plover	T
Red Knot	T
Loggerhead Sea Turtle	T
Green Sea Turtle	T
Atlantic Hawksbill Sea Turtle	E
Leatherback Sea Turtle	E
Kemp's Ridley Sea Turtle	E
West Indian Manatee	T

Notes: *E – federally endangered species*
T – federally threatened species

Essential Fish Habitat

The 1996 amendments to the Magnuson-Stevens Act set forth a mandate for NMFS, regional Fishery Management Councils (FMCs), and other federal agencies to identify and protect EFH of economically important marine and estuarine fisheries. To achieve this goal, suitable fishery habitats need to be maintained. EFH is separated into estuarine habitat types. Estuarine habitat is defined as “all estuarine waters and substrates (mud, sand, shell, rock and associated biological communities), including the sub-tidal vegetation (grasses and algae) and adjacent inter-tidal vegetation (marshes and mangroves).” EFH in the area of proposed action is identified and described for various life stages of managed fish and shellfish in the Gulf of Mexico. A provision of the Magnuson-Stevens Act requires that FMC's identify and protect EFH for every species managed by an FMP (U.S.C. 1853(a)(7)). There are FMPs in the Gulf region for red drum, shrimp, reef fish, and highly migratory species (HMS, e.g., sharks). Table 4-8 presents the EFH and species within the Bessie Heights Wetlands Restoration project area.

Table 4-8. EFH for estuarine habitats within the Bessie Heights Wetlands Restoration project area

Species Common Name	Eggs	Larvae	Post Larvae	Early Juvenile	Late Juvenile	Adult	Spawning Adult
Estuarine Emergent Marsh							
Red Drum			●	●	●	●	
Brown Shrimp			●	●			
White Shrimp			●	●			
Estuarine Mud/Soft Bottom							
Red Drum		●	●	●	●	●	
Brown Shrimp			●	●			
White Shrimp				●			

Note: ● indicates habitat type designated as EFH for species' life stage

Marine Mammals

The only marine mammal that is regularly found in Sabine Lake is bottlenose dolphin, however there are infrequent reports of sightings of West Indian manatees within the estuary.

Bald and Golden Eagles

Bald and golden eagles potentially forage within the project location.

Migratory Birds

Many species of birds spend all or a portion of their life cycle along the Gulf of Mexico using a variety of habitats at different stages. Major groups of birds that inhabit the northern Gulf of Mexico include waterfowl and other water-dependent species, pelagic seabirds, raptors, colonial waterbirds, marsh dwelling birds, and passerines.

Environmental Consequences

There would be short- and long-term minor adverse impacts to protected species. Sea turtles and marine mammals are not likely to be present in the restoration site due to the brackish to intermediate salinities and the shallow bathymetry of the Bessie Heights marsh. Impacts to wildlife would be avoided via management guidelines and techniques as appropriate. BMPs including the Sea Turtle and Smalltooth Sawfish Construction Conditions (NMFS 2006) and the Measures for Reducing Entrapment Risk to Protected Species (NMFS 2012) during levee construction to avoid entrapping marine mammals and other resources would be followed.

During construction, there would be short-term minor impacts to EFH through dredged material deposition and increased turbidity. The conversion of shallow open water to intertidal marsh would result in long-term minor adverse impacts to this habitat and species that utilize the habitat, including bald or golden eagles. However, this impact would be offset by the long-term major beneficial impact from restoring intertidal marsh. This project has been designed to meet the PDCs described in NMFS's Framework Biological Opinion on *Deepwater Horizon* Oil Spill Final Programmatic Damage Assessment and Restoration Plan and Final Programmatic Impact Statement (SER-2015-17459). NMFS' PDCs consider where construction would occur, construction methodologies, BMPs that would be implemented, and reporting requirements (NMFS 2016).

No known colonial water bird rookeries are located in the vicinity of Bessie Heights. The project is not likely to adversely affect piping plover or red knot. Piping plovers and red knots are not expected to occur in the construction area because typical habitats, beach and bayside tidal flat habitats, for the species do not exist. Piping plovers and red knots, if present and disturbed by construction noise, have access to nearby habitat that is within their normal flying distances for daily foraging movement. Forested areas in the construction right-of-way would be surveyed prior to construction to avoid impacting nesting bald eagles to ensure no adverse impacts to these species.

4.4.3.3 Human Uses and Socioeconomics

This section includes analyses of potential impacts to socioeconomics and environmental justice, cultural resources, infrastructure, land and marine management, tourism and recreational uses, fisheries and aquaculture, land and marine transportation, aesthetics and visual resources, and public health and safety.

4.4.3.3.1 Socioeconomics/Environmental Justice

Affected Resources

The 2016 population estimate for Orange County was 84,964 with 81% of the population identified as white (not Hispanic or Latino), 7% is Hispanic or Latino, 9% is black or African American, and 1% is Asian. Median household income (2011-2015) in Orange County is $49,763, with 16% of the county living below the poverty level (U.S. Census Bureau 2016f).

Environmental Consequences

Implementation of this project would not disproportionately place any adverse environmental, economic, social, or health impacts on minority and low-income populations. The project would have a positive, beneficial socioeconomic impact on surrounding communities of people equally. No residential communities are located adjacent to the project. As a result, there would be no potential for short-term impacts from construction.

The project may provide long-term benefits to recreationists through increased opportunities for wildlife viewing, kayaking, canoeing, hunting, fishing, and other recreational activities. Benefits to the local economy could accrue through an increase in employment and associated spending in the project area during construction and increased expenditures due to increased recreational visitation. In consideration of EO 12898, Environmental Justice, this restoration activity does not have the potential to adversely and/or disproportionately affect minority or low-income populations, including economically, socially, or in terms of conditions affecting their health. This restoration project would help restore an environment that is of benefit to all citizens, populations and groups in Texas and beyond.

4.4.3.3.2 Cultural Resources

Affected Resources

Coordination under Section 106 NHPA has been initiated for this project. There are no known historic sites or significant cultural, scientific, or historic resources in the area that would be affected by the proposed restoration actions. No cultural, scientific, or historic resources are known to be located in the vicinity of the project.

Environmental Consequences

Section 6.4.1.1 of the Final PDARP/PEIS, which describe the impacts to cultural resources from restoration projects intended to create, restore, and enhance coastal wetlands, is incorporated here by reference. As explained in the Final PDARP/PEIS, minor (small area of disturbance without substantial loss of cultural information) to moderate (disturbance without substantial loss of cultural information) impacts on cultural and historic resources due to construction activities such as dredging, addition of sediments or borrow materials, and/or removal of sediments could occur, depending on the scale of the action and site-specific characteristics. If cultural resources are discovered at the site, adverse impacts could include physical destruction or alteration of resources and may alter, damage, or destroy resources such as historic shipwrecks, engineering structures or landscapes, or connectivity with related sites.

No adverse impacts to cultural resources are anticipated as a result of this project. If any culturally or historically important resources are identified during project preparations or pre- deployment surveys, such areas would be avoided during construction. A complete review of this project under Section 106 of the NHPA is ongoing and would be completed prior to any project activities that would restrict consideration of measures to avoid, minimize or mitigate any adverse effects on historic properties located within the project area. This project would be implemented in accordance with all applicable laws and regulations concerning the protection of cultural and historic resources.

4.4.3.3.3 Infrastructure

Affected Resources

The Bessie Heights marsh is part of a WMA that has no infrastructure associated with its operations. Within Bessie Heights, there is infrastructure associated with oil and gas extraction from the Port Neches Oilfield.

Environmental Consequences

None of the proposed actions involves activities or potential results that could directly or indirectly affect, positively or negatively, energy production, transport, or infrastructure in this area of coastal Texas. The proposed action is anticipated to have no impact to infrastructure, since new infrastructure would not be built and existing infrastructure in the area would be avoided. Final E&D would include measures to avoid known oil and gas pipeline is the Bessie Heights marsh. Magnetometer surveys would be used as necessary to minimize uncertainty to avoid impacting any pipelines.

4.4.3.3.4 Land and Marine Management

Affected Resources

Lower Neches River WMA has 7,998 acres located near Bridge City in Orange County (TPWD 2017). The WMA is composed of three separate units. The Nelda Stark and Old River units are located adjacent to the lower Neches River. The Nelda Stark Unit is primarily shallow open water, which resulted from the degradation of a former marsh system by saltwater intrusion and subsidence. The Old River Unit, near the mouth of the Neches River, is a mixture of intermediate marsh and open water.

Environmental Consequences

The proposed action is anticipated to have no impact to land and marine management, since projects would be consistent with the prevailing management, practices, plans, and direction governing the use of the areas where restoration actions would take place.

4.4.3.3.5 Tourism and Recreational Use

Affected Resources

The Bessie Heights marsh is managed by TPWD as a part of the Lower Neches WMA. The management includes the use the marsh for recreational fishing and waterfowl hunting. The project area is open water, however, hunting, fishing, hiking and wildlife viewing are regularly enjoyed by the public on the Lower Neches WMA.

Environmental Consequences

Section 6.4.1.1 of the Final PDARP/PEIS, which describe the impacts to tourism and recreational use from restoration projects intended to create, restore, and enhance coastal wetlands, is incorporated here by reference. As stated in the Final PDARP/PEIS, short-term indirect adverse impacts in the immediate area could occur during construction through limits on recreational activities near the construction area and temporary increases in road traffic due to movement of construction vehicles.

The marsh habitat in Bessie Heights is a foundation for many recreational activities (e.g., fishing, bird watching, etc.) and the improvement in site conditions would enhance opportunities for, and quality of, a variety of recreational uses. Long-term benefits would come from restoring the nursery habitat of many recreationally important fish species which in turn, would be expected to benefit recreational fishing in the area.

4.4.3.3.6 Fisheries and Aquaculture

Affected Resources

The marshes and shallow open water of Bessie Heights are designated as EFH for brown and white shrimp and red drum. Commercial crabbing also occurs regularly in the vicinity of the project area.

Environmental Consequences

Section 6.4.1.1 of the Final PDARP/PEIS, which describe the impacts to fisheries and aquaculture from restoration projects intended to create, restore, and enhance coastal wetlands, is incorporated here by reference. As stated in the Final PDARP/PEIS, the noise and increased turbidity of surface waters arising from earth-moving activities during project construction are expected to cause minor, short-term impacts to existing fisheries. However, long-term benefits would arise from the improvement of habitat for commercially important brown and white shrimp fisheries and the recreational red drum fishery.

4.4.3.3.7 Land and Marine Transportation

Affected Resources

Bessie Heights for the most part is only accessible by water. There are small roads that the WMA staff can use to access the site; however, these are not used regularly for land-based transportation. The site is adjacent to the commercially important SNWW.

Environmental Consequences

The proposed action is anticipated to have no impact to land and marine transportation. As there is minimal access to the site, there would be no impact to land based traffic. Shipping routes would be identified prior to the dredge and beneficial use operations to prevent any impacts to marine transportation. Activities related to construction would require coordination with the users of the waterway. While the SNWW would be used to transport equipment and materials, barges would be staged adjacent to the project area and not within the authorized waterway. It is expected that activities would not interrupt the channel traffic to any significant degree. Most of the commercial traffic takes place on a routine schedule and construction activities would be timed to reduce any interference with commercial operators. The pipeline route would be clearly marked to avoid vessel strikes.

4.4.3.3.8 Aesthetics and Visual Resources

Affected Resources

The affected environment consists of the construction footprint of the project. The landscape in the vicinity of the proposed wetland restoration is characterized by a mosaic of open water, coastline, levees, and marsh habitat from previous restoration projects. The site is adjacent to the SNWW, a highly industrialized water body, and though the WMA is adjacent and undeveloped, the viewshed is dominated by the industrial nature of the area. There are no designated protected viewsheds in the vicinity of the project. Equipment and construction activities related to the restoration actions would be visible.

Environmental Consequences

Section 6.4.1.1 of the Final PDARP/PEIS, which describe the impacts to aesthetics and visual resources from restoration projects intended to create, restore, and enhance coastal wetlands, is incorporated here by reference. As stated in the Final PDARP/PEIS, there may be short-term adverse effects in the immediate area to aesthetics due to the presence of construction equipment during the construction period. There would be long-term minor impacts to aesthetics associated with the constructed breakwater structures. Upon completion, this project would have benefits to the area's aesthetics and visual resources. The creation of marsh habitat and planting of a mixture of emergent and upland vegetation would improve the overall viewscape of the project area. In addition, the new habitat is anticipated to attract additional birds and wildlife, which could be enjoyed by recreational users of the area.

4.4.3.3.9 Public Health and Safety

Affected Resources

The recreational and industrial users of Bessie Heights are accustomed to navigating the marsh via the existing channels and avoiding shallow areas and areas that contain obstructions. The immediate vicinity of the project area was historically uplands habitat, but has since been inundated primarily due to subsidence from growing industry in the area. This has had adverse impacts on coastal resiliency and deleterious effects on the protectiveness of the area for storm surges.

Environmental Consequences

Section 6.4.1.1 of the Final PDARP/PEIS, which describe the impacts to public health and safety from restoration projects intended to create, restore, and enhance coastal wetlands, is incorporated here by reference. As stated in the Final PDARP/PEIS, short-term indirect adverse impacts in the immediate area could occur during construction through limits on recreational activities near the construction area to protect public safety. Additionally, construction projects involving the use of boats and barges, and associated equipment, for the placement of materials to create habitat could impact the public through construction activities and the potential to contaminate surface waters, resulting in short-term minor adverse impacts.

BMPs in accordance with Occupational Safety and Health Administration and state and local requirements would be incorporated into construction activities on site to ensure the proper handling, storage, transport and disposal of all hazardous substances. Personal protective equipment would be required for all construction personnel and authorized access zones would be established at the perimeter of the worksite during construction. Due to the potential increase in small boat traffic (construction related) in the area, appropriate safety measures would be employed to ensure water related accidents and conflicts are minimized. No adverse effects to public health and safety are expected as a result of this project.

Outreach with recreational users of the site would also be used to inform the public of the bathymetry and topography of Bessie Heights marsh that would result from the project. Impacts to public safety would be minor and short-term as the user groups would adapt to the new conditions on site in a relatively short period of time. Improvements in water quality resulting from increased water filtration from these activities could also contribute long-term benefits to public health. Construction of breakwaters and wetland restoration and enhancement activities could provide benefits to coastal populations and infrastructure through improved flood and shoreline protection, thereby improving coastal resiliency. This benefit is particularly effective for low-energy storm events.

4.4.4 Pierce Marsh Wetland Restoration

The Pierce Marsh Wetland Restoration project would restore and conserve wetlands and coastal habitats by beneficially using dredged material to create a viable, vegetated, wetland habitat for a variety of plants, fish, birds, and other wildlife that frequent the area. The placement of dredged material and associated planting would restore up to 150 acres of marsh and contribute to an ongoing effort to restore the wetland complex in West Galveston Bay. The estimated cost for the project is $3,095,000.

This analysis incorporates by reference the relevant portions of Section 6.4.1.1 of the Final PDARP/PEIS. The Final PDARP/PEIS provides programmatic evaluation of the environmental consequences of the Restoration Approach “Create, restore, and enhance coastal wetlands,” which are considered in this RP/EA and are incorporated by reference here. Tiering from that analysis, this section presents the Affected Environment of the Pierce Marsh Wetland Restoration and the environmental consequences of the proposed actions in the context of the project-specific affected environment.

The programmatic analysis looked at a series of resources as part of the biological, physical, and socioeconomic environment. As appropriate in a tiered analysis, the evaluation of each project focuses on the specific resources with a potential to be affected by the project.

The description and analysis of the project below are based on a project-specific preliminary design concept rather than detailed engineering plans. Throughout the design process, every practical attempt would be made to avoid and minimize potentially adverse environmental and cultural resource impacts. The following descriptions for each of the construction elements are preliminary and based on current planning efforts and resource agency experience with similar projects. While the Texas TIG does not consider it likely, it is possible that the E&D process could generate a plan that has environmental impacts that are different in type or magnitude from those discussed in this document. If that is the case, the Texas TIG would consider whether further environmental impacts analysis would be necessary.

The impacts from the project are largely beneficial and adverse impacts are minor. Benefits to the physical, biological, and human uses and socioeconomics would result if this project was implemented. BMPs required in the permit, consultations, or environmental reviews would be followed. Additionally, BMPs described in Appendix 6.A of the Final PDARP/PEIS as well as Appendix B of this document would be considered and applied where appropriate, to reduce or eliminate impacts to the environment. A summary of the conclusions of this analysis are in Table 4-9. Categories and terminology in the table follow a consistent format used for all projects in this RP/EA. Information from this EA was used to populate this table using the definitions provided in Appendix C.

Table 4-9. Summary of beneficial impacts as well as short-term and long-term adverse impacts from implementation of the Pierce Marsh Wetland Restoration project

Resource Categories	Benefits	Adverse Short-Term	Adverse Long-Term
Physical Resources			
Geology and Substrates	Yes	Minor	Minor

Resource Categories	Benefits	Adverse Short-Term	Adverse Long-Term
Hydrology and Water Quality	Yes	Minor	Minor
Air Quality and GHG Emissions	Yes	Minor	NE
Noise	NE	Minor	NE
Biological Resources			
Habitats	Yes	Minor	NE
Living Coastal and Marine Resources	Yes	Minor	NE
Protected Species	Yes	Minor	Minor
Human Uses and Socioeconomics			
Socioeconomics and Environmental Justice	Yes	NE	NE
Cultural Resources	NE	NE	NE
Infrastructure	NE	NE	NE
Land and Marine Management	NE	NE	NE
Tourism and Recreation Use	Yes	Minor	NE
Fisheries and Aquaculture	Yes	Minor	NE
Land and Marine Transportation	NE	NE	NE
Aesthetics and Visual Resources	Yes	Minor	Minor
Public Health and Safety	Yes	Minor	NE

Notes: Yes – provides benefits
NE – no effect
Adverse short-term and long-term impacts are designated as minor, moderate, or major

4.4.4.1 Physical Environment

The physical environment is divided into geology and substrates, hydrology and water quality, air quality and GHG emissions, as well as noise characteristics of the area.

4.4.4.1.1 Geology and Substrates

Affected Resources

Historically, Pierce Marsh was a salt marsh crisscrossed with channels on the north shore of West Galveston Bay. Currently, the project area is completely inundated primarily due to subsidence. Pierce Marsh would be restored over submerged sediments in subtidal unvegetated flats. Sediment cores have been collected in the project area as a part of ongoing restoration and monitoring projects and the substrate composition has been analyzed. The substrate varies throughout the restoration and borrow sites, but is predominantly comprised of fine silt overlying a lay of clay of varying depths (Howard and Dobberstine 2008).

Environmental Consequences

Section 6.4.1.1 of the Final PDARP/PEIS, which describe the impacts to geology and substrates from restoration projects intended to create, restore, and enhance coastal wetlands, is incorporated here by reference. Impacts from projects intended to create, restore, and enhance coastal wetlands were described as having minor to moderate short-term adverse impacts on geology an substrates as well as beneficial impacts.

The project would have minor short-term adverse impacts to geology and substrates. Impacts from construction activities, use of heavy equipment, and trenching for sediment transport can cause direct localized and short-term, minor adverse impacts from sediment disturbance and compaction. Preexisting levees may be raised to a sufficient height to contain dredged sediment at the appropriate depth to establish marsh habitat. This action would affect marsh substrates during the construction period. Long-term, minor adverse indirect impacts on the physical environment could occur from the placement of dredged material, which may affect sediment dynamics. BMPs would be used where and when appropriate to minimize adverse impacts. Additionally, this project provides beneficial impacts to Pierce Marsh by restoring the area to a suitable elevation to sustain historical marsh habitat.

Mitigation measures to minimize adverse impacts to geology and substrates could include employment of standard BMPs for construction to reduce erosion and loss of sediments.

4.4.4.1.2 Hydrology and Water Quality

Affected Resources

Pierce Marsh is a 2,346-acre area located on the north shore of Galveston Bay within the coastal plains ecoregion. Much of the area consists of marsh and slow-moving coastal bayous. The project area is bordered to the east by Galveston Bay and to the northeast by Swan Lake, a sub-bay of Lower Galveston Bay. Several industrial facilities, including the closed Solutia South 20 site, the GCWDA Campbell Bayou facility, and a closed Texas City landfill are located west of the project area. Protected marsh and wetlands owned by Scenic Galveston, Inc. border the southern portions of Pierce Marsh.

Pierce Marsh was once part of Basford Lake, a salt marsh crisscrossed with channels and rich with fish and wildlife. Gradually, the marsh became inundated due to subsidence and much of that salt marsh habitat was lost. Since the late 1990s, several distinct marsh restoration activities, including marsh terracing and BUDM, improved over 400 acres at the site. There is additional capacity within dredged material containment levees constructed for a recently implemented beneficial use project.

According to the EPA’s water quality index, Galveston Bay received a poor rating. Galveston Bay is rated fair for dissolved inorganic nitrogen concentrations and rated poor for dissolved inorganic phosphorus concentrations (EPA 2007a). Thirteen percent of the estuarine area was rated poor for dissolved inorganic nitrogen concentrations, and 68% of the estuarine area was rated poor for dissolved inorganic phosphorus concentrations. Expectations for water clarity are similar to those for normally turbid estuaries, with water clarity rated poor at a sampling site if light penetration at 1 meter was less than 10% of surface illumination. Dissolved oxygen conditions in Galveston Bay are rated as “good” (EPA

2007a). There are restricted consumption advisories in Galveston Bay for all species of catfish, spotted seatrout, and blue crab due to elevated levels of PCBs and dioxin (TDSHS 2013).

Environmental Consequences

Section 6.4.1.1 of the Final PDARP/PEIS, which describes the impacts to hydrology and water quality from restoration projects intended to create, restore, and enhance coastal wetlands, is incorporated here by reference. Impacts from projects intended to create, enhance, or restore coastal wetlands were described as having some short-term minor to moderate adverse impacts to turbidity with some long-term, minor impacts to existing substrate and hydrology. The Final PDARP/PEIS also describes beneficial impacts from this restoration approach on water quality and hydrology.

The project would have minor, short-term adverse impacts to water quality from increased turbidity during dredging activities and placement of fill material. These impacts would be localized to the project area and would be temporary in nature. The fill material would eventually settle in the placement area and the turbidity due to project activities would no longer occur. Similar impacts due to turbidity at the borrow site would occur regardless of the implementation of this project, as maintenance dredging of the GIWW is an ongoing activity of USACE and is scheduled independently of this project.

Additional long-term, minor adverse impacts may occur to the existing substrate due to placement of dredged materials. This may in turn have long-term minor adverse impacts to hydrology where tidal connectivity is modified per the project design. However, long-term benefits would also occur from the restoration and levee protection of the marsh. This approach would reconnect coastal marshes to tidal flooding, and would restore the natural hydrology of this habitat. This approach also supports linkages within the broader coastal and nearshore ecosystem by restoring the natural movement of water, sediments, energy, and nutrients among habitats.

Measures to control turbidity and sediment movement would be in place to ensure water quality standards are met and sensitive resources are not affected. These measures may include appropriate water control structures to decant water, as well as the installation of silt fences or curtains, hay bales, filter-fabric, and/or temporary levees to control sediments and avoid negative impacts associated with the fill placement.

4.4.4.1.3 Air Quality and GHG Emissions

Affected Resources

Air Quality

Pierce Marsh is located in an area the EPA designates as the HGB. The HGB is in attainment or unclassified with the NAAQS for all criteria pollutants except ozone. The EPA currently lists the HGB as moderate nonattainment for 2008 ozone standards (TCEQ 2017). Designation for HGB is pending for 2015 ozone standards.

GHG Emissions

Criteria air pollutants and GHG emissions are largely generated by electricity production, vehicular movements, and commercial and residential buildings using electricity. GHG emissions would result from both the implementation and operation of the project from the use of vessels during construction and monitoring activities. Engine exhaust from barges, boats, excavators, and equipment would contribute to an increase in GHG emissions. BMPs would be considered and applied where appropriate and practical to reduce the release of GHGs during project implementation. BMPs considered would include using energy efficient machinery and equipment; the incorporation of anti-idling procedures; and the use of gas as compared to diesel.

Environmental Consequences

Section 6.4.1.1 of the Final PDARP/PEIS, which describes the impacts to air quality and GHG emissions from restoration projects intended to create, restore, and enhance coastal wetlands, is incorporated here by reference. Adverse impacts to air quality from projects intended to create, restore, and enhance coastal wetlands were described as being short-term and minor.

This project would have minor, short-term adverse impacts to air quality. Project implementation would require the use of equipment which would temporarily affect air quality in the project vicinity due to construction vehicle emissions. During dredging, excavation, or placement of materials to restore marshland elevations, there could be minor adverse impacts to air quality from the use of these heavy equipment and vehicles. The use of gasoline and diesel-powered construction vehicles and equipment could contribute to GHG emissions. To the extent possible, the project would consider resource conservation measures and technology to reduce energy use. BMPs would be considered and applied where appropriate and practical to reduce the release of GHGs during project implementation. BMPs considered would include using energy efficient machinery and equipment; the incorporation of anti-idling procedures; and the use of gas as compared to diesel. Adverse impacts to air quality would be short-term, only occurring during active construction activities. Where appropriate, additional BMPs for minimizing impacts to air quality at the construction sites would be utilized (Appendix B).

Additionally, implementation of the project may have long-term benefits for air quality. Wetland and marsh soils are an important carbon sink. Reconstruction of marsh habitat and revegetation of newly deposited sediment would provide a means of carbon capture and provides a long-term benefit.

4.4.4.1.4 Noise

Affected Resources

There is a natural soundscape in the project area from wildlife and natural environmental processes such as water movement and wind. Sounds from recreational activities are minimal to moderate, and could include boating general recreational from the nearby yacht club. There are major highways (I-45, Hwy 6) in the general vicinity of the project area which generate road noise.

Environmental Consequences

Section 6.4.1.1 of the Final PDARP/PEIS, which describes the impacts to noise from restoration projects intended to create, restore, and enhance coastal wetlands, is incorporated here by reference. Adverse impacts due to noise were described as being minor to moderate and short term.

The project would have minor, short-term adverse impacts due to noise from construction activities. Instances of increased noise are expected during the construction phases associated with the restoration project. Heavy equipment can cause direct localized and minor adverse impacts due to noise. This impact would be short-term and limited to the period of construction. The project would generate construction noise associated with equipment during placement of the fill material, dredging, grading, and levee construction if necessary. Construction equipment noise is known to disturb fish, marine mammals, and nesting shorebirds. The timing of noise producing activities would be planned to minimize disturbance to nesting birds. The majority of construction activities would occur outside of the nesting season. Construction noise would also create a potential nuisance to visitors in areas adjacent to project construction activities.

In order to mitigate some of the potential impacts from project activities due to noise, the timing of noise producing activities would be planned to minimize disturbance to nesting birds. To prevent disturbance to nearby residential communities, construction activities that produce significant noise would be limited to daylight hours. Construction noise would be temporary and the construction period is not anticipated to last more than 12 months.

4.4.4.2 Biological Environment

The biological environment is divided into habitats, living coastal and marine resources, and protected species.

4.4.4.2.1 Habitats

Affected Resources

The affected habitat resources of the project site includes salt marsh and shallow subtidal mudflats. Seagrasses are not expected in the vicinity of the project area and seagrasses were not identified using the TPWD seagrass viewer (http://tpwd.texas.gov/gis/seagrass/). Additionally, no seagrasses have been reported by resource agency biologists working in the area.

Pierce Marsh is a subsided intertidal and high salt marsh complex adjacent to Highland Bayou in Hitchcock, Texas, on the north side of West Bay. The Pierce Marsh complex covers an area of approximately 2,346 acres, owned jointly by the GBF and TNC. Located along the Central Migratory Flyway, shallow subtidal mudflats of Pierce Marsh supports wintering ducks as well as a variety of shore and wading birds. Wading birds and shorebirds utilize the mudflats and shallow marsh ponds located throughout the area. Wintering waterfowl include gadwall, northern pintail, lesser scaup, American widgeon, greenwinged and blue-winged teal, and snow geese. The habitat is also considered EFH, as it is important nursey habitat for a variety of fish and invertebrates.

Wetlands in West Bay are a part of important processes that support the bay ecosystem. Estuarine or fringing marsh and freshwater wetlands filter polluted runoff, which enhances water quality, and provides habitat for many species of plants, fish, birds, and other wildlife. The principal commercial and recreational fishery species of Galveston Bay rely on estuarine wetlands during at least some part of their life cycle. The wetland edge is a particularly important habitat for white and brown shrimp (Whaley and Minello 2002), but the habitat also supports a variety of invertebrate and vertebrate fishery species, which rely on the protected waters of the marsh for breeding and foraging (GBF 2003, 2008). Other marsh dwelling species present in the project area include blue crab, red drum, spotted seatrout, Southern flounder and Gulf menhaden. Wetlands act as nurseries to hundreds of non-commercial species that comprise a large part of the bay food web. Bird species, such as snowy egrets, great egrets, roseate spoonbills, tri-colored herons, black-crowned night herons and great blue herons use marsh as feeding habitat.

Environmental Consequences

Section 6.4.1.1 of the Final PDARP/PEIS which describes the impacts to habitats from restoration projects intended to create, restore, and enhance coastal wetlands, is incorporated here by reference. Impacts from projects intended to create, restore, and enhance coastal wetlands were described as having short-term to long-term, minor to moderate adverse impacts on habitats.

The project may have short-term, minor adverse impacts to the habitat in the vicinity of the project area due to habitat- disturbing construction activities, such as use of heavy machinery, pipeline construction, and transportation of sediment, associated with marsh creation. Additionally, the project would have long-term adverse impacts associated with the transition of one habitat type (subtidal mudflats) to another (salt marsh). This conversion is integral to the restoration process, and the creation of up to 150 acres of highly-productive nursey habitat in West Bay is anticipated to be an overall benefit to the local ecosystem. The extent to which habitats are impacted may change as E&D phases of this project are completed, and a precise project location is identified.

While the Texas TIG does not consider it likely, it is possible that the E&D process could generate a plan that has environmental impacts that are different in type or magnitude from those discussed in this document. If that is the case, the Texas TIG would consider whether further environmental impacts analysis would be necessary.

4.4.4.2.2 Living Coastal and Marine Resources

Affected Resources

As discussed in the previous section, salt marsh and subtidal flats are the two primary habitat types at the project site. There are no oyster reefs/shell pads in the vicinity of any of the site alternatives. However, these two habitat types support a diverse array of species that can be found in the immediate vicinity of the project area.

The subtidal flats and salt marsh of the West Bay watershed support an abundance of shrimp, oysters, and blue crab, which are frequently harvested in upper and lower Galveston Bay, as well as in the surrounding salt marshes and throughout the rest of the estuary. These habitats act as nurseries to hundreds of economically and ecologically important species that comprise a large part of the bay food web. The principal commercial and recreational fishery species of Galveston Bay, White shrimp, brown shrimp, and eastern oysters, are also abundant in the system and rely on estuarine wetlands during at least some part of their life cycle (Whaley and Minello 2002). Other marsh dwelling species in West Bay include blue crab, red drum, spotted seatrout, Southern flounder and Gulf menhaden.

The area also supports a large waterfowl population in the winter, as well as a variety of year-round bird species. West bay has vital nesting islands, including North Deer Island, and thus serves as an important feeding area during nesting season. Wading birds and shorebirds utilize the mudflats and shallow marsh ponds located throughout the area. Species such as snowy egrets, great egrets, roseate spoonbills, tri-colored herons, black-crowned night herons and great blue herons use marsh as feeding habitat. Wintering waterfowl include gadwall, northern pintail, lesser scaup, American widgeon, green-winged and blue-winged teal, and snow geese.

It is possible that birds protected under the Migratory Bird Treaty Act and Texas Parks and Wildlife Code may nest in the Project area. Efforts would be made to avoid construction activities during the nesting season (Feb 15 through Jul 31). However, if construction activities occur during the nesting season, the area affected by project activities would be surveyed for the presence of nesting birds by a qualified biologist. If nesting birds are present or indications of pre-nesting behavior are observed, appropriate BMPs would be employed to ensure that no incidental take of any individuals occurs. Example BMPs may include virtual fencing, signage, exclusion zones for workers and equipment, hazing, and deterrents. BMP activities would be coordinated with USFWS and TPWD biologists.

Environmental Consequences

Section 6.4.1.1 of the Final PDARP/PEIS, which describes the impacts to living coastal and marine resources from restoration projects intended to create, restore, and enhance coastal wetlands, is incorporated here by reference. As explained in the Final PDARP/PEIS, short-term minor to moderate adverse impacts from construction could displace land-based or aquatic faunal species resulting from staging equipment and materials, as well as entrapment of marine mammals. Minor long-term adverse impacts could include conversion of one wetland vegetation type to another with changes in the distribution of faunal communities. However, the creation of additional highly-productive marsh habitat is anticipated to be largely ecologically beneficial. The creation of up to 150 acres of additional salt marsh habitat generates additional nursey habitat for many ecologically and economically important fish and invertebrate species, including but not limited to those listed above. This project would also generate additional bird habitat, which is crucial along the central flyway migration route, and benefit the wintering, nesting, and foraging species that regularly utilize the project area.

4.4.4.2.3 Protected Species

Affected Resources

Threatened or Endangered Species

Eight endangered or threatened species could potentially be affected are listed in Table 4-10. No activities related to implementation of the project would take place in any area designated as critical habitat.

Table 4-10. Federal Threatened and Endangered Species potentially affected in the Pierce Marsh Wetland Habitat Restoration project area

Common Name	Status
Piping Plover	T
Red Knot	T
Loggerhead Sea Turtle	T
Green Sea Turtle	T
Atlantic Hawksbill Sea Turtle	E
Kemp's Ridley Sea Turtle	E
Leatherback Sea Turtle	E
West Indian Manatee	T

Notes: E – federally endangered species
T – federally threatened species

Essential Fish Habitat

EFH in the project's area of effect is identified and described for various life stages of 12 managed fish and shellfish (Gulf of Mexico Fisheries Management Council 2005). The project is located in an area that is designated as EFH under the Magnuson-Stevens Act for several species of shark, shrimp, coastal migratory pelagic species, and reef fish. No Habitat Areas of Particular Concern or EFH Areas Protected from Fishing were identified at the project location. EFH for these species in the vicinity of the proposed and alternative sites includes estuarine emergent wetlands; estuarine mud, sand and shell substrates; and estuarine water column. Detailed information on federally managed fisheries and their EFH is provided in the 1998 EFH amendment of the FMPs for the Gulf of Mexico, prepared by the GMFMC, and in Appendix B of the 2006 Final Consolidated Atlantic Highly Migratory Species Fishery Management Plan prepared by the NMFS. Tables 4-11 and 4-12 present the EFH and species within the Pierce Marsh Wetland Restoration project area.

Table 4-11. EFH for estuarine habitats within the Pierce Marsh Wetland Restoration project area

Species Common Name	Eggs	Larvae	Post Larvae	Early Juvenile	Late Juvenile	Adult	Spawning Adult
Estuarine Emergent Marsh							
Red Drum			●	●		●	
Gray Snapper						●	
Brown Shrimp				●			
White Shrimp				●			
Estuarine Oyster Reef							
Brown Shrimp				●			
Estuarine Sand and Shell Bottom							
Red Drum			●			●	
Gray Snapper						●	
Lane Snapper				●	●		
Brown Shrimp				●			
Estuarine Mud/Soft Bottom							
Red Drum		●	●	●		●	
Gray Snapper						●	
Lane Snapper				●	●		
Brown Shrimp				●			
White Shrimp				●			

Note: ● indicates habitat type designated as EFH for species' life stage

Table 4-12. Highly migratory species EFH designations within the Pierce Marsh Wetland Restoration project area

Species Common Name	Life Stage Within Estuarine Waters
Scalloped Hammerhead Shark	Neonate & Juvenile
Blacktip Shark	Neonate, Juvenile & Adult
Bull Shark	Neonate, Juvenile & Adult
Lemon Shark	Neonate
Spinner Shark	Neonate & Juvenile
Bonnethead Shark	Neonate, Juvenile & Adult
Atlantic Sharpnose Shark	Neonate, Juvenile & Adult

Marine Mammals

The bottlenose dolphin and the West Indian Manatee (manatees are also protected under the ESA) are the only marine mammals known to occur in the Galveston Bay system. Manatees are rarely found in Galveston Bay and not expected to be found in the project area.

Bald and Golden Eagles

Bald and golden eagles potentially forage within the project component location.

Migratory Birds

Pierce Marsh is located near nesting islands in West Bay including North Deer Island, and thus serves as an important feeding area during nesting season. Wading birds and shorebirds utilize the mudflats and shallow marsh ponds located throughout the area. Major groups of birds that inhabit the northern Gulf of Mexico include waterfowl and other water-dependent species, pelagic seabirds, raptors, colonial waterbirds, marsh dwelling birds, and passerines. Migratory birds found in the vicinity of Pierce Marsh include gadwall, northern pintail, lesser scaup, American widgeon, green-winged and blue-winged teal, and snow geese.

Environmental Consequences

There would be short- and long-term minor adverse impacts to protected species. Sea turtles and marine mammals present in project areas where dredging or underwater use of equipment is occurring could be adversely affected by temporary increases in noise and turbidity, water quality changes, alteration or loss of habitats, and potential interactions with dredging equipment.

Potential minor adverse effects of this project could include disturbance to marine mammals, sea turtles, and birds in nearshore waters from increased vessel traffic. Additional minor long-term adverse impacts to species would stem from the conversion of existing subsided habitat to salt marsh, and the loss of habitat associated with that action. If disturbed mobile organisms including birds, sea turtles, and marine mammals would likely leave the area to avoid impacts from construction activities. BMPs including the Sea Turtle and Smalltooth Sawfish Construction Conditions (NMFS 2006) and Measures for Reducing Entrapment Risk to Protected Species (NMFS 2012) would be followed. If marine mammals are sighted within 50 feet of the construction area, work would stop until the animals move away from the area under their own volition. Therefore, no incidental take of marine mammals is anticipated. The project is not likely to adversely affect piping plover or red knot. Piping plovers and red knots are not expected to occur in the construction area because typical habitats, beach and bayside tidal flat habitats, for the species do not exist. Piping plovers and red knots, if present and disturbed by construction noise, have access to nearby habitat that is within their normal flying distances for daily foraging movement.

The creation of additional highly-productive marsh habitat is anticipated to be largely ecologically beneficial. The creation of up to 150 acres of additional salt marsh habitat generates additional EFH habitat for many ecologically and economically important fish and invertebrate species, including but not limited to those listed above. This project would also generate additional bird habitat, which is crucial along the central flyway migration route, and benefit the wintering, nesting, and foraging species that regularly utilize the project area.

This project would follow the PDCs described in NMFS's Framework Biological Opinion on *Deepwater Horizon* Oil Spill Final Programmatic Damage Assessment and Restoration Plan and Final Programmatic Impact Statement (SER-2015-17459). NMFS' PDCs consider where construction would occur, construction methodologies, BMPs that would be implemented, and reporting requirements (NMFS 2016).

4.4.4.3 Human Uses and Socioeconomics

This section includes analyses of potential impacts to socioeconomics and environmental justice, cultural resources, infrastructure, land and marine management, tourism and recreational uses, fisheries and aquaculture, land and marine transportation, aesthetics and visual resources, and public health and safety.

4.4.4.3.1 Socioeconomics/Environmental Justice

Affected Resources

In 2016 the population in Galveston County was estimated to be over 300,000 which accounted for just over 1% of the Texas population. Approximately 59% of the population in Galveston County is white (not Hispanic or Latino), 23% is Hispanic or Latino, 14% is black or African American, and 3% is Asian. Around 18% of the county population speaks a language other than English at home. Median household income (2011-2015) in Galveston County and the state is $62,313 and $53,207, respectively, with 14% of the county and 16% of the state estimated to be living below the poverty level (U.S. Census Bureau 2016d; U.S. Census Bureau 2016c).

Environmental Consequences

There would be no adverse impacts to socioeconomics or environmental justice from this project. Implementation of this project would not disproportionately place any adverse environmental, economic, social, or health impacts on minority and low-income populations. The project would have a positive, beneficial socioeconomic impact on surrounding communities of people equally. No residential communities are located adjacent to the project. As a result, there would be no potential for adverse impacts from construction.

In consideration of EO 12898, Environmental Justice, this restoration activity does not have the potential to adversely and/or disproportionately affect minority or low-income populations, including economically, socially, or in terms of conditions affecting their health. This restoration project would help restore an environment that is of benefit to all citizens, populations and groups in Texas and beyond.

The project may provide long-term benefits to recreationists through increased opportunities for wildlife viewing, kayaking, canoeing, hunting, fishing, and other recreational activities. Benefits to the local economy could accrue through an increase in employment and associated spending in the project area during construction and increased expenditures due to increased recreational visitation (USFWS 2005).

4.4.4.3.2 Cultural Resources

Affected Resources

Coordination under Section 106 NHPA has been initiated for all projects. There are no known historic sites or significant cultural, scientific, or historic resources in the area that would be affected by the proposed restoration actions. No cultural, scientific, or historic resources are known to be located in the vicinity of the project area.

Environmental Consequences

Section 6.4.1.1 of the Final PDARP/PEIS, which describes the impacts to cultural resources from restoration projects intended to create, restore, and enhance coastal wetlands, is incorporated here by reference. As explained in the Final PDARP/PEIS, minor (temporary disturbance) to moderate (disturbance without loss of cultural information) impacts on cultural and historic resources due to construction activities such as dredging, addition of sediments or borrow materials, and/or removal of sediments could occur, depending on the scale of the action and site-specific characteristics. If cultural resources are discovered at the site, adverse impacts could include physical destruction or alteration of resources and may alter, damage, or destroy resources such as historic shipwrecks, engineering structures or landscapes, or connectivity with related sites.

No adverse impacts to cultural resources are anticipated as a result of this project. If any culturally or historically important resources are identified during project preparations or pre- deployment surveys, such areas would be avoided during construction. A complete review of this project under Section 106 of the NHPA is ongoing and would be completed prior to any project activities that would restrict consideration of measures to avoid, minimize or mitigate any adverse effects on historic properties located within the project area. This project would be implemented in accordance with all applicable laws and regulations concerning the protection of cultural and historic resources, as such there are no anticipated adverse impacts.

4.4.4.3.3 Infrastructure

Affected Resources

No public water supply intakes are located in the project area. There are petroleum pipelines within the vicinity of the project area. There are active oil and gas wells within one mile of Pierce Marsh. There are abandoned oil and gas wells within the area of the marsh.

Environmental Consequences

The proposed action is anticipated to have no impact to infrastructure, since new infrastructure would not be built and existing infrastructure in the area would be avoided. Pipelines, active wells, and inactive wells would not be impacted by project activities. Existing infrastructure of this type would be thoroughly mapped and project activities would be planned to avoid the area. None of the proposed actions involves activities or potential results that could directly or indirectly affect, positively or negatively, energy production, transport, or infrastructure in this area of coastal Texas.

4.4.4.3.4 Land and Marine Management

Affected Resources

North Deer Island Sanctuary is a 140 acre island in West Galveston Bay, one of the few natural islands left in this system. It is one of the most important colonial waterbird nesting islands on the upper Texas coast, used by 10,000 to 30,000 pairs of birds each year (TPWD 2013). Dredged material has been placed over approximately one-third of the island. Natural uplands are covered by a plant community unique on the upper Texas coast, composed of lime prickly ash, mesquite, paloverde, and mulberry trees, as well as lantana and cactus. High-quality salt marshes border the uplands on the southeast side of the island. The island is owned by three equal undivided interests - the National Audubon Society, the Houston Audubon Society, and a private individual. It is a Houston Audubon/National Audubon Bird sanctuary.

The Scenic Galveston Preserve contains a wetland corridor gateway to Galveston Island and a mainland coastal prairie component at Virginia Point. The O'Quinn estuarine portion runs along both sides of Interstate Highway 45 (I-45) as it passes from the mainland to Galveston Island. This 900-acre area is composed of natural, undisturbed tidal marsh and about 70 acres that have been restored to historical marsh conditions. The 1,500-acre Virginia Point tract is predominantly coastal prairie with interspersed freshwater sloughs and ponds. Together, these tracts of land form a contiguous coastal preserve across the southern tip of the mainland from Jones Bay to the west, where the wetlands are adjacent to property across Highland Bayou

Environmental Consequences

The proposed action is anticipated to have no impact to land and marine management, since projects would be consistent with the prevailing management, practices, plans, and direction governing the use of the areas where the restoration actions would take place. A TGLO Coastal Surface Lease would be acquired prior to project initiation to allow for construction activities.

4.4.4.3.5 Tourism and Recreational Use

Affected Resources

Pierce Marsh is regularly used for fishing, boating, kayaking, bird watching, and general recreation by the public. A yacht club with a private dock is located within several miles of the project area. There are several boat rental facilities and launches in the vicinity of the project area.

Environmental Consequences

Section 6.4.1.1 of the Final PDARP/PEIS, which describes the impacts to tourism and recreational use from restoration projects intended to create, restore, and enhance coastal wetlands, is incorporated here by reference. As stated in the Final PDARP/PEIS, short-term indirect adverse impacts in the immediate area could occur during construction through limits on recreational activities near the construction area and temporary increases in road traffic due to movement of construction vehicles.

Efforts would be made to avoid or minimize impacts to public boat launch facilities if they exist in nearby areas. Appropriate signage and buoys markers at the site and at boat ramps would be displayed. Postings in local media would also take place to ensure that efforts are made to inform recreational users. Due to the potential increased small boat traffic (construction related) in the area, appropriate safety measures would be employed to ensure that water-related accidents and conflicts are minimized. Any impacts to tourism and recreation as a result of construction activities are expected to be short term and minor in nature.

The marsh habitat in Pierce Marsh is a foundation for many recreational activities (e.g., fishing, bird watching, etc.) and the improvement in site conditions would enhance opportunities for, and quality of, a variety of recreational uses. Long term benefits would come from restoring the nursery habitat of many recreationally important fish species.

4.4.4.3.6 Fisheries and Aquaculture

Affected Resources

West Bay and its adjacent wetlands support a wide range of commercial and recreational fishing. Primary species fished include blue crab, red drum, black drum, mangrove snapper, spotted sea trout, southern flounder, and Atlantic croaker. Habitats in the vicinity of the project area support several important commercial fisheries. Large quantities of shrimp, oysters, and blue crab are harvested in upper and lower Galveston Bay, as well as in the surrounding salt marshes and throughout the rest of the estuary. White shrimp, brown shrimp, and eastern oysters are economically important species found in the system. Commercial harvest of finfish also occurs at low levels. These human activities are dependent on the condition of the coastal and marine habitats.

Environmental Consequences

Section 6.4.1.1 of the Final PDARP/PEIS, which describes the impacts to fisheries and aquaculture from restoration projects intended to create, restore, and enhance coastal wetlands, is incorporated here by reference. Many estuarine-dependent species of fish are harvested from Galveston Bay, including flounder, Atlantic croaker, spotted seatrout, sand seatrout, and red drum. In addition, five species of invertebrates (oysters, blue crabs, and three penaeid shrimps) are harvested from the Galveston Bay Estuary. The noise and increased turbidity of surface waters arising from earth-moving activities during project construction are expected to cause minor, short-term adverse impacts during the construction period. However, long term benefits would arise from the addition and improvement of nursery habitat for commercially important fisheries.

4.4.4.3.7 Land and Marine Transportation

Affected Resources

GIWW shipping operations occur within two miles of the project area. The project site is only accessible via boat/water, so there are no roads in the immediate vicinity of project activities and construction. Roads would not be used to transport materials to and from the site.

Environmental Consequences

The proposed action is anticipated to have no impact to land and marine transportation. Land-based equipment traffic would occur at the site during the period of construction. There is little to no other land-based traffic around Pierce Marsh, so no effects on other land-based traffic would occur. Once construction is complete, the added land-based equipment traffic would end. Marine transportation routes would be identified prior to the dredge and beneficial use operations. BMPs regarding transportation would be implemented to prevent any impacts to marine transportation. It is expected that activities would not interrupt the channel traffic to any significant degree. Most of the commercial traffic takes place on a routine schedule and construction activities would be timed to reduce any interference with commercial operators.

4.4.4.3.8 Aesthetics and Visual Resources

Affected Resources

The affected environment consists of the construction footprint of the project. The landscape in the vicinity of the project area is characterized by a mosaic of open water, coastline, levees, and marsh habitat from previous restoration projects. There are no designated protected viewsheds in the vicinity of the project area.

Environmental Consequences

Section 6.4.1.1 of the Final PDARP/PEIS, which describe the impacts to aesthetics and visual resources from restoration projects intended to create, restore, and enhance coastal wetlands, is incorporated here by reference. As stated in the Final PDARP/PEIS, there may be short-term adverse effects in the immediate area to aesthetics due to the presence of construction equipment, new breakwaters, or other changes to the surrounding environment. For example, equipment and construction activities related to the restoration actions would be visible. These impacts would be minor in nature and limited to the construction period. Upon completion, this project would have benefits to the area’s aesthetics and visual resources. The creation of marsh habitat and planting of cordgrasses would improve the overall viewscape of the project area. In addition, the new habitat is anticipated to attract additional birds and wildlife, which could be enjoyed by recreational users of the area.

4.4.4.3.9 Public Health and Safety

Affected Resources

West Bay is used by commercial fisheries, industrial, and recreational users. Recreational angling is primarily conducted from boats for areas near the potential sites. The immediate vicinity of the project area was historically marsh habitat, but has since been inundated primarily due to subsidence. This has had adverse impacts on coastal resiliency and deleterious effects on the protectiveness of the bay from storm surges.

Environmental Consequences

Section 6.4.1.1 of the Final PDARP/PEIS, which describes the impacts to public health and safety from restoration projects intended to create, restore, and enhance coastal wetlands, is incorporated here by reference. As stated in the Final PDARP/PEIS, short-term indirect adverse impacts in the immediate area could occur during construction through limits on recreational activities near the construction area to protect public safety. Additionally, construction projects involving the use of boats and barges, and associated equipment, for the placement of materials to create habitat could impact the public through construction activities and the potential to contaminate surface waters, resulting in short-term minor adverse impacts. Improvements in water quality resulting from increased water filtration from these activities could also contribute long-term benefits to public health. Construction of breakwaters and wetland restoration and enhancement activities could improve coastal resiliency by and benefit the public by providing infrastructure through improved flood and shoreline protection. This benefit is particularly effective for low-energy storm events.

Due to the nature and location of the project area, no adverse impacts to public health and safety are anticipated as a result of project implementation. All occupational and marine safety regulations and laws would be followed to ensure safety of all workers and monitors. The project deployment would use mechanical equipment and marine vessels that use oil, lubricants, and fuels. All hazardous materials handled during construction would be contained and appropriate barriers would be in place to ensure the protection of adjacent water resources from potential spills and leaks. In the event of a discharge of oil or release of hazardous substances, the release would be reported to the National Response Center (800-424-8802) and Texas Emergency Oil Spill and Hazardous Substance Reporting line (800-832-8224) as required.

BMPs in accordance with Occupational Safety and Health Administration and state and local requirements would be incorporated into construction activities on site to ensure the proper handling, storage, transport and disposal of all hazardous substances. Personal protective equipment would be required for all construction personnel and authorized access zones would be established at the perimeter of the worksite during construction. Due to the potential increase in small boat traffic (construction related) in the area, appropriate safety measures would be employed to ensure water related accidents and conflicts are minimized. No adverse effects to public health and safety are expected as a result of this project.

This project would provide long-term benefits to public health and safety by providing improvements to water quality resulting from the filtering capacity of wetlands that are to be restored or protected. Additionally, the creation of marshes along with breakwaters would improve the safety of nearby communities by protecting infrastructure during storms. The breakwaters would provide a wave break and wetlands absorb energy.

4.4.5 Dollar Bay and Moses Lake Habitat Restoration

The Dollar Bay and Moses Lake Wetlands Restoration (Phase IV) project would restore subsided marsh habitat in Dollar Bay and Moses Lake by creating about 15 acres of marsh terraces and protecting them with about 4,200 linear feet of rock breakwaters. This project would include construction implementation and the completion of planning documents which includes environmental reviews and final engineering designs. The estimated cost for the project is $4,225,000.

This analysis incorporates by reference the relevant portions of Section 6.4.1.1 of the Final PDARP/PEIS. The Final PDARP/PEIS provides programmatic evaluation of the environmental consequences of the Restoration Approach "Create, restore, and enhance coastal wetlands", which are considered in this RP/EA and are incorporated by reference here. Tiering from that analysis, this section presents the Affected Environment of Dollar Bay and Moses Lake project area and the environmental consequences of the proposed actions in context of the project-specific affected environment.

The programmatic analysis looked at a series of resources as part of the biological, physical, and socioeconomic environment. As appropriate in a tiered analysis, the evaluation of each project focuses on the specific resources with a potential to be affected by the project.

The description and analysis of the project below are based on a project-specific preliminary design concept rather than detailed engineering plans. Throughout the design process, every practical attempt would be made to avoid and minimize potentially adverse environmental and cultural resource impacts. The following descriptions for each of the construction elements are preliminary and based on current planning efforts and resource agency experience with similar projects. While the Texas TIG does not consider it likely, it is possible that the E&D process could generate a plan that has environmental impacts that are different in type or magnitude from those discussed in this document. If that is the case, the Texas TIG would consider whether further environmental impacts analysis would be necessary.

The impacts from the project are largely beneficial and adverse impacts are minor to moderate. Benefits to the biological and human uses and socioeconomics would result if this project was implemented. BMPs required in the permit, consultations, or environmental reviews would be followed. Additionally, BMPs described in Appendix 6.A of the Final PDARP/PEIS as well as Appendix B of this document would be considered and applied where appropriate, to reduce or eliminate impacts to the environment. A summary of the conclusions of this analysis are in Table 4-13. Categories and terminology in the table follow a consistent format used for all projects in this RP/EA. Information from this EA was used to populate this table using the definitions provided in Appendix C.

Table 4-13. Summary of beneficial impacts as well as short-term and long-term adverse impacts from implementation of the Dollar Bay and Moses Lake Wetlands Restoration project

Resource Categories	Benefits	Adverse Short-Term	Adverse Long-Term
Physical Resources			
Geology and Substrates	Yes	Moderate	Moderate
Hydrology and Water Quality	Yes	Minor	Minor
Air Quality and GHG Emissions	Yes	Minor	NE
Noise	NE	Minor	NE
Biological Resources			
Habitats	Yes	Minor	Minor
Living Coastal and Marine Resources	Yes	Minor	Minor

Resource Categories	Benefits	Adverse Short-Term	Adverse Long-Term
Protected Species	Yes	Minor	NE
Human Uses and Socioeconomics			
Socioeconomics and Environmental Justice	Yes	NE	NE
Cultural Resources	NE	NE	NE
Infrastructure	NE	NE	NE
Land and Marine Management	NE	NE	NE
Tourism and Recreation Use	Yes	Minor	NE
Fisheries and Aquaculture	Yes	NE	NE
Land and Marine Transportation	NE	NE	NE
Aesthetics and Visual Resources	Yes	Minor	Minor
Public Health and Safety	Yes	NE	NE

Notes: *Yes – provides benefits*
NE – no effect
Adverse short-term and long-term impacts are designated as minor, moderate, or major

4.4.5.1 Physical Environment

The description of the physical environment is divided into geology and substrates, hydrology and water quality, air quality and GHG emissions, as well as noise characteristics of the area.

4.4.5.1.1 Geology and Substrates

Affected Resources

Construction would occur on submerged sediments in subtidal habitat in Moses Lake and Dollar Bay, Texas. NOAA nautical charts (http://www.charts.noaa.gov/BookletChart/11327_BookletChart.pdf) show water depths of 0-2 feet in the project area. Sediments within the Lake and Bay are muddy and soft. It is unknown if any hard substrates or oysters exist in the project area. A shallow navigation channel connects Moses Lake with the larger Galveston Bay system.

Environmental Consequences

Section 6.4.1.1 of the Final PDARP/PEIS, which describes the impacts to geology and substrates from restoration projects intended to create, restore, and enhance coastal wetlands, is incorporated here by reference. Impacts from projects intended to create, restore, and enhance coastal wetlands were described as causing short- and long-term minor to moderate adverse impacts.

The project is consistent with the impacts and activities described in the Final PDARP/PEIS. This project would have short- and long-term moderate adverse effects. Impacts would be caused by construction activities as well as the permanent placement of the breakwater and creation of marsh habitat. Placement of the breakwater would result in a permanent conversion of soft-bottom to hard bottom substrate. All impacts would be localized. Additionally, this project provides beneficial impacts by restoring the area to a suitable elevation to sustain historical marsh habitat. The breakwaters would stabilize sediments and protect of the shoreline from erosion and wave action.

4.4.5.1.2 Hydrology and Water Quality

Affected Resources

The project area is adjacent to Moses Lake, which is fed by Moses Bayou and drains into Galveston Bay. Moses Lake and Galveston Bay are connected by a gated levee. The gate is open during periods of normal tide and is closed during periods of high tide and hurricane surge (USGS, https://waterdata.usgs.gov/tx/nwis/wys_rpt/?site_no=08077650&agency_cd=USGS). Water depths in the project area range from 1-3 feet.

Water quality in Moses Lake is impaired. It is listed by TCEQ as having impairments from dioxin in edible tissue and PCBs in edible tissue (TCEQ 2015a)

Water quality in Moses Bayou is also impaired from bacteria, dioxin in edible tissue, and PCBs in edible tissue. Total maximum daily loads (TMDLs) in Moses Lake and Bayou for dioxin in edible tissue and PCBs in edible tissue are planned. Additional data is being collected before a management strategy is selected for the bacteria impairment.

Environmental Consequences

Section 6.4.1.1 of the Final PDARP/PEIS, which describes the impacts to hydrology and water quality from restoration projects intended to create, restore, and enhance coastal wetlands, is incorporated here by reference. Impacts from projects intended to create, restore, and enhance coastal wetlands were described as causing short-term minor to moderate adverse impacts as well as long-term minor adverse impacts.

The project is consistent with the impacts and activities described in the Final PDARP/PEIS. This project would have short-term minor and long-term minor adverse effects. BMPs would be implemented to minimize any adverse effects that may occur. However, long-term benefits would also occur from the marsh restoration and breakwater protection of the marsh. The marshes would filter nutrients and the breakwater could reduce erosion and improve impacts from turbidity.

4.4.5.1.3 Air Quality and GHG Emissions

Affected Resources

Air Quality

The project area is located in an area the EPA designates as the HGB. The HGB is in attainment or unclassified with the NAAQS for all criteria pollutants except ozone. The EPA currently lists the HGB as moderate nonattainment for the 2008 ozone standard and is pending designation for the 2015 ozone standard (http://www.tceq.state.tx.us/airquality/sip/hgb/hgb-status).

GHG Emissions

Criteria air pollutants and GHG emissions are largely generated by electricity production, vehicular movements, and commercial and residential buildings using electricity. GHG emissions would result from public use and management of the project from the use of vehicles. Engine exhaust from vehicles would contribute to an increase in GHG emissions. BMPs would be employed to reduce the release of GHG during project land management activities.

Environmental Consequences

Section 6.4.1.1 of the Final PDARP/PEIS, which describes the impacts to air quality and GHG emissions from restoration projects intended to create, restore, and enhance coastal wetlands, is incorporated here by reference. Impacts from projects intended to create, restore, and enhance coastal wetlands were described as having short-term, adverse impacts to air quality from emissions generated by construction equipment.

Consistent with the Final PDARP/PEIS, the project would have short-term, minor, and localized adverse impacts to air quality. To the extent possible, the project would consider resource conservation measures and technology to reduce energy use. BMPs would be considered and applied where appropriate and practical to reduce the release of GHGs during project implementation. BMPs considered would include using energy efficient machinery and equipment; the incorporation of anti-idling procedures; and the use of gas as compared to diesel.

Additionally, this project may indirectly help to slow or minimize marsh loss, thereby providing a benefit to air quality by keeping carbon sequestered.

4.4.5.1.4 Noise

Affected Resources

The project area is near residential communities, roads, and undeveloped areas. The residential communities and traffic on the roadways contribute to noise in the landscape. Noise beyond that created from the natural environment (e.g., noise from wind and waves) is minimal.

Environmental Consequences

Section 6.4.1.1 of the Final PDARP/PEIS, which describes the impacts to noise from restoration projects intended to create, restore, and enhance coastal wetlands, is incorporated here by reference. Adverse impacts due to noise were described as being minor to moderate and short term. Instances of increased noise are expected during the construction phases associated with the restoration project. The project would generate construction noise associated with equipment during placement of the fill material, grading, and dredging. Construction equipment noise is known to disturb fish, marine mammals and nesting shorebirds. The timing of noise producing activities would be planned to minimize disturbance to nesting birds. The majority of construction activities would occur outside of the nesting season. Construction noise would be temporary and the construction period is not anticipated to last more than 12 months.

The project would have minor, short-term adverse impacts to noise from construction activities. Heavy equipment can cause direct localized and minor adverse impacts due to noise. This impact would be short-term and limited to the period of construction which is anticipated to be no longer than 12 months.

4.4.5.2 Biological Environment

The biological environment is divided into habitats, living coastal and marine resources, and protected species.

4.4.5.2.1 Habitats

Affected Resources

The project area includes Moses Lake and Dollar Bay, which are tidally influenced waterbodies on the western shore of Galveston Bay. Historically, much of the perimeter and interior of the project area once consisted of estuarine emergent marsh. However, historical subsidence coupled with shoreline erosion has greatly impacted these areas, converting marsh to open water. In addition, development around the Houston metropolitan area as well as areas surrounding Dollar Bay and Moses Lake have resulted in loss of important coastal habitats directly through transition of natural areas to developed properties.

Environmental Consequences

Section 6.4.1.1 of the Final PDARP/PEIS, which describes the impacts to habitats from restoration projects intended to create, restore, and enhance coastal wetlands, is incorporated here by reference. Impacts from projects intended to create, restore, and enhance coastal wetlands were described as having short- and long-term minor to moderate adverse as well as beneficial impacts.

Consistent with the Final PDARP/PEIS, this project would also have minor adverse impacts during construction as well as minor, long-term adverse impacts that would be limited to the project area. Adverse impacts are caused by the change in habitat types. Best practices would be implemented to minimize adverse impacts. Beneficial impacts would occur from the restoration and protection of wetland and coastal habitat. Improved habitat and protection of marsh edge would benefit many estuarine species.

4.4.5.2.2 Living Coastal and Marine Resources

Affected Resources

Much of the project would be conducted in shallow open water areas of Moses Lake and Dollar Bay. Benthic surveys were completed in 2015 and no seagrasses were present in the project area. One area of oyster reef was identified and two small areas of scattered shell were identified in Dollar Bay. Preliminary project designs show that a silt fence would be use to protect the oyster reef (USACE permit application).

There are a number of aquatic species found in the proposed restoration area. Fish species include sand seatrout, spotted or speckled seatrout, red drum, tonguefish, flounders, Atlantic bumper, and porgys.

Benthic organisms include bivalves, gastropods and other mollusks, amphipods, annelids, and brown and white shrimp.

Water dependent birds may use the open bay to forage and roost. These would include loons, bay ducks, gulls, terns, and pelicans. Texas diamondback terrapins may use the marshes and surrounding waters. Seagrasses are not present in or near the project area.

Environmental Consequences

Section 6.4.1.1 of the Final PDARP/PEIS, which describes the impacts to living coastal and marine resources from restoration projects intended to create, restore, and enhance coastal wetlands, is incorporated here by reference. Impacts from projects intended to create, restore, and enhance coastal wetlands were described as having short-and long-term minor to moderate adverse impacts as well as beneficial impacts.

Consistent with the Final PDARP/PEIS, this project would have short-and long-term minor to moderate adverse as well as beneficial impacts to living coastal and marine resources. Short-term minor adverse impacts would result from the displacement of land-based or aquatic faunal species during construction activities. Areas of scattered shell may have live benthic organisms which may be adversely impacted by the creation of marsh mounds. However, these impacts may be offset by the creation of rock breakwater which could support oysters. Long-term moderate adverse impacts would result from a conversion of habitat types (mud bottom to the breakwater or marsh) that would affect species presence. Beneficial impacts would result from the creation of hard bottom substrate and the restoration of marsh habitat in shallow protected waters. These habitat improvements would benefit fauna that use the interconnected habitats.

4.4.5.2.3 Protected Species

Protected species and their habitats include ESA-listed species and designated critical habitats, which are regulated by either the USFWS or the NMFS. Protected species and habitat also include marine mammals protected under the Marine Mammal Protection Act, EFH protected under the Magnuson-Stevens Act, migratory birds protected under the Migratory Bird Treaty Act and eagles protected under the Bald and Golden Eagle Protection Act.

Affected Resources

Threatened or Endangered Species

The six endangered or threatened species that could potentially be affected are listed in Table 4-14. No activities related to implementation of the project would take place in any area considered critical habitat. The presence of aquatic threatened or endangered species in Moses Lake and Dollar Bay is unlikely (G. Sutton, TPWD, personal communication 2017). However, appropriate habitat is present for sea turtles and the West Indian manatee. Although the West Indian manatee has been documented in Galveston Bay, sightings are extremely rare in Texas. There are no threatened or endangered birds in the project area that would use the project area, which consists of open water habitat.

Table 4-14. Federal Threatened and Endangered Species potentially affected in the Dollar Bay and Moses Lake Wetland Restoration project area

Common Name	Status
Loggerhead Sea Turtle	T
Green Sea Turtle	T
Atlantic Hawksbill Sea Turtle	E
Kemp's Ridley Sea Turtle	E
Leatherback Sea Turtle	E
West Indian Manatee	T

Notes: *E – federally endangered species*
T – federally threatened species

Essential Fish Habitat

Habitats within the project area are subject to designation as EFH. The 1996 amendments to the Magnuson-Stevens Act set forth a mandate for NMFS, regional FMCs, and other federal agencies to identify and protect EFH of economically important marine and estuarine fisheries. To achieve this goal, suitable fishery habitats need to be maintained. EFH is separated into estuarine habitat types. Estuarine habitat is defined as "all estuarine waters and substrates (mud, sand, shell, rock and associated biological communities), including the sub-tidal vegetation (grasses and algae) and adjacent inter-tidal vegetation (marshes and mangroves)." EFH in the area of proposed action is identified and described for various life stages of managed fish and shellfish in the Gulf of Mexico (GMFMC 2005). A provision of the Magnuson-Stevens Act requires that FMC's identify and protect EFH for every species managed by an FMP (U.S.C. 1853(a)(7)). There are FMPs in the Gulf region for red drum, shrimp, reef fish, and HMS (e.g., sharks). Table 4-15 and 4-16 present the EFH and species within the Dollar Bay and Moses Lake Wetland Restoration project area.

Table 4-15. EFH for estuarine habitats within the Dollar Bay and Moses Lake Wetland Restoration project area

Species Common Name	Eggs	Larvae	Post Larvae	Early Juvenile	Late Juvenile	Adult	Spawning Adult
Estuarine Emergent Marsh							
Red Drum			●	●		●	
Gray Snapper						●	
Brown Shrimp				●			
White Shrimp				●			
Estuarine Oyster Reef							
Brown Shrimp				●			

Species Common Name	Eggs	Larvae	Post Larvae	Early Juvenile	Late Juvenile	Adult	Spawning Adult
Estuarine Sand and Shell Bottom							
Red Drum			●		●	●	
Gray Snapper						●	
Lane Snapper				●	●		
Brown Shrimp				●			
Estuarine Mud/Soft Bottom							
Red Drum		●	●	●		●	
Gray Snapper						●	
Lane Snapper				●	●		
Brown Shrimp				●			
White Shrimp				●			

Note: ● indicates habitat type designated as EFH for species' life stage

Table 4-16. Highly migratory species EFH designations within the Dollar Bay and Moses Lake Marsh Wetland Restoration project area

Species Common Name	Life Stage Within Estuarine Waters
Scalloped Hammerhead Shark	Neonate & Juvenile
Blacktip Shark	Neonate & Juvenile
Bull Shark	Neonate, Juvenile & Adult
Lemon Shark	Neonate & Juvenile
Spinner Shark	Neonate & Juvenile
Bonnethead Shark	Neonate & Juvenile
Atlantic Sharpnose Shark	Neonate, Juvenile & Adult
Finetooth Shark	Neonate

Marine Mammals

The bottlenose dolphin and the West Indian Manatee (manatees are protected under the Endangered Species Act) are the only marine mammals known to occur in the Galveston Bay system. Manatees are rarely found in Galveston Bay. There is only one, small connection to Moses Lake and Galveston Bay, located at the tide gate. Inside Dollar Bay and Moses Lake water depth are generally less than 3 feet, but there are a few deeper pockets of water (USACE permit application). With the relatively shallow depth of the project, and the established ranges and depths that the majority of the cetaceans occupy, additional marine mammals would not be expected to enter the construction area.

Bald and Golden Eagles

There are no are eagle home ranges or established territories within the project areas. The nearest sightings of eagles are almost two miles from the project area (http://ebird.org). No eagles are nesting within 650 feet of the project area.

Migratory Birds

The project area currently provides habitat for migratory birds that use open bay habitat for fishing, staging and roosting purposes.

For non-breeding migratory birds, the open water site currently supports roosting and foraging use. The different bird taxonomic guilds and use activities are listed below:

Loons and Grebes – This group of birds may use waters surrounding the site locations during the fall, winter, and spring to forage. Presence in the area would be based on available forage fish and invertebrates.

Waterfowl – Bay ducks may use this part of Dollar and Moses Bay during migration and for overwintering.

Pelicans and Cormorants – These would use the open bay to forage.

Terns and Gulls – These species would use the open bay habitat to forage.

Environmental Consequences

Sea turtles and marine mammals present in project areas where dredging or underwater use of equipment is occurring could be adversely affected by temporary increases in noise and turbidity, water quality changes, alteration or loss of habitats, entrapment, and potential interactions with dredging equipment. Potential minor adverse effects of this approach could include disturbance to marine mammals, sea turtles, and birds in nearshore waters from increased vessel traffic.

Consistent with the Final PDARP/PEIS, this project would have short-term, minor adverse impacts. These impacts could occur from placement of materials in water, dredging, or other borrowing techniques which result in suspended sediments and increased near-site turbidity. Adverse impacts may also occur if species using the project area are temporarily disturbed and must move to another area. The disruptions caused by construction activities would be temporary and once completed the restored and protected marsh area would provide benefits to habitats used by birds, fish, and other wildlife including protected species. Placement of fill material is a slow process allowing mobile organisms to leave the area. Construction activities are not expected to have impacts to protected marine species and their habitats in the areas where the materials would be placed. Material would be removed from the borrow site with a back hoe or a clamshell dredge both of which would have minimal impacts to pelagic species.

Impacts to wildlife would be avoided via management guidelines and techniques as appropriate. The Sea Turtle and Smalltooth Sawfish Construction Conditions would be followed (NMFS 2006). Long-term impacts would be beneficial with the addition of hard substrate that would support a more diverse community of benthic organisms and fish.

Birds that forage in or near the dredge site could be temporarily affected. However, these effects would be short-term and minor as birds would be expected to move away to forage in other readily available foraging habitat during the dredging. Acclimation to construction activities may take place and therefore the limit the intensity of the adverse impact. Once construction has been completed the restored area would provide a greater range of habitats available for birds to use. Increased area of protected marsh would improve habitats and provide a long-term benefit. The proposed actions would also provide additional habitat for many of the above listed bird groups as well as other guilds during the non-nesting season. Consultation with appropriate agencies would be required prior to final design and project implementation.

There would be beneficial impacts to EFH from the protection and restoration of marsh habitat. There may be short-term, minor impacts during construction from the movement of sediments, turbidity, and the addition of hard structure to the substrate. The submerged side slopes of the breakwaters would provide hard substrate with interstitial spaces that would enhance foraging areas for fish as well as provide cover for juvenile fish and substrate for establishment of oyster habitat. Fish present in the dredging area could be subject to a temporary increase in sound pressure levels, a decrease in water quality, entrainment in dredge sediments, and removal of benthos from dredged areas. Sound pressure levels or entrainment could result in mortality of individual finfish. This would be a minor short-term adverse effect that would not be expected to reduce local fish populations or designated EFH. Consultation with appropriate agencies would be required prior to final design and project implementation. The project would provide benefits to marine and estuarine fauna by providing additional structural fish habitat. Over the life of the project, the quality of aquatic habitat would increase.

If present, dolphins and manatees would likely leave the area to avoid the construction activities and/or would generally avoid the area because optimal habitat does not exist. Manatees are extremely rare in Texas waters with sightings less than one per year on average across the entire Texas coast. However, if marine mammals are sighted within 50 feet of the construction area, work would stop until the animals move away from the area under their own volition. Therefore, marine mammals would not be impacted during construction activities and no incidental take of marine mammals is anticipated.

4.4.5.3 Human Uses and Socioeconomics

This section includes analyses of potential impacts to socioeconomics and environmental justice, cultural resources, infrastructure, land and marine management, tourism and recreational uses, fisheries and aquaculture, land and marine transportation, aesthetics and visual resources, and public health and safety.

4.4.5.3.1 Socioeconomics/Environmental Justice

Affected Resources

In 2015, the population in Galveston County was estimated to be over 300,000. Approximately 59% of the population in Galveston County is white (not Hispanic or Latino), 23% is Hispanic or Latino, 14% is black or African American, and 3% is Asian. Median household income (2011-2015) in Galveston County and the state is $62,313 and $53,207, respectively, with 14% of the county and 16% of the state estimated to be living below the poverty level (U.S. Census Bureau 2016c).

Environmental Consequences

Area closures are anticipated during construction to protect public safety. This may result in short-term adverse impacts associated with limited access to, and opportunities for, tourism and recreation in specific areas. If these closures occur in areas with high levels of hunting, fishing, and tourist activity, resource users may choose to pursue these recreational activities in different locations, or forgo the activity. Adverse impacts to tourism and recreation resulting from potential closures would be expected to be short-term.

The proposed restoration of this project would have a positive, beneficial socioeconomic impact on surrounding communities of people. The project may provide long-term benefits to recreationists through enhanced opportunities for wildlife viewing, fishing, and other recreational activities. However, short-term beneficial impacts to the local and regional economies would also occur from increases in construction jobs and demand for workforce to support the restoration projects. These jobs would provide income, sales, and downstream economic activity in the region. Any non-local workers, brought in for a short period of time, would bring in additional spending as workers stay in local hotels and eat in local eating and drinking establishments. Project spending would include and contribute to support of the workforce needed to design, engineer, manage, and carry out the projects. Additionally, locally purchased (or rented) equipment and materials would also benefit the regional economy.

In consideration of EO 12898, Environmental Justice, this restoration activity does not have the potential to adversely and/or disproportionately affect minority or low-income populations, including economically, socially, or in terms of conditions affecting their health. This restoration project would help restore an environment that is of benefit to all citizens, populations and groups in Texas and beyond.

4.4.5.3.2 Cultural Resources

Affected Resources

The project area is located within Moses Lake and Dollar Bay. There are no known cultural resources in the project area.

Environmental Consequences

Section 6.4.1.1 of the Final PDARP/PEIS, which describe the impacts to cultural resources from restoration projects intended to create, restore, and enhance coastal wetlands, is incorporated here by reference. As explained in the Final PDARP/PEIS, minor (small area of disturbance without substantial loss of cultural information) to moderate (disturbance without substantial loss of cultural information) impacts on cultural and historic resources due to construction activities such as dredging, addition of sediments or borrow materials, and/or removal of sediments could occur, depending on the scale of the action and site-specific characteristics. If cultural resources are discovered at the site, adverse impacts could include physical destruction or alteration of resources and may alter, damage, or destroy resources such as historic shipwrecks, engineering structures or landscapes, or connectivity with related sites.

No adverse impacts to cultural resources are anticipated as a result of this project. If any culturally or historically important resources are identified during project preparations or pre- deployment surveys, such areas would be avoided during construction. A complete review of this project under Section 106 of the NHPA is ongoing and would be completed prior to any project activities that would restrict consideration of measures to avoid, minimize or mitigate any adverse effects on historic properties located within the project area. This project would be implemented in accordance with all applicable laws and regulations concerning the protection of cultural and historic resources. All BMPs identified in the coordination process would be followed.

4.4.5.3.3 Infrastructure

Affected Resources

The Project area is bordered to the south and west by residential areas of the city of Texas City. Existing road, water, sewer, power and communication infrastructure are present, however, they would not be affected by project activities. No public water supply intakes are location in the project area. There are no petroleum pipelines or oil field related structures within the vicinity of the project area.

Environmental Consequences

The proposed action is anticipated to have no impact to infrastructure, since new infrastructure would not be built and existing infrastructure in the area would be avoided. None of the proposed actions involves activities or potential results that could directly or indirectly affect, positively or negatively, energy production, transport, or infrastructure in this area of coastal Texas.

4.4.5.3.4 Land and Marine Management

Affected Resources

The 2,300 acre Nature Conservancy's Texas City Prairie Preserve borders the north side of Moses Lake. Native preserve plants include big and little bluestem, indiangrass, switchgrass, eastern gamagrass, gulf cordgrass and the rare bracted blazing star. This preserve is an important coastal prairie and wetland complex that supports waterfowl, shorebirds and wading birds as well as wintering and migrating grassland songbirds. A living shoreline hard structure that protects the shoreline from loss due to erosion has been constructed along the preserves Moses Lake shoreline.

A hurricane gate restricts the only connection of the Mosses Lake and Dollar Bay system with Galveston Bay. The gate generally remains open but is closed to protect the area from storm surge associated with coastal storms and hurricanes. TGLO owns the bay bottom, and the hurricane gate is owned and operated by Galveston County and USACE.

Environmental Consequences

Appropriate leases would be obtained prior to construction. The proposed action is anticipated to have no impact to land and marine management, since projects would be consistent with the prevailing management, practices, plans, and direction governing the use of the areas where restoration actions would take place.

4.4.5.3.5 Tourism and Recreational Use

Affected Resources

Approximately 5 million people live around Galveston Bay. Recreational fishing, boating, and potentially wildlife viewing occurs in the open water areas. Birds associated with the Moses Lake and Dollar Bay area use surrounding habitats readily accessible from land based viewing opportunities.

Environmental Consequences

Section 6.4.1.1 of the Final PDARP/PEIS, which describes the impacts to tourism and recreational use from restoration projects intended to create, restore, and enhance coastal wetlands, is incorporated here by reference. Impacts from projects intended to create, restore, and enhance coastal wetlands would be short-term and adverse.

Consistent with the Final PDARP/PEIS, the project would have short-term adverse impacts and long-term benefits to tourism and recreational use. Minor short-term adverse impacts would result from limiting recreational activities such as boating and fishing during construction. Benefits to the public would be achieved through the habitat protection activities (i.e., the breakwaters that would help prevent erosion) as well as the increased marsh and hard bottom habitat, which helps provided a nursery area for fishery species and habitat for wildlife such as birds.

4.4.5.3.6 Fisheries and Aquaculture

Affected Resources

The marshes and shallow open water of Mosses Lake and Dollar Bay support a wide range of commercial and recreational important fisheries resources. These water bodies are designated as Essential Fishery Habitat for brown and white shrimp, grey snapper, lane snapper and red drum.

Environmental Consequences

Section 6.4.1.1 of the Final PDARP/PEIS, which describes the impacts to fisheries and aquaculture from restoration projects intended to create, restore, and enhance coastal wetlands, is incorporated here by reference. Many estuarine-dependent species of fish are harvested from Galveston Bay, including flounder, Atlantic croaker, spotted seatrout, sand seatrout, and red drum. In addition, five species of invertebrates (Easter oysters, blue crabs, and three penaeid shrimps) are harvested from the Galveston Bay Estuary. The noise and increased turbidity of surface waters arising from earth-moving activities during project construction are expected to cause minor, temporary impacts during the construction period. However, long term benefits would arise from the addition and improvement of nursery habitat for commercially important fisheries.

4.4.5.3.7 Land and Marine Transportation

Affected Resources

The project site is only accessible via boat/water, so there are no roads in the immediate vicinity of project activities and construction. Roads associated with adjacent community would not be used to transport materials to and from the site. The Mosses Lake and Dollar Bay complex does support a relatively low level of vessel traffic that is primarily recreational in nature.

Environmental Consequences

The proposed action is anticipated to have no impact to land and marine transportation. Land-based equipment traffic would not occur at the site during the period of construction. No long-term impacts to traffic in the area are anticipated. Marine transportation routes would be identified prior to construction. BMPs regarding transportation would be implemented to prevent any impacts to marine transportation. It is expected that activities would not interrupt the channel traffic to any significant degree.

4.4.5.3.8 Aesthetics and Visual Resources

Affected Resources

The affected environment consists of the construction footprint. The landscape in the vicinity of the project area is characterized by a mosaic of open water, coastline, and shallow bay. There are no designated protected viewsheds in the vicinity of the project area. Equipment and construction activities related to shoreline protection would be visible.

Environmental Consequences

Section 6.4.1.1 of the Final PDARP/PEIS, which describes the impacts to aesthetics and visual resources from restoration projects intended to create, restore, and enhance coastal wetlands, is incorporated here by reference. Impacts from projects intended to create, restore, and enhance coastal wetlands were described as having short- and long-term adverse impacts to aesthetics and visual resources.

Consistent with the Final PDARP/PEIS, this project would have minor short- and long-term adverse impacts to aesthetics and visual resources due to the presence of construction equipment and installation of breakwaters. However, long-term benefits would be realized from the protection and restoration coastal habitats.

4.4.5.3.9 Public Health and Safety

Affected Resources

The recreational uses of Moses Land and Dollar Bay are accustomed to navigating via the existing channels and avoiding shallow areas and areas that contain obstructions. The immediate vicinity of the project area was historically wetlands habitat, but has since been inundated primarily due to subsidence. This has had adverse impacts on coastal resiliency and deleterious effects on the protectiveness of the area from storm surges.

Environmental Consequences

Section 6.4.1.1 of the Final PDARP/PEIS, which describe the impacts to public health and safety from restoration projects intended to create, restore, and enhance coastal wetlands, is incorporated here by reference. As stated in the Final PDARP/PEIS, improvements in water quality resulting from increased water filtration from these activities could also contribute long-term benefits to public health. Construction of breakwaters and wetland restoration and enhancement activities could provide benefits to coastal populations and infrastructure through improved flood and shoreline protection, thereby improving coastal resiliency. Construction projects involving the use of boats and barges, and associated equipment, for the placement of materials to create habitat could impact the public through construction activities and the potential to contaminate surface waters, resulting in short-term minor adverse impacts.

BMPs in accordance with Occupational Safety and Health Administration and state and local requirements would be incorporated into construction activities on site to ensure the proper handling, storage, transport and disposal of all hazardous substances. Personal protective equipment would be required for all construction personnel and authorized access zones would be established at the perimeter of the worksite during construction. Due to the potential increase in small boat traffic (construction related) in the area, appropriate safety measures would be employed to ensure water related accidents and conflicts are minimized. No adverse effects to public health and safety are expected as a result of this project.

Outreach with recreational users of the site would also be used to inform the public of the bathymetry and topography of the constructed marsh and the protective hard structure breakwater that would result from the project. Impacts to public safety would be minor and short-term as the user groups would adapt to the new conditions on site in a relatively short period of time.

4.4.6 Indian Point Shoreline Erosion Protection

The Indian Point Shoreline Erosion Protection project would construct approximately 2,800 linear-feet of segmented breakwaters to protect 50 acres of critical seagrass, coastal marsh, lagoons and associated upland habitats within Indian Point on Corpus Christi Bay in San Patricio County. The project would protect the existing shoreline from wind and wave driven erosion and protect the remaining marsh and associated coastal habitats adjacent to the shoreline. The estimated cost for the project is $2,199,000.

This analysis incorporates by reference the relevant portions of Section 6.4.1.1 of the Final PDARP/PEIS and the USACE Statement of Findings issued for the permit (USACE 2013; USACE 2014a). The Final PDARP/PEIS provides programmatic evaluation of the environmental consequences of the Restoration Approach “Create, restore, and enhance coastal wetlands”, which are considered in this RP/EA and are incorporated by reference here. Tiering from that analysis, this section presents the Affected Environment of Indian Point Shoreline Erosion Protection project and the environmental consequences of the proposed actions in context of the project-specific affected environment.

The description and analysis of the project below are based on a project-specific preliminary design concept rather than detailed engineering plans. Throughout the design process, every practical attempt would be made to avoid and minimize potentially adverse environmental and cultural resource impacts. The following descriptions for each of the construction elements are preliminary and based on current planning efforts and resource agency experience with similar projects. While the Texas TIG does not consider it likely, it is possible that the E&D process could generate a plan that has environmental impacts that are different in type or magnitude from those discussed in this document. If that is the case, the Texas TIG would consider whether further environmental impacts analysis would be necessary.

The programmatic analysis looked at a series of resources as part of the biological, physical, and socioeconomic environment. As appropriate in a tiered analysis, the evaluation of each project focuses on the specific resources with a potential to be affected by the project.

The impacts from the project are largely beneficial and the adverse impacts are minor to moderate. Benefits to the physical, biological, and human uses and socioeconomics environment would result if this project was implemented. BMPs required in the permit, consultations, or environmental reviews would be followed. Additionally, BMPs described in Appendix 6.A of the Final PDARP/PEIS as well as Appendix B of this document would be considered and applied where appropriate, to reduce or eliminate impacts to the environment. A summary of the conclusions of this analysis are in Table 4-17. Categories and terminology in the table follow a consistent format used for all projects in this RP/EA. Information from this EA was used to populate this table using the definitions provided in Appendix C.

Table 4-17. Summary of beneficial impacts as well as short-term and long-term adverse impacts from implementation of the Indian Point Shoreline Erosion Protection project

Resource Categories	Benefits	Adverse Short-Term	Adverse Long-Term
Physical Resources			
Geology and Substrates	Yes	Moderate	Moderate
Hydrology and Water Quality	Yes	Minor	NE
Air Quality and GHG Emissions	NE	Minor	NE
Noise	NE	Minor	NE
Biological Resources			
Habitats	Yes	Minor	Minor
Living Coastal and Marine Resources	Yes	Minor	NE
Protected Species	Yes	Minor	NE
Human Uses and Socioeconomics			
Socioeconomics and Environmental Justice	NE	NE	NE
Cultural Resources	NE	NE	NE
Infrastructure	Yes	NE	NE

Resource Categories	Benefits	Adverse Short-Term	Adverse Long-Term
Land and Marine Management	Yes	NE	NE
Tourism and Recreation Use	Yes	NE	NE
Fisheries and Aquaculture	Yes	Minor	NE
Land and Marine Transportation	NE	NE	NE
Aesthetics and Visual Resources	Yes	Minor	NE
Public Health and Safety	Yes	NE	NE

Notes: *Yes – provides benefits*
NE – no effect
Adverse short-term and long-term impacts are designated as minor, moderate, or major

4.4.6.1 Physical Environment

Recent human activities associated with urban and port development in the Corpus Christi Bay System have resulted in alteration of tidal regimes and sediment transport. These activities include transition of open farm lands to urban development, armoring of the shorelines, shore protection structures that alter downdrift transfer of sediment, and damming of nearby stream segments for irrigation. The cumulative impacts of these alterations, in addition to storm driven erosion, have led to long-term shoreline retreat in the bay system and loss of critical wetland habitats.

Tremblay et al. (2008) demonstrated that in the last 50 years, the rate of marsh loss in the Nueces Estuary has averaged about 94 acres/year with a total loss of approximately 4,750 acres. The most extensive loss of habitat was tidal flats which saw a significant decline with roughly 30% lost as these habitats transitioned from tidal flats to estuarine marsh in response to sea level rise.

The shoreline of Indian Point Park has been eroding rapidly over the past 50 years. The shoreline has retreated over 500 feet and approximately 19 acres of beach, shallow lagoons, and marsh have been converted to open bay. In addition to conversion to open bay, saltwater intrusion into the lagoons and wetlands have slowly altered the vegetation and habitat services these areas provide.

4.4.6.1.1 Geology and Substrates

Affected Resources

The breakwaters would be built over submerged sediments in subtidal habitat. Sediment cores were taken and the substrate was analyzed. Bathymetric and topographic surveys of the project area were performed by Naismith Marine Services, Inc. on May 16, 2012. The nearshore has prominent sandbars along the entire length of the project shoreline. Seaward of the shelf, the water depth has a steep slope. The upper shore-face is also relatively steep. The dry beach is narrow and decreases in elevation and transitions to wetlands. The dry beach primarily consists of sand, shells, and shell fragments, which contributes to steepness of the upper shore-face.

Environmental Consequences

Section 6.4.1.1 of the Final PDARP/PEIS, which describes the impacts to geology and substrates from restoration projects intended to create, restore, and enhance coastal wetlands, is incorporated here by reference. As described in the Final PDARP/PEIS, there may be moderate short- and long-term adverse impacts from this project. Staging areas and heavy equipment (both shoreline and barges) can cause direct localized and short-term, moderate adverse impacts from sediment disturbance and compaction. Standard BMPs for construction to reduce erosion and limit loss of sediments would be employed to minimize adverse impacts to geology and substrates.

Construction of the breakwaters at Indian Point would affect substrates within the footprint of the project through the placement of hard structural materials and geotextile fabric. The placement of geotextile fabric and breakwaters would have long-term moderate adverse impacts on substrates and geology directly under the structures but it would be limited to approximately two acres of open bay bottom. However, the adverse impacts would be localized and long-term benefits would occur to the bottom substrates adjacent to the breakwaters due to stabilization of sediments and protection of the shoreline from erosion and wave action. In addition, the contractor would access the project area by land across the existing breakwaters; therefore, not disturbing adjacent sediments. Mitigation measures to minimize adverse impacts to geology and substrates could include employment of standard BMPs for construction to reduce erosion and loss of sediments.

4.4.6.1.2 Hydrology and Water Quality

Affected Resources

There are two major tidal inlets into Corpus Christi Bay. Aransas Pass (Corpus Christi Ship Channel), between Mustang Island and San Jose Island, which accounts for the majority of the tidal exchange between the bay and the Gulf of Mexico. Packery Channel, between the southwestern end of Mustang Island and North Padre Island, is manmade inlet that supplies a lesser amount of the bay’s tidal exchange. Overall, the natural depth of the bay is relatively shallow, with an average depth of approximately 9 feet. Tides in Corpus Christi Bay under normal conditions are very small in amplitude, usually less than 3 feet between low and high tide. Wind speed and direction within Corpus Christi Bay plays an important role in affecting tide elevation. It can dampen or enhance the height of waves as well as their potential energy. Prevailing winds are from the southeast, with occasional strong northerly winds that are associated with passing cold fronts. Winds combined with seasonal tide events can greatly exacerbate the tidal range as well as move the range up or down by 1 or 2 feet. Storm tides during Category 4 or 5 hurricanes could be as high as 15-20 feet above normal water levels according to NOAA’s Sea, Lake, and Overland Surge from Hurricanes (SLOSH) Model.

The project site is located along Indian Point in Upper Corpus Christi Bay. Indian Point is a small peninsula that extends from the northeastern shore and extends towards Rincon Point on the southwestern shore. The two peninsulas separate Nueces Bay from Upper Corpus Christi Bay. Conditions within project area are primarily influenced by Corpus Christi Bay. The hydrology of the area is affected by tidal actions from the inlets and inflows of freshwater from the Nueces River through the delta into Nueces Bay. The breakwaters have been engineered to withstand existing hydrological tidal pressures in the area and up to category three hurricane wave actions. The recent construction of the adjacent shore protection project and breakwaters, located just northwest of the proposed six breakwaters would be used as a model to implement measures to effectively manage any hydrology related concerns with the existing breakwaters.

Corpus Christi Bay has four very specific areas listed in the 2014 Integrated Report of Water Quality Impairments (TCEQ 2015a; TCEQ 2015b) as not meeting recreation use criteria, specifically bacteria. The TCEQ is currently developing a TMDL and implementation plan for the water bodies. These impaired segments are Cole Park Beach, Ropes Park Beach, and Poenisch Park Beach. In addition, Oso Bay has impairments for bacterial and depressed dissolved oxygen. Nueces Bay has an oyster waters impairment listed specifically relating to zinc in the edible tissues. There are no restricted consumption advisories for Corpus Christi Bay.

Environmental Consequences

Section 6.4.1.1 of the Final PDARP/PEIS describes the impacts to hydrology and water quality from restoration projects intended to create, restore, and enhance coastal wetlands, is incorporated here by reference. As described in the Final PDARP/PEIS, minor adverse impacts could occur. Construction, staging areas, and heavy equipment (both shoreline and barges) can cause direct localized and short-term, moderate adverse impacts from increased turbidity. Localized, minor impacts may occur to the existing substrate due to placement of materials (such as dredged material or riprap). Hydrology also may be affected where tidal connectivity is modified per project design. This modification, however, would be beneficial to the system. BMPs (such as silt curtains, buffer zones, and water quality monitoring) to minimize or avoid adverse impacts would be implemented throughout the duration of construction in order to minimize impacts.

For these breakwaters, impacts to hydrology and water quality were analyzed adequately within the PEIS. The PEIS determined that “create, restore, and enhance coastal wetlands by constructing shore protection projects would provide long-term benefits for many ecologically and economically important species by protecting highly productive habitats that provide food, shelter, breeding, and nursery areas”. These would be long-term beneficial effects because they would extend beyond the construction period. Some short-term adverse impacts due to turbidity could occur in the immediate vicinity of the work area. These effects would be minor and short-term as turbidity would dissipate shortly after placement activities are completed.”

No impacts to floodplains or hydrology would occur. Short-term, local, and minor impacts to water quality would result from increased turbidity during the placement of the breakwaters. Long-term benefits would also occur from the breakwater/armored levee protection of the seagrass beds, sand/shell beaches, estuarine marshes, and tidal pools.

Measures to control turbidity and sediment movement would be in place to ensure water quality standards are met and sensitive resources are not affected. These measures may include the installation of silt fences and filter-fabric to control sediments and avoid negative impacts associated with the breakwaters. In addition, construction equipment and materials would be staged in an existing parking lot within the park and construction access to the additional breakwaters would utilize the existing breakwaters to access the project area.

4.4.6.1.3 Air Quality and GHG Emissions

Affected Resources

Air Quality

Indian Point is located in the Corpus Christi area. The Corpus Christi area is in attainment or unclassified with the NAAQS for all criteria pollutants (https://www.tceq.texas.gov/airquality/sip).

GHG Emissions

Criteria air pollutants and GHG emissions are largely generated by electricity production, vehicular movements, and commercial and residential buildings using electricity. GHG emissions would result from both the implementation and operation of the project from the use of heavy machinery during construction and vessels during monitoring activities. Engine exhaust from boats, excavators, and equipment would contribute to an increase in GHG emissions. BMPs would be considered and applied where appropriate and practical to reduce the release of GHGs during project implementation. BMPs considered would include using energy efficient machinery and equipment; the incorporation of anti-idling procedures; and the use of gas as compared to diesel.

Environmental Consequences

Section 6.4.1.1 of the Final PDARP/PEIS, which describes the impacts to air quality and GHG emissions from restoration projects intended to create, restore, and enhance coastal wetlands, is incorporated here by reference. As stated in the Final PDARP/PEIS, there could be short-term adverse impacts to air quality from emissions generated by construction equipment and vehicles. Construction activities are anticipated to result in short-term minor adverse impacts to air quality due to pollutants from fuel emissions, including particulate matter, lead, and carbon monoxide. Greenhouse gases (GHGs) are specifically addressed in Section 6.14.1, Impacts of Restoration Approaches on GHG Emissions. BMPs would be employed, as appropriate to mitigate any impacts to air quality in the immediate vicinity of the project.

For the construction of the breakwaters or groins, impacts to air quality and GHG emissions were analyzed adequately within the Final PDARP/PEIS. The Final PDARP/PEIS determined that “During dredging, excavation or placement of materials to restore or enhance beaches, barrier islands and wetlands for habitat protection or restoration there could be short-term minor to moderate adverse impacts to air quality from the use of heavy equipment and vehicles. The severity of impacts would be highly dependent on the length and type of construction required and the location of the project. The use of gasoline and diesel-powered construction vehicles and equipment could contribute to a minor increase in GHG emissions.”

Consistent with the Final PDARP/PEIS, project implementation would require the use of equipment which would temporarily affect air quality in the project vicinity due to construction vehicle emissions. Excavation associated with construction of portions of the improvements may produce fine particulate matter; however, sediments deposited would be mixed with water, keeping airborne particles to a minimum. Where applicable, electricity requirements would be met by local suppliers. To the extent possible, the project would consider resource conservation measures and technology to reduce energy use. Adverse impacts to air quality would be minor, local, and temporary, only occurring during active construction activities.

4.4.6.1.4 Noise

Affected Resources

The project area consists of open water. Current noise is generated from the natural soundscape (winds, wave action, birds, etc.) as well as recreational users (boaters, anglers, etc.). Indian Point Park is located near the project area and users would contribute noise to the soundscape.

Environmental Consequences

Section 6.4.1.1 of the Final PDARP/PEIS, which describes the impacts to noise from restoration projects intended to create, restore, and enhance coastal wetlands, is incorporated here by reference. The Final PDARP/PEIS stated that "During the construction period to create or protect habitats, minor to major short-term adverse impacts to ambient noise levels may occur, particularly during the placement of rock breakwaters. The severity of impacts would depend to a large degree on the location of the project, type of equipment, the amount of noise that these activities would generate, and the distance to sensitive receptors such as recreational users or wildlife. Impacts on noise would be short-term during the construction period and limited to day light hours."

The project would have localized, minor, and short-term adverse impacts to noise from construction activities. Noise impacts would be short-term and limited to the period of construction which is anticipated to be no longer than 12 months. Heavy equipment can cause direct localized and minor adverse impacts due to noise. Construction equipment noise is known to disturb fish, marine mammals and nesting shorebirds. The timing of noise producing activities would be planned to minimize disturbance to nesting birds. Construction noise would also create a potential nuisance to visitors in areas adjacent to project construction activities. It is unlikely that the noise from construction would be able to travel to the residential dwellings on Indian Point. However, to prevent disturbance of the residential community near Indian Point and in the Park, construction activities that produce significant noise or require precision, such as moving or placing rock would be limited to daylight hours.

4.4.6.2 Biological Environment

The Corpus Christi Bay system contains a variety of habitat types, ranging from open water areas to wetlands to upland prairie. Wetlands, tidal flats, seagrass meadows, and mangroves are four important habitat types in Corpus Christi Bay system. A wide variety of fish, wildlife, plant, and invertebrate populations either reside in or periodically utilize Corpus Christi Bay and its associated habitats, including oysters, finfish, shrimp, crabs, birds, sea turtles, and marine mammals. The biological environment is divided into habitats, living coastal and marine resources, and protected species.

4.4.6.2.1 Habitats

Affected Resources

The action area includes staging areas, the location of breakwater installation, transportation corridors, and habitats that would be affected by the installation of the breakwaters. The proposed location of the breakwater installation is at the southwestern end of a peninsula that separates Nueces Bay (west-northwest) from the upper part of Corpus Christi Bay (south-southeast).

Habitat in and adjacent to the construction area consists of a very productive and complex mosaic of habitats that include sand and shell beaches, dunes, seagrass beds, tidal flats, scrub/shrub uplands, intertidal and high saltmarsh, and lagoons. Current habitats that could be positively affected by the installation of the breakwaters include:

- Seagrasses
- Open water
- Estuarine wetlands
- Freshwater wetlands

The open water and estuarine marsh habitats in or near the project area are sustained by tidal exchange and the freshwater wetlands are dependent on rainfall. Plant species near the project area include saltwort, sea ox-eye daisy, glassworts, smooth cordgrass, turtle weed, dwarf saltwort, Virginia glasswort, and shoregrass, shoal grass, and widgeon grass.

Estuarine marsh habitat is critical for larval, post-larval, and juvenile stages of many species. For example, brown shrimp are dependent on marsh-surface habitat during its post-larval and early juvenile stages (Minello and Zimmerman 1991). The recognition of estuarine emergent marsh as critical to fishery species is reflected in that estuarine emergent marsh is designated as EFH by NMFS in accordance with the Magnuson-Stevens Act.

Installation of rock breakwater would also create hard substrate habitat that would be similar to oyster reef habitat. While rock breakwaters differ from oyster reefs in their structure and formation, they would be similar in habitat type and provide some of the same beneficial ecological services as reefs. The interstitial spaces between the rocks provide cover for many of the same crustacean and finfish species utilizing oyster reefs. In addition, rock breakwaters provide hard substrate for encrusting species of bivalves, bryozoans, polychaete worms, and barnacles.

Environmental Consequences

Section 6.4.1.1 of the Final PDARP/PEIS describes the impacts to habitats from restoration projects intended to create, restore, and enhance coastal wetlands, is incorporated here by reference. As stated in the Final PDARP/PEIS, there may be minor, short-term adverse impacts during construction activities to wetland vegetation during construction. Minor, long-term adverse impacts could result from the conversion of one habitat type to another.

The project would result in short- and long-term minor impacts associated with the conversion of shallow bay bottom habitats. However, the project would benefit habitat (wetlands, seagrass beds, open water habitats) north of the project area. It would also help protect the existing road infrastructure by providing a buffer to storm impacts. The proposed breakwater would also provide hard substrate habitat as well as protect other natural habitats (estuarine marsh and seagrasses) that are rich and abundant in estuarine species. Avian species also use portions of the breakwaters for foraging and resting areas.

This project would protect habitat types that are classified as EFH for species under federal fishery management in accordance with the Magnuson-Stevens Act. This project would protect habitat types that are classified as EFH for species under federal FMPs such as brown shrimp, white shrimp and pink shrimp, Gulf stone crab, red drum, gray snapper, and blue fish. These species spend a portion of their juvenile life stages in estuarine nurseries. These estuarine habitats also benefit numerous other fishery species not under Fishery Management Plans.

4.4.6.2.2 Living Coastal and Marine Resources

Affected Resources

There are a number of aquatic species found in the project area. Fish species include sand seatrout, spotted or speckled seatrout, red drum, tonguefish, flounders, Atlantic bumper, and porgys. Benthic organisms include bivalves, gastropods and other mollusks, amphipods, annelids, and brown and white shrimp.

Water dependent birds may use the open bay to forage and roost. These would include loons, bay ducks, gulls, terns, and pelicans. Colonial waterbirds nest and roost in the scrub/shrub vegetation and wading shorebirds forage within the tidal lagoons within Indian Point Park, which is outside of the project area. Texas diamondback terrapins have been observed nearby and may use the project area.

Environmental Consequences

Section 6.4.1.1 of the Final PDARP/PEIS, which describes the impacts to living coastal and marine resources from restoration projects intended to create, restore, and enhance coastal wetlands, is incorporated here by reference. As explained in the Final PDARP/PEIS, minor short-term adverse impacts could displace land-based or aquatic faunal species resulting from staging equipment and materials, as well as entrapment of marine mammals. Long-term minor adverse impacts could include conversion of one habitat type to another with changes in the distribution of fauna communities.

The Final PDARP/PEIS determined that “the creation, restoration, and enhancement of coastal wetlands, including marshes, mangroves, and pine savannahs, that provide benefits to injured resources through the replacement of injured wetland resources, provision of habitat for injured faunal resources and/or their prey, and improvement of water quality benefit injured resources in coastal watersheds.”

The Final PDARP/PEIS also found that “some short-term adverse impacts could occur from the placement of construction of hard structures such as breakwaters can involve use of heavy equipment on the shoreline and barges that can cause direct localized and short-term, moderate adverse impacts from sediment disturbance and compaction, increased turbidity, and noise as the materials are placed in the designed configuration. Long-term, minor adverse indirect impacts on the physical environment could occur from the placement of dredged material and breakwaters in shallow water areas, which may affect sediment dynamics. Placement of materials (such as dredged material or riprap) would result in long-term, but localized, adverse impacts to the existing substrate. Hydrology also may be affected where tidal connectivity is modified per project design. However, projects would typically require implementation of best practices to minimize or avoid adverse impacts. Best practices, such as silt curtains, buffer zones, and water quality monitoring, would be used to minimize such effects. Placement of hard structures could impact local benthic organisms on or near the placement site from compaction, increased turbidity, substrate disturbances or siltation, which could locally increase mortality and inhibit activities in the short-term until the site recovered".

This project would likely result in short-term minor adverse impacts due to construction related disturbances and small changes to sessile species populations if present. However, there would likely be no impact to feeding, reproduction, or other factors affecting population levels. Short-term, minor, and localized impacts to fish and wildlife resources would occur during the construction phase of the project. Mobile aquatic animals including fish and birds would be expected to move away from the area during construction and return following completion of the project. Isolated, short-term effects on pelagic fish eggs and larvae in the immediate area may occur. Sessile and other limited movement species, especially those buried/burrowed in the substrate could be injured or killed by the breakwater placement activity. However, these types of species are typically numerous and recolonize quickly. Any adverse impacts to marine and estuarine fauna (fish, shell beds, benthic organisms) are expected to be temporary, localized, and minor as those species that would be affected are likely numerous in the area.

The project would provide overall long-term benefits to living coastal and marine resources by providing additional structural fish habitat and increased hard substrate, which is known to increase productivity compared to soft-bottom bay habitat. Over the life of the project, the quality of aquatic habitat would increase. The construction of an intertidal or subtidal breakwater or armored levee would provide long-term benefits to marine species by providing additional hard structure (including crevices and interstitial voids) habitat.

Construction activities would cause temporary impacts to wildlife due to the presence of people and use of heavy equipment within Indian Point Park. These impacts would last for the duration of construction, which is estimated to be a maximum of 12 months. Permanent impacts result from the construction of the breakwaters and associated hard structure habitat would provide long-term benefit to breeding and nesting birds within the Park. Natural colonization of fish and invertebrates along the breakwaters could occur which would provide foraging habitat for many shore and water bird species.

4.4.6.2.3 Protected Species

Affected Resources

<u>Threatened or Endangered Species</u>

The five endangered or threatened species that could potentially be affected are listed in Table 4-18. No activities related to implementation of the project would take place in any area designated as critical habitat.

Table 4-18. Federal Threatened and Endangered Species potentially affected in the Indian Point Shoreline Erosion Protection project area

Common Name	Status
Loggerhead Sea Turtle	T
Green Sea Turtle	T
Atlantic Hawksbill Sea Turtle	E
Kemp's Ridley Sea Turtle	E
Leatherback Sea Turtle	E

Notes: *E – federally endangered species*
T – federally threatened species

Five species of endangered or threatened species of sea turtles could potentially be affected in the project area: loggerheads, green, hawksbill, leatherback and Kemp's ridley sea turtles. Sea turtles nest on beaches, and most species use nearshore hard bottom reef complexes, shallow water habitat (including seagrasses), or other coastal areas with rocky bottoms to forage for food. This area has not been designated as critical habitat for any of the sea turtle species. Sea turtle nesting activities are not expected to occur here since there is no Gulf facing beach habitat; however, sea turtles could be encountered in the open water.

Essential Fish Habitat

Habitats within the project area are subject to designation as EFH. The 1996 amendments to the Magnuson-Stevens Act set forth a mandate for NMFS, regional FMCs, and other federal agencies to identify and protect EFH of economically important marine and estuarine fisheries. To achieve this goal, suitable fishery habitats need to be maintained. EFH is separated into estuarine habitat types. Estuarine habitat is defined as "all estuarine waters and substrates (mud, sand, shell, rock and associated biological communities), including the sub-tidal vegetation (grasses and algae) and adjacent inter-tidal vegetation (marshes and mangroves)." EFH in the area of proposed action is identified and described for various life stages of managed fish and shellfish in the Gulf of Mexico (GMFMC 2005). A provision of the Magnuson-Stevens Act requires that FMC's identify and protect EFH for every species managed by an FMP (U.S.C. 1853(a)(7)). There are FMPs in the Gulf region for red drum, shrimp, reef fish, and HMS (e.g., sharks). Table 4-19 and 4-20 present the EFH and species within the Indian Point Shoreline Erosion Protection project area.

Table 4-19. EFH for estuarine habitats within the Indian Point Shoreline Erosion Protection project area

Species Common Name	Eggs	Larvae	Post Larvae	Early Juvenile	Late Juvenile	Adult	Spawning Adult
Estuarine Emergent Marsh							
Red Drum			●	●		●	
Gray Snapper						●	
Brown Shrimp				●			
White Shrimp				●			
Estuarine Sand and Shell Bottom							
Red Drum			●			●	
Gray Snapper						●	
Lane Snapper				●	●		
Brown Shrimp				●			
Estuarine Mud/Soft Bottom							
Red Drum		●	●	●		●	
Gray Snapper						●	
Lane Snapper				●	●		
Brown Shrimp				●			
White Shrimp				●			

Note: ● indicates habitat type designated as EFH for species' life stage

Table 4-20. Highly migratory species EFH designations within project area for the Indian Point Shoreline Erosion Protection project area

Species Common Name	Life Stage Within Estuarine Waters
Scalloped Hammerhead	Neonate & Juvenile
Blacktip Shark	Neonate, Juvenile & Adult
Bull Shark	Neonate, Juvenile & Adult
Lemon Shark	Neonate & Juvenile
Spinner Shark	Neonate & Juvenile
Bonnethead Shark	Neonate, Juvenile & Adult
Atlantic Sharpnose Shark	Neonate & Adult

Marine Mammals

The bottlenose dolphin and the West Indian Manatee (manatees are protected under the ESA) are the only marine mammals known to occur in the Corpus Christi Bay. Manatees are rarely found in Corpus Christi Bay.

Bald and Golden Eagles

There are eagle home ranges or established territories within the Indian Point Park area (http://ebird.org). Eagles have been observed at Nueces Delta during the winter months. Bald eagles may be found in the vicinity of Corpus Christi Bay however no nests have been documented in near the project area.

Migratory Birds

The Indian Point Park is known migratory bird habitat that provides foraging, loafing, resting and roosting areas. The different bird taxonomic guilds and use activities are listed below:

Loons and Grebes – This group of birds may use waters surrounding the site locations during the fall, winter, and spring to forage. Presence in the area would be based on available forage fish and invertebrates. Construction activities may cause the birds to move to other foraging areas.

Waterfowl – Bay ducks may use this part of Corpus Christi Bay during migration and for overwintering. Any effects to this group would be temporary and they would also be more likely to use open bay habitat further from waterways.

Pelicans and Cormorants – These would use the open bay and tidal lagoons to forage. Construction activities would cause the birds using the area to move to other locations in the bay. Acclimation to construction activities may take place.

Terns and Gulls – These species would use the open bay habitat to forage and sand/shell beaches of loafing and nesting areas. These birds would move to other nearby sites in the bay system to forage and construction would occur in the water so as not to impact nesting birds.

Songbirds and Land Birds - Some landbirds may use vegetation associated with the site such as black mangrove stands. These areas will be avoided by project activities.

The disruptions caused by construction activities would be temporary and once completed the breakwaters would provide a greater range of habitats available for birds to use for foraging or resting. The breakwaters would provide long-term benefits by protecting essential nesting areas for colonial waterbirds and shorebirds, and protect foraging lagoons that would serve nearby nesting pairs and fledglings. The proposed actions would support the project goal to protect critical habitats. The proposed actions would also provide more opportunity for many of the above listed bird groups as well as other guilds during the non-nesting season.

Environmental Consequences

Section 6.4.1.1.1 of the Final PDARP/PEIS stated that "some short-term adverse impacts could occur from the placement of rock breakwaters which result in suspended sediments and increased near-site turbidity." Adverse effects from the construction of breakwaters may include:

Sea turtle and marine mammal individuals may be present in project areas where dredging or underwater use of equipment is occurring. They could be subjected to temporary increased noise, turbidity, and water quality changes. These activities could temporarily displace individuals or prey during construction and could result in short-term, minor impacts. Consultation with appropriate agencies was completed during the issuance of a USACE permit and all required BMPs would be followed in accordance with the USACE permit.

Fish present in the placement area could be subject to a temporary increase in sound pressure levels, a decrease in water quality, entrainment in geotextile fabric, and removal of benthos from the breakwater project area. Sound pressure levels or entrainment could result in mortality of individual finfish. This would be a minor short-term adverse effect that would not be expected to reduce local fish populations or designated EFH. Consultation with appropriate agencies was completed during the issuance of a USACE permit and all required BMPs would be followed in accordance with the USACE permit.

Birds that forage in or near the breakwater construction site could be temporarily affected. However, these effects would be short-term and minor as birds would be expected to move away to forage in other readily available foraging habitat during the placement of the materials. Consultation with appropriate agencies was completed during the issuance of a USACE permit and all required BMPs would be followed in accordance with the USACE permit.

Birds using the sites as roosting and/or loafing areas would be forced to other parts of the peninsula or other surrounding areas during construction activities. This would be temporary, however, and once the project was completed, the project would have long-term benefits to birds for these uses.

There will be no take of migratory birds. If construction activities occur during the nesting season, the portion of action area consisting of nesting habitat will be surveyed for the presence of nesting birds by a qualified biologist. If nesting birds are present or indications of pre-nesting behavior are observed, appropriate BMPs will be employed to ensure that no incidental take of any individuals occurs. BMPs will be coordinated with USFWS prior to implementation.

Placement of rock material is a slow process allowing plenty of time for sea turtles to leave the area. Breakwater construction activities are not expected to have impacts to protected marine species and their habitats in the areas where the materials would be placed. Short-term minor impacts may occur if species using the project area are temporarily disturbed and must move to another area. Impacts to wildlife would be avoided via management guidelines and techniques as appropriate; therefore, restoration activities are not likely to adversely affect federally-listed sea turtles. Additionally, the Sea Turtle and Smalltooth Sawfish Construction Conditions would be followed (NMFS 2006). Long-term impacts would be beneficial with the addition of hard substrate that would support a more diverse community of benthic organisms and fish. This project would follow the PDCs described in NMFS's Framework Biological Opinion on *Deepwater Horizon* Oil Spill Final Programmatic Damage Assessment and Restoration Plan and Final Programmatic Impact Statement (SER-2015-17459). NMFS' PDCs consider where construction would occur, construction methodologies, BMPs that would be implemented, and reporting requirements (NMFS 2016).

Temporary and localized turbidity impacts during placement of the breakwaters could impact EFH. The placement of the breakwaters would result in the permanent loss of approximately 6 acres of submerged bay habitat designated as EFH for federally managed fish species through the altering of existing estuarine water column and the underlying estuarine mud/sand/shell substrates by converting these aquatic areas to hard structure habitat. The proposed breakwaters would result in the permanent filling of EFH. However, the submerged side slopes of the breakwaters would provide hard substrate with interstitial spaces that would enhance foraging areas for fish as well as provide cover for juvenile fish and substrate for establishment of oyster habitat.

Any adverse impacts to marine and estuarine fauna (fish, shell beds, benthic organisms) are expected to be short in duration and minor as those species that would be affected are likely numerous in the area. The project would provide benefits to marine and estuarine fauna by providing additional structural fish habitat which would compensate for loss of benthic bay bottom habitat. Over the life of the project, the quality of aquatic habitat would increase.

Marine mammals that may use Corpus Christi Bay (e.g. dolphins and manatees) would likely leave the area to avoid the construction activities and/or would generally avoid the area because optimal habitat does not exist. Manatees are extremely rare in Texas waters with sightings less than one per year on average across the entire Texas coast. However, if marine mammals are sighted within 50 feet of the construction area, work would stop until the animals move away from the area under their own volition. Therefore, marine mammals would not be impacted during construction activities and no incidental take of marine mammals is anticipated.

Construction activities would be relatively short-term and occur outside of the nesting season period, and would not affect any bird nesting activities. Birds using the site for loafing and resting during the construction window may use adjacent areas and features during construction if they become acclimatized to the activities. Birds using the nearby open water for foraging may also be displaced to sites more remote from the peninsula. Some minor and temporary displacement of local foraging and roosting birds could occur during operations. The disruptions caused by construction activities would be temporary and once completed the breakwaters would provide a greater protection of the available habitats for birds to use.

4.4.6.3 Human Uses and Socioeconomics

This section includes discussions of social economics and environmental justice, cultural resources, infrastructure, land and marine management, tourism and recreation use, fisheries and aquaculture, land and marine transportation, aesthetic and visual resources, and a general characterization of public health and safety issues.

4.4.6.3.1 Socioeconomics/Environmental Justice

Affected Resources

The project area does not include any residential or other private dwellings. People do not live within the project area. The nearest city is Portland, Texas. In 2016, the population in Portland was estimated to be 16,118. Around 60% of the population in is white (not Hispanic or Latino), 35% is Hispanic or Latino, 2% is black or African American, and 1% is Asian. Median household income in Portland and the state is $62, 561 and $53,207, respectively, with 7% of Portland and 16% of the state living below the poverty level (U.S. Census Bureau 2016d; U.S. Census Bureau 2016g).

Environmental Consequences

Section 6.4.1.5 of the Final PDARP/PEIS, which describe the impacts to socioeconomics from restoration projects intended to protect and conserve marine, coastal, estuarine, and riparian habitats, is incorporated here by reference. The Final PDARP/PEIS describes acquisition and protection activities has having minor to moderate adverse effects due to changes in development activities, spending, and taxes. In addition, there would also be beneficial impacts from preventing development that would be at risk from future severe storms (e.g., hurricanes, tropical storms, etc.) and opening private lands for public use.

This project is not expected to result in any socioeconomic impacts. Short-term beneficial impacts to the local and regional economies would occur from construction associated with project implementation activities. Nature tourism and other recreational activities may increase as a result of this project due to the increase in wildlife resources, which is likely to have a positive impact on the local economy. In addition, commercial and recreational fisheries would be enhanced by restoration of estuarine nursery habitat for shellfish and finfish. The reduction of erosion along the shoreline of the park, would beneficially impact local towns by protecting the natural resources, public roadways, and park infrastructure from further losses. The towns of Portland, Aransas Pass, Corpus Christi, Rockport, Port Aransas, and Ingleside, would all experience an increase in quality of life, due to the protection of the existing park and public infrastructure and preservation of the natural resources.

In consideration of EO 12898, Environmental Justice, this restoration activity does not have the potential to adversely and/or disproportionately affect minority or low-income populations, including economically, socially, or in terms of conditions affecting their health. This restoration project would help restore an environment that is of benefit to all citizens, populations and groups in Texas and beyond.

4.4.6.3.2 Cultural Resources

Affected Resources

A review of the project area Section 106 NHPA was conducted during the USACE permitting process. “The National Register of Historic Places has been consulted and no properties are listed in the permit area…in a correspondence dated 19 November 2012, the State Historic Preservation Office stated that no survey is required and that the project may proceed”. Additionally, the Texas TIG has reinitiated coordination under Section 106 NHPA.

Environmental Consequences

Section 6.4.1.1 of the Final PDARP/PEIS, which describes the impacts to cultural resources from restoration projects intended to create, restore, and enhance coastal wetlands, is incorporated here by reference. As explained in the Final PDARP/PEIS, minor (temporary disturbance) to moderate (disturbance without loss of cultural information) impacts on cultural and historic resources due to construction activities such as dredging, addition of sediments or borrow materials, and/or removal of sediments could occur, depending on the scale of the action and site-specific characteristics. Long-term, adverse impacts could include physical destruction or alteration of resources and may alter, damage, or destroy resources such as historic shipwrecks, engineering structures or landscapes, or connectivity with related sites.

No adverse impacts to cultural resources are anticipated as a result of this project. This project was reviewed as part of the USACE permitting process (USACE 2014a). No properties in the National Register of Historic Places are in the permit area. Additionally, the State Historic Preservation Officer stated that no survey is required and that the project could proceed. If any culturally or historically important resources are identified during project preparations or pre- deployment surveys, such areas would be avoided during construction. A complete review of this project under Section 106 of the NHPA is ongoing and would be completed prior to any project activities that would restrict consideration of measures to avoid, minimize or mitigate any adverse effects on historic properties located within the project area; therefore impacts are expected from project implementation. This project would be implemented in accordance with all applicable laws and regulations concerning the protection of cultural and historic resources.

4.4.6.3.3 Infrastructure

Affected Resources

The project is located within open water. It is not part of an identified marine transportation channel. The nearest pipeline is about 1 mile away.

Environmental Consequences

The proposed action is anticipated to have no adverse impacts to existing infrastructure. This project would provide benefits to infrastructure by creating breakwaters that would protect existing roads from storm events.

4.4.6.3.4 Land and Marine Management

Affected Resources

The project area is on state owned water bottom. The project area does not include any land.

Environmental Consequences

The proposed action is anticipated to have no impact to land and marine management, since projects would be consistent with the prevailing restoration methods, coastal management plans, and the feasibility study specifically developed for protection and preservation of Indian Point Park and the natural resources located within the park. Benefits to land management related to the reduction of erosion are expected from the project as park amenities would be protected from damage or loss by the constructed breakwaters.

4.4.6.3.5 Tourism and Recreational Use

Affected Resources

Aransas Pass, Ingleside and Portland are the communities that comprise the North Bay. These cities offer plenty of birding, fishing, boating, sailing, swimming, and kite surfing opportunities. Indian Point Fishing Park & Pier is a 333-acre public park known as Sunset Lake. This park provides an ecologically rich wetland and saltwater lake, lined by a 2 mile hike and bike trail. Outdoor enthusiasts can enjoy fishing, birding, kayaking, canoeing, swimming and sailing. The park is part of the Corpus Christi Bay Loop of the Great Texas Coastal Birding Trail. About 10 minutes from downtown Corpus Christi, the park provides access to Corpus Christi Bay as well as to a small saltwater lake and a vast network of wetlands and marshes. The pier itself extends about 1,000 feet into the bay. Summertime anglers catch speckled trout, flounder and redfish from the pier, but black drum is often the target species during the winter months.

Environmental Consequences

Section 6.4.1.1 of the Final PDARP/PEIS, which describes the impacts to tourism and recreational use from restoration projects intended to create, restore, and enhance coastal wetlands, is incorporated here by reference. As stated in the Final PDARP/PEIS, short-term indirect adverse impacts in the immediate area could occur during construction through limits on recreational activities near the construction area and temporary increases in road traffic due to movement of construction vehicles and temporary storage of materials.

Short term impacts to recreation would be limited to the construction period for this project and are expected to be minor. When construction is completed, the project would result in benefits to recreational use by protecting existing recreational infrastructure which includes bird observation trails, a public fishing pier, public bay access, public parking, and educational kiosks. By protecting this infrastructure, the temporary impacts would be offset by long-term benefits.

4.4.6.3.6 Fisheries and Aquaculture

Affected Resources

The project area contains open water. Seagrasses and wetlands are present adjacent to the project area. These are an important nursery habitat for aquatic-dependent species. There are no aquaculture activities occurring in the project area.

Environmental Consequences

Section 6.4.1.1 of the Final PDARP/PEIS, which describes the impacts to fisheries and aquaculture from restoration projects intended to create, restore, and enhance coastal wetlands, is incorporated here by reference.

This project would have short-term, minor impacts to fisheries. The noise and increased turbidity of surface waters arising from earth-moving activities during project construction are expected to cause minor, temporary impacts during the construction period. However, long term benefits would arise from the addition and improvement of nursery habitat for commercially important fisheries.

The proposed breakwaters project would benefit fisheries and aquaculture by protecting existing seagrass beds and estuarine marshes that provide nursery areas for juvenile finfish, shrimp, and other invertebrates.

4.4.6.3.7 Land and Marine Transportation

Affected Resources

The project area is located in open water within Corpus Christi Bay. Nearby open land as well as residential developments are present. Highway 181 and Sunset Drive are located to the north.

Environmental Consequences

The proposed action is anticipated to have no impact to land and marine transportation. Land-based equipment traffic would occur during the period of construction. There is little land-based traffic around the project area, so no effects on other land-based traffic would occur. Once construction is complete, the added land-based equipment traffic would end. Marine transportation routes would be identified prior to the dredge and beneficial use operations. BMPs regarding transportation would implemented to prevent any impacts to marine transportation. It is expected that activities would not interrupt the channel traffic. Transportation would be coordinated with local authorities to ensure there are no significant impacts land based transportation corridors.

4.4.6.3.8 Aesthetics and Visual Resources

Affected Resources

The affected environment consists of the construction footprint of the breakwaters. The construction footprint is in open water. The landscape in the vicinity of the project area is characterized by a mosaic of open water, coastline, and peninsula. Much of the area on the nearby coastline and peninsula is protected as part of a city park. This area consists of a very productive mosaic of habitats that include wetlands, seagrass beds, tidal flats, scrub/shrub uplands, wetlands, and lagoons. There are no designated protected viewsheds in the vicinity. Equipment and construction activities related to breakwater construction would be visible. The site is also near highway 181 and is within view of Liquefied natural gas facilities.

Environmental Consequences

Section 6.4.1.1 of the Final PDARP/PEIS, which describes the impacts to aesthetics and visual resources from restoration projects intended to create, restore, and enhance coastal wetlands, is incorporated here by reference. Similar to that described in the Final PDARP/PEIS, short-term adverse impacts for this project would occur in the immediate area to aesthetics due to the presence of construction equipment or other changes to the surrounding environment. However, there would be a long-term beneficial impact to visual and aesthetic resources related to the protection and persistence of existing wetland habitats once the restoration is completed.

4.4.6.3.9 Public Health and Safety

Affected Resources

Corpus Christi Bay is used by commercial fisheries, industrial, and recreational users. Recreational angling is significant and is primarily conducted from boats for areas near the potential site. Indian Point Fishing Park & Pier is a 333-acre public park known as Sunset Lake. This park provides an ecologically rich wetland and saltwater lake, lined by a 2 mile hike and bike trail. Outdoor enthusiasts can enjoy fishing, birding, kayaking, canoeing, swimming and sailing.

Environmental Consequences

Section 6.4.1.1 of the Final PDARP/PEIS, which describe the impacts to public health and safety from restoration projects intended to create, restore, and enhance coastal wetlands, is incorporated here by reference. As stated in the Final PDARP/PEIS, construction projects involving the use of boats and barges, and associated equipment, for the placement of materials to create habitat could impact the public through construction activities and the potential to contaminate surface waters, resulting in short-term minor adverse impacts. Improvements in water quality resulting from increased water filtration from these activities could also contribute long-term benefits to public health. Construction of breakwaters and wetland restoration and enhancement activities could provide benefits to coastal populations and infrastructure through improved flood and shoreline protection. This benefit is particularly effective for low-energy storm events

Due to the nature and location of the project area, no adverse impacts to public health and safety are anticipated as a result of project implementation. Efforts would be made to avoid or minimize impacts to public boat launch facilities and the park. Appropriate signage and buoys markers at the park and at boat ramps would be displayed. Postings in local media would also take place to ensure that efforts are made to inform recreational users. Due to the potential increased in small boat traffic (construction related) in the area, appropriate safety measures would be employed to ensure that risk to water related accidents and or conflicts are minimized.

Shoreline erosion protection at Indian Point is not anticipated to generate hazardous waste or the need for disposal of hazardous waste. In the event of a discharge of oil or release of hazardous substances, the release would be reported to the National Response Center (800-424-8802) and Texas Emergency Oil Spill and Hazardous Substance Reporting line (800-832-8224) as required. All occupational and marine safety regulations and laws would be followed to ensure safety of all workers and monitors. The project deployment would use mechanical equipment and marine vessels that use oil, lubricants, and fuels.

This project would provide long-term benefits to public health and safety by providing improvements to water quality resulting from the filtering capacity of wetlands that are to be restored or protected. Additionally, the retention and creation of marshes along with breakwaters would improve the safety of nearby communities by protecting infrastructure during storms and improving coastal resiliency. The breakwaters would provide a wave break and wetlands absorb energy.

4.4.7 Bahia Grande Hydrologic Restoration

The Bahia Grande Hydrologic Restoration project would restore and conserve the Bahia Grande wetland complex in the LANWR near Brownsville, Texas. This project would enlarge and stabilize a pilot channel that would increase tidal flow into Bahia Grande, restoring the system’s natural tidal exchange and creating habitat for a variety of fish, shellfish, and migratory waterfowl. The estimated cost for the project is $5,050,000.

This analysis incorporates by reference the relevant portions of Section 6.4.1.1 of the Final PDARP/PEIS. The Final PDARP/PEIS provides programmatic evaluation of the environmental consequences of the Restoration Approach “Create, restore, and enhance coastal wetlands”, which are considered in this RP/EA and are incorporated by reference here. Tiering from that analysis, this section presents the Affected Resources of Bahia Grande and the environmental consequences of the proposed actions in context of the project-specific affected resources.

The programmatic analysis looked at a series of resources as part of the biological, physical, and socioeconomic environment. As appropriate in a tiered analysis, the evaluation of each project focuses on the specific resources with a potential to be affected by the project.

The description and analysis of the project below are based on a project-specific preliminary design concept rather than detailed engineering plans. Throughout the design process, every practical attempt would be made to avoid and minimize potentially adverse environmental and cultural resource impacts. The following descriptions for each of the construction elements are preliminary and based on current planning efforts and resource agency experience with similar projects. While the Texas TIG does not consider it likely, it is possible that the E&D process could generate a plan that has environmental impacts that are different in type or magnitude from those discussed in this document. If that is the case, the Texas TIG would consider whether further environmental impacts analysis would be necessary.

The 2005 USFWS Final Environmental Assessment of the Proposed Restoration of Bahia Grande evaluated the potential environmental impacts of these project activities. The 2005 EA included background information about the project, preliminary design plans (Chapters 1 and 2), an evaluation of project alternatives (Chapter 2), a detailed description of the affected resources (Chapter 3), an analysis of potential environmental consequences and an alternatives analysis (Chapter 4), an analysis of potential unexpected impacts (Chapter 5), environmental justice issues (Chapter 7), and a description of permitting requirements of the project. All of the alternatives related to the design and configuration of the project attempted to minimize impacts to the surrounding environment and reduce external effects resulting from weather events. The preferred alternative in this EA is inclusive of the project proposed in this RP/EA, but also includes the construction of one other channel from San Martín Lake (referred to as Channel A in the USFWS EA) to maximize hydrologic flow to the area. However, to allow for funding and management flexibility, this preferred alternative would be implemented in phases, and the project proposed in this RP/EA (referred to as Channel E in the USFWS EA) is the first phase.

The Channel E project in the USFWS EA is identical to the project proposed in this RP/EA with the exception of channel width. The channel width evaluated in the 2005 USFWS EA was 200 feet, while the project proposed in this RP/EA is 250 feet. However, both the preferred alternative and the project proposed in this RP/EA would divert water directly into the Bahia Grande from the Brownsville Ship Channel through a relatively short, wide channel that would pass under SH 48. In addition, the affected environment has not changed significantly since the time the EA was drafted. The USFWS EA and its analysis are therefore incorporated by reference (per CEQ's NEPA regulations at 40 CFR §1502.21) as applicable. This summation is not fully inclusive of the extensive information found in the EA. Readers should reference the USFWS EA for complete information.

Overall, the conclusion of the EA indicates impacts of the project would result in beneficial impacts over the long-term and negligible short- or long-term adverse impacts. This project would contribute not only to the restoration and conservation of wetlands and coastal habitats but help to increase resiliency of coastal habitats and ameliorate potential adverse impacts associated with past, present and future changes expected for the lower Texas coast.

Additionally, a Section 10/404 permit (SWG-2003-01954) for this project, the Bahia Grande Main Channel project, was approved by the USACE in December 2015. An EA was prepared as a part of Brownsville Navigation District’s application for the Bahia Grande Main Channel project permit. An SOF was issued by the USACE in response. The EA and SOF did not identify any significant environmental effects resulting from the proposed work. The USACE evaluated the impact of this proposed activity on aspects affecting the quality of the human environment and determined that this action does not require an environmental impact statement (USACE 2015). This EA and SOF are utilized and incorporated by reference in the affected resources text below.

The following section evaluates potential environmental consequences and benefits that could arise from project activities proposed herein. Analyses from the 2005 USFWS EA are incorporated into this section by reference. The Texas TIG expanded the existing environmental analysis to incorporate those resources that are not included or not sufficiently addressed in the 2005 EA.

The impacts from the project are largely beneficial and the adverse impacts are minor to moderate. Benefits to the physical, biological, and human uses and socioeconomics would result if this project was implemented. BMPs required in the permit, consultations, or environmental reviews would be followed. Additionally, BMPs described in Appendix 6.A of the Final PDARP/PEIS as well as Appendix B of this document would be considered and applied where appropriate, to reduce or eliminate impacts to the environment. A summary of the conclusions of this analysis are in Table 4-21. Categories and terminology in the table follow a consistent format used for all projects in this RP/EA. Information from this EA was used to populate this table using the definitions provided in Appendix C.

Table 4-21. Summary of beneficial impacts as well as short-term and long-term adverse impacts from implementation of the Bahia Grande Hydrologic Restoration project

Resource Categories	Benefits	Adverse Short-Term	Adverse Long-Term
Physical Resources			
Geology and Substrates	Yes	Moderate	Moderate
Hydrology and Water Quality	Yes	Minor	NE
Air Quality and GHG Emissions	Yes	Minor	NE
Noise	NE	Minor	NE
Biological Resources			
Habitats	Yes	Minor	Minor
Living Coastal and Marine Resources	Yes	Minor	Minor
Protected Species	Yes	Minor	NE
Human Uses and Socioeconomics			
Socioeconomics and Environmental Justice	Yes	NE	NE
Cultural Resources	NE	NE	NE
Infrastructure	NE	NE	NE
Land and Marine Management	NE	NE	NE
Tourism and Recreation Use	Yes	NE	NE
Fisheries and Aquaculture	Yes	Minor	NE
Land and Marine Transportation	NE	NE	NE
Aesthetics and Visual Resources	Yes	Minor	NE
Public Health and Safety	NE	Minor	NE

Notes: *Yes – provides benefits*
NE – no effect
Adverse short-term and long-term impacts are designated as minor, moderate, or major

4.4.7.1 Physical Environment

The project area is located in Cameron County west of Port Isabel, Texas. Part of the Tamaulipan Biotic Province, the Bahia Grande Unit is close to the Gulf of Mexico and consists of wind tidal flats and high ground that includes brush-covered clay dunes (lomas) that attain heights of up to 30 feet. This matrix of stabilized clay dunes is interspersed with grass and brush-covered uplands, saline flats, marshes, and shallow bays. Historically, the Bahia Grande area was rich in biological resources and contained important waterfowl habitat, especially for wintering waterfowl. Bahia Grande was also an important estuarine nursery area, contributing to a productive sport and commercial fishery. A small island within the bay provided nesting habitat for more than 10,000 terns, gulls and black skimmers (USFWS 2005).

With the construction of the Brownsville Ship Channel in the mid-1930s, and the placement of dredge spoil on the north side of the channel, the shallow bay and wind tidal flats were isolated from the Laguna Madre. Open exchange of water was effectively blocked. An additional blockage was caused by the construction of SH48 in the early 1950s, when this roadway paralleled the ship channel on its northern side. These barriers to the natural hydrological connection between Bahia Grande and the Lower Laguna Madre caused a decline in biological productivity on the tidal flats and a loss of wildlife that was dependent on this productivity, including a decline in waterfowl numbers. In its historical condition prior to the 1930's, Bahia Grande reportedly supported wintering flocks of redhead ducks (15,000 were reported in one survey) and other ducks, much as the adjacent Lower Laguna Madre does today. Once converted from a dry basin to one inundated by tidal variations, it is probable that flocks of redheads and other waterfowl would once again use the area on a regular basis in the winter months. In addition, floral assemblages, both upland and wetland, were altered. At present, Bahia Grande is barren and dry most of the year with only portions having ephemeral, moist sediment or standing water conditions. Primary inflows are limited to water captured during precipitation events and occasional storm surges and other high tidal conditions (USFWS 2005).

The Bahia Grande area, located along the Gulf Coast of Texas in the Lower Rio Grande Valley, lies approximately 27° north of the equator and receives an average annual rainfall of 26 inches (50-year average). The climate is both semi-arid and subtropical. Diurnal onshore and nocturnal offshore breezes moderate the thermal highs and lows along the coast. Prevailing winds, from the southeast off the Gulf of Mexico bring high humidity most of the year. Seasonal temperature variations range from a mean of 62° F in the winter to 84° F in the summer. Freezing temperatures occur once every four years on the average. Tropical storms and hurricanes periodically strike the area during the summer and fall months. Drought conditions, some of which extend over several years, also occur periodically (USFWS 2005).

This section includes impact analysis to geology and substrates, hydrology and water quality, air quality and GHG emissions, and noise.

4.4.7.1.1 Geology and Substrates

Affected Resources

The Gulf Coast Plain is geologically of recent origin. The area is typified by sediments deposited during Pleistocene interglacial periods. Most of the sediments were derived from deltaic or fluvial deposits of the ancestral Nueces and Rio Grande Rivers. Large portions were subsequently covered by wind-deposited silts and sands. These sediments continue to undergo wind transport and form extensive dune fields on the barrier islands and clay lomas (brushy dunes) in the Rio Grande delta. Wetland soils in the area are scattered and highly variable, usually with little peat and high sand content (USDA 1977, as cited in USFWS 2005).

Environmental Consequences

Section 6.4.1.1 of the Final PDARP/PEIS, which describes the impacts to geology and substrates from restoration projects intended to create, restore, and enhance coastal wetlands, is incorporated here by reference. As described in the Final PDARP/PEIS, there may be moderate short-term adverse impacts from construction. Staging areas and heavy equipment (both shoreline and barges) can cause direct localized and short-term, moderate adverse impacts from sediment disturbance and compaction. The removal of sediment to increase the tidal connection would cause long-term moderate adverse impacts to geology and substrates. Standard BMPs for construction to reduce erosion and limit loss of sediments would be employed to minimize adverse impacts to geology and substrates.

In fortifying this tidal connection, this project would have a positive benefit to vegetation in the area. In addition, some of the soils removed in digging channels, when appropriate, would be used to “patch” eroded gullies and other damage to the existing lomas. This should stabilize existing erosion problems, conserve the topsoil, and encourage colonization by various plant species, which would further stabilize the areas.

4.4.7.1.2 Hydrology and Water Quality

Affected Resources

Several types of wetland habitat are found in the Bahia Grande area including natural inland ponds, small constructed impoundments (for livestock watering), resacas (old oxbow river channels), estuaries and tidal flats. San Martín Lake contains permanent water even in drought years. Other surface waters are seasonal in nature. The Bahia Grande, once a tidal bay, was disconnected from the Gulf of Mexico by the construction of the Brownsville Ship Channel in the mid-1930s.

Impacts to U.S. Waters and salinity are discussed at length in the 2015 EA referenced above. The TCEQ does not actively monitor the water quality of Bahia Grande. However, TCEQ maintains active water quality stations along adjacent water body, the Brownville Ship Channel (segment 2494). The Brownsville Ship Channel does not meet water quality standards for bacteria levels. However, it is categorized as a 5c water body, where additional data is required prior to development of a TMDL or management strategy (TCEQ 2015a). This segment has been listed on the 303d list for bacterial impairment since 2010 (TCEQ 2015a).

Environmental Consequences

Section 6.4.1.1 of the Final PDARP/PEIS, which describes the impacts to hydrology and water quality from restoration projects intended to create, restore, and enhance coastal wetlands, is incorporated here by reference. As described in the Final PDARP/PEIS, minor adverse impacts could occur. Construction, staging areas, and heavy equipment (both shoreline and barges) can cause direct localized and short-term, moderate adverse impacts from increased turbidity. Localized, minor impacts may occur to the existing substrate due to placement of materials (such as dredged material or riprap). Hydrology also may be affected where tidal connectivity is modified per project design. This modification, however, would be beneficial to the system. BMPs (such as silt curtains, buffer zones, and water quality monitoring) to minimize or avoid adverse impacts would be implemented throughout the duration of construction in order to minimize impacts.

As explained in analyses of the USFWS EA, restoring tidal hydrological patterns in these waters would greatly increase wildlife and fishery resources, and may provide additional recreational opportunities. The exchange of salt water would contribute to improving water circulation in the Bahia Grande. A total of about 6,500 acres would be flooded in Bahia Grande under this alternative, 4,000 permanently, and 2,500 tidally. In addition, about 1,700 acres in Laguna Larga would be flooded, either by freshwater from the NRCS diversions under SH100, or by saltwater from Bahia Grande. Another 1,400 acres would be inundated in Little Laguna Madre under this alternative. Therefore a total of approximately 9,600 acres would be flooded, either permanently (6,800-plus acres) or periodically by lunar and wind tidal effects (2,800-plus acres) (USFWS 2004).

4.4.7.1.3 Air Quality and GHG Emissions

Affected Resources

Air Quality

The Bahia Grande area is within Region 15 of the TCEQ. According to information released by the TCEQ, the area is in attainment of unclassifiable for all NAAQS. Blowing dust is the cause for most of the particulate matter in the region’s air.

GHG Emissions

Criteria air pollutants and GHG emissions are largely generated by electricity production, vehicular movements, and commercial and residential buildings using electricity. GHG emissions would result from both the implementation and operation of the project from the use of vessels during construction and monitoring activities. Engine exhaust from barges, boats, excavators, and equipment would contribute to an increase in GHG emissions.

Environmental Consequences

Section 6.4.1.1 of the Final PDARP/PEIS, which describes the impacts to air quality and GHG emissions from restoration projects intended to create, restore, and enhance coastal wetlands, is incorporated here by reference. As stated in the Final PDARP/PEIS, there could be short-term adverse impacts to air quality from emissions generated by construction equipment and vehicles. Construction activities are anticipated to result in temporary minor adverse impacts to air quality due to pollutants from fuel emissions, including particulate matter, lead, and carbon monoxide. Greenhouse gases (GHGs) are specifically addressed in Section 6.14.1, Impacts of Restoration Approaches on GHG Emissions. BMPs would be considered and applied where appropriate and practical to reduce the release of GHGs during project implementation. BMPs considered would include using energy efficient machinery and equipment; the incorporation of anti-idling procedures; and the use of gas as compared to diesel. See Appendix B for other BMPs that may be considered where appropriate.

As explained in the USFWS EA, under this alternative, air quality would improve. Blowing dust would still account for most of the particulate matter in the region’s air, but it would be reduced in the Bahia Grande area by restoring a tidal hydrological pattern to flood the dry basin. A traffic hazard may still be occasionally present in the form of blowing dust across SH48 and SH100, but it would be much reduced. The major source of blowing dust would be eliminated, representing perhaps 60% of the total problem. Additional dust would still come from Long Island, from the sides of the Brownsville Ship Channel, and from USACE spoil areas in the vicinity (USFWS 2005).

4.4.7.1.4 Noise

Affected Resources

There is a natural soundscape in the project area from wildlife and natural environmental processes such as water movement and wind. There is one major highway (SH 48) that runs directly through the project area, so there is some ambient road noise in the vicinity of the project area.

Environmental Consequences

Section 6.4.1.1 of the Final PDARP/PEIS, which describes the impacts to noise from restoration projects intended to create, restore, and enhance coastal wetlands, is incorporated here by reference. As described in the Final PDARP/PEIS, the project would have minor, short-term adverse impacts due to noise from construction activities. Instances of increased noise are expected during the construction phases associated with the restoration project. The project would generate construction noise associated with equipment during placement of the fill material, grading, and dredging. This impact would be short-term, minor, and limited to the period of construction which is anticipated to be no longer than 12 months for the Bahia Grande Hydrologic Restoration project.

Construction equipment noise is known to disturb fish, marine mammals and nesting shorebirds. In order to limit some of the potential impacts from project activities due to noise, the timing of noise producing activities would be planned to minimize disturbance to nesting birds.

4.4.7.2 Biological Environment

Wetlands, tidal flats, and open water are three important habitat types in the project area. A wide variety of fish, wildlife, plant, and invertebrate populations either reside in or periodically utilize the LANWR and its associated habitats, including oysters, finfish, shrimp, crab, birds, sea turtles, and marine mammals (GBEP 2011).

4.4.7.2.1 Habitats

Affected Resources

In the project area itself, topographically low areas are generally unvegetated tidal flats, although some algal mats and scattered vegetation may be present. Much of the project area open water or wetland vegetation, with scattered uplands occurring in topographically high areas. Vegetation in wetland areas is dominated by saltwort, shoreline sea-purslane, glasswort, and black mangroves.

<u>Tidal Flats</u>

Tidal flats (or ‘mud flats’ or ‘salt flats’) in the Brownsville-Port Isabel area are special aquatic sites that are exposed at low tides and inundated at high tides, with varying frequency, and exhibiting a water table at or near the surface of the substrate. They are either unvegetated or vegetated only by algal mats. The tidal flats that occur within the project area are mostly unvegetated with a dynamic zone of scattered halophytic plants such as Virginia glasswort, dwarf saltwort, shoregrass, and annual seepweed associated with tidally influenced channels within these flats. The observed soils at tidal flat observation points consist of loamy sands near the surface with clayey soils at greater depths. The clayey soils displayed some redox features and calcium carbonate concentrations. There are approximately 17.5

acres of tidal flats in the project area, of which 7.5 acres would be converted to open water (USACE 2014b).

Sand/mud/algal flat environments are important feeding sites for a variety of wildlife species, including the piping plover, which is listed as a threatened species by the federal government. These flats provide a rich source of aquatic and surface invertebrates such as small crustaceans (including crabs and shrimp) and mollusks (including clams and snails), which are essential foods for shorebirds and wading birds as well as other wildlife. These species would also benefit from enhanced habitat conditions as a result of flooding Bahia Grande and the ancillary wetlands (USFWS 2005, internal citations omitted).

Estuarine Intertidal Scrub Shrub Wetlands

Estuarine intertidal scrub shrub wetlands are found throughout the project area. Dominant vegetation includes saltwort, shoreline seapurslane, glasswort, and scattered black mangroves. The soils within these wetlands are clays and silty clays with some sand seams. Wetlands in the project area take the form of mangrove marshes and are dominated by saltwort, shoreline sea-purslane, glasswort, and black mangroves. In general, black mangrove marshes are not regularly flooded and are common in tidal basins and areas of higher salinity.

Open Water

Open water in the project area covers 13.24 acres and includes small portions of the Brownsville Ship Channel and Bahia Grande, as well as the existing pilot channel that connects these two water bodies. The Brownsville Ship Channel is an excavated, federally authorized channel used for commercial and recreational navigation. It provides primarily deep open water, with shallow open water along its edges. Bahia Grande is a large, shallow basin. The existing pilot channel is 34 feet wide at the top, 15 feet wide at the bottom, approximately 4 feet deep, and 2,200 feet long. Within Bahia Grande, the project area includes approximately 0.45 acre of oyster beds and approximately 2.31 acres of vegetated shallows. Vegetated shallows are special aquatic sites that are permanently inundated and, under normal circumstances, support communities of rooted aquatic vegetation. In south Texas, vegetated shallows often include seagrasses such as shoal grass, manatee grass, and turtle grass. Nearly 80% of all seagrass beds in Texas are found in Laguna Madre, a hypersaline system with the shallow depths, clear water, and warm climate that foster seagrass production. Similar conditions in Bahia Grande following the construction of the pilot channel have allowed seagrasses to grow in the Bahia, as observed during the May 2014 field investigations (USACE 2014b, internal citations omitted).

Environmental Consequences

Section 6.4.1.1 of the Final PDARP/PEIS, which describes the impacts to habitats from restoration projects intended to create, restore, and enhance coastal wetlands, is incorporated here by reference. As stated in the Final PDARP/PEIS, there may be minor, short-term adverse impacts during construction activities to wetland vegetation during construction. Minor, long-term adverse impacts could result from the conversion of one habitat type to another.

In this project, the impacts resulting from this transition would largely be beneficial. As explained in the USFWS EA, benefits would largely outweigh the consequences. The primary goal of this project is improvement of the habitat. The project would also support the natural proliferation of plant life, revegetation of denuded loma sites, and stabilization of all wildlife populations native to the site.

The proposed action would provide a much greater circulation, volume and aeration of waters in Bahia Grande, Laguna Larga, and Little Laguna Madre, converting what is currently an arid, dry environment back to historic tidal wetlands. This would result in a proliferation of plant and animal life in the aquatic habitat, and the permanent flooding with tidal waters would benefit upland plants and wildlife on loma and other sites by suppressing the windblown, salty dust that historically has impacted negatively the plants and wildlife thereon.

4.4.7.2.2 Living Coastal and Marine Resources

Affected Resources

The Bahia Grande Unit of the LANWR is located within the Tamaulipan Biotic Province and, in conjunction with surrounding natural lands, is regarded as an important reservoir of natural biological diversity. The area is an important estuarine nursery area, contributing to both recreationally and commercially important fish and benthic species such as shrimp, crab, and finfish (USFWS 2005). The sand/mud/algal flat environments are crucial for other invertebrates such as small crustaceans (crabs and shrimp) and molluscs (clams). The broader area of the Laguna Madre is important nursery habitat for redfish, spotted seatrout, and black drum. It is one of the most productive fisheries on the Gulf Coast.

Limited wildlife surveys on the Unit have recorded several of the Valley's birds, the plain chachalaca, groove-billed ani, great kiskadee, and green jay. Other wildlife of interest encountered on the Unit are the Texas horned lizard, Rio Grande lesser siren, bobcat, ocelot, and javelina. The LANWR has documented more than 400 species of birds, one of the highest diversities on NWRs in the nation. The Rio Grande lesser siren, black-spotted newt, green jay, brown jay, tropical parula, Rio Grande ayenia, Coues rice rat, ocelot, and jaguarundi occur only in the Tamaulipan Biotic province (Refuge Checklists). This biotic province extends from the Nueces River of Texas south to the Rio Corona in Tamaulipas.

The Lower Laguna Madre area contains important habitat for migratory and resident waterfowl and shorebirds and as well as wading birds. It is an important migration corridor for other birds such as peregrine falcons, ospreys and swallow-tailed kites and is an important resting and feeding area for trans-Gulf neotropical migrant bird species (USFWS 2005).

Environmental Consequences

Section 6.4.1.1 of the Final PDARP/PEIS, which describes the impacts to living coastal and marine resources from restoration projects intended to create, restore, and enhance coastal wetlands, is incorporated here by reference. As explained in the Final PDARP/PEIS, minor short-term adverse impacts could displace land-based or aquatic faunal species resulting from staging equipment and materials, as well as entrapment of marine mammals. Long-term minor adverse impacts could include conversion of one wetland vegetation type to another with changes in the distribution of fauna communities.

This project would beneficially impact living coastal and marine resources. As explained in the USFWS EA, there would be greatly improved habitat for wading birds, shorebirds, and threatened species like the piping plover. Migration of marine organisms into and out of the Bahia Grande would be facilitated. Biological productivity would be significantly increased. In addition to the obvious habitat provision for shrimp, crabs, shellfish and other invertebrates, and finfish, these would provide a rich feeding source for shorebirds, wading birds, and waterfowl (USFWS 2004).

4.4.7.2.3 Protected Species

Protected species and their habitats include ESA-listed species and designated critical habitats, which are regulated by either the USFWS or the NMFS. Protected species and habitat also include marine mammals protected under the Marine Mammal Protection Act, EFH protected under the Magnuson-Stevens Act, migratory birds protected under the Migratory Bird Treaty Act and eagles protected under the Bald and Golden Eagle Protection Act.

Affected Resources

Threatened or Endangered Species

The five endangered or threatened species that could be affected in the project area are listed in Table 4-22. No activities related to implementation of the project would take place in any area designated as critical habitat.

Table 4-22. Federal Threatened and Endangered Species potentially affected in the Bahia Grande Hydrologic Restoration project area (USACE 2014b, internal citations omitted)

Common Name	Status
Loggerhead Sea Turtle	T
Green Sea Turtle	T
Atlantic Hawksbill Sea Turtle	E
Kemp's Ridley Sea Turtle	E
Loggerhead Sea Turtle	T

Notes: *E – federally endangered species*
T – federally threatened species

Five species of endangered or threatened species of sea turtles were identified as possibly being affected in the project area: loggerheads, green, hawksbill, leatherback and Kemp's ridley sea turtles. Sea turtles nest on beaches, and most species use nearshore hard bottom reef complexes, shallow water habitat (including seagrasses), or other coastal areas with rocky bottoms to forage for food. This area has not been designated as critical habitat for any of the sea turtle species. Sea turtle nesting activities are not expected to occur here since there is no beach habitat; however, sea turtles could be encountered in the open water. Subadult green sea turtles have been captured by researchers at the seaward end of the Brownsville Ship Channel in Brazos Santiago Pass and near the entrance to South Bay (Coyne 1994).

Essential Fish Habitat

Habitats within the project area are subject to designation as EFH. The 1996 amendments to the Magnuson-Stevens Act set forth a mandate for NMFS, regional FMCs, and other federal agencies to identify and protect EFH of economically important marine and estuarine fisheries. To achieve this goal, suitable fishery habitats need to be maintained. EFH is separated into estuarine habitat types. Estuarine habitat is defined as "all estuarine waters and substrates (mud, sand, shell, rock and associated biological communities), including the sub-tidal vegetation (grasses and algae) and adjacent inter-tidal vegetation (marshes and mangroves)." EFH in the area of proposed action is identified and described for various life stages of managed fish and shellfish in the Gulf of Mexico (GMFMC 1998). A provision of the Magnuson-Stevens Act requires that FMC's identify and protect EFH for every species managed by an FMP (U.S.C. 1853(a)(7)). There are FMPs in the Gulf region for red drum, shrimp, reef fish, and HMS (e.g., sharks). Table 4-23 and 4-24 present the EFH and species within the Bahia Grande Hydrological Restoration project area.

Table 4-23. EFH for estuarine habitats within the Bahia Grande Hydrological Restoration project area

Species Common Name	Eggs	Larvae	Post Larvae	Early Juvenile	Late Juvenile	Adult	Spawning Adult
Estuarine Emergent Marsh							
Red Drum			●	●	●	●	
Gray Snapper						●	
Brown Shrimp				●			
White Shrimp				●			
Estuarine Mud/Soft Bottom							
Red Drum		●	●	●	●	●	
Gray Snapper						●	
Lane Snapper				●	●		
Brown Shrimp				●			
White Shrimp				●			
Mangrove							
Goliath			●	●			
Lane Snapper				●	●		
Submerged Aquatic Vegetation							

Species Common Name	Eggs	Larvae	Post Larvae	Early Juvenile	Late Juvenile	Adult	Spawning Adult
Red Drum		●	●	●	●	●	
Goliath				●	●		
Lane Snapper			●	●	●		
Brown Shrimp				●			

Note: ● indicates habitat type designated as EFH for species' life stage

Table 4-24. Highly migratory species EFH designations within the Bahia Grande Hydrological Restoration project area

Species Common Name	Life Stage Within Estuarine Waters
Scalloped Hammerhead Shark	Neonate & Juvenile
Blacktip Shark	Neonate, Juvenile & Adult
Bull Shark	Neonate, Juvenile & Adult
Lemon Shark	Neonate & Juvenile
Spinner Shark	Neonate & Juvenile
Tiger Shark	Adult
Bonnethead Shark	Neonate, Juvenile & Adult
Atlantic Sharpnose Shark	Neonate, Juvenile & Adult

Marine Mammals

The bottlenose dolphin and the West Indian Manatee (manatees are protected under the ESA) are the only marine mammals known to occur in the Lower Laguna Madre. The West Indian manatee is an aquatic mammal that inhabits the Gulf of Mexico and associated bay systems. The manatee is an opportunistic herbivore that once utilized the habitats of the Lower Laguna Madre. There are historic records of this species along the Texas coast, including a report from the mouth of the Rio Grande, but they are now considered extremely rare in Texas waters. The presence of a manatee in the Brownsville Ship Channel or the Bahia Grande Main Channel would be considered extremely rare. Because of this, the West Indian manatee is not expected to be adversely affected by the project (USACE 2014b).

Bald and Golden Eagles

Bald and Golden Eagles are not known to occur in or near the project area.

Migratory Birds

Major groups of birds that inhabit the northern Gulf of Mexico include waterfowl and other water-dependent species, pelagic seabirds, raptors, colonial waterbirds, marsh dwelling birds, and passerines. These groups are discussed in the Final PDARP/PEIS. A detailed discussion of protected Migratory birds can be found in the Final PDARP/PEIS. The Lower Laguna Madre area contains important habitat for migratory and resident waterfowl and shorebirds and as well as wading birds. It is an important migration corridor for other birds such as peregrine falcons, ospreys and swallow-tailed kites and is an important resting and feeding area for trans-Gulf neotropical migrant bird species (USFWS 2005).

Environmental Consequences

Sea turtles and marine mammals present in project areas where dredging or underwater use of equipment is occurring could be adversely affected by temporary increases in noise and turbidity, water quality changes, alteration or loss of habitats, entrapment, and potential interactions with dredging equipment. Potential minor adverse effects of this approach could include disturbance to marine mammals, sea turtles, and birds in nearshore waters from increased vessel traffic.

Some short-term minor adverse impacts could occur from dredging which would result in suspended sediments and increased near-site turbidity. The use of BMPs during the project would minimize temporary impacts associated with construction-related erosion and sediment loading that could increase turbidity. Sea turtles and marine mammals present in project areas where dredging or underwater use of equipment is occurring could be adversely affected by temporary increases in noise and turbidity, water quality changes, alteration or loss of habitats, entrapment, and potential interactions with dredging equipment. These activities could temporarily displace individuals or prey during construction and could result in short-term, minor impacts. Consultation with appropriate agencies would be required prior to final design and project implementation.

Potential minor adverse effects of this approach could include disturbance to marine mammals, sea turtles, and birds in nearshore waters from increased vessel traffic. Short-term minor impacts may occur if species using the project area are temporarily disturbed and must move to another area. Adverse impacts to wildlife would be avoided via management guidelines and techniques as appropriate; therefore, restoration activities are not likely to adversely affect federally-listed sea turtles. Additionally, the Sea Turtle and Smalltooth Sawfish Construction Conditions would be followed (NMFS 2006). Long-term impacts would be beneficial with the re-establishment of natural habitats that would support a more diverse community of benthic organisms and fish.

Fish present in the dredging area could be subject to a temporary increase in sound pressure levels, a decrease in water quality, entrainment in dredge sediments, and removal of benthos from dredged areas. Sound pressure levels or entrainment could result in mortality of individual finfish. This would be a minor short-term adverse effect that would not be expected to reduce local fish populations or designated EFH. Consultation with appropriate agencies would be required prior to final design and project implementation. However, the proposed channel is intended to improve tidal flow into and out of Bahia Grande, with an accompanying re-establishment of natural habitats in the Bahia. This is expected to confer a significant benefit to the ecological diversity of Bahia Grande, including the creation of nursery areas for juvenile finfish, shrimp, and other invertebrates (USACE 2014b).

The marine mammals that may use Lower Laguna Madre would likely leave the area to avoid the construction activities and/or would generally avoid the area because optimal habitat does not exist. Manatees are extremely rare in Texas waters with sightings less than one per year on average across the entire Texas coast. However, if marine mammals are sighted within 50 feet of the construction area, work would stop until the animals move away from the area under their own volition. Therefore, marine mammals would not be impacted during construction activities and no incidental take of marine mammals is anticipated. Moreover, there are additional long term benefits to marine mammals due to expected increase in forage areas and food sources that would arise from restoring hydrology to the area.

No impacts are expected on migratory birds or their habitat in the project area. Construction contracts would include instructions to avoid impacts on migratory birds and their nests from construction-related activities. The disruptions caused by construction activities would be temporary and once completed the hydrologic restoration would re-establish natural habitats in the Bahia available for birds to use.

As explained in the USFWS EA, this project would potential benefit threatened and endangered species through habitat improvements. By restoring historic tidal inflows to the area, species such as the Northern Aplomado Falcon may be encouraged to return to the area (USFWS 2005). Piping and snowy plover habitat would be enhanced by the proposed flooding of Bahia Grande and the ancillary wetlands (USFWS 2005).

4.4.7.3 Human Uses and Socioeconomics

This section includes analyses of potential impacts to socioeconomics/environmental justice, cultural resources, infrastructure, land and marine management, tourism and recreational uses, fisheries and aquaculture, land and marine transportation, aesthetics and visual resources, and public health and safety.

4.4.7.3.1 Socioeconomics/Environmental Justice

Affected Resources

The Lower Rio Grande Valley of Texas (LRGV) is characterized by agricultural and urban development, scattered small farming communities, and the seasonal influx of summer visitors and winter residents. There are three major metropolitan areas in the Valley. The City of Brownsville, with a population of 139,722, is located nearby along the Rio Grande. Harlingen has a population of 57,564. The third major metropolitan area is McAllen, with a population of 106,414. Overall, the population of the LRGV, which is comprised of Cameron, Hidalgo, Starr, and Willacy counties, has grown from 701,888 in 1990 to 978,369 in 2000, a 39.4 percent increase. Cameron County grew by 28.9 percent and Willacy County grew by 13.4 percent during the same 10-year period. In fact, the LRGV metropolitan area is one of the top 30 fastest growing regions in the nation. Population in the LRGV is expected to continue to grow at a rate of 4 percent per year in the coming years. Despite this growth, the LRGV ranks as one of the highest unemployment areas in the United States and also has high poverty rates. Over 85 percent of the population in the LRGV is Hispanic, and over 30 percent of LRGV families live below the poverty level (USFWS 2010, internal citations omitted).

Environmental Consequences

This project would not adversely affect socioeconomics/environmental justice. Implementation of this project would not disproportionately place any adverse environmental, economic, social, or health impacts on minority and low-income populations. The proposed restoration of Bahia Grande would have a positive, beneficial socioeconomic impact on surrounding communities of people equally. With elimination of the blowing dust from these particular basins, land developers may build houses on the northern bluffs, along SH 100, overlooking the basins. The project may provide long-term benefits to recreationists through increased opportunities for wildlife viewing, kayaking, canoeing, hunting, fishing, and other recreational activities. Benefits to the local economy could accrue through an increase in employment and associated spending in the project area during construction and increased expenditures due to increased recreational visitation (USFWS 2005). In consideration of EO 12898, Environmental Justice, this restoration activity does not have the potential to adversely and/or disproportionately affect minority or low-income populations, including economically, socially, or in terms of conditions affecting their health. This restoration project would help restore an environment that is of benefit to all citizens, populations and groups in Texas and beyond.

4.4.7.3.2 Cultural Resources

Affected Resources

An important cultural resource is an abandoned railroad bed that bisects the Bahia Grande. The railroad bed consists of local fill and windblown sand/clay drifts around approximately 2 miles of degraded cypress pilings on which a narrow-gauge railroad trestle was historically supported. From information provided by the Port Isabel Museum, it has been determined that this railroad may have been originally constructed in 1865 under command of General Phil Sheridan to move Union troops between Brownsville and Port Isabel. Later, in 1872, Simón Celaya converted the army railroad to a “42-inch gauge” railroad, and named it the Rio Grande Railroad. This railroad ran a total of 26 miles between Brownsville and Port Isabel. Some of the railroad bed is deteriorated and some pilings are missing; therefore, this resource is no longer fully intact. In previous surveys, two significant archeological sites were found but were determined to be unimpacted by project activities (USFWS 2005).

Environmental Consequences

Section 6.4.1.1 of the Final PDARP/PEIS, which describes the impacts to cultural resources from restoration projects intended to create, restore, and enhance coastal wetlands, is incorporated here by reference. As explained in the Final PDARP/PEIS, minor (temporary disturbance) to moderate (disturbance without loss of cultural information) impacts on cultural and historic resources due to construction activities such as dredging, addition of sediments or borrow materials, and/or removal of sediments could occur. Long-term, adverse impacts could include physical destruction or alteration of resources and may alter, damage, or destroy resources such as historic shipwrecks, engineering structures or landscapes, or connectivity with related sites.

As explained in the USFWS EA, a review of cultural resources was conducted by the USFWS (USFWS 2005). No problems were anticipated, as restoring flow to the Bahia Grande would not produce areas of inundation of water depths greater than what occurred historically under natural high tide conditions more than 70 years ago. It was determined that breaching the railroad bed would not diminish the overall integrity of the property's location, design, setting, materials, or workmanship. The restoration project would replicate historic flooding conditions, would not exceed historical flood levels, and was determined to represent the type of activity that has no potential to cause deleterious effects on historical properties present. The freshwater channel that would bring rainwater into Laguna Larga would cut though an old railroad right of way, but only where local fill materials were used to elevate it. No pilings or other structures would be impacted by this freshwater channel's crossing of the right-of-way. Otherwise, the refuge would continue protection of cultural resources under this alternative. (USFWS 2006).

If any culturally or historically important resources are identified during project preparations or pre-deployment surveys, such areas would be avoided during construction. A complete review of this project under Section 106 of the NHPA is ongoing and would be completed prior to any project activities that would restrict consideration of measures to avoid, minimize or mitigate any adverse effects on historic properties located within the project area. This project would be implemented in accordance with all applicable laws and regulations concerning the protection of cultural and historic resources.

4.4.7.3.3 Infrastructure

Affected Resources

The current channel and proposed expansion run directly under SH48. The pilot channel was dredged to run directly under the highway, and the footprint of the project would widen that channel and remain under the highway. There are several plugged gas wells in the vicinity of the Bahia Grande Unit in addition to several dry holes (RRC 2017). There are no active wells in the project area.

Environmental Consequences

The proposed action is anticipated to have no impact to infrastructure, since new infrastructure would not be built and existing infrastructure in the area would be avoided. The SH48 Bridge is 260 feet wide, which is sufficient to accommodate the width of the proposed channel.

4.4.7.3.4 Land and Marine Management

Affected Resources

The LANWR (Bahia Grande Unit inclusive) is currently and would continue to be managed by the USFWS 2010 CCP. The Brownsville Navigation District owns and manages the land adjacent to the Brownsville Ship Channel where the project would occur.

Environmental Consequences

Section 6.4.1.1 of the Final PDARP/PEIS, which describe the impacts to land and marine management from restoration projects intended to create, restore, and enhance coastal wetlands, is incorporated here by reference. The proposed action is anticipated to have no impact to land and marine management, since project activities would be consistent with the prevailing management, practices plans, and direction governing the use of the areas where the island restoration would take place. No change in land or marine management is expected to result from this project.

4.4.7.3.5 Tourism and Recreational Use

Affected Resources

The current direction of public use, recreation, and management of the Bahia Grande Unit of the LANWR is guided by the 2010 LANWR CCP. Hunting is not currently authorized in the Bahia Grande Unit of the NWR. Fishing in San Martin Lake in the Bahia Grande Unit is available via the Highway 48 boat launch operated by Cameron County Parks. Only non-motorized boats may enter San Martin Lake. All other waters in the Bahia Grande unit are currently closed to boats and are classified as non-navigable waters. Bank-fishing is permitted between Highway 48 and the refuge boundary signs (USFWS 2016a).

Environmental Consequences

Section 6.4.1.1 of the Final PDARP/PEIS, which describes the impacts to tourism and recreational use from restoration projects intended to create, restore, and enhance coastal wetlands, is incorporated here by reference. As stated in the Final PDARP/PEIS, short-term indirect adverse impacts in the immediate area could occur during construction through limits on recreational activities near the construction area and temporary increases in road traffic due to movement of construction vehicles. Impacts to recreation would be limited to the construction period. Additionally, as recreation in the Bahia Grande Unit is currently limited, the severity of the impact may be minimized.

As explained in the USFWS EA, opportunities for wildlife-oriented recreation under this alternative would be beneficial for the general public. The restoration of the Bahia Grande would increase wildlife viewing opportunities, such as birdwatching. Additional public uses, including hunting, fishing, wildlife observation, photography, environmental, education, and interpretation, would be explored (USFWS 2005).

Efforts would be made to avoid or minimize impacts to public boat launch facilities. Appropriate signage and buoys markers at the site and at boat ramps would be displayed. Postings in local media would also take place to ensure that efforts are made to inform recreational users. Due to the potential increased small boat traffic (construction related) in the area, appropriate safety measures would be employed to ensure that water related accidents and conflicts are minimized.

4.4.7.3.6 Fisheries and Aquaculture

Affected Resources

The Lower Laguna Madre area has tremendous importance as a finfish and shellfish nursery area on which a major commercial fishery and a lucrative recreational fishery are dependent. The Lower Laguna Madre supports a significant shrimping fleet for the state of Texas.

Environmental Consequences

Section 6.4.1.1 of the Final PDARP/PEIS, which describes the impacts to fisheries and aquaculture from restoration projects intended to create, restore, and enhance coastal wetlands, is incorporated here by reference. The noise and increased turbidity of surface waters arising from earth-moving activities during project construction are expected to cause minor, temporary impacts during the construction period. However, long-term benefits would arise from the addition and improvement of nursery habitat for commercially important fisheries.

The project is not expected to have a permanent adverse effect on any of the species occurring in or near the project area. On the contrary, the proposed main channel is intended to re-establish natural habitats in the area. This is expected to confer a significant benefit to the ecological diversity of Bahia Grande, including the creation of nursery areas for juvenile finfish, shrimp, and other invertebrates.

4.4.7.3.7 Land and Marine Transportation

Affected Resources

The project site connects The Brownsville Ship Channel to the Bahia Grande Unit of LANWR.

Environmental Consequences

The proposed action is anticipated to have no impact to land and marine transportation. Shipping routes would need to be properly identified prior to the selection of borrow sites for dredge and fill material to prevent any impacts to marine transportation. Activities related to construction would require coordination with the users of the waterway. The shipping channel is not currently planned to be used to transport sediment. It is expected that activities would not interrupt the channel traffic to any significant degree. Most of the commercial traffic takes place on a routine schedule and construction activities would be timed to reduce any interference with commercial operators.

4.4.7.3.8 Aesthetics and Visual Resources

Affected Resources

While the LANWR is frequently visited, the landscape of Bahia Grande is xeric and does not currently equal the rest of the NWR in its visual resources. There are no designated protected viewsheds in the vicinity.

Environmental Consequences

Section 6.4.1.1 of the Final PDARP/PEIS, which describes the impacts to aesthetics and visual resources from restoration projects intended to create, restore, and enhance coastal wetlands, is incorporated here by reference. As described in the Final PDARP/PEIS, short-term adverse impacts would occur in the immediate area to aesthetics due to the presence of construction equipment or other changes to the surrounding environment. However, there would be a long-term beneficial impact to visual and aesthetic resources once the restoration is completed.

Adverse impacts to aesthetics and visual resources caused by the implementation of this project would be minor and short-term. Equipment and construction activities related to construction activities would be visible during the construction period. Habitat improvements resulting from the project would gradually but favorably alter views.

4.4.7.3.9 Public Health and Safety

Affected Resources

Bahia Grande is not regularly used by the public for fishing or hunting. Prior to the construction of the pilot channel, strong coastal winds blew dust from the dry basin into area towns, which caused health problems, clogged air conditioners, shorted power lines, and restricted visibility on SH 48 and SH 100 (Ocean Trust 2009). At one time, blowing dust was the cause for most of the particulate matter in the region's air (USFWS 2005). This effect was largely abated after the construction of the Pilot channel, but still intermittently persists in drought conditions.

Environmental Consequences

Section 6.4.1.1 of the Final PDARP/PEIS, which describes the impacts to public health and safety from restoration projects intended to create, restore, and enhance coastal wetlands, is incorporated here by reference. As explained in the Final PDARP/PEIS, short-term indirect adverse impacts in the immediate area could occur during construction through limits on recreational activities near the construction area to protect public safety. There are anticipated to be minor, short-term adverse impacts to public health and safety arising from potential dust and land disturbance that would be limited to the construction period. For the most part, impacts on public health and safety resulting from project activities are anticipated to be beneficial, further ameliorating the historically persistent dust problem in the basin.

All applicable measures to reduce impact to public health and safety would be taken during the construction period. Due to the potential increased small boat traffic (construction related) in the area, appropriate safety measures would be employed to ensure that water related accidents and conflicts are minimized. Restoration and protection of the Bahia Grande are not anticipated to generate hazardous waste or the need for disposal of hazardous waste. All occupational and marine safety regulations and laws would be followed to ensure safety of all workers and monitors. The project deployment would use mechanical equipment and marine vessels that use oil, lubricants, and fuels.

4.4.8 Follets Island Habitat Acquisition

The Follets Island Habitat Acquisition project would acquire and conserve approximately 300 acres of wetland and coastal habitats on Follets Island between San Luis Pass and Drum Bay in Brazoria County, Texas. The project would conserve dune, coastal strand prairie, and marsh habitat in perpetuity through fee-simple acquisition. Once acquired, the land would be transferred to and managed by TPWD for the purpose of habitat preservation. The estimated cost for the project is about $2,037,000.

This analysis incorporates by reference the relevant portions of Section 6.4.1.5 of the Final PDARP/PEIS. The Final PDARP/PEIS provides programmatic evaluation of the environmental consequences of the Restoration Approach "Protect and conserve marine, coastal, estuarine and riparian habitats", which are considered in this RP/EA and are incorporated by reference here. Tiering from that analysis, this section presents the Affected Environment of the Follets Island Habitat Acquisition project and the environmental consequences of the proposed actions in context of the project-specific affected environment.

The programmatic analysis looked at a series of resources as part of the biological, physical, and socioeconomic environment. As appropriate in a tiered analysis, the evaluation of each project focuses on the specific resources with a potential to be affected by the project.

The impacts from the project are largely beneficial and adverse impacts are minor. Significant benefits to the physical, biological, and human uses and socioeconomics would result if this project was implemented. BMPs required in consultations or environmental reviews would be followed. Additionally, BMPs described in Appendix 6.A of the Final PDARP/PEIS as well as Appendix B of this document would be considered and applied where appropriate, to reduce or eliminate impacts to the environment. A summary of the conclusions of this analysis are in Table 4-25. Categories and terminology in the table follow a consistent format used for all projects in this RP/EA. Information from this EA was used to populate this table using the definitions provided in Appendix C.

Table 4-25. Summary of beneficial impacts as well as short-term and long-term adverse impacts from implementation of the Follets Island Habitat Acquisition project

Resource Categories	Benefits	Adverse Short-Term	Adverse Long-Term
Physical Resources			
Geology and Substrates	Yes	NE	NE
Hydrology and Water Quality	Yes	NE	NE
Air Quality and GHG Emissions	Yes	NE	NE
Noise	Yes	NE	NE
Biological Resources			
Habitats	Yes	NE	NE
Living Coastal and Marine Resources	Yes	NE	NE
Protected Species	Yes	NE	NE
Human Uses and Socioeconomics			
Socioeconomics and Environmental Justice	Yes	NE	NE
Cultural Resources	Yes	NE	NE
Infrastructure	NE	NE	NE
Land and Marine Management	Yes	NE	Minor
Tourism and Recreation Use	Yes	NE	NE
Fisheries and Aquaculture	Yes	NE	NE
Land and Marine Transportation	NE	NE	NE
Aesthetics and Visual Resources	Yes	NE	NE
Public Health and Safety	Yes	NE	NE

Notes: Yes – provides benefits
NE – no effect
Adverse short-term and long-term impacts are designated as minor, moderate, or major

4.4.8.1 Physical Environment

The physical environment is divided into geology and substrates, hydrology and water quality, air quality and GHG emissions, as well as noise characteristics of the area.

4.4.8.1.1 Geology and Substrates

Affected Resources

The project area is located on Follets Island, a barrier island, on the northern coast of Texas. The barrier island was formed by wave and tidal action parallel to the shoreline. The island may move and shift during storms and other events, but also absorb energy and protect the coastline. In general, there are sands, clay lomas, and sandy lomas in upland areas and clays in the wetlands. Soils present in the potential project area could include (USDA 2017):

- Beaches
- Edna fine sandy loam, 1-3% slopes
- Follet clay loam, 0-1% slopes, frequently flooded
- Galveston fine sand, 0 to 3 percent slopes, occasionally flooded
- Harris clay, 0 to 1 percent slopes, frequently flooded, tidal
- Ijam clay
- Mustang fine sand, 0 to 1 percent slopes, frequently flooded, frequently ponded
- Madre fine sand, 0 to 1 percent slopes, occasionally flooded, frequently ponded
- Surfside clay, 0 to 1 percent slopes, occasionally flooded
- Tatlum clay loam, 0 to 1 percent slopes, very frequently flooded, occasionally ponded
- Tracosa mucky clay
- Velasco clay, 0 to 1 percent slopes, frequently flooded
- Veston fine sandy loam, 0 to 1 percent slopes, frequently flooded
- Veston silty clay loam, strongly saline

Environmental Consequences

Section 6.4.1.5 of the Final PDARP/PEIS, which describes the impacts to geology and substrates from restoration projects intended to protect and conserve marine, coastal, estuarine, and riparian habitats, is incorporated here by reference. Impacts from projects intended to protect and conserve marine, coastal, estuarine, and riparian habitats were described as having beneficial impacts as well as short-term minor to moderate impacts on geology and substrates.

This project would not have any adverse effects to geology and substrates. Implementation of this project would increase protections of the land and decrease impacts caused by trespassers. TPWD would employ management actions to reduce impacts as much as possible. There would be clear signs to designate the appropriate use of vehicles and other activities on the land, restricting vehicles to appropriate designated roads and access easements. Other management activities such as the installation of bollards may occur in order to preserve and/or enhance habitat quality. The area would also be patrolled by law enforcement professionals and other TPWD staff to enforce regulations to prevent resource damage from illegal vehicular activity. No off-road access would be allowed except through current legal access easements. Consistent with the Final PDARP/PEIS, this project would provide beneficial by improving geology and substrates in comparison to current conditions.

4.4.8.1.2 Hydrology and Water Quality

Affected Resources

The project area has Drum and Christmas Bays in the inland side and the Gulf of Mexico to the east. Christmas Bay and Drum Bay are minor estuaries that border the project area that are protected from the Gulf of Mexico by Follets Island. Christmas Bay is a Coastal Preserve that has been recognized by the TGLO as a unique, high quality area. There is a connection with the Gulf of Mexico through Cold Pass and San Luis Pass. Bastrop Bayou is the main source of freshwater inflow to the system, in addition to runoff from surrounding coastal watersheds.

Waters in the Gulf of Mexico are influenced by riverine sediment and nutrients inputs. A turbid surface layer of suspended particles is associated with the freshwater plume from these rivers. The river system supplies nitrate, phosphate, and silicate to the shelf (Minerals Management Service 2005). Water quality in the Gulf of Mexico is sufficient to support aquatic life use, recreation use, and general use (Clean Water Act [CWA] §303c; 40 CFR §131). However, there are restricted consumption advisories due to elevated levels of mercury in edible tissues of some tuna, jack, mackerel, shark, and bill fish species. Information regarding the recommended level of consumption for fish that could contain high mercury levels is described on the TPWD's website (http://www.tpwd.state.tx.us/regulations/outdoor-annual/fishing/general-rules-regulations/fish-consumption-bans-and-advisories).

Water quality in Christmas and Drum bays is impacted from bacteria (TCEQ 2015b). Data has shown that localized section of bay segments on the Upper Texas Coast are not suitable for harvesting shellfish because of elevated bacteria concentrations (https://www.tceq.texas.gov/assets/public/waterquality/tmdl/74uppercoast/74-uppercoastbacteria-po.pdf). A TMDL for both bays has been completed and approved by EPA.

Environmental Consequences

Section 6.4.1.5 of the Final PDARP/PEIS describes the impacts to hydrology and water quality from restoration projects intended to protect and conserve marine, coastal, estuarine, and riparian habitats, is incorporated here by reference. Impacts from projects intended to protect and conserve marine, coastal, estuarine, and riparian habitats were described as having short-term minor to moderate impacts on water resources.

There would be no adverse impacts to hydrology and water quality. The project would have long-term beneficial impacts from land preservation. Preservation of lands would eliminate the potential of development activities which may alter hydrological functions (i.e., flow pathways, wave energy, etc.) and discharge of pollutants that may adversely impact biota. Additionally, marshes on Follets Island help filter nutrient and sediments, thereby maintaining/improving water quality.

4.4.8.1.3 Air Quality and GHG Emissions

Affected Resources

Air Quality

The project area is located in an area the EPA designates as the HGB. The HGB is in attainment or unclassified with the NAAQS for all criteria pollutants except ozone. The EPA currently lists the HGB as moderate nonattainment for the 2008 ozone standard and is pending designation for the 2015 ozone standard (https://www.tceq.texas.gov/airquality/sip/hgb/hgb-status).

GHG Emissions

Criteria air pollutants and GHG emissions are largely generated by electricity production, vehicular movements, and commercial and residential buildings using electricity. GHG emissions would result from public use and management of the project from the use of vehicles.

Environmental Consequences

Section 6.4.1.5 of the Final PDARP/PEIS describes the impacts to air quality and GHG emissions from restoration projects intended to protect and conserve marine, coastal, estuarine, and riparian habitats, is incorporated here by reference. Impacts from projects intended to protect and conserve marine, coastal, estuarine, and riparian habitats were described as having short-term, minor to moderate adverse impacts to air quality from emissions generated by construction equipment and vehicles.

The project would not have any adverse effects to air quality. There would not be any additional activities that cause the release of GHGs compared to the current conditions. Additionally, the project would have long-term beneficial effects from land preservation. Preservation of lands would eliminate the potential of development activities which could adversely affect air quality. This project would also benefit to air quality by protecting wetlands which sequester carbon.

4.4.8.1.4 Noise

Affected Resources

The project area is located on Follets Island in an area that is relatively undeveloped. Noise in the project area from human activities is minor resulting from activities such as vehicle use, minor construction of facilities, and recreational activities.

Environmental Consequences

Section 6.4.1.5 of the Final PDARP/PEIS describes the impacts to noise from restoration projects intended to protect and conserve marine, coastal, estuarine, and riparian habitats, is incorporated here by reference. Impacts from projects intended to protect and conserve marine, coastal, estuarine, and riparian habitats were described as having short- and long-term adverse impacts to noise from land management activities. Additionally, the Final PDARP/PEIS stated that the preservation of lands may help to maintain natural quiet over a longer term.

There would be no adverse impacts to noise since noise producing activities over current conditions would not occur. Consistent with the Final PDARP/PEIS, this project would help maintain natural quiet over the long-term. Beneficial impacts to noise would result from the prevention of potential development and associated activities.

4.4.8.2 Biological Environment

The biological environment is divided into habitats, living coastal and marine resources, and protected species.

4.4.8.2.1 Habitats

Affected Resources

Recognized by the USFWS as a nationally significant coastal barrier ecosystem, Follets Island is situated within the Gulf Prairies and Marshes ecological region and borders Drum and Christmas Bays. Ecological habitats in the project area include beaches, dunes, strand plains, coastal prairies, and wetlands. Seagrasses are located within waters adjacent to the project area. Christmas Bay is a bay of uniquely high quality that is relatively unaltered by human activity, demonstrated by its designation as a Coastal Preserve. The land north of and adjacent to the Christmas Bay Coastal Preserve is the Brazoria NWR, which further protects extensive coastal prairies and marshes and the water quality and wildlife habitat north of Christmas Bay.

Environmental Consequences

Section 6.4.1.5 of the Final PDARP/PEIS, which describes the impacts to habitats from restoration projects intended to protect and conserve marine, coastal, estuarine, and riparian habitats and is incorporated here by reference. The Final PDARP/PEIS describes acquisition and protection activities as having long-term beneficial impact on habitats. However, management activities and public use could have short to long-term minor to moderate adverse effects, depending on the intensity of the activity.

This project would not adversely affect habitats compared to current conditions. Consistent with the Final PDARP/PEIS, beneficial impacts would result from acquisition and protection of lands. The land would provide space that allows marshes to migrate inland in response to sea level rise, thus ensuring Christmas Bay and Brazoria NWR habitats remains of unique high quality and productivity. Open water habitats and seagrasses in the adjacent waters would be protected by preventing the project area from development and maintaining the habitat buffer. The habitat buffer would help filter nutrients and prevent erosion, leading to better water quality.

4.4.8.2.2 Living Coastal and Marine Resources

Affected Resources

The project area contains a mosaic of coastal habitats that host a variety of wildlife. It borders Christmas Bay, Drum Bay and the Gulf of Mexico. These waterbodies support aquatic-dependent species that use marshes, a habitat type in the project area, for at least part of their life cycle. The marshes serve as nursery grounds for over 95% of the recreational and commercial fish species found in the Gulf of Mexico and are designated as EFH for species under federal FMPs.

The wetlands provide habitat for many species of plants, fish, birds, and other wildlife. Many species rely on estuarine wetlands during at least some part of their life cycle. The wetland edge is a particularly important habitat for white and brown shrimp (Whaley and Minello 2002). Other marsh dwelling species include blue crab, red drum, spotted seatrout, Southern flounder and Gulf menhaden.

Wetlands act as nurseries to hundreds of non-commercial species that comprise a large part of the bay food web. A variety of birds use the estuarine habitats associated with Follets Island. These include waders, shorebirds, secretive marsh birds, and waterfowl. Example species include, clapper rail, seaside sparrow, great blue heron, reddish egret, redhead, lesser scaup, willet, and snowy plover.

Habitats at the site support foraging, breeding and sheltering habitat for migrating, wintering and resident species throughout the year (Eubanks et al. 2006).

Environmental Consequences

Section 6.4.1.5 of the Final PDARP/PEIS, which describes the impacts to living coastal and marine resources from restoration projects intended to protect and conserve marine, coastal, estuarine, and riparian habitats and is incorporated here by reference. Impacts from projects intended to protect and conserve marine, coastal, estuarine, and riparian habitats were described as having short-term minor to moderate adverse impacts from land use activities which could include activities such as invasive species management and public use. Additionally, the Final PDARP/PEIS stated that the preservation of these habitats would have long-term benefits.

This project would not adversely affect living coastal and marine resources. Consistent with the Final PDARP/PEIS, this project would have long-term beneficial impacts from the protection of habitats. Protection of habitats would help water quality by maintaining a natural vegetated buffer, decrease the risk of pollution caused by development (e.g., sedimentation, erosion, leaking septic tanks, stormwater runoff, etc.), connect coastal habitats (bay, wetland, dune, to beach) and provide habitat for foraging, breeding, and resting wildlife.

4.4.8.2.3 Protected Species

Protected species and their habitats include ESA-listed species and designated critical habitats, which are regulated by either the USFWS or the NMFS. Protected species and habitat also include marine mammals protected under the Marine Mammal Protection Act, EFH protected under the Magnuson-Stevens Act, migratory birds protected under the Migratory Bird Treaty Act and eagles protected under the Bald and Golden Eagle Protection Act.

Affected Resources

Threatened or Endangered Species

Three endangered or threatened species that could potentially be affected are listed in Table 4-26. No activities related to implementation of the project would take place in any area designated as critical habitat.

Table 4-26. Federal Threatened and Endangered Species potentially affected in the Follets Island Habitat Acquisition project area

Common Name	Status
Piping Plover	T
Red Knot	T
Kemp's Ridley Sea Turtle	E

Notes: E – federally endangered species
T – federally threatened species

Red knots and piping plover have been observed on the beaches of Follets Island. The red knot and piping plover are winter residents on the Texas coast and occur in Brazoria County. Additionally both species are known to use shoreline of bays and mudflats. There is no critical habitat for red knot or piping plover on Follets Island.

Kemp's ridley nesting has been observed on Follets Island. They nest during the day time and are the most abundant nesting species in Texas. Sea turtles use nearshore hard bottom reef complexes, shallow water habitat (including seagrasses), or other coastal areas with rocky bottoms to forage for food. The project area has not been designated as critical habitat for sea turtles.

Essential Fish Habitat

Habitats within the project area are subject to designation as EFH. The 1996 amendments to the Magnuson-Stevens Act set forth a mandate for NMFS, regional FMCs, and other federal agencies to identify and protect EFH of economically important marine and estuarine fisheries. To achieve this goal, suitable fishery habitats need to be maintained. EFH is separated into estuarine habitat types. Estuarine habitat is defined as "all estuarine waters and substrates (mud, sand, shell, rock and associated biological communities), including the sub-tidal vegetation (grasses and algae) and adjacent inter-tidal vegetation (marshes and mangroves)." EFH in the area of proposed action is identified and described for various life stages of managed fish and shellfish in the Gulf of Mexico (GMFMC 2005). A provision of the Magnuson-Stevens Act requires that FMC's identify and protect EFH for every species managed by an FMP (U.S.C. 1853(a)(7)). There are FMPs in the Gulf region for red drum, shrimp, reef fish, and HMS (e.g., sharks). Table 4-27 and 4-28 present the EFH and species within the Follets Island Habitat Acquisition project area.

Table 4-27. EFH for estuarine habitats within the Follets Island Habitat Acquisition project area

Species Common Name	Eggs	Larvae	Post Larvae	Early Juvenile	Late Juvenile	Adult	Spawning Adult
<u>Estuarine Emergent Marsh</u>							
Red Drum			●	●	●	●	
Gray Snapper						●	

Species Common Name	Eggs	Larvae	Post Larvae	Early Juvenile	Late Juvenile	Adult	Spawning Adult
Brown Shrimp				●			
White Shrimp				●			
Estuarine Mud/Soft Bottom							
Red Drum		●	●	●	●	●	
Gray Snapper						●	
Lane Snapper				●	●		
Brown Shrimp				●			
White Shrimp				●			

Note: ● indicates habitat type designated as EFH for species' life stage

Table 4-28. Highly migratory species EFH designations within the Follets Island Habitat Acquisition project area

Species Common Name	Life Stage Within Estuarine Waters
Scalloped Hammerhead Shark	Neonate & Juvenile
Blacktip Shark	Neonate & Juvenile
Bull Shark	Neonate, Juvenile & Adult
Lemon Shark	Neonate & Juvenile
Spinner Shark	Neonate & Juvenile
Bonnethead Shark	Neonate & Juvenile
Atlantic Sharpnose Shark	Neonate, Juvenile & Adult

Marine Mammals

The project area includes land on Follets Island. It does not include open water areas in the adjacent bays or Gulf of Mexico. There are no marine mammals present in the project area.

Bald and Golden Eagles

There are no known bald or golden Eagle nests on Follets Island. One bald eagle was observed on Follets Island in 2014 (http://ebird.org) and there have been no observances of golden eagles on Follets Island. However, golden eagles have been observed on the north shore of Christmas Bay in Brazoria NWR. Bald and golden eagles could potentially forage within the project location.

Migratory Birds

Major groups of birds that inhabit the northern Gulf of Mexico include waterfowl and other water-dependent species, pelagic seabirds, raptors, colonial waterbirds, marsh dwelling birds, and passerines. These groups are discussed in the Final PDARP/PEIS. A detailed discussion of protected Migratory birds can be found in the Final PDARP/PEIS. The project area contains important habitat for migratory birds including shorebirds and as well as wading birds.

Environmental Consequences

This project would not adversely affect protected species. Increased protection from public ownership would reduce impacts compared to the current condition. TPWD would employ management actions to reduce impacts as much as possible. There would be clear signs to designate the appropriate use of vehicles and other activities on the land, restricting vehicles to appropriate designated roads and access easements. Other management activities such as the installation of bollards may occur in order to preserve and/or enhance habitat quality. The area would also be patrolled by law enforcement professionals and other TPWD staff to enforce regulations to prevent resource damage from illegal vehicular activity. No off-road access would be allowed except through current legal access easements. All management activities would incorporate BMPs to eliminate or minimize any potential adverse effects to protected species.

Consistent with the Final PDARP/PEIS, this project would provide long-term benefits to protected species. Land would be preserved and managed, thereby maintaining habitat quality and preventing development activities on important habitats necessary for protected species. This project would allow for the upland migration of beach, wetland and other habitat as sea level rises and would also limit development. The preservation of habitat would provide a buffer that would help preserve water quality and habitats for aquatic species in the adjacent waterbodies.

4.4.8.3 Human Uses and Socioeconomics

This section includes analyses of potential impacts to socioeconomics and environmental justice, cultural resources, infrastructure, land and marine management, tourism and recreational uses, fisheries and aquaculture, land and marine transportation, aesthetics and visual resources, and public health and safety.

4.4.8.3.1 Socioeconomics/Environmental Justice

Affected Resources

In 2016, the population in Brazoria County was estimated to be over 350,000. Around 49% of the population in Brazoria County is white (not Hispanic or Latino), 30% is Hispanic or Latino, 14% is black or African American, and 7% is Asian. Around 26% of the county population speaks a language other than English at home. Median household income in Brazoria County (2011-2015) and the state is $69,749 and $53,889, respectively, with 11% of the county and 14% of the state estimated to be living below the poverty level (U.S. Census Bureau 2016a). According to EPA, the environmental justice index on Follets Island for all categories evaluated (PM2.5, ozone, NATA Diesel PM, NATA Cancer Risk, NATA Respiratory HI, traffic proximity, lead paint indicator, superfund proximity, RMP proximity, hazardous waste proximity, and water discharger proximity) is below the state percentile (https://ejscreen.epa.gov/mapper/). Definitions for the environmental justice index categories is located EPA's website (https://www.epa.gov/ejscreen/glossary-ejscreen-terms).

Environmental Consequences

Section 6.4.1.5 of the Final PDARP/PEIS, which describe the impacts to socioeconomics from restoration projects intended to protect and conserve marine, coastal, estuarine, and riparian habitats, is incorporated here by reference. The Final PDARP/PEIS describes acquisition and protection activities as having minor to moderate adverse effects due to changes in development activities, spending, and taxes. In addition, there would also be beneficial impacts from preventing development that would be at risk from future severe storms (e.g., hurricanes, tropical storms, etc.) and opening private lands for public use.

This project would not adversely affect socioeconomics or environmental justice. There are no adverse effects to low income or minority populations anticipated from the proposed action. Furthermore, this project would enhance passive recreation and provide additional access points to areas for beachgoers. In consideration of EO 12898, Environmental Justice, this restoration activity does not have the potential to adversely and/or disproportionately affect minority or low-income populations, including economically, socially, or in terms of conditions affecting their health. This restoration project would help restore an environment that is of benefit to all citizens, populations and groups in Texas and beyond.

4.4.8.3.2 Cultural Resources

Affected Resources

The project area is largely undeveloped and contains high quality natural habitat. There are no known cultural resources in the project area.

Environmental Consequences

Section 6.4.1.5 of the Final PDARP/PEIS describes the impacts to cultural resources from restoration projects intended to protect and conserve marine, coastal, estuarine, and riparian habitats, is incorporated here by reference. Impacts to cultural resources and infrastructure resulting from the implementation of a conservation action or habitat management plan could result if conservation includes protecting cultural or infrastructure resources that are within or close to protected areas.

Due to the land use objectives of the property (habitat protection), it is anticipated that there would be no effect to cultural resources. Land would be managed by TPWD for habitat protection and passive recreation. Construction would be limited to management activities such as the installation of bollards or signs which would be used to minimize impacts from public use (e.g., accessing the bays and beaches, fishing, etc.). Coordination under Section 106 NHPA has been initiated for this project. All necessary reviews or consultations for cultural resources would occur prior to the implementation of management activities (not funded as part of this project) that could affect any cultural resources. If cultural resources were found to be present on the property, they would be more protected than in the current conditions. TPWD would follow all applicable agency and state policies regarding cultural resources on TPWD property.

4.4.8.3.3 Infrastructure

Affected Resources

Land in the project area is relatively undeveloped. There are trail roads and a major highway, Bluewater Highway, which bisects the project area.

Environmental Consequences

The proposed action is anticipated to have no impacts to infrastructure, since new infrastructure would not be built and any existing infrastructure would be managed in accordance with management objectives of the property.

4.4.8.3.4 Land and Marine Management

Affected Resources

The project area is largely undeveloped and contains high quality natural habitat. Land is currently held by private interests. There are trail roads within the project area. Bluewater Highway, the major transportation route on Follets Island bisects the project area. Bluewater Highway is a public road that is not part of the project area.

Environmental Consequences

Section 6.4.1.5 of the Final PDARP/PEIS describes the impacts to land and marine management from restoration projects intended to protect and conserve marine, coastal, estuarine, and riparian habitats, is incorporated here by reference. The Final PDARP/PEIS states that opening private lands to the public could beneficial.

The project would convey the tract to TPWD and change the current land management for the property. This is anticipated to have a minor, long term-adverse impact on local tax revenue. The conveyance of this tract—which is currently zoned as residential/commercial property—to TPWD, represents a loss in taxable property and a corresponding loss in tax revenue to the local economy. Once conveyed, this property would be removed from tax rolls.

However, consistent with the Final PDARP/PEIS, there would be beneficial impacts from the Follets Island Habitat Acquisition project because it would convert private to public lands. The area would be preserved and human activity would be managed to prevent impacts to the land. Trails, roads or access points deemed compatible with the land management objectives associated this preservation project would be maintained for the public to use.

4.4.8.3.5 Tourism and Recreational Use

Affected Resources

The project area is currently held by private interests and does not permit the public to access the land. The land would be transferred to state ownership that would allow passive recreational uses. The project area is adjacent to Christmas Bay, Drum Bay and gulf beaches.

Environmental Consequences

There would be no adverse effects to tourism and recreational use from the project. There would be long-term benefits from increased opportunities to access lands including beaches for passive recreational activities.

4.4.8.3.6 Fisheries and Aquaculture

Affected Resources

The project area contains marshes, which are an important nursery habitat for aquatic-dependent species. There are not commercial fisheries or aquaculture activities occurring in the project area.

Environmental Consequences

Long-term benefits to fisheries and aquaculture would result from the acquisition of lands that contain coastal marshes, an important nursery habitat for commercial and recreational fisheries.

4.4.8.3.7 Land and Marine Transportation

Affected Resources

The project area is largely undeveloped and contains high quality natural habitat. Land is currently held by private interests. There are trail roads within the project area. Bluewater Highway, the major transportation route on Follets Island, bisects the project area. Bluewater Highway is a public road that is not part of the project area.

Environmental Consequences

The proposed action would have no impact to land and marine transportation. Lands are currently in private holdings and not used for transportation and there would be no change in transportation activities if the project was implemented.

4.4.8.3.8 Aesthetics and Visual Resources

Affected Resources

The project area is largely undeveloped and contains high quality natural habitat. Habitats, include dunes, coastal strand prairies, and marshes. Bluewater highway bisects the project area.

Environmental Consequences

There would be no adverse impacts to aesthetics and visual resources. Long-term benefits to aesthetics and visual resources would occur from the preservation of natural habitat and the prevention of future development that could adversely impact aesthetics and visual resources.

4.4.8.3.9 Public Health and Safety

Affected Resources

The project area contains marshes and boarders Christmas and Drum Bays as well as the Gulf of Mexico. The preservation of the land will help with storm abatement and help protect the existing road, Bluewater Highway.

Environmental Consequences

Due to the nature the project (land preservation), no adverse impacts to public health and safety would occur as a result of project implementation. The action of placing the tract into conservation would preserve its current state and preclude development of the tract for recreational residences. This action would prevent development that would be affected by tropical storm winds and tides and thus minimize flood risks to human health and safety. Additionally, the preservation of habitat would allow the landscape to recover quicker after storms and would provide benefits for coastal resiliency. Benefits would also be realized by the public from the opportunity to enjoy the outdoors and participate in recreational activities.

4.4.9 Mid-Coast Habitat Acquisition

The Mid-Coast Habitat Acquisition project would acquire a coastal estuarine land tract that would be conveyed to the USFWS to be managed as part of the Texas Mid-Coast NWR in Matagorda County. The proposed tract is around 800 acres, including 555 acres of mostly estuarine wetlands. The restoration action would protect the tract, thereby providing a protective buffer to estuarine and bay waters from future land use changes. The estimated cost for the project is $2,082,000

This analysis incorporates by reference the relevant portions of Section 6.4.1.5 of the Final PDARP/PEIS. The Final PDARP/PEIS provides programmatic evaluation of the environmental consequences of the Restoration Approach “Protect and conserve marine, coastal, estuarine, and riparian habitats”, which are considered in this RP/EA and are incorporated by reference here. Tiering from the Final PDARP/PEIS analysis, this section presents the Affected Environment of the project area and the environmental consequences of the proposed action in context of the project-specific affected environment.

The programmatic analysis looked at a series of resources as part of the biological, physical, and socioeconomic environment. As appropriate in a tiered analysis, the evaluation of each project focuses on the specific resources with a potential to be affected by the project.

The proposed acquisition is within the approved expansion boundaries for the Texas Mid-Coast NWR CCP (USFWS 2013). USFWS completed the CCP and conducted an EA for the Texas Mid-Coast NWR, which includes the proposed tract, in 2013. The Texas Mid-Coast NWR and EA are designed to guide management of the complex for the subsequent 15-years. The CCP provides a description of the desired future conditions and long-range guidance to accomplish the purposes for which each refuge was established. Draft versions of the CCP and EA were submitted to the public for review and comment. Within the CCP are also Land Protection Plans for each refuge that provide a regional and resource based rationale and plan for land conservation and sets goals for land protection. The CCP and accompanying EA address USFWS legal mandates, policies, goals, and NEPA compliance. A Finding of No Significant Impacts (FONSI) was issued in 2013. The NEPA analysis of the environmental consequences suggests no adverse impacts are anticipated to result from the acquisition of the tract. For the purposes of this project, the Texas TIG has incorporated by reference the analyses and conclusions of the 2013 Texas Mid-Coast NWR CCP EA (USFWS 2013).

It also identifies, describes, and compares the consequences (or impacts) of implementing three management alternatives including current management on the physical, biological, and human environments described in the CCP. The CCP and EA are incorporated here by reference. This proposed acquisition would be incorporated into the Mid-Coast CCP and EA. This proposed tract would fall under the San Bernard Refuge Land Protection Plan.

The 2013 CCP EA presents a range of alternatives for habitat and wildlife management, visitor services, and facilities management that consider issues and opportunities on the Complex. It also identifies, describes, and compares the consequences (or impacts) of implementing three management alternatives (including current management) on the physical, biological, and human environments described in the CCP. The management actions included in the selected alternative of the CCP EA are inclusive of the activities proposed in the Mid-Coast Habitat Acquisition. However, the scope of the project is limited only to acquisition and habitat monitoring activities, and does not include activities such as public recreation or construction of facilities. Therefore, only those impacts analyses that fall within the scope of the project are incorporated by reference below. All resource categories are fully analyzed below, even those not addressed in the CCP EA.

The impacts from the project are largely beneficial and adverse impacts are minor. Benefits to the physical, biological, and human uses and socioeconomics would result if this project was implemented. BMPs required in consultations or environmental reviews would be followed. Additionally, BMPs described in Appendix 6.A of the Final PDARP/PEIS as well as Appendix B of this document would be considered and applied where appropriate, to reduce or eliminate impacts to the environment. A summary of the conclusions of this analysis are in Table 4-29. Categories and terminology in the table follow a consistent format used for all projects in this RP/EA. Information from this EA was used to populate this table using the definitions provided in Appendix C.

Table 4-29. Summary of beneficial impacts as well as short-term and long-term adverse impacts from implementation of the Mid-Coast Habitat Acquisition project

Resource Categories	Benefits	Adverse Short-Term	Adverse Long-Term
Physical Resources			
Geology and Substrates	Yes	NE	NE

Resource Categories	Benefits	Adverse Short-Term	Adverse Long-Term
Hydrology and Water Quality	Yes	NE	NE
Air Quality and GHG Emissions	Yes	Minor	NE
Noise	Yes	NE	NE
Biological Resources			
Habitats	Yes	Minor	NE
Living Coastal and Marine Resources	Yes	Minor	NE
Protected Species	Yes	NE	NE
Human Uses and Socioeconomics			
Socioeconomics and Environmental Justice	Yes	NE	NE
Cultural Resources	Yes	NE	NE
Infrastructure	NE	NE	NE
Land and Marine Management	Yes	NE	Minor
Tourism and Recreation Use	NE	NE	NE
Fisheries and Aquaculture	Yes	NE	NE
Land and Marine Transportation	NE	NE	NE
Aesthetics and Visual Resources	Yes	Minor	NE
Public Health and Safety	Yes	NE	NE

Notes: Yes – provides benefits
NE – no effect
Adverse short-term and long-term impacts are designated as minor, moderate, or major

4.4.9.1 Physical Environment

The physical environment is divided into geology and substrates, hydrology and water quality, air quality and GHG emissions, as well as noise characteristics of the area.

4.4.9.1.1 Geology and Substrates

Affected Resources

Sediments associated with this region of the Texas coast are unconsolidated at depth and made from deposition associated with lowered sea levels of the Pleistocene and more recent deposits associated with rising sea levels of the Holocene. The soils present at the site are comprised primarily of saline clays and loams. Upland soil series is used for grazing purposes while the other soil types are predominately too saline for agricultural purposes (NRCS 2002).

Environmental Consequences

As evaluated, the CCP EA addresses impacts related to recreation and public use. However, this property would not be open for public use, but for preservation and conservation only. There would be no public access roads built or other ground-disturbing activity conducted as a part of this project, therefore there are no adverse impacts anticipated to geology and substrates due to the proposed action. The project would have long-term beneficial effects from land preservation. Under the ownership of USFWS, the habitats would be monitored regularly.

Placement of this tract into conservation status would ensure the geologic nature of the site is preserved in perpetuity. The most likely use of the tract for its geologic resources would be as a borrow site for clay. Conservation and preservation of the tract by the Texas TIG would prevent the tract from being used as a borrow site. However, there are ample sources of clays and loams in the region. There are no unique geological resources associated with the tract.

4.4.9.1.2 Hydrology and Water Quality

Affected Resources

Matagorda County receives an average of 47.61 inches of rain a year (NRCS 2002). The tract is bisected by a small tidally influenced bayou. Surrounding this area and water side portions of the tract, the tide influences the degree of flooding as well as the organisms that live here. There are no degraded water quality conditions known to be present in the area. The nearest degraded conditions known are for the eastern most end of East Matagorda Bay associated with Caney Creek where bacteria levels impair oyster waters designation for that portion of East Matagorda Bay (TCEQ 2015b). See Section 3.2.3 of the Texas Mid-Coast NWR CCP for more information.

Environmental Consequences

As evaluated, the CCP EA addresses impacts related to recreation and public use. However, this property would not be open for public use, but for preservation and conservation only. There would be no public access roads built or other ground-disturbing activity conducted as a part of this project, therefore there are no adverse impacts anticipated to water quality and hydrology due to the proposed action.

The project would have long-term benefits to water quality from land preservation. The tract would be protected in perpetuity and thereby its contribution to maintaining water quality would be preserved. Management of the site for conservation would prevent development of the tract from reducing water quality in the area. See Section 4.3.2 of the Texas Mid-Coast NWR EA for more information.

4.4.9.1.3 Air Quality and Greenhouse Emissions

Affected Resources

Air Quality

Matagorda County air quality is rated “Good” by the Air Quality Index with values reported less than 50 over the past few years (USA.com 2009 from USEPA). The subject tract is near East Matagorda Bay and as a result, the predominant winds are southeasterly, and flow from the Gulf of Mexico. Air quality can be degraded locally and temporarily due to prescribed application of fire on agricultural lands.

GHG Emissions

Criteria air pollutants and GHG emissions are largely generated by electricity production, vehicular movements, and commercial and residential buildings using electricity. Currently, this property is vacant and has no GHG-producing infrastructure or activity taking place on it.

Environmental Consequences

As evaluated, the CCP EA addresses impacts to air quality related to habitat management activities. Once this property is conveyed to USFWS, the refuge would regularly monitor existing habitat and conduct management activities such as prescribed burns. The CCP EA explains that minor, adverse impacts to air quality may result from these actions but would be temporary in nature limited to the duration of the burn. Because the proposed property acquisition would not allow for public vehicular access to the property, there would be no increased burning in fossil fuels, therefore there are no anticipated adverse impacts to air quality from vehicles.

In order to mitigate impacts to air quality from management activities, the refuge would employ the following BMPs: habitat management involving prescribed burning would occur only under ideal weather conditions and smoke management practices would be implemented during all burning events, an approved prescribed burn plan, favorable weather conditions, and adequate firefighting resource would work jointly to prevent pervasive air pollution or unnecessary effects on air quality (USFWS 2013).

Incorporation of the tract into the refuge system would have long-term benefits for air quality. Preventing the land from development for recreational home sites would prevent air quality from degrading due to increased burning of fossil fuels and household refuse. Management activities such as prescribed burns would help to restore and conserve additional habitat acreage over the long-term, which would in turn improve air quality.

4.4.9.1.4 Noise

Affected Resources

The ambient noise level for the subject tract is relatively low. The project location is remote, far from factors that would cause moderate to high ambient noise levels such as highways, airports, industrial operations, or residential subdivisions. The community of Chinquapin is the closest residences to the subject tract. Nearby agricultural operations may use aerial application of fertilizers and herbicides intermittently. Vessel traffic on the GIWW may increase noise levels when passing near the area. Nearby Chinquapin Road gets light to moderate traffic.

Environmental Consequences

Section 6.4.1.5 of the Final PDARP/PEIS describes the impacts to noise from restoration projects intended to protect and conserve marine, coastal, estuarine, and riparian habitats, is incorporated here by reference. The Final PDARP/PEIS stated that the preservation of lands may help to maintain natural quiet over a longer term. Because no planned infrastructure development in the form or public access roads or trails is planned as a part of this proposed acquisition, there are no anticipated adverse impacts to noise.

Furthermore, incorporation of the tract into the refuge system would have a long-term benefit for noise. Preventing the land from development for recreational home sites would prevent ambient noise levels from being raised.

4.4.9.2 Biological Environment

The biological environment is divided into habitats, living coastal and marine resources, and protected species.

4.4.9.2.1 Habitats

Affected Resources

Habitats associated with the subject tract include salty prairie, high tidal marsh, and low tidal marsh. Marshes near the project area are typically dominated by cordgrass. They are subject to intermittent inundation due to tidal action and high levels of freshwater inflow. Fluctuations in temperature, salinity, water depth, and sediment composition can have a limiting effect on the number of plant species found. (USFWS 2013, internal citations omitted).

Additional description of the habitats associated within the Texas Mid-Coast NWR in provided in Section 3.3.1, and vegetation associations are described in Appendix F, Sections IV and V of the Texas Mid-Coast NWR CCP. Additional information on habitats can be found in Land Protection Plan, Appendix I.

Environmental Consequences

Section 6.4.1.5 of the Final PDARP/PEIS, which describes the impacts to habitats from restoration projects intended to protect and conserve marine, coastal, estuarine, and riparian habitats, is incorporated here by reference. The Final PDARP/PEIS describes acquisition and protection activities has having long-term beneficial impact on habitats. The habitat types present at the site are not expected to change once the tract is incorporated into the refuge system.

As evaluated, the CCP EA addresses impacts to habitat related to refuge management activities. Once this property is conveyed to USFWS, the refuge would regularly monitor existing habitat and conduct management activities such as prescribed burns. The CCP EA explains that minor, adverse impacts to habitats may result from prescribed burns but they would be temporary in nature (USFWS 2013). Because no planned infrastructure development in the form or public access roads or trails is planned as a part of this proposed acquisition, there are no anticipated adverse impacts to habitats from public use.

In order to mitigate impacts to habitats from management activities, the refuge would employ the following BMPs: habitat management involving prescribed burning would occur only under ideal weather conditions and smoke management practices would be implemented during all burning events, an approved prescribed burn plan, favorable weather conditions, and adequate firefighting resource would work jointly to prevent pervasive air pollution or unnecessary effects on air quality (USFWS 2013).

4.4.9.2.2 Living and Coastal Marine Resources

Affected Resources

This region of the Texas coast is extremely diverse with regard to animals and plants. The subject tract contains upland prairie and tidal marsh habitats that support a wide range of wetland and grassland dependent vertebrate and invertebrate species. The tidally influenced wetlands are important as a nursery for commercially and recreationally important species. These include blue crab, white and brown shrimp, speckled seatrout, red drum, and Southern flounder. More information is provided in Section 3.2.2.

Environmental Consequences

Section 6.4.1.5 of the Final PDARP/PEIS, which describes the impacts to living coastal and marine resources from restoration projects intended to protect and conserve marine, coastal, estuarine, and riparian habitats, is incorporated here by reference. The Final PDARP/PEIS stated that the preservation of coastal property would have long-term benefits to living coastal and marine resources. By conveying this tract to the refuge system, and removing the risk of development on the property, the quality of habitat used by the area's living coastal and marine resources would be preserved.

As evaluated, the CCP EA, addresses impacts to living coastal and marine resources related management activities. Once this property is conveyed to USFWS, the refuge service would regularly monitor existing habitat and conduct management activities such as prescribed burns. The CCP EA explains that minor, adverse impacts to living coastal and marine resources may result from these actions but they would be temporary in nature (USFWS 2013).

Moreover, the property once placed into perpetual conservation would have long-term benefits to conditions for living and coastal marine resources. The site would be monitored and managed to prevent invasion by exotic species, alert managers if problems at the site are encountered such as excessive erosion, trespass or poaching. See Section 4.4.4 for Migratory Birds and Resident Native Wildlife in the Texas Mid-Coast NWR EA.

4.4.9.2.3 Protected Species

Affected Resources

Protected species and their habitats include ESA-listed species and designated critical habitats, which are regulated by either the USFWS or the NMFS. Protected species and habitat also include marine mammals protected under the Marine Mammal Protection Act, EFH protected under the Magnuson-Stevens Act, migratory birds protected under the Migratory Bird Treaty Act and eagles protected under the Bald and Golden Eagle Protection Act.

Threatened or Endangered Species

There are no threatened or endangered species that would be affected by this project. No activities related to implementation of the project would take place in any area designated as critical habitat.

Essential Fish Habitat

The 1996 amendments to the Magnuson-Stevens Act set forth a mandate for NMFS, regional FMCs, and other federal agencies to identify and protect EFH of economically important marine and estuarine fisheries. To achieve this goal, suitable fishery habitats need to be maintained. EFH is separated into estuarine habitat types. Estuarine habitat is defined as "all estuarine waters and substrates (mud, sand, shell, rock and associated biological communities), including the sub-tidal vegetation (grasses and algae) and adjacent inter-tidal vegetation (marshes and mangroves)." EFH in the area of proposed action is identified and described for various life stages of managed fish and shellfish in the Gulf of Mexico (GMFMC 1998). A provision of the Magnuson-Stevens Act requires that FMC's identify and protect EFH for every species managed by an FMP (U.S.C. 1853(a)(7)). There are FMPs in the Gulf region for red drum, shrimp, reef fish, and HMS (e.g., sharks). Table 4-31 presents the EFH and species within the Mid-Coast Habitat Acquisition project area.

Table 4-31. EFH for estuarine habitats within the project area for the Mid-Coast Habitat Acquisition project area

Species Common Name	Eggs	Larvae	Post Larvae	Early Juvenile	Late Juvenile	Adult	Spawning Adult
Estuarine Emergent Marsh							
Red Drum			●	●	●	●	
Gray Snapper						●	
Brown Shrimp				●			
White Shrimp				●			
Estuarine Mud/Soft Bottom							
Red Drum		●	●	●	●	●	
Gray Snapper						●	
Lane Snapper				●	●		
Brown Shrimp				●			
White Shrimp				●			

Note: ● indicates habitat type designated as EFH for species' life stage

Marine Mammals

The West Indian Manatee (manatees are protected under the ESA) is the only marine mammal known to occur in near the project area. However, their habitat consists of open water and therefore would not be present in the project area.

Bald and Golden Eagles

Bald and Golden Eagles are not known to occur in or near the project area.

Migratory Birds

Major groups of birds that inhabit the northern Gulf of Mexico include waterfowl and other water-dependent species, pelagic seabirds, raptors, colonial waterbirds, marsh dwelling birds, and passerines. These groups are discussed in the Final PDARP/PEIS. A detailed discussion of protected Migratory birds can be found in the Final PDARP/PEIS. The project area contains important habitat for migratory birds including shorebirds and as well as wading birds.

Environmental Consequences

Because there are no ground disturbing activities or public use objectives planned as a part of this project, there are no anticipated adverse impacts to protected species. Through the proposed change in land management, this project would provide long-term benefits to protected species through conservation of habitat and prevention of development on the property in perpetuity. It is the USFWS's responsibility to conserve and protect federally-listed species. Sea turtle protection activities would occur on the property (USFWS 2013).

4.4.9.3 Human Uses and Socioeconomics

This section includes analyses of potential impacts to socioeconomics and environmental justice, cultural resources, infrastructure, land and marine management, tourism and recreational uses, fisheries and aquaculture, land and marine transportation, aesthetics and visual resources, and public health and safety.

4.4.9.3.1 Socioeconomics and Environmental Justice

Affected Resources

Socioeconomics of the region is described in Section 3.4 of the Texas Mid-Coast NWR CCP. In 2016, the population in Matagorda County was estimated to be 37,187. Approximately 44% of the population in Matagorda County is white (not Hispanic or Latino), 42% is Hispanic or Latino, 11% is black or African American, and 2% is Asian. Median household income (2011-2015) in Matagorda County and the state is $40,797 and $53,207, respectively, with 14% of the county and 16% of the state living below the poverty level (U.S. Census Bureau 2016d; U.S. Census Bureau 2016e).

Environmental Consequences

An analysis in the Texas Mid-Coast NWR CCP is incorporated here by reference. As explained in the EA, the conveyance of this tract of land into the refuge system would not disproportionately place any adverse environmental, economic, social, or health impacts on minority and low-income populations. The acquisition of the subject tract to the refuge would have a neutral to slightly positive impact to socioeconomics and environmental justice. As this project does not include any direct engagement or provision for public use, there are no anticipated adverse impacts to environmental justice. Overall, this proposed acquisition would provide for long-term benefits to socioeconomics/environmental justice as resources of the associated tract would be held in the public trust and thus its service flows would be held in perpetuity for the general public. In consideration of EO 12898, Environmental Justice, this restoration activity does not have the potential to adversely and/or disproportionately affect minority or low-income populations, including economically, socially, or in terms of conditions affecting their health.

This restoration project would help restore an environment that is of benefit to all citizens, populations and groups in Texas and beyond.

Further discussion of impacts to the local population and economy are discussed in Section 4.5.1 of the Texas Mid-Coast NWR EA.

4.4.9.3.2 Cultural Resources

Affected Resources

There are currently no sites listed on the National Register of Historic Places; however, numerous identified archaeological or cultural sites are located within the boundaries of the Complex. The majority of the sites are prehistoric, generally shell middens and campsites located along the banks of bayous, lakes, and oxbow lakes or meander scars. The remaining sites are historic in nature and include cemeteries, shipwrecks, a plantation, canal, cattle dipping vat, and foundations for structures (USFWS 2013). Additional discussion is provided in Section 3.6.7 of the Texas Mid-Coast NWR CCP. The subject tract is not known to contain cultural resource assets, however, no surveys have been conducted to assess their possible presence.

Environmental Consequences

Coordination under Section 106 NHPA has been initiated for all projects. An analysis in the Texas Mid-Coast NWR CCP is incorporated here by reference. Section 4.2 of the Texas Mid-Coast NWR EA discusses potential impacts to cultural resources. There are no anticipated adverse impacts that would arise from implementation of this project. Benefits to cultural resources would be realized through added protection provided by becoming part of a NWR. This project would be implemented in accordance with all applicable laws and regulations concerning the protection of cultural and historic resources.

4.4.9.3.3 Infrastructure

Affected Resources

There is little infrastructure adjacent to the subject tract. Human infrastructure near the tract includes Chinquapin Road, fencing around the tract, and electrical service adjacent to the road that provides electricity to the community of Chinquapin. There currently exist no active oil and gas infrastructure within the project area. The subject tract contains two gravel roads, a cabin, several sheds, and three historic drilling well pads. Additional information concerning refuge infrastructure can be found in Section 3.6.4 of the Texas Mid-Coast NWR CCP.

Environmental Consequences

There are no anticipated adverse impacts to infrastructure that would result from this project. The buildings present on the property would be incorporated into refuge management operations or dismantled. The existing roads would be maintained and the three former well pads may be restored or left in place. Impacts related to Public Use and Infrastructure can be found in Section 4.5.3 and 4.5.4 of the Texas Mid-Coast NWR EA.

4.4.9.3.4 Land and Marine Management

Affected Resources

The proposed property is currently zoned as residential/commercial use. However, the tract is currently not developed and has no public access points.

Environmental Consequences

The project would convey the tract to the USFWS refuge system and change the current land management for the property. This is anticipated to have a minor, long term-adverse impact on local tax revenue. The conveyance of this tract—which is currently zoned as residential/commercial property—to USFWS, represents a loss in taxable property and a corresponding loss in tax revenue to the local economy. Once conveyed to the refuge system, this property would be removed from tax rolls. However, Refuge Revenue Sharing Act payments from the DOI are designed to offset the burden that counties feel when Refuge properties are removed from the tax rolls.

Long-term benefits from the conveyance of property to the USFWS refuge system would include prevention of recreational, residential, or commercial development of the property and protection of its resources in perpetuity.

4.4.9.3.5 Tourism and Recreation Use

Affected Resources

The tract is currently vacant and is not used by the public for tourism or recreational uses. Recreation is discussed in Sections 3.4.2.1, 3.6.4 of the Texas Mid-Coast NWR CCP and Section 3.6 of Appendix I of the Texas Mid-Coast NWR CCP.

Environmental Consequences

Public use opportunities are evaluated in Section 4.5.3 of the Texas Mid-Coast NWR EA. While this project is being conveyed to the USFWS refuge system, it would be not open to the public for recreation, but maintained for conservation purposes only. For this reason, there are no anticipated adverse impacts to tourism and recreational use that may arise from the project.

4.4.9.3.6 Fisheries and Aquaculture

Affected Resources

There are no current aquaculture operations in the vicinity of the Texas Mid-Coast NWR. There are some fisheries activities present in estuarine waters of East Matagorda Bay such as a blue crab and Eastern oyster fisheries. The estuarine waters near the subject tract are used heavily by recreational anglers.

Environmental Consequences

As there are no aquaculture operations in the vicinity of the Texas Mid-Coast NWR, the proposed action is anticipated to have no adverse impacts to fisheries and aquaculture. A benefit would be provide by protection of wetlands that provide important nursery habitat for commercial and recreational important species such as blue crab, speckled trout, Southern flounder, white shrimp, and redfish.

4.4.9.3.7 Land and Marine Transportation

Affected Resources

The subject tract is near Chinquapin Road. There is otherwise no land or marine transportation corridors or plans in place that relate to the subject tract. The GIWW is less than one mile distant from the property.

Environmental Consequences

The proposed action is anticipated to have no impact to land and marine transportation. There are no public land or marine transportation routes on the tract, and this is not anticipated to change upon implementation of the project.

4.4.9.3.8 Aesthetics and Visual Resources

Affected Resources

The landscapes in the immediate vicinity of the tract are pastoral in nature with croplands, grazing lands, coastal prairie, or tidal marshes.

Environmental Consequences

Evaluated in the CCP EA, that analysis addresses impacts to aesthetics and visual resources related management activities. Once this property is conveyed to USFWS, the refuge service would regularly monitor existing habitat and conduct management activities such as prescribed burns. The CCP EA explains that minor, adverse impacts to aesthetics and visual resources may result from these actions but would be temporary in nature, limited to the duration of the burn (USFWS 2013).

In order to mitigate impacts to aesthetics and visual resources from management activities, the refuge would employ the following BMPs: habitat management involving prescribed burning would occur only under ideal weather conditions and smoke management practices would be implemented during all burning events, an approved prescribed burn plan, favorable weather conditions, and adequate firefighting resource would work jointly to prevent pervasive air pollution or unnecessary effects on air quality (USFWS 2013).

Long-term benefits to aesthetics and visual resources would occur from the preservation of natural habitat and the prevention of future development that could adversely impact aesthetics and visual resources. These benefits would result from improved aesthetics and opportunities to view wildlife on the protected lands and in nearby areas that are likely to experience improved abundance and diversity of species as a result of the spillover effects of conservation efforts.

The tract would be preserved in perpetuity and thus this action would protect current aesthetics and visual resource values. The Texas Mid-Coast NWR EA addresses aesthetics and visual resources in Section 4.5.2.

4.4.9.3.9 Public Health and Safety

Affected Resources

The tract is not located within an incorporated city and falls under County management. Most of the proposed tract is within a 100-year floodplain (FEMA 1985). Roughly 50% is designated in Zone A12 and the remainder in Zone V13. Zone A12 indicates a 1% annual chance of flooding and a 26% chance of flooding over a 30-year span. Zone V13 indicates a coastal area with a 1% or greater chance of flooding and an additional hazard associated with storm waves. These areas have a 26% chance of flooding over a 30-year span.

Environmental Consequences

Acquisition of the subject tract would have no adverse impacts to public health and safety. The action of placing the tract into conservation would preserve its current state and preclude development of the tract for recreational, residential, or commercial purposes. Preventing development and subsequent land impacts would result in maintenance of coastal resiliency. This action would prevent development that would be affected by tropical storm winds and tides and thus minimize flood risks to human health and safety.

4.4.10 Matagorda Peninsula Habitat Acquisition

The Matagorda Peninsula Habitat Acquisition project would acquire and conserve up to 3,000 acres of wetland and coastal habitats on Matagorda Peninsula east of the Colorado River between Driftwood Drive and property owned by TPWD in Matagorda County, Texas. The project would conserve beach to bay barrier island habitat in perpetuity through fee-simple acquisition. Once acquired, the land would be transferred to and managed by the TPWD for the purpose of habitat preservation. The estimated cost for the project is about $3,012,000.

This analysis incorporates by reference the relevant portions of Section 6.4.1.5 of the Final PDARP/PEIS. The Final PDARP/PEIS provides programmatic evaluation of the environmental consequences of the Restoration Approach “Protect and conserve marine, coastal, estuarine and riparian habitats”, which are considered in this RP/EA and are incorporated by reference here. Tiering from that analysis, this section presents the Affected Environment of the Matagorda Peninsula Habitat Acquisition project and the environmental consequences of the proposed actions in context of the project-specific affected environment.

The programmatic analysis looked at a series of resources as part of the biological, physical, and socioeconomic environment. As appropriate in a tiered analysis, the evaluation of each project focuses on the specific resources with a potential to be affected by the project.

The impacts from the project are largely beneficial and adverse impacts are minor. Benefits to the physical, biological, and human uses and socioeconomics would result if this project was implemented. BMPs required in consultations or environmental reviews would be followed. Additionally, BMPs described in Appendix 6.A of the Final PDARP/PEIS as well as Appendix B of this document would be considered and applied where appropriate, to reduce or eliminate impacts to the environment. A summary of the conclusions of this analysis are in Table 4-32. Categories and terminology in the table follow a consistent format used for all projects in this RP/EA. Information from this EA was used to populate this table using the definitions provided in Appendix C.

Table 4-32. Summary of beneficial impacts as well as short-term and long-term adverse impacts from implementation of the Matagorda Peninsula Habitat Acquisition project

Resource Categories	Benefits	Adverse Short-Term	Adverse Long-Term
Physical Resources			
Geology and Substrates	Yes	NE	NE
Hydrology and Water Quality	Yes	NE	NE
Air Quality and GHG Emissions	Yes	NE	NE
Noise	Yes	NE	NE
Biological Resources			
Habitats	Yes	NE	NE
Living Coastal and Marine Resources	Yes	NE	NE
Protected Species	Yes	NE	NE
Human Uses and Socioeconomics			
Socioeconomics and Environmental Justice	Yes	NE	NE
Cultural Resources	Yes	NE	NE
Infrastructure	NE	NE	NE
Land and Marine Management	Yes	NE	Minor
Tourism and Recreation Use	Yes	NE	NE
Fisheries and Aquaculture	Yes	NE	NE
Land and Marine Transportation	NE	NE	NE
Aesthetics and Visual Resources	Yes	NE	NE
Public Health and Safety	Yes	NE	NE

Notes: *Yes – provides benefits*
NE – no effect
Adverse short-term and long-term impacts are designated as minor, moderate, or major

4.4.10.1 Physical Environment

The physical environment is divided into geology and substrates, hydrology and water quality, air quality and GHG emissions, as well as noise characteristics of the area.

4.4.10.1.1 Geology and Substrates

Affected Resources

The project area is located on Matagorda Peninsula on the middle Texas coast. The barrier island was formed by wave and tidal action parallel to the shoreline. The island may move and shift during storms and other events, but also absorb energy and protect the coastline. In general, there are sands, clay loams, and sandy loams in upland areas and clays in the wetlands. Soils present in the potential project area could include (USDA 2017):

- Beaches
- Follet clay loam, 0-1% slopes, frequently flooded
- Galveston fine sand, 0 to 3 percent slopes, occasionally flooded
- Madre fine sand, 0 to 1 percent slopes, occasionally flooded, frequently ponded
- Veston fine sandy loam, 0 to 1 percent slopes, frequently flooded

Environmental Consequences

Section 6.4.1.5 of the Final PDARP/PEIS, which describes the impacts to geology and substrates from restoration projects intended to protect and conserve marine, coastal, estuarine, and riparian habitats, is incorporated here by reference. Impacts from projects intended to protect and conserve marine, coastal, estuarine, and riparian habitats were described as having beneficial impacts as well as short-term minor to moderate impacts on geology and substrates.

This project would not have any adverse effects to geology and substrates. Implementation of this project would increase protections of the land and decrease impacts caused by trespassers. TPWD would employ management actions to reduce impacts as much as possible. There would be clear signs to designate the appropriate use of vehicles and other activities on the land, restricting vehicles to appropriate designated roads and access easements. Over the long term, if necessary, TPWD would provide alternative pedestrian access and pedestrian trails designed in a manner to allow access but reduce impacts on the island habitats. Other management activities such as the installation of bollards may occur in order to preserve and/or enhance habitat quality. The area would also be patrolled by law enforcement professionals and other TPWD staff to enforce regulations to prevent resource damage from illegal vehicular activity. No off-road access would be allowed except through current legal access easements. Consistent with the Final PDARP/PEIS, this project would provide beneficial by improving geology and substrates in comparison to current conditions.

4.4.10.1.2 Hydrology and Water Quality

Affected Resources

The project area is bordered by East Matagorda Bay and the Gulf of Mexico. East Matagorda Bay is part of a minor bay system that has an average depth of 3.4 feet. The Bay receives freshwater inflow only from runoff of surrounding coastal watersheds and from direct precipitation on the bay. There are no direct sources of river inflow into the bay system (TWDB n.d.). East Matagorda Bay connects to the Gulf of Mexico through a small inlet on the northeast corner of the Bay.

Waters in the Gulf of Mexico are influenced by riverine sediment and nutrients inputs. A turbid surface layer of suspended particles is associated with the freshwater plume from these rivers. The river system supplies nitrate, phosphate, and silicate to the shelf (Minerals Management Service 2005). Water quality in the Gulf of Mexico is sufficient to support aquatic life use, recreation use, and general use (CWA §303c; 40 CFR §131). However, there are restricted consumption advisories due to elevated levels of mercury in edible tissues of some tuna, jack, mackerel, shark, and bill fish species. Information regarding the recommended level of consumption for fish that could contain high mercury levels is described on the TPWD's website (http://www.tpwd.state.tx.us/regulations/outdoor-annual/fishing/general-rules-regulations/fish-consumption-bans-and-advisories).

Water quality in East Matagorda Bay is impacted from bacteria (TCEQ 2015b). As of November 2016, the Texas Department of State Health Services Seafood and Aquatic Life Group provided information indicating closures of shellfish harvesting in eastern and western East Matagorda Bay (TDSHS 2016). A TMDL for this bay is underway, scheduled, or will be scheduled.

Environmental Consequences

Section 6.4.1.5 of the Final PDARP/PEIS describes the impacts to hydrology and water quality from restoration projects intended to protect and conserve marine, coastal, estuarine, and riparian habitats, and is incorporated here by reference. Impacts from projects intended to protect and conserve marine, coastal, estuarine, and riparian habitats were described as having short-term minor to moderate impacts on water resources.

There would be no adverse impacts to hydrology and water quality. The project would have long-term beneficial impacts from land preservation. Preservation of lands would eliminate the potential of development activities which may alter hydrological functions (i.e., flow pathways, wave energy, etc.) and discharge of constituents that may adversely impact biota. This project would also benefit water quality by preserving wetlands that help filter nutrients and sediments, thereby maintaining/improving water quality.

4.4.10.1.3 Air Quality and GHG Emissions

Affected Resources

Air Quality

Matagorda Peninsula is located in the Matagorda County. This county is in attainment or unclassified with the NAAQS for all criteria pollutants.

GHG Emissions

Criteria air pollutants and GHG emissions are largely generated by electricity production, vehicular movements, and commercial and residential buildings using electricity. GHG emissions would result from public use and manage of the project from the use of vehicles. Engine exhaust from vehicles would contribute to an increase in GHG emissions

Environmental Consequences

Section 6.4.1.5 of the Final PDARP/PEIS describes the impacts to air quality and GHG emissions from restoration projects intended to protect and conserve marine, coastal, estuarine, and riparian habitats, is incorporated here by reference. Impacts from projects intended to protect and conserve marine, coastal, estuarine, and riparian habitats were described as having short-term, minor to moderate adverse impacts to air quality from emissions generated by construction equipment and vehicles.

There would be no adverse impacts to air quality because there would not be any additional activities that cause the release of GHGs compared to the current conditions. The project would have long-term beneficial impacts from land preservation. Preservation of lands would eliminate the potential of development activities which could adversely affect air quality. It would also benefit air quality by protecting wetlands that sequester carbon.

4.4.10.1.4 Noise

Affected Resources

The project area is located on Matagorda Peninsula in an area that is relatively undeveloped and noise in the area is dominated by natural processes (wind, waves, wildlife, etc.). Human activities also contribute to noise in the project area. Noise from human activities is minor resulting from activities such as vehicle use and recreational activities.

Environmental Consequences

Section 6.4.1.5 of the Final PDARP/PEIS describes the impacts to noise from restoration projects intended to protect and conserve marine, coastal, estuarine, and riparian habitats, is incorporated here by reference. Impacts from projects intended to protect and conserve marine, coastal, estuarine, and riparian habitats were described as having short- and long-term adverse impacts to noise from land management activities. Additionally, the Final PDARP/PEIS stated that the preservation of lands may help to maintain natural quiet over a longer term.

There would be no adverse impacts to noise since noise producing activities over current conditions would not occur. Consistent with the Final PDARP/PEIS, this project would help maintain natural quiet over the long-term. Beneficial impacts to noise would result from the prevention of potential development and associated activities.

4.4.10.2 Biological Environment

The biological environment is divided into habitats, living coastal and marine resources, and protected species.

4.4.10.2.1 Habitats

Affected Resources

The lands surrounding East Matagorda Bay are largely undeveloped and have high quality coastal habitat. Much of this land is currently in conservation. Matagorda Peninsula has healthy mosaics of lagoons, coves, washover channels, emergent marshes, tidal and algal flats, and salt meadows. Within the Bay waters there are seagrasses and oyster reefs. Having this mosaic of interconnect habitats provides valuable nursery habitat for a host of aquatic species.

Environmental Consequences

Section 6.4.1.5 of the Final PDARP/PEIS, which describes the impacts to habitats from restoration projects intended to protect and conserve marine, coastal, estuarine, and riparian habitats and is incorporated here by reference. The Final PDARP/PEIS describes acquisition and protection activities as having long-term beneficial impact on habitats. However, management activities and public use could have short to long-term minor to moderate adverse effects, depending on the intensity of the activity.

This project would not adversely affect habitats compared to current conditions. Consistent with the Final PDARP/PEIS, beneficial impacts would result from acquisition and protection of lands. The land would provide space that allows marshes to migrate inland in response to sea level rise, thus ensuring East Matagorda Bay and the surrounding protected lands managed by USFWS and TPWD remains of high quality and productivity. Open water habitats and seagrasses in the adjacent waters would be protected by the preventing the project area from development and maintaining the habitat buffer. The habitat buffer would help filter nutrients and prevent erosion, leading to better water quality. This project would protect tidal shoreline and littoral zone, which in turn protects adjacent oyster and seagrass beds from the detrimental effects that inevitably follow shoreline development. This development often includes construction of canal subdivisions, access channels, bulkheads, breakwaters, piers and boat launches, all of which can have direct and indirect impacts on habitat and water quality, including turbidity, nutrient loading, and fuel spills.

4.4.10.2.2 Living Coastal and Marine Resources

Affected Resources

The project area contains a mosaic of coastal habitats that host a variety of wildlife. It borders East Matagorda Bay and the Gulf of Mexico. These waterbodies support aquatic-dependent species that use marshes, a habitat type in the project area, for at least part of their life cycle. The marshes serve as nursery grounds for over 95% of the recreational and commercial fish species found in the Gulf of Mexico and are designated as EFH for species under federal FMPs.

The wetlands provide habitat for many species of plants, fish, birds, and other wildlife. Many species rely on estuarine wetlands during at least some part of their life cycle. The wetland edge is a particularly important habitat for white and brown shrimp (Whaley and Minello 2002). Other marsh dwelling species include blue crab, red drum, spotted seatrout, Southern flounder and Gulf menhaden.

Wetlands act as nurseries to hundreds of non-commercial species that comprise a large part of the bay food web. A variety of birds use the estuarine habitats associated with Matagorda Peninsula. These include waders, shorebirds, secretive marsh birds, and waterfowl. Example species include, clapper rail, seaside sparrow, great blue heron, reddish egret, redhead, lesser scaup, willet, northern Aplomado falcon, and snowy plover.

Habitats at the site support foraging, breeding and sheltering habitat for migrating, wintering and resident species throughout the year (Eubanks et al. 2006).

Environmental Consequences

Section 6.4.1.5 of the Final PDARP/PEIS, which describes the impacts to living coastal and marine resources from restoration projects intended to protect and conserve marine, coastal, estuarine, and riparian habitats and is incorporated here by reference. Impacts from projects intended to protect and conserve marine, coastal, estuarine, and riparian habitats were described as having short-term minor to moderate adverse impacts from land use activities which could include activities such as invasive species management and public use. Additionally, the Final PDARP/PEIS stated that the preservation of these habitats would have long-term benefits.

This project would not adversely impact living coastal and marine resources. Consistent with the Final PDARP/PEIS, this project would have long-term beneficial impacts from the protection of habitats. Protection of habitats would help water quality by maintaining a natural vegetated buffer, decrease the risk of pollution caused by development (e.g., sedimentation, erosion, leaking septic tanks, stormwater runoff, etc.), connect coastal habitats (bay, wetland, dune, to beach) and provide habitat for foraging, breeding, and resting wildlife.

4.4.10.2.3 Protected Species

Protected species and their habitats include ESA-listed species and designated critical habitats, which are regulated by either the USFWS or NMFS. Protected species and habitat also include marine mammals protected under the Marine Mammal Protection Act, EFH protected under the Magnuson-Stevens Act, migratory birds protected under the Migratory Bird Treaty Act and eagles protected under the Bald and Golden Eagle Protection Act.

Affected Resources

Threatened or Endangered Species

Six species of endangered or threatened species were identified as possibly being affected in the project area: loggerhead sea turtles, green sea turtles, Kemp's ridley sea turtles, piping plovers, whooping cranes, and red knots (Table 4-33). Although habitat is present for whooping cranes, they have not been observed in the project area. No activities related to implementation of the project would take place in any area designated as critical habitat.

Table 4-33. Federal Threatened and Endangered Species potentially affected in the Matagorda Peninsula Habitat Acquisition project area.

Common Name	Status
Piping Plover	T
Red Knot	T
Whooping Crane	E

Common Name	Status
Loggerhead Sea Turtle	T
Green Sea Turtle	T
Kemp's Ridley Sea Turtle	E

Notes: E – federally endangered species
T – federally threatened species

The red knot and piping plover are winter residents on the Texas coast and occur in Matagorda County. Additionally both species are known to use shoreline of bays and mudflats. There is critical habitat for piping plover on Matagorda Peninsula.

Although there are no records of the whooping crane in the project area, they are present in the Brazoria NWR, which is on the north side of Christmas Bay. Whooping cranes may forage within or near the project area. There is no critical habitat for the whooping crane in the project area.

Sea turtle nesting has been observed on Matagorda Peninsula. Green, loggerhead and Kemp's Ridley sea turtles are the only sea turtles known to nest in Texas. Kemp's Ridley sea turtle nests during the day time and is the most abundant nesting species in Texas. Other species of sea turtles nest at night. Sea turtles use nearshore hard bottom reef complexes, shallow water habitat (including seagrasses), or other coastal areas with rocky bottoms to forage for food. The project area has not been designated as critical habitat for any of the sea turtle species. Species of sea turtles, leatherback and Atlantic hawksbill, that do not nest in Texas are not included in this analysis because they would not use habitat that is included in the project area.

Essential Fish Habitat

Habitats within the project area are subject to designation as EFH. The 1996 amendments to the Magnuson-Stevens Act set forth a mandate for NMFS, regional FMCs, and other federal agencies to identify and protect EFH of economically important marine and estuarine fisheries. To achieve this goal, suitable fishery habitats need to be maintained. EFH is separated into estuarine habitat types. Estuarine habitat is defined as "all estuarine waters and substrates (mud, sand, shell, rock and associated biological communities), including the sub-tidal vegetation (grasses and algae) and adjacent inter-tidal vegetation (marshes and mangroves)." EFH in the area of proposed action is identified and described for various life stages of managed fish and shellfish in the Gulf of Mexico (GMFMC 2005). A provision of the Magnuson-Stevens Act requires that FMC's identify and protect EFH for every species managed by an FMP (U.S.C. 1853(a)(7)). There are FMPs in the Gulf region for red drum, shrimp, reef fish, and HMS (e.g., sharks). Table 4-34 presents the EFH and species within the Matagorda Peninsula Habitat Acquisition project area.

Table 4-34. EFH for estuarine habitats within the project area for the Matagorda Peninsula Habitat Acquisition project area.

Species Common Name	Eggs	Larvae	Post Larvae	Early Juvenile	Late Juvenile	Adult	Spawning Adult
Estuarine Emergent Marsh							
Red Drum			●	●	●	●	
Gray Snapper						●	
Brown Shrimp				●			
White Shrimp				●			
Estuarine Mud/Soft Bottom							
Red Drum		●	●	●	●	●	
Gray Snapper						●	
Lane Snapper				●	●		
Brown Shrimp				●			
White Shrimp				●			

Note: ● indicates habitat type designated as EFH for species' life stage

Marine Mammals

The project area includes land on Matagorda Peninsula. It does not include open water areas in the adjacent bays or Gulf of Mexico. There are no marine mammals present in the project area.

Bald and Golden Eagles

There are no known bald or golden Eagle nests on Matagorda Peninsula. Bald eagles have been observed in or near Matagorda Peninsula (http://ebird.org) but there have been no observances of golden eagles on the peninsula.

Migratory Birds

Major groups of birds that inhabit the northern Gulf of Mexico include waterfowl and other water-dependent species, pelagic seabirds, raptors, colonial waterbirds, marsh dwelling birds, and passerines. These groups are discussed in the Final PDARP/PEIS. A detailed discussion of protected Migratory birds can be found in the Final PDARP/PEIS. The project area contains important habitat for migratory birds including shorebirds and as well as wading birds.

Environmental Consequences

Consistent with the Final PDARP/PEIS, this project would provide long-term benefits to protected species. Land would be preserved and managed, thereby maintaining habitat quality and preventing development activities on important habitats necessary for protected species. This project would allow for the upland migration of beach, wetland and other habitat as sea level rises and would also limit development. The preservation of habitat would provide a buffer that would help preserve water quality and habitats for aquatic species in the adjacent waterbodies.

This project would not adversely affect protected species. Increased protection from public ownership would reduce impacts compared to the current condition. TPWD would employ management actions to reduce impacts as much as possible. There would be clear signs to designate the appropriate use of vehicles and other activities on the land, restricting vehicles to appropriate designated roads and access easements. Over the long term, if necessary, TPWD would provide alternative pedestrian access and pedestrian trails designed in a manner to allow access but reduce impacts on the island habitats. Other management activities such as the installation of bollards may occur in order to preserve and/or enhance habitat quality. The area would also be patrolled by law enforcement professionals and other TPWD staff to enforce regulations to prevent resource damage from illegal vehicular activity. No off-road access would be allowed except through current legal access easements. All management activities would incorporate BMPs to eliminate or minimize any potential adverse effects to protected species.

4.4.10.3 Human Uses and Socioeconomics

This section includes analyses of potential impacts to socioeconomics and environmental justice, cultural resources, infrastructure, land and marine management, tourism and recreational uses, fisheries and aquaculture, land and marine transportation, aesthetics and visual resources, and public health and safety.

4.4.10.3.1 Socioeconomics/Environmental Justice

Affected Resources

In 2016, the population in Matagorda County was estimated to be 37,187. Around 44% of the population in Matagorda County is white (not Hispanic or Latino), 42% is Hispanic or Latino, 11% is black or African American, and 2% is Asian. Median household income in Matagorda County (2015) and the state is $40,797 and $53,207, respectively, with 21% of the county and 16% of the state living below the poverty level (U.S. Census Bureau 2016e).

Environmental Consequences

Section 6.4.1.5 of the Final PDARP/PEIS, which describe the impacts to socioeconomics from restoration projects intended to protect and conserve marine, coastal, estuarine, and riparian habitats, is incorporated here by reference. The Final PDARP/PEIS describes acquisition and protection activities as having minor to moderate adverse effects due to changes in development activities, spending, and taxes. In addition, there would also be beneficial impacts from preventing development that would be at risk from future severe storms (e.g., hurricanes, tropical storms, etc.) and opening private lands for public use.

This project would not adversely affect socioeconomics or environmental justice. There are no adverse effects to low income or minority populations anticipated from the proposed action. Furthermore, this project would enhance passive recreation and provide additional access points to areas for beachgoers. In consideration of EO 12898, Environmental Justice, this restoration activity does not have the potential to adversely and/or disproportionately affect minority or low-income populations, including economically, socially, or in terms of conditions affecting their health. This restoration project would help restore an environment that is of benefit to all citizens, populations and groups in Texas and beyond.

4.4.10.3.2 Cultural Resources

Affected Resources

The project area is largely undeveloped and contains high quality natural habitat. There are no known cultural resources in the project area.

Environmental Consequences

Section 6.4.1.5 of the Final PDARP/PEIS describes the impacts to cultural resources from restoration projects intended to protect and conserve marine, coastal, estuarine, and riparian habitats, is incorporated here by reference. Impacts to cultural resources and infrastructure resulting from the implementation of a conservation action or habitat management plan could result if conservation includes protecting cultural or infrastructure resources that are within or close to protected areas.

Due to the land use objectives of the property (habitat protection), it is anticipated that there would be no effect to cultural resources. Land would be managed by TPWD for habitat protection and passive recreation. Construction would be limited to management activities such as the installation of bollards or signs which would be used to minimize impacts from public use (e.g., accessing the bays and beaches, fishing, etc.). Coordination under Section 106 NHPA has been initiated for this project. All necessary reviews or consultations for cultural resources would occur prior to the implementation of management activities (not funded as part of this project) that could affect any cultural resources. If cultural resources, were found to be present on the property, they would be more protected than in the current conditions. TPWD would follow all applicable agency and state policies regarding cultural resources on TPWD property.

4.4.10.3.3 Infrastructure

Affected Resources

Land in the project area is relatively undeveloped. There are only unpaved roads in project area.

Environmental Consequences

The proposed action is anticipated to have no impacts to infrastructure, since new infrastructure would not be built and any existing infrastructure would be managed in accordance with management objectives of the property.

4.4.10.3.4 Land and Marine Management

Affected Resources

The project area is largely undeveloped and contains high quality natural habitat. Land is currently held by private interests. There are trail roads within the project area.

Environmental Consequences

Section 6.4.1.5 of the Final PDARP/PEIS describes the impacts to land and marine management from restoration projects intended to protect and conserve marine, coastal, estuarine, and riparian habitats, is incorporated here by reference. The Final PDARP/PEIS states that opening private lands to the public could beneficial.

This project is anticipated to have a minor, long term-adverse impact on local tax revenue. The conveyance of this tract—which is currently zoned as residential/commercial property—to TPWD, represents a loss in taxable property and a corresponding loss in tax revenue to the local economy. Once conveyed, this property would be removed from tax rolls.

However, consistent with the Final PDARP/PEIS, there would be beneficial impacts from the Matagorda Peninsula Habitat Acquisition project because it would convert private to public lands. The area would be preserved and human activity would be managed to prevent impacts to the land. Trails, roads or access points deemed compatible with the land management objectives associated this preservation project would be maintained for the public to use.

4.4.10.3.5 Tourism and Recreational Use

Affected Resources

The project area is currently held by private interests and does not permit the public to access the land. The land would be transferred to state ownership that would allow passive recreational uses. The project area is adjacent to East Matagorda Bay and gulf beaches.

Environmental Consequences

There would be no adverse effects to tourism and recreational use from the project. There would be long-term benefits from increased opportunities to access lands including beaches for passive recreational activities.

4.4.10.3.6 Fisheries and Aquaculture

Affected Resources

The project area contains marshes, which are an important nursery habitat for aquatic-dependent species. There are no commercial fisheries or aquaculture activities occurring in the project area.

Environmental Consequences

There would be no adverse effects from this project on fisheries and aquaculture. Long-term benefits to fisheries and aquaculture would result from the acquisition of lands that contain coastal marshes, an important nursery habitat for commercial and recreational fisheries.

4.4.10.3.7 Land and Marine Transportation

Affected Resources

The project area is largely undeveloped and contains high quality natural habitat. Land is currently held by private interests. There are trail roads within the project area.

Environmental Consequences

The proposed action would have no impact to land and marine transportation. Lands are currently in private holdings and not used for transportation and there would be no change in transportation activities if the project was implemented.

4.4.10.3.8 Aesthetics and Visual Resources

Affected Resources

The project area is largely undeveloped and contains high quality natural habitat. Habitats, include beaches, dunes, marshes, tidal flats, salt prairie, as well as other habitats.

Environmental Consequences

There would be no adverse impacts to aesthetics and visual resources. Long-term benefits to aesthetics and visual resources would occur from the preservation of natural habitat and the prevention of future development that could adversely impact aesthetics and visual resources.

4.4.10.3.9 Public Health and Safety

Affected Resources

The project area contains marshes and boarders East Matagorda Bay. It provides storm protection to nearby communities and habitats.

Environmental Consequences

Due to the nature the project (land preservation), no adverse impacts to public health and safety would occur as a result of project implementation. The action of placing the tract into conservation would preserve its current state and preclude development of the tract. This action would prevent development that would be affected by tropical storm winds and tides and thus minimize flood risks to human health and safety. The preservation of land also maintains a storm buffer that would help protect the city of Matagorda. Additionally, preserving the land would maintain water quality by filtering nutrients and preventing development that would cause pollution into the Bay.

4.4.11 Bahia Grande Coastal Corridor Habitat Acquisition

The Bahia Grande Coastal Corridor Habitat Acquisition project would include acquisition of important coastal habitat that would be conveyed to the USFWS to be managed as part of the LANWR. This tract includes 1,322 acres of tidal wetlands, thorn scrub, and coastal prairie with more than a mile of frontage on the Lower Laguna Madre and almost 2 miles frontage on a tidal inlet called Laguna Vista Cove. The estimated cost for the project is $6,900,000 of which the Texas TIG proposes providing $2,271,000.

This analysis incorporates by reference the relevant portions of Section 6.4.1.5 of the Final PDARP/PEIS. The Final PDARP/PEIS provides programmatic evaluation of the environmental consequences of the Restoration Approach "Protect and conserve marine, coastal, estuarine, and riparian habitats", which are considered in this RP/EA and are incorporated by reference here. Tiering from the Final PDARP/PEIS analysis, this section presents the Affected Environment of the Bahia Grande area and the environmental consequences of the proposed action in context of the project-specific affected environment.

The programmatic analysis looked at a series of resources as part of the biological, physical, and socioeconomic environment. As appropriate in a tiered analysis, the evaluation of each project focuses on the specific resources with a potential to be affected by the project.

The proposed acquisition is within the approved expansion boundaries for the LANWR. USFWS completed the CCP and conducted an EA for the LANWR, which includes the Bahia Grande unit, in 2010. The CCP provides a vision for the NWR and offers management direction for conducting scientific research, habitat restoration, and maintenance and management of compatible public uses of refuge resources. The CCP and accompanying EA address USFWS legal mandates, policies, goals, and NEPA compliance. A FONSI was issued in fall 2010. The NEPA analysis of the environmental consequences suggests no adverse impacts are anticipated to result from the acquisition of the tract. For the purposes of this project, the Texas TIG has incorporated by reference the analyses and conclusions of the 2010 LANWR CCP EA (USFWS 2010).

In its CCP EA, the USFWS selected Alternative B: Implement CCP as its proposed action. This alternative encompasses the action of adopting and implementing the CCP, including an emphasis on all federal trust species (e.g., migratory birds and federally-listed species) and priority species and their habitats within the Refuge, and invasive species control. This alternative also would improve and expand compatible public uses, improve and add new facilities, and enhance educational and outreach programs. This alternative would continue to use successful pre-existing Refuge management strategies, as well as a series of new planning strategies to protect, maintain, and restore native brush land, coastal prairies, wetlands, and other biotic communities on the Refuge for federal trust and priority species. With respect to land acquisition, additional activities proposed under this alternative are to pursue acquisitions in Cameron and Willacy Counties as well as coordinate land acquisition activities with the Lower Rio Grande Valley NWR to establish several wildlife corridors (Ranchito Corridor, South Coastal Corridor, Boca Chica Corridor, North Coastal Corridor, and North Valley Corridor) to establish connectivity between endangered ocelot populations. These actions are inclusive of the activities proposed in the Bahia Grande Coastal Corridor Acquisition. However, the scope of the project is limited only to acquisition and habitat monitoring activities, and does not include activities such as public recreation or construction of facilities. Therefore, only those impacts analyses that fall within the scope of the project are incorporated by reference below. All resource categories are fully analyzed below, even those not addressed in the CCP EA.

The Incident was not considered as part of the affected environment in the LANWR CCP, and therefore the environmental consequences of the LANWR CCP implementation were not considered in light of the

Incident. However, the environmental consequences of the LANWR CCP alternatives would occur regardless of the Incident and the relative impacts of the alternatives considered would not materially change because of the Incident.

The impacts from the project are largely beneficial and adverse impacts are minor. Benefits to the physical, biological, and human uses and socioeconomics would result if this project was implemented. BMPs required in consultations or environmental reviews would be followed. Additionally, BMPs described in Appendix 6.A of the Final PDARP/PEIS as well as Appendix B of this document would be considered and applied where appropriate, to reduce or eliminate impacts to the environment. A summary of the conclusions of this analysis are in Table 4-35. Categories and terminology in the table follow a consistent format used for all projects in this RP/EA. Information from this EA was used to populate this table using the definitions provided in Appendix C.

Table 4-35. Summary of beneficial impacts as well as short-term and long-term adverse impacts from implementation of the Bahia Grande Coastal Corridor Habitat Acquisition project

Resource Categories	Benefits	Adverse Short-Term	Adverse Long-Term
Physical Resources			
Geology and Substrates	Yes	NE	NE
Hydrology and Water Quality	Yes	NE	NE
Air Quality and GHG Emissions	Yes	NE	NE
Noise	Yes	NE	NE
Biological Resources			
Habitats	Yes	NE	NE
Living Coastal and Marine Resources	Yes	NE	NE
Protected Species	Yes	NE	NE
Human Uses and Socioeconomics			
Socioeconomics and Environmental Justice	Yes	NE	NE
Cultural Resources	Yes	NE	NE
Infrastructure	NE	NE	NE
Land and Marine Management	Yes	NE	Minor
Tourism and Recreation Use	NE	NE	NE
Fisheries and Aquaculture	Yes	NE	NE
Land and Marine Transportation	NE	NE	NE
Aesthetics and Visual Resources	Yes	NE	NE
Public Health and Safety	Yes	NE	NE

Notes: Yes – provides benefits
NE – no effect
Adverse short-term and long-term impacts are designated as minor, moderate, or major

4.4.11.1 Physical Environment

The physical environment is divided into geology and substrates, hydrology and water quality, air quality and GHG emissions, as well as noise characteristics of the area.

4.4.11.1.1 Geology and Substrates

Affected Resources

Soil types occurring on or near the project area include alluvial clays and silty clay lomas. The majority of the project area's topsoil is shallow with underlying, dense, impervious soils resulting in slow percolation. Thus, many ponds and potholes retain water for several weeks, and sometimes months, after a period of heavy rains. The soils are also highly saline due to marine influence (USFWS 1989).

The Bahia Grande area is entirely comprised of the Sejita-Lomalta-Barrada soils association (USDA 1977). The soils of the former association are saline, loamy, and clayey at or near sea level, and broad areas of barren clay are inundated by high tides and rains (USDA 1977). The flat topography is interspersed by "clay dunes" or "lomas" rising 10–40 feet above the surrounding soils. These lomas range from less than one acre to over 100 acres in size (USFWS 2010).

Environmental Consequences

No public access roads would be built or other ground-disturbing activity conducted as a part of this project, therefore there are no adverse impacts anticipated to geology and substrates due to the proposed action. This property would not be open for public use, but for preservation and conservation only. The project would have long-term beneficial effects to geology and substrates from land preservation.

4.4.11.1.2 Hydrology and Water Quality

Affected Resources

The project area lies along the Laguna Madre to the east, which is the area's main source of tidal exchange into the system. The Laguna Madre is a unique hypersaline lagoon, and has been the focus of many restoration efforts in Texas. The Lower Laguna Madre is connected to the Gulf of Mexico via the Port Mansfield Channel and Brazos-Santiago Pass. Typically, this estuary receives 743,000 acre-feet of freshwater inflow per year from its major contributing sources, San Fernando Creek through Baffin Bay in the Upper Laguna Madre and the Arroyo Colorado in the Lower Laguna Madre, as well as from surrounding coastal watersheds (Schoenbaechler et al. 2011).

The project area occurs within the Arroyo Colorado Watershed (ACW), which has been degraded over time through chemical pollution and other contaminants. The project area receives farmland and residential runoff water. Water quality is an issue in some of the major wetlands in the area, such as Laguna Atascosa Lake (USFWS 2010).

Environmental Consequences

As evaluated, the CCP EA addresses impacts related to recreation and public use. However, this property would not be open for public use, but for preservation and conservation only. There would be no public access roads built or other ground-disturbing activity conducted as a part of this project, therefore there are no adverse impacts anticipated to water quality and hydrology due to the proposed action.

The project would have long-term benefits to water quality from land preservation. In the long-term, conservation projects such as the one proposed would protect the quality of the watershed by protecting or facilitating natural wetland cycling process (USFWS 2010). Under the ownership of USFWS, the habitats would be monitored regularly and are expected to improve upon incorporation into the refuge management system (USFWS 2010).

4.4.11.1.3 Air Quality and GHG Emissions

Affected Resources

Air Quality

The project area lies north of the Brownsville Ship Channel. Airborne salty clay dust from dredge spoil sites south of the Brownsville Ship Channel and airborne contaminants (e.g., heavy metals, solvents, lead paint, asbestos) from industrial operations, such as ship salvage and oil platform construction, affect air quality in the Bahia Grande corridor (USFWS 2010).

However, the Bahia Grande corridor is within Region 15 of the TCEQ. According to information released by the TCEQ, the area is in attainment of unclassifiable for all NAAQS. Blowing dust accounts for most of the particulate matter in the region's air (TCEQ, pers. comm.)

GHG Emissions

Criteria air pollutants and GHG emissions are largely generated by electricity production, vehicular movements, and commercial and residential buildings using electricity. Currently, this property is vacant and has no GHG-producing infrastructure or activity taking place on it.

Environmental Consequences

As explained in the existing analysis, the CCP EA addresses impacts to air quality related to recreation and public use. However, this property would not be open for public use, but conveyed to USFWS for preservation and conservation only. Because the proposed property acquisition would not allow for public vehicular access to the property, there would be no increased burning in fossil fuels, therefore there are no anticipated adverse impacts to air quality due to the proposed action. The project would have long-term beneficial effects from land preservation and elimination of the risk of industrial or residential development. Preventing the land from development for recreation, residential, or commercial uses would prevent air quality from degrading due to increased burning of fossil fuels and household refuse.

4.4.11.1.4 Noise

Affected Resources

The ambient noise level for the subject tract is relatively low. It is in a remote location, far from many factors that would cause moderate to high ambient noise levels such as highways, airports, industrial operations, or residential subdivisions. The nearest noise source, a major road, is several miles from the tract across a body of water.

Environmental Consequences

Section 6.4.1.5 of the Final PDARP/PEIS describes the impacts to noise from restoration projects intended to protect and conserve marine, coastal, estuarine, and riparian habitats, is incorporated here by reference. The Final PDARP/PEIS stated that the preservation of lands may help to maintain natural quiet over a longer term. Because no planned infrastructure development in the form or public access roads or trails is planned as a part of this proposed acquisition, there are no anticipated adverse impacts to noise.

Furthermore, incorporation of the tract into the refuge system would have a long-term benefit for noise. Preventing the land from development for recreation, residential, or commercial uses would prevent ambient noise levels from increasing.

4.4.11.2 Biological Environment

The biological environment is divided into habitats, living coastal and marine resources, and protected species.

4.4.11.2.1 Habitats

Affected Resources

The tract includes tidal wetlands, thorn scrub, and coastal prairie with more than a mile of frontage on the Lower Laguna Madre and almost 2 miles frontage on a tidal inlet called Laguna Vista Cove. The tract protects extensive tidal flats, mud flats, emergent tidal marshes and seagrass beds. This tract is also part of the Laguna Madre/Bahia Grande wetlands system, which hosts 85 percent of the world population of redhead ducks, one-third of the Great Plains population of endangered piping plover for nine months of the year, and hundreds of threatened peregrine falcons during migration.

Environmental Consequences

Section 6.4.1.5 of the Final PDARP/PEIS, which describes the impacts to habitats from restoration projects intended to protect and conserve marine, coastal, estuarine, and riparian habitats, is incorporated here by reference. The Final PDARP/PEIS describes acquisition and protection activities as having long-term beneficial impact on habitats.

Because no planned infrastructure development in the form or public access roads or trails is planned as a part of this proposed acquisition, there are no anticipated adverse impacts to habitats. The habitat types present at the site are not expected to change once the tract is incorporated into the refuge system. Furthermore, preventing the land from development for recreation, residential, or commercial uses would prevent potential future adverse impacts to habitats.

4.4.11.2.2 Living Coastal and Marine Resources

Affected Resources

The habitats found within the Bahia Grande corridor are some of the most biologically diverse regions in North America. The area is home to 417 species of birds, 45 species of mammals, 44 species of reptiles, 130 types of butterflies, and 450 plant species. Nine federally listed endangered or threatened animal species and 23 state listed species can be found at the Refuge, including the ocelot, jaguarundi, Northern Aplomado Falcon, piping plover, red knot and Kemp's Ridley, Atlantic hawksbill, leatherback, loggerhead and green sea turtles.

The area is an important estuarine nursery area, contributing to both recreationally and commercially important fish and benthic species such as shrimp, crab, and finfish (USFWS 2005). The sand/mud/algal flat environments are crucial for other invertebrates such as small crustaceans (crabs and shrimp) and molluscs (clams). The broader area of the Laguna Madre is important nursery habitat for redfish, spotted seatrout, and black drum. It is one of the most productive fisheries on the Gulf Coast.

The Lower Laguna Madre area contains important habitat for migratory and resident waterfowl and shorebirds and as well as wading birds. It is an important migration corridor for other birds such as peregrine falcons, ospreys and swallow-tailed kites and is an important resting and feeding area for trans-Gulf neotropical migrant bird species (USFWS 2005). This property is important foraging habitat for nearby rookeries that support some of the largest populations of gull-billed terns, black skimmers, reddish egrets and brown pelicans in the Gulf of Mexico. Habitats within this corridor are utilized by many federally list state-threatened species such as the reddish egret, Botteri's sparrow, white-tailed hawk, white-faced ibis, Texas tortoise, Texas indigo snake and horned lizard. Sea turtles forage in nearshore seagrass beds in the Laguna Madre and nest nearby on Padre Island.

Environmental Consequences

There are no anticipated adverse impacts that would result from the project. Section 6.4.1.5 of the Final PDARP/PEIS, which describes the impacts to living coastal and marine resources from restoration projects intended to protect and conserve marine, coastal, estuarine, and riparian habitats, is incorporated here by reference. The Final PDARP/PEIS stated that the preservation of coastal property would have long-term benefits to living coastal and marine resources. By conveying this tract to the refuge system, and removing the risk of development on the property, the quality of habitat used by the area's living coastal and marine resources would be preserved.

As evaluated, the CCP EA states that overall, implementing the CCP would have no known adverse impacts to the area's resources and would produce positive benefits in most key environmental areas. Efforts would be directed toward improving and protecting habitats (e.g., habitat restoration, wetland creation, and water level manipulation) for migratory birds, wintering waterfowl, federally-listed species, and resident fish and wildlife that currently occur or historically occurred on the Refuge (USFWS 2010).

4.4.11.2.3 Protected Species

Affected Resources

Protected species and their habitats include ESA-listed species and designated critical habitats, which are regulated by either the USFWS or NMFS. Protected species and habitat also include marine mammals protected under the Marine Mammal Protection Act, EFH protected under the Magnuson-Stevens Act, migratory birds protected under the Migratory Bird Treaty Act and eagles protected under the Bald and Golden Eagle Protection Act.

Threatened or Endangered Species

There are no threatened or endangered species that would be affected by this project. No activities related to implementation of the project would take place in any area designated as critical habitat.

Essential Fish Habitat

Habitats within the project area are subject to designation as EFH. The 1996 amendments to the Magnuson-Stevens Act set forth a mandate for NMFS, regional FMCs, and other federal agencies to identify and protect EFH of economically important marine and estuarine fisheries. To achieve this goal, suitable fishery habitats need to be maintained. EFH is separated into estuarine habitat types. Estuarine habitat is defined as "all estuarine waters and substrates (mud, sand, shell, rock and associated biological communities), including the sub-tidal vegetation (grasses and algae) and adjacent inter-tidal vegetation (marshes and mangroves)." EFH in the area of proposed action is identified and described for various life stages of managed fish and shellfish in the Gulf of Mexico (GMFMC 1998). A provision of the Magnuson-Stevens Act requires that FMC's identify and protect EFH for every species managed by an FMP (U.S.C. 1853(a)(7)). There are FMPs in the Gulf region for red drum, shrimp, reef fish, and HMS (e.g., sharks). Table 4-37 and 4-38 present the EFH and species within the Bahia Grande Coastal Corridor Habitat Acquisition project area.

Table 4-37. EFH for estuarine habitats within the project area for the Bahia Grande Coastal Corridor Habitat Acquisition project area

Species Common Name	Eggs	Larvae	Post Larvae	Early Juvenile	Late Juvenile	Adult	Spawning Adult
Estuarine Emergent Marsh							
Red Drum			●	●	●	●	
Gray Snapper						●	
Brown Shrimp				●			
White Shrimp				●			
Estuarine Mud/Soft Bottom							
Red Drum		●	●	●	●	●	
Gray Snapper						●	

Species Common Name	Eggs	Larvae	Post Larvae	Early Juvenile	Late Juvenile	Adult	Spawning Adult
Lane Snapper				●	●		
Brown Shrimp				●			
White Shrimp				●			
Submerged Aquatic Vegetation							
Red Drum		●	●	●	●	●	
Goliath				●	●		
Lane Snapper			●	●	●		
Brown Shrimp				●			

Note: ● indicates habitat type designated as EFH for species' life stage

Table 4-38. Highly migratory species EFH designations within the Bahia Grande Coastal Corridor Habitat Acquisition project area

Species Common Name	Life Stage Within Estuarine Waters
Scalloped Hammerhead Shark	Neonate & Juvenile
Blacktip Shark	Neonate, Juvenile & Adult
Bull Shark	Neonate, Juvenile & Adult
Lemon Shark	Neonate & Juvenile
Spinner Shark	Neonate & Juvenile
Tiger Shark	Adult
Bonnethead Shark	Neonate, Juvenile & Adult
Atlantic Sharpnose Shark	Neonate, Juvenile & Adult

Marine Mammals

The bottlenose dolphin and the West Indian Manatee (manatees are protected under the ESA) are the only marine mammals known to occur in the Lower Laguna Madre. Their habitat consists of open water and therefore would not be present in the project area.

Bald and Golden Eagles

Bald and Golden Eagles are not known to occur in or near the project area.

Migratory Birds

Major groups of birds that inhabit the northern Gulf of Mexico include waterfowl and other water-dependent species, pelagic seabirds, raptors, colonial waterbirds, marsh dwelling birds, and passerines. The Lower Laguna Madre area contains important habitat for migratory and resident waterfowl and shorebirds and as well as wading birds. It is an important migration corridor for other birds such as peregrine falcons, ospreys and swallow-tailed kites and is a resting and feeding area for trans-Gulf neotropical migrant bird species (USFWS 2005).

Environmental Consequences

Because there are no ground disturbing activities or public use objectives planned as a part of this project, there are no adverse impacts anticipated to protected species. Through the proposed change in land management, this project would provide long-term benefits to protected species through conservation of habitat and prevention of development on the property in perpetuity. It is the USFWS's responsibility to conserve and protect federally-listed species. The USFWS would actively pursue opportunities to strengthen or improve partnerships and cooperative efforts with other agencies and individuals to improve conservation efforts for the recovery of endangered species (USFWS 2010). Land would be preserved and managed, thereby maintaining habitat quality and preventing development activities on important habitats necessary for protected species.

4.4.11.3 Human Uses and Socioeconomics

This section includes analyses of potential impacts to socioeconomics/environmental justice, cultural resources, infrastructure, land and marine management, tourism and recreational uses, fisheries and aquaculture, land and marine transportation, aesthetics and visual resources, and public health and safety.

4.4.11.3.1 Socioeconomics/Environmental Justice

Affected Resources

The Lower Rio Grande Valley of Texas (LRGV) is characterized by agricultural and urban development, scattered small farming communities, and the seasonal influx of summer visitors and winter residents. There are three major metropolitan areas in the Valley. The City of Brownsville, with a population of 139,722, is located about 30 miles south of the Refuge headquarters, along the Rio Grande. Harlingen, located about 25 miles west of the Refuge, has a population of 57,564. The third major metropolitan area is McAllen, located about 58 miles west of the Refuge, with a population of 106,414. Overall, the population of the LRGV, which is comprised of Cameron, Hidalgo, Starr, and Willacy counties, has grown from 701,888 in 1990 to 978,369 in 2000, a 39.4 percent increase. Cameron County grew by 28.9 percent and Willacy County grew by 13.4 percent during the same 10-year period. In fact, the LRGV metropolitan area is one of the top 30 fastest growing regions in the nation. Population in the LRGV is expected to continue to grow at a rate of 4 percent per year in the coming years. Despite this growth, the LRGV ranks as one of the highest unemployment areas in the United States and also has high poverty rates. Over 85 percent of the population in the LRGV is Hispanic, and over 30 percent of LRGV families live below the poverty level (USFWS 2010, internal citations omitted).

Environmental Consequences

This project would not adversely affect socioeconomics/environmental justice. Analysis from the CCP EA (USFWS 2010) is incorporated here by reference. As explained in the CCP EA, expanding the LANWR would not disproportionately place any adverse environmental, economic, social, or health impacts on minority and low-income populations. As this project does not include any direct engagement or provision for public use, there are no anticipated adverse impacts to environmental justice. Overall, this proposed acquisition would provide for long-term benefits to socioeconomics/environmental justice as resources of the associated tract would be held in the public trust and thus its service flows would be held in perpetuity for the general public. In consideration of EO 12898, Environmental Justice, this restoration activity does not have the potential to adversely and/or disproportionately affect minority or low-income populations, including economically, socially, or in terms of conditions affecting their health. This restoration project would help restore an environment that is of benefit to all citizens, populations and groups in Texas and beyond.

4.4.11.3.2 Cultural Resources

Affected Resources

The area surrounding LANWR has a rich history of Native American use and Spanish exploration, as well as historic involvement in the Mexican War, the Civil War, and World War II (USFWS 2010). Portions of the LANWR qualify as a Marine Protected Area. Marine Protected Areas or MPAs are defined as any area of the marine environment reserved by federal, state, territorial, tribal, or local laws or regulations to provide lasting protection for part or all of the natural and cultural resources therein. EO 13158 (65 FR 34909-11) directs federal agencies to work together with states, territories, tribes, and non-governmental partners to maintain the MPA system and to accomplish a variety of related tasks working with public and private partners (USFWS 2010).

Environmental Consequences

Coordination under Section 106 NHPA has been initiated for this project. There are no anticipated adverse impacts that would arise from implementation of this project. Benefits to cultural resources would be realized through added protection provided by becoming part of a NWR. This project would be implemented in accordance with all applicable laws and regulations concerning the protection of cultural and historic resources.

4.4.11.3.3 Infrastructure

Affected Resources

Bahia Grande Unit is bounded on the north by SH 100 and on the south by SH 48. These are major, four-lane highways that connect the Town of South Padre Island to the City of Brownsville (SH 48) and to U.S. Highway 77/83 (SH 100), near the City of San Benito. Except for a public boat ramp located off SH 48 at San Martín Lake, there are currently no developed public access points to this unit from these highways (USFWS 2010). The tract is currently vacant and new infrastructure is not being proposed as part of this project. There currently exist no active oil and gas infrastructure within the project area (RRC 2017).

Environmental Consequences

There are no anticipated adverse impacts to infrastructure that would result from this project. The project activities do not encompass any ground-disturbing activities that would directly or indirectly interfere with any infrastructure in the vicinity of the project area.

4.4.11.3.4 Land and Marine Management

Affected Resources

The proposed property is currently zoned as residential/commercial use. As discussed in Section 6.4.3.3, SH 100 and SH 48 are in the vicinity of the proposed acquisition area. However, the tract is currently not developed and has no public access points (USFWS 2010).

Environmental Consequences

The project would convey the tract to the USFWS refuge system and change the current land management for the property. This is anticipated to have a minor, long term-adverse impact on local tax revenue. The conveyance of this tract—which is currently zoned as residential/commercial property—to USFWS, represents a loss in taxable property and a corresponding loss in tax revenue to the local economy. Once conveyed to the refuge system, this property would be removed from tax rolls.

However, Refuge Revenue Sharing Act payments from the DOI are designed to offset the burden that counties feel when Refuge properties are removed from the tax rolls. For example, LANWR's tax payments to Cameron and Willacy counties from 2003 through 2005 averaged $87,273 and $16,330 respectively (USFWS 2010, internal citations omitted).

Long-term benefits from the conveyance of property to the USFWS refuge system would include prevention of recreational, residential, or commercial development of the property and protection of its resources in perpetuity.

4.4.11.3.5 Tourism and Recreational Use

Affected Resources

The tract is currently vacant and is not used by the public for tourism or recreational uses.

Environmental Consequences

While this project is being conveyed to the USFWS refuge system, it would be not open to the public for recreation, but maintained for conservational purposes only. For this reason, there are no anticipated adverse impacts to tourism and recreational use that may arise from the project.

4.4.11.3.6 Fisheries and Aquaculture

Affected Resources

The Lower Laguna Madre area has tremendous importance as a finfish and shellfish nursery area on which a major commercial fishery and a lucrative recreational fishery are dependent. The Lower Laguna Madre supports a significant shrimping fleet for the state of Texas. Large, commercial shrimp farms are located adjacent to the Laguna Atascosa Unit, one on the south boundary and two near Arroyo City, Texas. These farms may be converted into other types of aquaculture (e.g., algae, menhaden) for the production of biofuels (USFWS 2010).

Environmental Consequences

The proposed action is anticipated to have no adverse impacts to fisheries and aquaculture. The addition of this tract to the LANWR is anticipated to have no direct effect on the relationship of the refuge to surrounding fisheries resources.

Long-term benefits to the nearby fisheries and shrimp farms would arise from sustaining preserved, managed habitat in perpetuity, and the prevention of commercial development of the property.

4.4.11.3.7 Land and Marine Transportation

Affected Resources

The city currently has the proposed property zoned as residential/commercial use. As discussed in Section 6.4.3.3, SH 100 and SH 48 are in the vicinity of the proposed acquisition area. However, the tract is currently not developed and has no public access points (USFWS 2010).

Environmental Consequences

The proposed action is anticipated to have no impact to land and marine transportation. There are no public land or marine transportation routes on the tract, and this is not anticipated to change upon implementation of the project.

4.4.11.3.8 Aesthetics and Visual Resources

Affected Resources

The landscapes in the immediate vicinity of the tract are pastoral in nature with tidal wetlands, pristine thorn scrub, and coastal prairie. The tract would be protected in perpetuity and thus its current natural state would be preserved. As the tract is privately owned, there are currently no designated viewsheds in the area.

Environmental Consequences

The proposed change in land management is expected to have no anticipated adverse impacts to aesthetics and visual resources. Long-term benefits to aesthetics and visual resources would occur from the preservation of natural habitat and the prevention of future development that could adversely impact aesthetics and visual resources. These benefits would result from improved aesthetics and opportunities to view wildlife on the protected lands and in nearby areas that are likely to experience improved abundance and diversity of species as a result of the spillover effects of conservation efforts.

4.4.11.3.9 Public Health and Safety

Affected Resources

The tract is not located within an incorporated city and falls under County management. The entire tract falls within a Coastal Surge Influenced Area (FEMA 2015).

Environmental Consequences

Acquisition of the subject tract would have no adverse impacts to public health and safety. The action of placing the tract into conservation would preserve its current state and preclude development of the tract. This acquisition project benefit public health and safety by improving flood control and protect the towns of Laguna Vista and Port Isabel from dust and tropical weather related flooding. The project would be managed to prevent impacts to health and safety.

4.4.12 Laguna Atascosa Habitat Acquisition

The Laguna Atascosa Habitat Acquisition project would include acquisition of important coastal habitat that would be conveyed to the USFWS to be managed as part of the LANWR. This tract includes 1,682 acres of beach, dune, and tidal habitats on South Padre Island, Texas. The estimated cost for the project is $5,397,000.

This analysis incorporates by reference the relevant portions of Section 6.4.1.5 of the Final PDARP/PEIS. The Final PDARP/PEIS provides programmatic evaluation of the environmental consequences of the Restoration Approach "Protect and conserve marine, coastal, estuarine, and riparian habitats", which are considered in this RP/EA and are incorporated by reference here. Tiering from the Final PDARP/PEIS analysis, this section presents the Affected Environment of Laguna Atascosa and the environmental consequences of the proposed action in context of the project-specific affected environment.

The programmatic analysis looked at a series of resources as part of the biological, physical, and socioeconomic environment. As appropriate in a tiered analysis, the evaluation of each project focuses on the specific resources with a potential to be affected by the project.

The proposed acquisition is within the approved expansion boundaries for the LANWR. USFWS completed the CCP and conducted an EA for the LANWR, which includes this proposed tract, in 2010. The CCP provides a vision for the NWR and offers management direction for conducting scientific research, habitat restoration, and maintenance and management of compatible public uses of refuge resources. The CCP and accompanying EA address USFWS legal mandates, policies, goals, and NEPA compliance. A FONSI was issued in fall 2010. The NEPA analysis of the environmental consequences suggests no adverse impacts are anticipated to result from the acquisition of the tract. For the purposes of this project, the Texas TIG has incorporated by reference the analyses and conclusions of the 2010 LANWR CCP EA (USFWS 2010).

In its CCP EA, the USFWS selected Alternative B: Implement CCP as its proposed action. This alternative encompasses the action of adopting and implementing the CCP, including an emphasis on all federal trust species (e.g., migratory birds and federally-listed species) and priority species and their habitats within the Refuge, and invasive species control. This alternative also would improve and expand compatible public uses, improve and add new facilities, and enhance educational and outreach programs. This alternative would continue to use successful pre-existing Refuge management strategies, as well as a series of new planning strategies to protect, maintain, and restore native brush land, coastal prairies, wetlands, and other biotic communities on the NWR for federal trust and priority species. With respect to land acquisition, additional activities proposed under this alternative are to pursue acquisitions in Cameron and Willacy Counties as well as coordinate land acquisition activities with the Lower Rio Grande Valley NWR to establish several wildlife corridors (Ranchito Corridor, South Coastal Corridor, Boca Chica Corridor, North Coastal Corridor, and North Valley Corridor) to establish connectivity between endangered ocelot populations. These actions are inclusive of the activities proposed in the Laguna Atascosa Habitat Acquisition. However, the scope of the project is limited only to acquisition and habitat monitoring activities, and does not include activities such as public recreation or construction of facilities. Therefore, only those impacts analyses that fall within the scope of the project are incorporated by reference below. All resource categories are fully analyzed below, even those not addressed in the CCP EA.

The Incident was not considered as part of the affected environment in the LANWR CCP, and therefore the environmental consequences of the LANWR CCP implementation were not considered in light of the Incident. However, the environmental consequences of the LANWR CCP alternatives would occur regardless of the Incident and the relative impacts of the alternatives considered would not materially change because of the Incident.

The impacts from the project are largely beneficial and adverse impacts are minor. Benefits to the physical, biological, and human uses and socioeconomics would result if this project was implemented. BMPs required in consultations or environmental reviews would be followed. Additionally, BMPs described in Appendix 6.A of the Final PDARP/PEIS as well as Appendix B of this document would be considered and applied where appropriate, to reduce or eliminate impacts to the environment. A summary of the conclusions of this analysis are in Table 4-39. Categories and terminology in the table follow a consistent format used for all projects in this RP/EA. Information from this EA was used to populate this table using the definitions provided in Appendix C.

Table 4-39. Summary of beneficial impacts as well as short-term and long-term adverse impacts from implementation of the Laguna Atascosa Habitat Acquisition project

Resource Categories	Benefits	Adverse Short-Term	Adverse Long-Term
Physical Resources			
Geology and Substrates	Yes	NE	NE
Hydrology and Water Quality	Yes	NE	NE
Air Quality and GHG Emissions	Yes	NE	NE
Noise	Yes	NE	NE
Biological Resources			
Habitats	Yes	NE	NE

Resource Categories	Benefits	Adverse Short-Term	Adverse Long-Term
Living Coastal and Marine Resources	Yes	NE	NE
Protected Species	Yes	NE	NE
Human Uses and Socioeconomics			
Socioeconomics and Environmental Justice	Yes	NE	NE
Cultural Resources	Yes	NE	NE
Infrastructure	NE	NE	NE
Land and Marine Management	Yes	NE	Minor
Tourism and Recreation Use	NE	NE	NE
Fisheries and Aquaculture	Yes	NE	NE
Land and Marine Transportation	NE	NE	NE
Aesthetics and Visual Resources	Yes	NE	NE
Public Health and Safety	Yes	NE	NE

Notes: *Yes – provides benefits*
NE – no effect
Adverse short-term and long-term impacts are designated as minor, moderate, or major

4.4.12.1 Physical Environment

The physical environment is divided into geology and substrates, hydrology and water quality, air quality and GHG emissions, as well as noise characteristics of the area.

4.4.12.1.1 Geology and Substrates

Affected Resources

Sediments associated with this tract consist of saline Mustang sands and coastal dune sediments. Mustang sands and coastal dune sediments have a high permeability above the water table. Coastal dune sediments are partly stable and partly active. Coastal dune sediments are steep, choppy, and less stable than surrounding sediments and are not subject to flooding at high tides as are Mustang sand sediments. Coastal dune sediments are subject to recreational activities and development (on southern portions of the island (Cameron County, TX Soil Survey 1977). There are no unique geological resources associated with the tract.

Environmental Consequences

No public access roads would be built or other ground-disturbing activity conducted as a part of this project, therefore there are no adverse impacts anticipated to geology and substrates due to the proposed action. This property would not be open for public use, but for preservation and conservation only. The project would have long-term beneficial effects to geology and substrates from land preservation.

4.4.12.1.2 Hydrology and Water Quality

Affected Resources

South Padre Island, TX receives an average of 28.94 inches of rain a year (http://www.usclimatedata.com). The tract is a portion of the barrier island with the Gulf of Mexico to the east and the Lower Laguna Madre to the west. The tide influences the degree of flooding on the eastern and western portions of the tract as well as the organisms that live here.

The project area occurs within the Arroyo Colorado Watershed (ACW), which has been degraded over time through chemical pollution and other contaminants. The project area receives farmland and residential runoff water, water quality is an issue in some of the major wetlands in the area, such as Laguna Atascosa Lake (USFWS 2010). See Section 3.1.2 of the LANWR CCP for more information.

Environmental Consequences

No public access roads would be built or other ground-disturbing activity conducted as a part of this project, therefore there are no adverse impacts anticipated to hydrology and water quality due to the proposed action. This property would not be open for public use, but for preservation and conservation only.

The project would have long-term benefits to water quality from land preservation. In the long-term, conservation projects such as the one proposed protect the quality of the watershed by protecting or facilitating natural wetland cycling process (USFWS 2010). The tract would be placed into conservation for perpetuity and thereby its contribution to maintaining water quality would be preserved. Management of the site for conservation would prevent development of the tract from reducing water quality in the area (USFWS 2010).

4.4.12.1.3 Air Quality and GHG Emissions

Affected Resources

Air Quality

South Padre Island is within Region 15 of the TCEQ. According to information released by the TCEQ, the area is in attainment of unclassifiable for all NAAQS. Blowing dust accounts for most of the particulate matter in the region’s air (TCEQ pers. comm.). The subject tract is adjacent to the Gulf of Mexico and as a result, the predominant winds are southeasterly, and flow from the Gulf.

GHG Emissions

Criteria air pollutants and GHG emissions are largely generated by electricity production, vehicular movements, and commercial and residential buildings using electricity. Currently, this property is vacant and has no GHG-producing infrastructure or activity taking place on it.

Environmental Consequences

As evaluated, the CCP EA addresses impacts to air quality related to recreation and public use. However, this property would not be open for public use, but conveyed to USFWS for preservation and conservation only. Because the proposed property acquisition would not allow for public vehicular access to the property, there would be no increased burning in fossil fuels, therefore there are no anticipated adverse impacts to air quality due to the proposed action. The project would have long-term beneficial effects from land preservation and elimination of the risk of industrial or residential development. Preventing the land from development for recreation, residential, or commercial uses would prevent air quality from degrading due to increased burning of fossil fuels and household refuse.

4.4.12.1.4 Noise

Affected Resources

The ambient noise level for the subject tract is relatively low. It is in a remote location, far from many factors that would cause moderate to high ambient noise levels such as highways, airports, industrial operations, or residential subdivisions. The community of South Padre Island, TX is the closest residences to the subject tract. South Padre Island seashore gets light to moderate recreational traffic.

Environmental Consequences

Section 6.4.1.5 of the Final PDARP/PEIS describes the impacts to noise from restoration projects intended to protect and conserve marine, coastal, estuarine, and riparian habitats, is incorporated here by reference. The Final PDARP/PEIS stated that the preservation of lands may help to maintain natural quiet over a longer term. Because no planned infrastructure development in the form or public access roads or trails is planned as a part of this project, there are no anticipated adverse impacts to noise.

Furthermore, incorporation of the tract into the refuge system would have a long-term benefit for noise. Preventing the land from development for recreation, residential, or commercial uses would prevent ambient noise levels from increasing.

4.4.12.2 Biological Environment

The biological environment is divided into habitats, living coastal and marine resources, and protected species.

4.4.12.2.1 Habitats

Affected Resources

The tract includes sandy beaches, dune habitats, broad mud flats, and wind tidal flats. The tract protects extensive tidal flats, mud flats, emergent tidal marshes and seagrass beds. This tract is also part of the Laguna Madre/Bahia Grande wetlands system, which hosts 85 percent of the world population of redhead ducks, one-third of the Great Plains population of endangered piping plover for nine months of the year, and hundreds of threatened peregrine falcons during migration.

Environmental Consequences

Section 6.4.1.5 of the Final PDARP/PEIS, which describes the impacts to habitats from restoration projects intended to protect and conserve marine, coastal, estuarine, and riparian habitats, is incorporated here by reference. The Final PDARP/PEIS describes acquisition and protection activities has having long-term beneficial impact on habitats.

Because no planned infrastructure development in the form or public access roads or trails is planned as a part of this project, there are no anticipated adverse impacts to habitats. The habitat types present at the site are not expected to change once the tract is incorporated into the refuge system. Furthermore, preventing the land from development for recreation, residential, or commercial uses would prevent potential future adverse impacts to habitats.

4.4.12.2.2 Living Coastal and Marine Resources

Affected Resources

This region of the Texas coast is extremely diverse with regard to animals and plants. The subject tract contains tidal marsh, dune, and gulf beach habitats that support a wide range of wetland and grassland dependent vertebrate and invertebrate species. The tidally influenced wetlands are important as a nursery for commercially and recreationally important species. These include blue crab, white and brown shrimp, speckled seatrout, red drum, and Southern flounder.

The area is an important estuarine nursery area, contributing to both recreationally and commercially important fish and benthic species such as shrimp, crab, and finfish (USFWS 2005). The sand/mud/algal flat environments are crucial for other invertebrates such as small crustaceans (crabs and shrimp) and molluscs (clams). The broader area is important nursery habitat for redfish, spotted seatrout, and black drum. It is one of the most productive fisheries on the Gulf Coast.

This property is important foraging habitat for nearby rookeries that support some of the largest populations of gull-billed terns, black skimmers, reddish egrets and brown pelicans in the Gulf of Mexico. Habitats within this corridor are utilized by many federally list state-threatened species such as the reddish egret, Botteri’s sparrow, white-tailed hawk, white-faced ibis, Texas tortoise, indigo snake and horned lizard. Sea turtles forage in nearshore seagrass beds in the Laguna Madre and nest on Padre Island.

Environmental Consequences

Section 6.4.1.5 of the Final PDARP/PEIS, which describes the impacts to living coastal and marine resources from restoration projects intended to protect and conserve marine, coastal, estuarine, and riparian habitats, is incorporated here by reference. The Final PDARP/PEIS stated that the preservation of coastal property would have long-term benefits to living coastal and marine resources.

There are no anticipated adverse impacts that would result from the project. By conveying this tract to the refuge system, and removing the risk of development on the property, the quality of habitat used by the area’s living coastal and marine resources would be preserved.

The CCP EA explains that overall, implementing the CCP would have no known adverse impacts to the area’s resources and would produce positive benefits in most key environmental areas. Efforts would be directed toward improving and protecting habitats (e.g., habitat restoration, wetland creation, and water level manipulation) for migratory birds, wintering waterfowl, federally-listed species, and resident fish and wildlife that currently occur or historically occurred on the Refuge (USFWS 2010).

The property once placed into perpetual conservation would maintain and potentially improve conditions for living and coastal marine resources. The habitat resources of the site would be monitored, and managers would be alerted if problems at the site are encountered such as excessive erosion, trespass or poaching.

4.4.12.2.3 Protected Species

Protected species and their habitats include ESA-listed species and designated critical habitats, which are regulated by either the USFWS or NMFS. Protected species and habitat also include marine mammals protected under the Marine Mammal Protection Act, EFH protected under the Magnuson-Stevens Act, migratory birds protected under the Migratory Bird Treaty Act and eagles protected under the Bald and Golden Eagle Protection Act.

Threatened or Endangered Species

There are no threatened or endangered species that would be affected by this project. No activities related to implementation of the project would take place in any area designated as critical habitat.

Essential Fish Habitat

The 1996 amendments to the Magnuson-Stevens Act set forth a mandate for NMFS, regional FMCs, and other federal agencies to identify and protect EFH of economically important marine and estuarine fisheries. To achieve this goal, suitable fishery habitats need to be maintained. EFH is separated into estuarine habitat types. Estuarine habitat is defined as “all estuarine waters and substrates (mud, sand, shell, rock and associated biological communities), including the sub-tidal vegetation (grasses and algae) and adjacent inter-tidal vegetation (marshes and mangroves).” EFH in the area of proposed action is identified and described for various life stages of managed fish and shellfish in the Gulf of Mexico (GMFMC 1998). A provision of the Magnuson-Stevens Act requires that FMC's identify and protect EFH for every species managed by an FMP (U.S.C. 1853(a)(7)). There are FMPs in the Gulf region for red drum, shrimp, reef fish, and HMS (e.g., sharks). Tables 4-41 and 4-42 presents the EFH and species within the Laguna Atascosa Habitat Acquisition.

Table 4-41. EFH for estuarine habitats within the Laguna Atascosa Habitat Acquisition project area

Species Common Name	Eggs	Larvae	Post Larvae	Early Juvenile	Late Juvenile	Adult	Spawning Adult
Estuarine Emergent Marsh							
Red Drum			●	●	●	●	
Gray Snapper						●	
Brown Shrimp				●			
White Shrimp				●			
Estuarine Mud/Soft Bottom							
Red Drum		●	●	●	●	●	

Species Common Name	Eggs	Larvae	Post Larvae	Early Juvenile	Late Juvenile	Adult	Spawning Adult
Gray Snapper						●	
Lane Snapper				●	●		
Brown Shrimp				●			
White Shrimp				●			
Mangrove							
Goliath			●	●			
Lane Snapper				●	●		
Submerged Aquatic Vegetation							
Red Drum		●	●	●	●	●	
Goliath				●	●		
Lane Snapper			●	●	●		
Brown Shrimp				●			

Note: ● indicates habitat type designated as EFH for species' life stage

Table 4-24. Highly migratory species EFH designations within the Laguna Atascosa Habitat Acquisition project area

Species Common Name	Life Stage Within Estuarine Waters
Scalloped Hammerhead Shark	Neonate & Juvenile
Blacktip Shark	Neonate, Juvenile & Adult
Bull Shark	Neonate, Juvenile & Adult
Lemon Shark	Neonate & Juvenile
Spinner Shark	Neonate & Juvenile
Tiger Shark	Adult
Bonnethead Shark	Neonate, Juvenile & Adult
Atlantic Sharpnose Shark	Neonate, Juvenile & Adult

Marine Mammals

The bottlenose dolphin and the West Indian Manatee (manatees are protected under the ESA) are the only marine mammals known to occur in the Lower Laguna Madre. Their habitat consists of open water and therefore would not be present in the project area.

Bald and Golden Eagles

Bald and Golden Eagles are not known to occur in or near the project area.

Migratory Birds

Major groups of birds that inhabit the northern Gulf of Mexico include waterfowl and other water-dependent species, pelagic seabirds, raptors, colonial waterbirds, marsh dwelling birds, and passerines. The Lower Laguna Madre area contains important habitat for migratory and resident waterfowl and shorebirds and as well as wading birds. It is an important migration corridor for other birds such as peregrine falcons, ospreys and swallow-tailed kites and is a resting and feeding area for trans-Gulf neotropical migrant bird species (USFWS 2005).

Environmental Consequences

Because there are no ground disturbing activities or public use objectives planned as a part of this project, there are no adverse impacts anticipated to protected species. Through the proposed change in land management, this project would provide long-term benefits to protected species through conservation of habitat and prevention of development on the property in perpetuity. It is the USFWS's responsibility to conserve and protect federally-listed species. The USFWS would actively pursue opportunities to strengthen or improve partnerships and cooperative efforts with other agencies and individuals to improve conservation efforts for the recovery of endangered species (USFWS 2010). Land would be preserved and managed, thereby maintaining habitat quality and preventing development activities on important habitats necessary for protected species.

4.4.12.3 *Human Uses and Socioeconomics*

This section includes analyses of potential impacts to socioeconomics/environmental justice, cultural resources, infrastructure, land and marine management, tourism and recreational uses, fisheries and aquaculture, land and marine transportation, aesthetics and visual resources, and public health and safety.

4.4.12.3.1 Socioeconomics/Environmental Justice

Affected Resources

The Lower Rio Grande Valley of Texas (LRGV) is characterized by agricultural and urban development, scattered small farming communities, and the seasonal influx of summer visitors and winter residents. There are three major metropolitan areas in the Valley. The City of Brownsville, with a population of 139,722, is located about 30 miles south of the Refuge headquarters, along the Rio Grande. Harlingen, located about 25 miles west of the Refuge, has a population of 57,564. The third major metropolitan area is McAllen, located about 58 miles west of the Refuge, with a population of 106,414. Overall, the population of the LRGV, which is comprised of Cameron, Hidalgo, Starr, and Willacy counties, has grown from 701,888 in 1990 to 978,369 in 2000, a 39.4 percent increase. Cameron County grew by 28.9 percent and Willacy County grew by 13.4 percent during the same 10-year period. In fact, the LRGV metropolitan area is one of the top 30 fastest growing regions in the nation. Population in the LRGV is expected to continue to grow at a rate of 4 percent per year in the coming years. Despite this growth, the LRGV ranks as one of the highest unemployment areas in the United States and also has high poverty rates. Over 85 percent of the population in the LRGV is Hispanic, and over 30 percent of LRGV families live below the poverty level (USFWS 2010, internal citations omitted).

Environmental Consequences

Analysis from the CCP EA (USFWS 2010) is incorporated here by reference. As explained in the EA, expanding the LANWR would not disproportionately place any adverse environmental, economic, social, or health impacts on minority and low-income populations. As this project does not include any direct engagement or provision for public use, there are no anticipated adverse impacts to environmental justice. Overall, this proposed acquisition would provide for long-term benefits to socioeconomics/environmental justice as resources of the associated tract would be held in the public trust and thus its service flows would be held in perpetuity for the general public. In consideration of EO 12898, Environmental Justice, this restoration activity does not have the potential to adversely and/or disproportionately affect minority or low-income populations, including economically, socially, or in terms of conditions affecting their health. This restoration project would help restore an environment that is of benefit to all citizens, populations and groups in Texas and beyond.

4.4.12.3.2 Cultural Resources

Affected Resources

The area surrounding LANWR has a rich history of Native American use and Spanish exploration, as well as historic involvement in the Mexican War, the Civil War, and World War II (USFWS 2010). Portions of the LANWR quality as a Marine Protected Area. Marine Protected Areas or MPAs are defined as any area of the marine environment reserved by federal, state, territorial, tribal, or local laws or regulations to provide lasting protection for part or all of the natural and cultural resources therein. EO 13158 (65 FR 34909-11) directs federal agencies to work together with states, territories, tribes, and non-governmental partners to maintain the MPA system and to accomplish a variety of related tasks working with public and private partners (USFWS 2010).

Environmental Consequences

Coordination under Section 106 NHPA has been initiated for this project. There are no anticipated adverse impacts that would arise from implementation of this project. Benefits to cultural resources would be realized through added protection provided by becoming part of a NWR. This project would be implemented in accordance with all applicable laws and regulations concerning the protection of cultural and historic resources.

4.4.12.3.3 Infrastructure

Affected Resources

There is no infrastructure on or adjacent to the proposed acquisition area. The subject tract contains no roads aside from the beach which is open to vehicle traffic as allowed and defined in the Texas Open Beaches Act (1973). The tract is currently vacant and new infrastructure is not being proposed as part of this project. There currently exist no active oil and gas infrastructure within the project area (RRC 2017).

Environmental Consequences

There are no anticipated adverse impacts to infrastructure that would result from this project. The project activities do not encompass any ground-disturbing activities that would directly or indirectly interfere with any infrastructure in the vicinity of the project area.

4.4.12.3.4 Land and Marine Management

Affected Resources

The proposed property is currently zoned as residential/commercial use. However, the tract is currently not developed and has no public access points (USFWS 2010). There is no land or marine transportation corridors or plans in place that relate to the subject tract. The GIWW is over 4 miles away from the property.

Environmental Consequences

The project would convey the tract to the USFWS refuge system and change the current land management for the property. This is anticipated to have a minor, long-term-adverse impact on local tax revenue. The conveyance of this tract—which is currently zoned as residential/commercial property—to USFWS, represents a loss in taxable property and a corresponding loss in tax revenue to the local economy. Once conveyed to the refuge system, this property will be removed from tax rolls.

However, Refuge Revenue Sharing Act payments from the DOI are designed to offset the burden that counties feel when Refuge properties are removed from the tax rolls. For example, LANWR's tax payments to Cameron and Willacy counties from 2003 through 2005 averaged $87,273 and $16,330 respectively (USFWS 2010, internal citations omitted).

Long-term benefits from the conveyance of property to the USFWS refuge system would include prevention of recreational, residential, or commercial development of the property and protection of its natural resources in perpetuity.

4.4.12.3.5 Tourism and Recreational Use

Affected Resources

The tract is currently vacant and is not used by the public for tourism or recreational uses.

Environmental Consequences

While this project is being conveyed to the USFWS refuge system, it will be not open to the public for recreation, but maintained for conservational purposes only. For this reason, there are no anticipated adverse impacts to tourism and recreational use that may arise from the project.

4.4.12.3.6 Fisheries and Aquaculture

Affected Resources

Large, commercial shrimp farms are located in the vicinity of the project area, one on the south boundary and two near Arroyo City, Texas. These farms may be converted into other types of aquaculture (e.g., algae, menhaden) for the production of biofuels (USFWS 2010).

Environmental Consequences

The proposed action is anticipated to have no adverse impacts to fisheries and aquaculture. The addition of this tract to the LANWR is anticipated to have no direct effect on the relationship of the refuge to surrounding fisheries resources.

Long-term benefits to fisheries and aquaculture would arise from sustaining preserved, managed habitat in perpetuity, and the prevention of commercial development of the property.

4.4.12.3.7 Land and Marine Transportation

Affected Resources

The city currently has the proposed property zoned as residential/commercial use. As discussed in section 6.4.3.3, SH 100 and SH 48 are in the vicinity of the proposed acquisition area. However, the tract is currently not developed and has no public access points (USFWS 2010).

Environmental Consequences

The proposed action is anticipated to have no impact to land and marine transportation. There are no public land or marine transportation routes on the tract, and this is not anticipated to change upon implementation of the project.

Long-term benefits from the conveyance of property to the USFWS refuge system would include prevention of recreational, residential, or commercial development of the property and protection of its resources in perpetuity.

4.4.12.3.8 Aesthetics and Visual Resources

Affected Resources

The landscapes in the immediate vicinity of the tract are pastoral in nature with tidal marsh, dune, and gulf beach habitats. The tract will be protected in perpetuity and thus its current natural state will be preserved. As the tract in privately owned, there are currently no designated viewsheds in the area.

Environmental Consequences

The proposed change in land management is expected to have no anticipated adverse impacts to aesthetics and visual resources. Long-term benefits to aesthetics and visual resources would occur from the preservation of natural habitat and the prevention of future development that could adversely impact aesthetics and visual resources. These benefits would result from improved aesthetics and opportunities to view wildlife on the protected lands and in nearby areas that are likely to experience improved abundance and diversity of species as a result of the spillover effects of conservation efforts.

4.4.12.3.9 Public Health and Safety

Affected Resources

The tract is not located within an incorporated city and falls under County management. The entire tract falls within a Coastal Surge Influenced Area (FEMA 2015).

Environmental Consequences

The project is anticipated to have no adverse impacts to public health and safety. The action of placing the tract into conservation would prevent future development that could adversely impact coastal resiliency. Protection of this property would benefit coastal resiliency in the long-term.

4.4.13 Environmental Consequences for the No Action Alternative

Section 1502.14(d) of the CEQ Regulations requires the alternatives analysis to "include the alternative of No Action." CEQ states that in some cases "No Action" is "no change" from current management direction or level of management intensity. Therefore, the "No Action" alternative may be thought of in terms of continuing with the present course of action until that action is changed. Impacts of proposed actions would be compared to those impacts for the existing actions.

Under the No Action alternative, the Texas TIG would not, at this time select and implement the restoration alternatives in this RP to compensate for lost natural resources or their services resulting from the DWH oil spill. Accordingly, the No Action alternative would not meet the purpose and need for implementing alternatives that address lost natural resources and their services as described in Section 5.3.2 of the Final PDARP/PEIS and in Section 2.3 of this document, because it would not help meet the restoration goals of the Wetlands, Coastal and Nearshore Habitat and Oyster Restoration Types. If this plan was not implemented, none of the alternatives proposed as preferred alternatives would be selected for implementation and restoration benefits associated with these alternatives would not be achieved at this time. The impacts from the No Action alternative are largely adverse and moderate to major. Table 4-43 summarizes the impacts that could result if No Action, i.e. none of the projects are implemented. Categories and terminology in the table follow a consistent format used for all projects in this RP/EA. Information from this EA was used to populate this table using the definitions provided in Appendix C.

Table 4-43. Summary of beneficial impacts as well as short-term and long-term adverse impacts from implementation of the No Action alternative

Resource Categories	Benefits	Adverse Short-Term	Adverse Long-Term
<u>Physical Resources</u>			
Geology and Substrates	NE	Major	Major
Hydrology and Water Quality	NE	Major	Major

Resource Categories	Benefits	Adverse Short-Term	Adverse Long-Term
Air Quality and GHG Emissions	NE	Minor	Moderate
Noise	NE	Major	Major
Biological Resources			
Habitats	NE	Major	Major
Living Coastal and Marine Resources	NE	Moderate	Major
Protected Species	NE	Moderate	Moderate
Human Uses and Socioeconomics			
Socioeconomics and Environmental Justice	NE	NE	NE
Cultural Resources	NE	Major	Major
Infrastructure	NE	Moderate	Moderate
Land and Marine Management	NE	NE	NE
Tourism and Recreation Use	NE	Moderate	Moderate
Fisheries and Aquaculture	NE	NE	NE
Land and Marine Transportation	NE	NE	NE
Aesthetics and Visual Resources	NE	NE	NE
Public Health and Safety	NE	NE	NE

Notes: Yes – provides benefits
NE – no effect
Adverse short-term and long-term impacts are designated as minor, moderate, or major

4.4.13.1 Physical Environment

Under the No Action alternative past, present, and reasonably foreseeable future actions would be expected to continue. This alternative would not contribute to long-term restoration benefits to physical resources and would contribute to degradation of physical resources in the Texas Restoration Area.

4.4.13.1.1 Geology and Substrates

Environmental Consequences

The Landscape Approach to Oyster Reef Restoration, McFaddin Beach and Dune Restoration, Bessie Heights Wetland Restoration, Pierce Marsh Wetland Restoration, Dollar Bay and Moses Lake Habitat Restoration, Indian Point Shoreline Erosion Protection, and Bahia Grande Hydrologic Restoration alternatives would not be constructed and soil compaction and removal, reduced soil stability, and removal of substrates, would not occur. However, long-term major adverse impacts would be caused by continued degradation in the project areas. Continued wetland loss would result in continued erosion and conversion of land to open water.

Under the No Action alternative, the proposed habitat acquisition alternatives (Follets Island, Texas Mid-Coast NWR, Bahia Grande Coastal Corridor, Laguna Atascosa, and Matagorda Island) would not occur and no adverse impacts to geology and substrates would occur. However, long-term major adverse impacts could be caused by future development of the sites.

4.4.13.1.2 Hydrology and Water Quality

Environmental Consequences

The Landscape Approach to Oyster Reef Restoration, McFaddin Beach and Dune Restoration, Bessie Heights Wetland Restoration, Pierce Marsh Wetland Restoration, Dollar Bay and Moses Lake Habitat Restoration, Indian Point Shoreline Erosion Protection, and Bahia Grande Hydrologic Restoration alternatives would not be constructed and beach and dune restoration, dredging operations, effluent discharges at sea, sediment transportation, or changes in existing contour of the seabed would not occur. However, long-term major adverse impacts would be caused by continued degradation in the project areas. The No Action alternative would result in the continued degradation and habitat loss in and around the project areas. Influxes of Gulf of Mexico waters causing changes in flora and fauna and continued land loss would continue. In addition, continued wave action would erode adjacent sand/shell beaches and estuarine marshes causing additional turbidity in the area. The increased turbidity around Indian Point would impact the existing seagrass beds decreasing their coverage which would lead to destabilization of the sediments causing additional turbidity and could impact dissolved oxygen levels in the area.

Under the No Action alternative, the proposed habitat acquisition project alternatives (Follets Island, Texas Mid-Coast NWR, Bahia Grande Coastal Corridor, Laguna Atascosa, and Matagorda Island would not occur and no adverse impacts to hydrology and water quality would occur. However, long-term major adverse impacts could be caused by future development of the sites.

4.4.13.1.3 Air Quality and GHG Emissions

Environmental Consequences

Under the No Action alternative, the Landscape Approach to Oyster Reef Restoration, McFaddin Beach and Dune Restoration, Bessie Heights Wetland Restoration, Pierce Marsh Wetland Restoration, Dollar Bay and Moses Lake Habitat Restoration, Indian Point Shoreline Erosion Protection, and Bahia Grande Hydrologic Restoration alternatives would not be completed and no impacts to air quality and GHGs would occur.

Under the No Action alternative, the proposed habitat acquisition alternatives (Follets Island, Texas Mid-Coast NWR, Bahia Grande Coastal Corridor, Laguna Atascosa, and Matagorda Island) would not occur and no adverse impacts to air quality and GHG emissions would occur. However, short-term minor and long-term moderate adverse impacts could be caused by future development of the sites.

4.4.13.1.4 Noise

Environmental Consequences

Under the No Action alternative, the Landscape Approach to Oyster Reef Restoration, McFaddin Beach and Dune Restoration, Bessie Heights Wetland Restoration, Pierce Marsh Wetland Restoration, Dollar Bay and Moses Lake Habitat Restoration, Indian Point Shoreline Erosion Protection, and Bahia Grande Hydrologic Restoration alternatives would not be completed and no impacts to noise would occur.

Under the No Action alternative, the proposed habitat acquisition alternatives (Follets Island, Mid-Coast, Bahia Grande Coastal Corridor, Laguna Atascosa, and Matagorda Island) would not occur and no adverse impacts to noise would occur. However, short- and long-term major adverse impacts could be caused by future development of the sites.

4.4.13.2 Biological Environment

Past, present, and reasonably foreseeable future actions described above for the No Action alternative would be expected to continue. This alternative would not contribute to long-term restoration benefits to biological resources and would contribute to degradation of biological resources in the Texas Restoration Area.

4.4.13.2.1 Habitats

Environmental Consequences

Under the No Action alternative, the Landscape Approach to Oyster Reef Restoration, McFaddin Beach and Dune Restoration, Bessie Heights Wetland Restoration, Pierce Marsh Wetland Restoration, Dollar Bay and Moses Lake Habitat Restoration, Indian Point Shoreline Erosion Protection, and Bahia Grande Hydrologic Restoration alternatives would not be completed and no impacts to habitat would occur. However, the beneficial impacts from implementation of the alternatives would not be realized, resulting in the continued degradation of the sand/shell beaches, tidal lagoons, and wetlands.

Under the No Action alternative, the proposed habitat acquisition alternatives (Follets Island, Mid-Coast, Bahia Grande Coastal Corridor, Laguna Atascosa, and Matagorda Island) would not occur and no adverse impacts to habitat would occur. However, short- and long-term major adverse impacts could be caused by future development of the sites.

4.4.13.2.2 Living Coastal and Marine Resources

Environmental Consequences

Under the No Action alternative, the Landscape Approach to Oyster Reef Restoration, McFaddin Beach and Dune Restoration, Bessie Heights Wetland Restoration, Pierce Marsh Wetland Restoration, Dollar Bay and Moses Lake Habitat Restoration, Indian Point Shoreline Erosion Protection, and Bahia Grande Hydrologic Restoration alternatives would not be completed and no impacts to living coastal and marine resources would occur. However, the beneficial impacts from implementation of the alternatives would not be realized, resulting in adverse impacts to colonial waterbirds, shorebirds, fish, shrimp, shellfish, and sea turtles, marine mammals, and terrestrial mammals due to the continued degradation of habitats in the project areas. Degraded marshes are less functional as nurseries for many aquatic-dependent species. Additionally, increases in salinity would change the composition and abundance of the fishery community.

Under the No Action alternative, the proposed habitat acquisition alternatives (Follets Island, Mid-Coast, Bahia Grande Coastal Corridor, Laguna Atascosa, and Matagorda Island) would not occur and no adverse impacts to living coastal and marine resources would occur. However, short-term moderate and long-term major adverse impacts could be caused by future development of the sites.

4.4.13.2.3 Protected Species

Environmental Consequences

Under the No Action alternative, the Landscape Approach to Oyster Reef Restoration, McFaddin Beach and Dune Restoration, Bessie Heights Wetland Restoration, Pierce Marsh Wetland Restoration, Dollar Bay and Moses Lake Habitat Restoration, Indian Point Shoreline Erosion Protection, and Bahia Grande Hydrologic Restoration alternatives would not be completed and no impacts to protected species would occur. However, the beneficial impacts from implementation of the alternatives would not be realized, resulting in adverse impacts to EFH, colonial waterbirds, shorebirds, sea turtles, and, marine mammals due to the continued degradation of habitats in the project area due to degraded habitats.

Under the No Action alternative, the proposed habitat acquisition alternatives (Follets Island, Mid-Coast, Bahia Grande Coastal Corridor, Laguna Atascosa, and Matagorda Island) would not occur and no adverse impacts to protected species would occur. However, short- and long-term moderate adverse impacts could be caused by future development of the sites.

4.4.13.3 Human Uses and Socioeconomics

Past, present, and reasonably foreseeable future actions described above for the No Action alternative would be expected to continue. Current and future activities such as those related to ongoing coastal development and land use, commercial and recreational fishing and aquaculture, tourism, marine mineral mining, and energy development, as well as construction activities associated with stewardship, NRDA, and non-NRDA restoration activities, would result in adverse and beneficial effects on local economies. These impacts would depend on regional economic conditions, the types of activities occurring, their economic impacts, and their location with respect to regional economies in the Texas Restoration Area.

4.4.13.3.1 Socioeconomics/Environmental Justice

Environmental Consequences

Under the No Action alternative, the Landscape Approach to Oyster Reef Restoration, McFaddin Beach and Dune Restoration, Bessie Heights Wetland Restoration, Pierce Marsh Wetland Restoration, Dollar Bay and Moses Lake Habitat Restoration, Indian Point Shoreline Erosion Protection, and Bahia Grande Hydrologic Restoration alternatives would not be completed and no impacts to socioeconomics and environmental justice use would occur. However, the beneficial economic impacts from construction of the alternatives would not be realized.

Under the No Action alternative, the proposed habitat acquisition alternatives (Follets Island, Mid-Coast, Bahia Grande Coastal Corridor, Laguna Atascosa, and Matagorda Island) would not occur and no adverse impacts to socioeconomics and environmental justice would occur. However, the beneficial impacts from implementation of the alternatives would not be realized. Upon conveyance to the TPWD, the Follets Island and Matagorda Island tracts would be available for use by school groups, birders, hikers, and for other types of recreation. The Bahia Grande Coastal Corridor and Laguna Atascosa tracts are located in Cameron County, which as of 2016 is estimated to be 89% Latino or Hispanic (U.S. Census Bureau 2016b), providing opportunities for outreach to one of the most rapidly growing and historically underserved demographic groups in Texas and the nation. In consideration of EO 12898, Environmental Justice, the No Action alternative does not have the potential to adversely and/or disproportionately affect minority or low-income populations, including economically, socially, or in terms of conditions affecting their health.

4.4.13.3.2 Cultural Resources

Environmental Consequences

Under the No Action alternative, the Landscape Approach to Oyster Reef Restoration, McFaddin Beach and Dune Restoration, Bessie Heights Wetland Restoration, Pierce Marsh Wetland Restoration, Dollar Bay and Moses Lake Habitat Restoration, Indian Point Shoreline Erosion Protection, and Bahia Grande Hydrologic Restoration alternatives would not be completed and no impacts to cultural resources would occur.

Under the No Action alternative, the proposed habitat acquisition alternatives (Follets Island, Mid-Coast, Bahia Grande Coastal Corridor, Laguna Atascosa, and Matagorda Island) would not occur and no adverse impacts to cultural resources would occur. However, short-and long-term major adverse impacts could be caused by future development of the sites and added protection of any existing cultural resources would not be realized.

4.4.13.3.3 Infrastructure

Environmental Consequences

Under the No Action alternative, the Landscape Approach to Oyster Reef Restoration, McFaddin Beach and Dune Restoration, Bessie Heights Wetland Restoration, Pierce Marsh Wetland Restoration, Dollar Bay and Moses Lake Habitat Restoration, Indian Point Shoreline Erosion Protection, and Bahia Grande Hydrologic Restoration alternatives would not be completed and no impacts to infrastructure would occur. However, the beneficial impacts from implementation of the alternatives would not be realized, including erosion protection and coastal resiliency, resulting in long-term adverse impacts due to erosion and sea level rise.

Under the No Action alternative, the proposed habitat acquisition alternatives (Follets Island, Mid-Coast, Bahia Grande Coastal Corridor, Laguna Atascosa, and Matagorda Island) would not occur and no adverse impacts to infrastructure would occur. However, short- and long-term moderate impacts could be caused by future development of the sites.

4.4.13.3.4 Land and Marine Management

Environmental Consequences

Under the No Action alternative, the Landscape Approach to Oyster Reef Restoration, McFaddin Beach and Dune Restoration, Bessie Heights Wetland Restoration, Pierce Marsh Wetland Restoration, Dollar Bay and Moses Lake Habitat Restoration, Indian Point Shoreline Erosion Protection, and Bahia Grande Hydrologic Restoration alternatives would not be completed and no impacts to land and marine management would occur.

Under the No Action alternative, the proposed habitat acquisition alternatives (Follets Island, Mid-Coast, Bahia Grande Coastal Corridor, Laguna Atascosa, and Matagorda Island) would not occur and no adverse impacts to land and marine management would occur. In addition, changes in land and marine management due to conservation and preservation of the tracts would not be realized.

4.4.13.3.5 Tourism and Recreational Use

Environmental Consequences

Under the No Action alternative, the Landscape Approach to Oyster Reef Restoration, McFaddin Beach and Dune Restoration, Bessie Heights Wetland Restoration, Pierce Marsh Wetland Restoration, Dollar Bay and Moses Lake Habitat Restoration, Indian Point Shoreline Erosion Protection, and Bahia Grande Hydrologic Restoration alternatives would not be completed and no impacts to tourism and recreational use would occur. However, the beneficial impacts to tourism and recreational use due to implementation of these alternatives would not be realized.

Under the No Action alternative, the proposed habitat acquisition alternatives (Follets Island, Mid-Coast, Bahia Grande Coastal Corridor, Laguna Atascosa, and Matagorda Island) would not occur and no adverse impacts to tourism and recreational use would occur. However, short- and long-term moderate impacts could be caused by future development of the sites due to lost access. In addition, the beneficial impacts to tourism and recreational use due to implementation of these alternatives would not be realized. Conservation and acquisition of natural land resources would have indirect benefits on fish and wildlife habitat, resulting in increased recreation opportunities for hunting, fishing and wildlife observation. Under the No Action alternative, long-term benefits to tourism and recreational use from increased opportunity to access Follets Island and Matagorda Island tracts for passive recreational activities would not be realized.

4.4.13.3.6 Fisheries and Aquaculture

Environmental Consequences

Under the No Action alternative, the Landscape Approach to Oyster Reef Restoration, McFaddin Beach and Dune Restoration, Bessie Heights Wetland Restoration, Pierce Marsh Wetland Restoration, Dollar Bay and Moses Lake Habitat Restoration, Indian Point Shoreline Erosion Protection, and Bahia Grande Hydrologic Restoration alternatives would not be completed and no impacts to fisheries and aquaculture would occur. However, the beneficial impacts from implementation of the alternatives would not be realized, resulting in adverse impacts to fish, shrimp, and shellfish due to the continued degradation of habitats in the project areas. Degraded marshes are less functional as nurseries for many aquatic-dependent species. Additionally, increases in salinity would change the composition and abundance of the fishery community.

Under the No Action alternative, the proposed habitat acquisition alternatives (Follets Island, Mid-Coast, Bahia Grande Coastal Corridor, Laguna Atascosa, and Matagorda Island) would not occur and no adverse impacts to infrastructure would occur. However, the beneficial impacts to fisheries and aquaculture by protecting and conserving lands that contain coastal marshes, an important nursery habitat for commercial and recreational fisheries would not be realized.

4.4.13.3.7 Land and Marine Transportation

Environmental Consequences

Under the No Action alternative, the Landscape Approach to Oyster Reef Restoration, McFaddin Beach and Dune Restoration, Bessie Heights Wetland Restoration, Pierce Marsh Wetland Restoration, Dollar Bay and Moses Lake Habitat Restoration, Indian Point Shoreline Erosion Protection, and Bahia Grande Hydrologic Restoration alternatives would not be completed and no impacts to land and marine transportation would occur.

Under the No Action alternative, the proposed habitat acquisition alternatives (Follets Island, Mid-Coast, Bahia Grande Coastal Corridor, Laguna Atascosa, and Matagorda Island) would not occur and no adverse impacts to land and marine transportation would occur.

4.4.13.3.8 Aesthetics and Visual Resources

Environmental Consequences

Under the No Action alternative, the Landscape Approach to Oyster Reef Restoration, McFaddin Beach and Dune Restoration, Bessie Heights Wetland Restoration, Pierce Marsh Wetland Restoration, Dollar Bay and Moses Lake Habitat Restoration, Indian Point Shoreline Erosion Protection, and Bahia Grande Hydrologic Restoration alternatives would not be completed and no impacts to aesthetics and visual resources would occur. However, the beneficial impacts from implementation of the alternatives would not be realized. Habitats would not be improved and the species that the restored habitat would attract would not be present in the same abundance, thereby affecting the visual resources of the public.

Under the No Action alternative, the proposed habitat acquisition alternatives (Follets Island, Mid-Coast, Bahia Grande Coastal Corridor, Laguna Atascosa, and Matagorda Island) would not occur and no adverse impacts to aesthetics and visual resources would occur. However, the beneficial impacts from implementation of the alternatives would not be realized. Long-term benefits to aesthetics and visual resources would occur from the preservation of natural habitat and the prevention of future development that could adversely impact aesthetics and visual resources. These benefits would result from improved aesthetics and opportunities to view wildlife on the protected lands and in nearby areas that are likely to experience improved abundance and diversity of species as a result of the spillover effects of conservation efforts.

4.4.13.3.9 Public Health and Safety

Environmental Consequences

Under the No Action alternative, the Landscape Approach to Oyster Reef Restoration, McFaddin Beach and Dune Restoration, Bessie Heights Wetland Restoration, Pierce Marsh Wetland Restoration, Dollar Bay and Moses Lake Habitat Restoration, Indian Point Shoreline Erosion Protection, and Bahia Grande Hydrologic Restoration alternatives would not be completed and no impacts to public health and safety would occur. However, the beneficial impacts from implementation of the alternatives would not be realized, including erosion protection and coastal resiliency, resulting in long-term adverse impacts due to erosion and sea level rise.

Under the No Action alternative, the proposed habitat acquisition alternatives (Follets Island, Mid-Coast, Bahia Grande Coastal Corridor, Laguna Atascosa, and Matagorda Island) would not occur and no adverse impacts to public health and safety would occur. However, the beneficial impacts from implementation of the alternatives would not be realized, including the enjoyment of the outdoors and opportunity for physical activities. Acquisition could improve flood control and coastal resiliency, protecting nearby towns from tropical weather related flooding. The Bahia Grande Coastal Corridor acquisition would also protect Laguna Vista and Port Isabel from dust. All the tracts would be managed to prevent impacts to health and safety.

4.4.14 Conclusion of the No Action Alternative

The No Action alternative does not meet the Texas TIG's goals and clearly does not provide the significant environmental benefits to injured natural resources and services that would occur through active restoration. In addition, the No Action alternative could result in development of land resulting in associated adverse impacts. These impacts are largely moderate to major. Additionally, the benefits to resources intended as a result of implementing the proposed alternatives would not be realized.

4.5 Comparison of Impacts of the Proposed Alternatives

The environmental analysis demonstrated that there would only be minor to moderate adverse impacts as well as environmental benefits from the proposed restoration alternatives. The No Action Alternative largely had moderate to major adverse impacts. A summary of impacts for projects involving construction or acquisition as well as the No Action alternative is located in Table 4-16.

As addressed in the PDAPR/PEIS, alternatives which only include E&D activities would cause direct, short-term, minor adverse impacts through associated fieldwork. These impacts would be very minor and localized to the alternative site. Adverse impacts to the biological and physical environment also could include short-term disturbance of habitats and species, minor emissions from vehicles, and minor disturbance to terrestrial, estuarine, and marine environments. The environmental analysis of the other restoration alternatives that there would be minor to moderate adverse impacts to some resource categories. The McFaddin Beach and Dune Restoration project and the Landscape Approach to Oyster Reef Restoration would cause moderate adverse impacts to living coastal and marine resources and the Dollar Bay and Moses Lake Wetland project, Bahia Grande Hydrologic Restoration project and the Indian Point Shoreline Protection project would also moderately adversely impact geology and substrates.

Implementing Trustees would conduct due diligence to ensure that no unanticipated effects to listed species and habitats would occur. Adverse impacts would be minimized by following mitigation measures, BMPs and other guidance developed during the permitting process, environmental reviews, consultation process, and other relevant regulatory requirements. The Texas TIG would also consider best practices referenced in Section 6.15 and Appendix 6A of the Final PDARP/PEIS and Appendix B of this document.

Table 4-16. Direct and indirect Impact summary of proposed habitat construction and acquisition alternatives

Alternative	Geology and Substrates	Hydrology and Water Quality	Air Quality and GHGs	Noise	Habitats	Living Coastal and Marine Resources	Protected Species	Socioeconomics and Environmental Justice	Cultural Resources	Infrastructure	Land and Marine Management	Tourism and Recreational Use	Fisheries and Aquaculture	Land and Marine Transportation	Aesthetics and Visual Resources	Public Health and Safety
Landscape Approach to Oyster Reef Restoration	+/s/l	+/s	s/l	s/l	+/s/l	+/S/l	+/s	+	NE	NE	NE	+/s	+/s/l	s	+/s	+/s
McFaddin Beach and Dune Restoration	+/s/l	s	+/s	S	+/s/l	+/S	+/s	NE	NE	NE	NE	+/s	s	s	+/s/l	+
Bessie Heights Wetland Restoration	+/s/l	+/s/l	+/s	S	+/s	+/s	+/s/l	+	NE	NE	NE	+/s	+/s	NE	+/s/l	+/s
Pierce Marsh Wetland Restoration	+/s	+/s/l	+/s	S	+/s/l	+/s	+/s/l	+	NE	NE	NE	+/s	+/s	NE	+/s	NE
Dollar Bay and Moses Lake Wetland Restoration	+/S/L	+/s/l	+/s	S	+/s/l	+/s/l	+/s	+	NE	NE	NE	+/s	+	NE	+/s/l	+
Indian Point Shoreline Erosion Protection	+/S/L	+/s	s	S	+/s/l	+/s	+/s	NE	NE	+	+	+	+/s	NE	+/s	+
Bahia Grande Hydrologic Restoration	+/S/L	+/s	+/s	S	+/s/l	+/s/l	+/s	+	NE	NE	NE	+	+/s	NE	+/s	s
Follets Island Habitat Acquisition	+	+	+	+	+	+	+	+	+	NE	+/l	+	+	NE	+	+
Mid-Coast Habitat Acquisition	+	+	+/s	+	+/s	+/s	+	+	+	NE	+/l	NE	+	NE	+/s	+
Matagorda Peninsula Habitat Acquisition	+	+	+	+	+	+	+	+	+	NE	+/l	+	+	NE	+	+
Bahia Grande Coastal Corridor Habitat Acquisition	+	+	+	+	+	+	+	+	+	NE	+/l	NE	+	NE	+	+
Laguna Atascosa Habitat Acquisition	+	+	+	+	+	+	+	+	+	NE	+/l	NE	+	NE	+	+
No Action	**S/L**	**S/L**	**S**/L	**S/L**	**S/L**	s/**L**	S/L	NE	**S/L**	S/L	NE	S/L	NE	NE	NE	NE

Notes:	*+*	*Beneficial effect*
	NE	*No effect*
	s	*Short-term adverse effect*
	S	*Short-term moderate adverse effect*
	S	*Short-term major adverse effect*
	l	*Long-term adverse effect*
	L	*Long-term moderate adverse effect*
	L	*Long-term major adverse effect*

5 Cumulative Impacts

Section 6.6 and Appendix 6B of the Final PDARP/PEIS are incorporated by reference into the following cumulative impacts analysis including the methodologies for assessing cumulative impacts, identification of affected resources, and the cumulative impacts scenario. A development of the analysis in the context of the affected environment of the proposed alternatives (X), when added to the impacts from applicable past, present and reasonably foreseeable future actions (Y), to understand the potential cumulative impacts to an affected resource (Z), or where the effects may interact and/or be additive, that is X + Y = Z.

5.1 Cumulative Impacts Methodology

The CEQ regulations to implement NEPA require the assessment of cumulative impacts in the decision-making process for federal projects, plans, and programs. Cumulative impacts are defined as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions" (40 CFR §1508.7). As stated in the CEQ handbook, "Considering Cumulative Effects" (CEQ 1997), cumulative impacts need to be analyzed in terms of the specific resource, ecosystem, and human community being affected and should focus on effects on "important issues of national, regional, or local significance." Following the CEQ guidance, the goal of the cumulative impacts analysis below is not to capture every theoretically possible impact, but "to count what counts."

This cumulative impact analysis tiers from the Final PDARP/PEIS (See Section 6.6 and Appendix 6) analysis of the programmatic evaluation of environmental consequences (including cumulative impacts), which is incorporated by reference. The Final PDARP/PEIS describes and discusses the affected environment and evaluates the effects of restoration and habitat improvement programs as well as programmatic development activities. The Texas TIG determined the actions used to support the proposed E&D projects as well as the No Action Alternative fall within the scope of the analysis in the Final PDARP/PEIS and will not be discussed further. Relevant local and site-specific past, present, and reasonably foreseeable future actions not analyzed in the Final PDARP/PEIS were identified through communications with agencies and organizations and review of publicly available databases of planned projects relevant to the proposed projects. The Texas TIG determined whether the proposed projects would contribute substantially to adverse cumulative impacts when added to past, present, or reasonably foreseeable future actions. Chapter 5 specifically addresses alternatives that involve habitat construction or land acquisition.

5.2 Resources Affected by the Proposed Alternatives

Chapter 4 includes an environmental consequences analysis for each of the proposed alternatives/projects. Many of the resources analyzed would only have negligible to minor adverse effects. Resources with negligible to minor effects will not be included in the cumulative impacts analysis in order to appropriately narrow the scope of the environmental analysis to the issues that would have an influence on the decision-making process or deserve attention from an environmental perspective (CEQ 1997). The resources excluded from this cumulative impacts analysis based on their negligible to minor adverse effects are listed below:

- Physical Environment: hydrology and water quality; air quality and GHG emissions; noise;
- Biological Environments: habitats; protected species;
- Human Uses and Socioeconomics: socioeconomics and environmental justice; cultural resources; infrastructure; land and marine management; tourism and recreational; fisheries and aquaculture; land and marine transportation; aesthetics and visual resources; and public health and safety.

The following resources were analyzed in detail for environmental consequences that could result from implementation of the proposed alternatives/projects:

- Physical Environment: geology and substrates; and
- Biological Environments: living coastal and marine resources.

5.3 Cumulative Impacts Analysis

In order to effectively consider the potential cumulative impacts, the Texas TIG identified past, current, and reasonably foreseeable future actions which are considered relevant to identifying any cumulative impacts the alternatives may have on a local scale. These actions fall inside the Texas coastal zone which is within the established spatial boundaries identified in the Final PDARP/PEIS. For this RP/EA, the Texas TIG considered the categories of cumulative actions presented in Section 6.6.4 of the Final PDARP/PEIS and identified past, present, and reasonably foreseeable future actions through outreach to local, state and/or federal experts familiar with major environmental and development initiatives that have a potential to contribute significantly to cumulative impacts. Projects considered in previous restoration plans (Final Programmatic and Phase III Early Restoration Plan and Early Restoration Programmatic Environmental Impact Statement, Final Phase IV Early Restoration Plan and Environmental Assessments, and the Final PDARP/PEIS) were also reviewed to develop this list of actions. The Texas TIG also relied on expert judgments, primarily qualitative, about the potential for adverse impacts, using publicly available information about the likely design and location of these actions. Table 5-1 provides the resulting list of past, present, and reasonably foreseeable future actions considered.

Table 5-1. Description of other past, present, and reasonably foreseeable future actions considered in the cumulative impact analysis

Actions	Action Description	Key Resource Areas with Potential for Adverse Cumulative Impacts
Related to DWH Oil Spill		
DWH funded habitat restoration (including RESTORE, NRDA, and NFWF GEBF)	These programs will leverage other funding sources where available to achieve habitat restoration. These programs seek to restore habitat, water quality, and living coastal and	• Geology and Substrates • Living Coastal and Marine Resources

Actions	Action Description	Key Resource Areas with Potential for Adverse Cumulative Impacts
	marine resources. Projects currently funded would improve bird populations, oyster populations, sea turtle populations, dune habitat, marsh habitat, and coastal resiliency through shoreline protection, habitat protection, and acquisition, sea turtle populations.	
DWH funded recreational use restoration in Texas (NRDA Early Restoration)	Improvements (fish cleaning shelter, two wildlife viewing platforms, and a restroom) at Sea Rim State Park and the new campground at Galveston Island State Park in the planning phase. The creation of three artificial reefs to enhancing fishing and diving activities have already been implemented and are available for the public to enjoy. Two of the reefs are constructed with concrete pyramids and are located in state waters. A sunken ship, the Kraken, was used to create the artificial reef located in federal waters.	• Geology and Substrates • Living Coastal and Marine Resources
Resource Stewardship Activities		
Oyster restoration	Significant efforts have occurred and are underway to restore oyster reefs along the Texas coast. Restoration projects are adding habitat to oysters to colonize or restoring oyster reefs that were buried in sediment by Hurricane Ike.	• Geology and Substrates • Living Coastal and Marine Resources
Marsh restoration	Marsh restoration occurs and will continue to occur throughout the Texas coast. Marshes help protect infrastructure during storms, provide valuable habitat for wildlife species, improve water quality by the filtering nutrients, and help recharge groundwater.	• Geology and Substrates • Living Coastal and Marine Resources

Actions	Action Description	Key Resource Areas with Potential for Adverse Cumulative Impacts
Land acquisition	Land acquisition by NGOs and federal and state agencies for the purpose of restoration and preservation has occurred and is likely to continue occurring in Texas Coastal Areas.	• Geology and Substrates • Living Coastal and Marine Resources
Restoration Programs administered through the TGLO (Coastal Erosion Planning and Response Act; Coastal Impact Assistance Program; Coastal Management Program; Beach Maintenance Reimbursement Fund)	These programs are administered through the TGLO to reduce the effects of coastal erosion, remediate the impact of offshore oil and gas exploration; to implement projects in the coastal zone (e.g., water sediment quantity and quality improvements; ecotourism; public access); to increase knowledge through research; to clean and maintain Gulf Beaches.	• Geology and Substrates • Living Coastal and Marine Resources
Energy Activities		
Ongoing oil and gas exploration and production	The coastal region off the coast of Texas is among the most productive for oil and gas exploration and production. During 2015, wells in Texas state waters produced over 1,004,774 Mbbls of crude oil and over 8,304,000,000 McF of natural gas (RRC). Transport of staff, equipment and supplies necessary to support this exploration and production effort requires a large number of surface vessels and helicopters.	• Geology and Substrates • Living Coastal and Marine Resources
Dredged Material Disposal		
USACE maintenance dredging	Ship channels leading to Texas Ports as well as the GIWW are routinely dredged to maintain designated depths in order to facilitate waterborne cargo transportation. Dredged materials are either beneficially used as part of another project or deposited in a designated disposal location.	• Geology and Substrates • Living Coastal and Marine Resources
Coastal Development and Land Use		
Commercial and residential development	The Texas coastal area is rapidly developing and will continue to be developed. The rate of development is often tied to the economy and has been increasing since the end of the 2008-2009 recession.	• Geology and Substrates • Living Coastal and Marine Resources

Actions	Action Description	Key Resource Areas with Potential for Adverse Cumulative Impacts
Shoreline armoring	Armoring of the waterways (e.g., GIWW) and other shorelines to protect marine transportation and/or decrease erosion. Example activities include armoring the GIWW to prevent erosion. Activities have occurred and would continue to occur throughout the Texas coast. Armoring may be used to protect infrastructure or as part of a habitat restoration and protection project.	• Geology and Substrates • Living Coastal and Marine Resources
Beach nourishment	Texas has a scheduled maintenance plan to renourish engineered beaches. Beaches in the maintenance plan range from South Padre Island to McFaddin NWR (TGLO 2010).	• Geology and Substrates • Living Coastal and Marine Resources
Fisheries and Aquaculture		
Recreational fishing	The Texas coast is a popular destination for bay, beachfront and offshore fishing. A recent completed nationwide survey indicates that approximately 751,000 anglers took over 5.2 million fishing trips to the coastal waters of Texas. Direct economic impact of these fishing trips is estimated at over $890 million.	• Living Coastal and Marine Resources
Commercial fishing	The Texas coast supports a fleet of commercial fishing vessels that target primarily demersal bay species as well as offshore reef fish and pelagic species. During 2012, 107 licensed fishermen landed 1.7 million pounds of finfish valued at $1.6 million.	• Living Coastal and Marine Resources
Marine Transportation		
Marine transportation including shipping	In Texas, there are 11 commercial deep-draft ports (channels with a draft of more than 30 feet). There are six other ports that handle commercial cargoes with channel depths less than a 30-foot draft (shallow-draft ports). The remaining shallow-draft ports are used for commercial fishing and recreational purposes and do not handle commercial cargoes. Texas's ports are	• Geology and Substrates • Living Coastal and Marine Resources

Actions	Action Description	Key Resource Areas with Potential for Adverse Cumulative Impacts
	connected by the GIWW in Texas, which is a shallow-draft channel (TxDOT 2017). In 2014, over 86 million short tons of cargo were moved on the Texas portion of the GIWW (TxDOT 2016). Texas leads the nation in the total volume of intrastate maritime cargo (TxDOT 2017).	

The following section describes the cumulative impacts of the alternatives being considered when combined with other past, present and reasonably foreseeable future actions which were identified above. In many situations, implementation of the alternatives would likely help reduce overall long-term adverse impacts by providing a certain level of offsetting benefits, especially when considered in concert with the numerous other present and reasonably foreseeable future actions in the area.

5.3.1 Geology and Substrates

Implementation of the proposed alternatives/projects would cause short-term to long-term, minor to moderate impacts to substrates from sediment disturbing activities such as dredging, placement of dredged materials, and placement of breakwater structures. Impacts would be caused by the conversion of soft-bottom to hard bottom habitats, removal, and burial of sediments. Indian Point Shoreline Erosion Protection project and the Bahia Grande Hydrologic Restoration project are expected to have moderate impacts adverse impacts from the conversion of substrate types. There would be negligible cumulative adverse impacts from the depletion of sediment resources since materials would be beneficially reused from other maintenance projects (e.g., dredging of a waterway) or would be or have been specifically identified for the project. Natural sediment transport processes would replenish dredge borrow sites. Once implemented, the proposed alternatives/projects would provide long-term benefits to geology and substrates from reduction in erosion, replenishment of historic substrates, protection of geology and substrates, and addition of hard bottom substrates.

Other past, present and reasonably foreseeable future actions including USACE maintenance dredging, shoreline armoring, oyster restoration, land acquisition, commercial and residential development, marsh restoration, beach nourishment actions, DWH funded habitat restoration, ongoing oil and gas exploration, marine transportation, and restoration programs administered through the TGLO would have adverse impacts to geology and substrates. Adverse impacts would be short- to long-term and could vary in severity. Restoration actions from shoreline armoring, oyster restoration, land acquisition, marsh restoration, DWH funded habitat restoration, and restoration programs administered through the TGLO would provide long-term benefits to geology and substrates.

When the proposed alternatives/projects are analyzed in combination with other past, present, and reasonably foreseeable future actions, short- and long-term cumulative adverse impacts to geology and substrates would likely occur. Effects are unlikely to be substantial because the spatial extent of the area of impacts to geology and substrates is small in comparison to resource availability and other past, present, and reasonably foreseeable future actions. The alternatives would not contribute substantially to cumulative adverse impacts. The alternatives, carried out in conjunction with other conservation practices, would result in some long-term beneficial cumulative impacts to geology and substrates.

5.3.2 Living Coastal and Marine Resources

Implementation of the proposed alternatives/projects would cause short-term to long-term, minor to moderate impacts to living coastal and marine resources from sediment disturbing activities. McFaddin Beach and Dune Restoration project is expected to have moderate adverse impacts caused by the burial of benthic organisms during dredging and material placement activities. Minor impacts would be caused by turbidity and noise during construction activities. Typically, species most affected would be in the benthos but would recover quickly. No moderate or major adverse impacts would affect protected species. There would be negligible to minor cumulative adverse impacts from the temporary changes in habitat quality. Resources would recover quickly and only affect a fraction of the local population. Once implemented, the proposed alternatives/projects there would provide long-term benefits to living coastal and marine resources from improvements in habitat.

Other past, present and reasonably foreseeable future actions including USACE maintenance dredging, shoreline armoring, oyster restoration, recreational fishing, commercial fishing, land acquisition, commercial and residential development, and beach nourishment would have adverse and impacts to living coastal and marine resources. Impacts would be short- to long-term and range in severity. Restoration actions from shoreline armoring, oyster restoration, land acquisition, marsh restoration, DWH funded habitat restoration, and restoration programs administered through the TGLO would provide long-term benefits to living coastal and marine resources.

When the proposed alternatives/projects are analyzed in combination with other past present, and reasonably foreseeable future actions, short- and long-term cumulative adverse impacts to living coastal and marine resources would likely occur. Effects are unlikely to be substantial because the spatial extent and magnitude of the living coastal and marine resources are small in comparison to other past, present, and reasonably foreseeable future actions. The alternatives would not contribute substantially to cumulative adverse impacts. The alternatives, carried out in conjunction with other conservation practices, would result in long-term beneficial cumulative impacts to living coastal and marine resources.

6 Compliance with Other Laws and Regulations

Chapters 3 and 4 of this document provide detailed information and OPA and NEPA analyses for each proposed restoration alternative, its expected environmental consequences and its consistency with the Final PDARP/PEIS. In addition, coordination and reviews to ensure compliance with a variety of other legal authorities potentially applicable to the selected alternatives have begun. While compliance reviews are complete for some of the projects, others remain in progress. Progress to date suggests that all the selected alternatives will be able to meet permitting and other environmental compliance requirements and that all alternatives will be implemented in accordance with all applicable laws and regulations. Additional alternative-specific information regarding the environmental compliance requirements and the status of the selected alternatives are provided below.

Federal environmental compliance responsibilities and procedures would follow the Trustee Council SOP, which are laid out in Section 9.4.6 of that document. Following this SOP, the Implementing Trustees for each alternative would ensure that the status of environmental compliance (e.g., completed versus in progress) is tracked through the Restoration Portal. The Implementing Trustees would keep a record of compliance documents (e.g., ESA biological opinions, USACE permits) and ensure that they are submitted for inclusion in the Administrative Record.

6.1 Additional Federal Laws

Additional federal laws may apply to the preferred alternatives considered in this RP/EA. Legal authorities applicable to restoration alternative development were fully described in the context of the DWH restoration planning in the Final PDARP/PEIS, Section 6.9 Compliance with Other Applicable Authorities and Appendix 6.D Other Laws and Executive Orders. That material is incorporated by reference here.

Examples of applicable laws or Executive Orders include, but are not necessarily limited to those listed below. Additional detail on each of these laws or Executive Orders can be found in Chapter 6 of the Final PDARP/PEIS.

- Endangered Species Act (16 U.S.C. §§1531 *et seq.*)
- Magnuson-Stevens Fishery Conservation and Management Act (16 U.S.C. §§1801 *et seq.*)
- Marine Mammal Protection Act (16 U.S.C. §§1361 *et seq.*)
- Coastal Zone Management Act (16 U.S.C. §§1451 *et seq.*)
- National Historic Preservation Act (16 U.S.C. §§470 *et seq.*)
- Coastal Barrier Resources Act (16 U.S.C. §§3501 *et seq.*)
- 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 (CWA, 33 U.S.C. §§1251 *et seq.*) and/or Rivers and Harbors Act (33 U.S.C. §§401 *et seq.*)
- Marine Protection, Research and Sanctuaries Act
- Estuary Protection Act
- Archaeological Resource Protection Act

- National Marine Sanctuaries Act
- Farmland Protection Policy Act
- Executive Order 11988: Floodplain Management (now as augmented by Executive Order 13690, January 30, 2015)
- Executive Order 11990: Protection of Wetlands
- Executive Order 12898: Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations
- Executive Order 12962: Recreational Fisheries
- Executive Order 13112: Safeguarding the Nation from the Impacts of Invasive Species
- Executive Order 13175: Consultation and Coordination with Indian Tribal Governments
- Executive Order 13186: Responsibilities of Federal Agencies to Protect Migratory Birds
- Executive Order 13693: Planning for Federal Sustainability in the Next Decade

6.2 Additional State Laws

Additional state laws may apply to the proposed preferred alternatives considered in this RP/EA. Potentially applicable state laws may include but may not be limited to:

- Texas Natural Resources Code (TNRC)
- Coastal Public Lands Management Act (TNRC 33.001 to 33.663)
- Dune Protection Acts (TNRC 63)
- Open Beaches Act (TNRC 61)
- Texas Parks and Wildlife Code
- Texas Water Code
- Texas Health and Safety Code

6.3 Summary and Next Steps for Preferred Alternatives

The Texas TIG will ensure compliance with all applicable state and local laws and other applicable federal laws and regulations relevant to the selected restoration alternatives, including technical assistance from appropriate regulatory agencies during E&D evaluation to identify any compliance issues. A status of necessary federal permits, reviews, and consultations is summarized in Table 6-1. Documentation of regulatory compliance will be available in the administrative record that can be found at the Department of the Interior's Online Administrative Record repository for the Deepwater Horizon NRDA (https://www.doi.gov/deepwaterhorizon/adminrecord). The current status of environmental compliance by project can be viewed at any time on the Trustee Council's website (http://www.gulfspillrestoration.noaa.gov/environmental-compliance/). The Coastal Zone Management Act correspondence can be found in Appendix E of this document.

Pre-existing consultations or permits were reviewed to determine if the consultations/permits were still valid or if a re-initiation of the consultations was necessary. Implementing Trustees are required to implement alternative-specific mitigation measures (including BMPs) identified in the RP/EA and completed consultations/permits. Implementing Trustees will ensure no unanticipated effects to listed species and habitats occur including ensuring that BMPs are implemented.

Table 6-1. This table reflects the current status of federal regulatory compliance reviews and approvals

Alternative	Bald and Golden Eagle Protection Act (USFWS)	Coastal Barrier Resources Act (CRA) (USFWS)	Coastal Zone Management Act (CZMA)	Endangered Species Act (ESA) Section 7 (NMFS)	Endangered Species Act (ESA) Section 7 (USFWS)	Essential Fish Habitat (EFH) (NMFS)	Marine Mammal Protection Act (MMPA) (NMFS)	Marine Mammal Protection Act (MMPA) (USFWS)	Migratory Bird Treaty Act (MBTA) (USFWS)	National Historic Preservation Act (NHPA)	Rivers and Harbors Act/Clean Water Act (USACE permit)
Oyster Restoration Engineering	Complete	Complete	Complete	Complete	Complete	Complete	Complete	Complete	Complete	In Progress	N/A
Bird Island Cove Habitat Restoration	Complete	Complete	Complete	Complete	Complete	Complete	Complete	N/A	Complete	In Progress	N/A
Essex Bayou Habitat Restoration Engineering	Complete	Complete	Complete	Complete	Complete	Complete	Complete	Complete	Complete	In Progress	N/A
Dredged Material Planning for Wetland Restoration	Complete	Complete	Complete	Complete	Complete	Complete	Complete	Complete	Complete	In Progress	N/A
McFaddin Beach and Dune Restoration	Complete	Complete	Complete	In Progress	Complete	Complete	Complete	Complete	Complete	In Progress	Complete

Alternative	Bald and Golden Eagle Protection Act (USFWS)	Coastal Barrier Resources Act (CRA) (USFWS)	Coastal Zone Management Act (CZMA)	Endangered Species Act (ESA) Section 7 (NMFS)	Endangered Species Act (ESA) Section 7 (USFWS)	Essential Fish Habitat (EFH) (NMFS)	Marine Mammal Protection Act (MMPA) (NMFS)	Marine Mammal Protection Act (MMPA) (USFWS)	Migratory Bird Treaty Act (MBTA) (USFWS)	National Historic Preservation Act (NHPA)	Rivers and Harbors Act/Clean Water Act (USACE permit)
Bessie Heights Wetland Restoration	Complete	Complete	Complete	Complete	Complete	Complete	Complete	Complete	Complete	In Progress	In Progress
Pierce Marsh Wetland Restoration	Complete	Complete	Complete	Complete	Complete	Complete	Complete	Complete	Complete	In Progress	In Progress
Indian Point Shoreline Erosion Protection	Complete	Complete	Complete	In Progress	Complete	Complete	Complete	N/A	Complete	In Progress	Complete
Bahia Grande Hydrologic Restoration	Complete	Complete	Complete	In Progress	Complete	Complete	Complete	Complete	Complete	In Progress	Complete
Follets Island Habitat Acquisition	Complete	Complete	Complete	Complete	Complete	Complete	Complete	N/A	Complete	In Progress	N/A
Mid-Coast Habitat Acquisition	Complete	Complete	Complete	Complete	Complete	Complete	Complete	Complete	Complete	In Progress	N/A

Alternative	Bald and Golden Eagle Protection Act (USFWS)	Coastal Barrier Resources Act (CRA) (USFWS)	Coastal Zone Management Act (CZMA)	Endangered Species Act (ESA) Section 7 (NMFS)	Endangered Species Act (ESA) Section 7 (USFWS)	Essential Fish Habitat (EFH) (NMFS)	Marine Mammal Protection Act (MMPA) (NMFS)	Marine Mammal Protection Act (MMPA) (USFWS)	Migratory Bird Treaty Act (MBTA) (USFWS)	National Historic Preservation Act (NHPA)	Rivers and Harbors Act/Clean Water Act (USACE permit)
Bahia Grande Coastal Corridor Habitat Acquisition	Complete	Complete	Complete	Complete	Complete	Complete	Complete	N/A	Complete	In Progress	N/A
Laguna Atascosa Habitat Acquisition	Complete	Complete	Complete	Complete	Complete	Complete	Complete	N/A	Complete	In Progress	N/A

7 Public Comment on the Draft Restoration Plan/Environmental Assessment

The public comment period for the Texas TIG Draft 2017 Restoration Plan/Environmental Assessment: Restoration of Wetlands, Coastal, and Nearshore Habitats; and Oysters (Draft RP/EA) opened on May 18, 2017, and closed on June 19, 2017. During the public review period, the Texas TIG hosted two public meetings along the Texas Coast:

- June 7, 2017: Corpus Christi, TX
- June 8, 2017: La Marque, TX

At the public meetings, the Texas TIG accepted written comments, as well as oral comments that were recorded by court reporters. In addition, the Texas TIG hosted a web-based comment submission site and provided a mailing and email address for the public to provide comments in the Federal Register and during the public meetings. As a result, the Texas TIG received comments at public meetings and through web-based submissions, emailed submissions, and mailed-in submissions.

During the public comment period, the Texas TIG received approximately 117 submissions from private citizens; businesses; federal, state, and local agencies; and non-governmental organizations. Similar or related comments contained in the submissions have been grouped and summarized for purposes of this response. All comments submitted during the period for public comment were reviewed and considered by the Texas TIG prior to finalizing this RP/EA. All comments submitted are represented in the summary comment descriptions listed in this chapter, and all public comments, whether written or oral, will be included in the Administrative Record (https://www.doi.gov/deepwaterhorizon/adminrecord).

7.1 The Comment Analysis Process

Comment analysis is a process used to compile similar public comments into a format that can be addressed efficiently. Comments were sorted into logical groups by topics and issues, consistent with the range of topics applicable to the Draft RP/EA. The process was designed to capture and condense all comments received rather than to restrict or exclude any comments. The comment analysis process allows the Texas TIG to provide an organized and comprehensive response to public comments, consistent with OPA and NEPA regulations. The Department of the Interior's Planning, Environment and Public Comment (PEPC) database was used to manage public comments. The database stores the full text of all submissions and allows each comment to be grouped by topic and issue. All comments were read and analyzed, including those of a technical nature; those that contained opinions, feelings, and preferences for one element over another; and comments of a personal or philosophical nature.

7.2 Comments Summary

Below is a summary of the comments received by the Texas TIG during the comment period and the Texas TIG's response.

7.2.1 General comments received about the 2017 Draft Restoration Plan and Environmental Assessment

1. Comment: A large number of commenters expressed support for the Texas TIG restoration plan.

   Response: The Texas TIG acknowledges and appreciates this support.

2. Comment: Commenter noted the significance of the restoration opportunity that the *Deepwater Horizon* NRDA presents to address ecosystem-level natural resource injury from both the oil spill and chronic underlying ecological stressors along the Texas Gulf Coast.

   Response: The Texas TIG acknowledges and appreciates this comment. An understanding of these connections was fundamental to the Texas TIG's approach to restoration planning. In the PDARP/PEIS the DWH Trustees established a comprehensive, integrated ecosystem restoration plan based on the programmatic Trustee goals to Restore and Conserve Habitat; Restore Water Quality; Replenish and Protect Living Coastal and Marine Resources; Provide and Enhance Recreational Opportunities; and Provide for Monitoring, Adaptive Management, and Administrative Oversight to Support Restoration Implementation. The Texas TIG has used this document's guiding restoration principals and has selected projects that begin to address restoration at an ecosystem scale. This RP/EA selects 13 preferred alternatives which represent restoration activities in a wide range of habitat types and regions within the Texas Restoration Area, and which potentially have far-reaching positive benefits for the Gulf ecosystem as a whole.

3. Comment: Commenters expressed appreciation for the extent to which the Restoration Plan leveraged the resources of multiple projects and noted that the plan showed strong evidence of decision-maker coordination.

   Response: The Texas TIG considers leveraging resources as vital to the restoration process. In developing this Restoration Plan, the TIG sought to maximize other sources of funding.

   Several proposed projects have received previous and current funding investments by state, federal, and/or conservation organizations. At the time of this response they include:

   - Bird Island Cove Habitat Restoration Engineering
   - Essex Bayou Habitat Restoration Engineering
   - McFaddin Beach and Dune Restoration
   - Bessie Heights Wetland Restoration
   - Pierce Marsh Wetland Restoration
   - Indian Point Shoreline Erosion Protection, and
   - Bahia Grande Hydrologic Restoration.

4. Comment: Commenters expressed appreciation for the restoration plan and the importance of its emphasis on coastal reclamation and protection.

   Response: The Texas TIG acknowledges and appreciates this support.

5. Comment: Commenters expressed appreciation for the inclusion of land acquisition/ conservation in the plan.

   Response: The Texas TIG acknowledges and appreciates this support.

7.2.2 Comments received regarding project selection & implementation

1. Comment: Commenter requested clarification on the project screening process and the process by which Restoration Types were identified.

   Response: In 2010, the DWH Trustees published the PDARP/PEIS, which outlined five Restoration Types for which funding was allocated in the Texas Restoration Area: Oysters; Water Quality (Nutrient Reduction); Sea Turtles; Birds; and Wetlands, Coastal, and Nearshore Habitats. The Texas TIG sought restoration project ideas from the public through two websites: the DWH Trustee website (NOAA Gulf Spill web portal; http://www.gulfspillrestoration.noaa.gov) and later the State of Texas website (Restore the Texas Coast web portal; https://www.RestoretheTexasCoast.org), resulting in the submission of over 800 projects relevant to Texas. Because the Trustees had implemented projects to restore Sea Turtles and Birds as a part of Early Restoration, the Texas TIG chose to prioritize the categories of Wetlands, Coastal, and Nearshore Habitats; Oysters; and Water Quality (Nutrient Reduction) as the primary resources to be restored in this RP/EA. The Texas TIG reviewed project submissions, identified the projects that benefitted the target resource types, and then selected the projects that best fit under the OPA criteria, PDARP framework, and budget. From this screening process, the Texas TIG developed a list of 16 potential projects and evaluated each in the Restoration Plan consistent with the National Environmental Policy Act (NEPA). The Texas TIG recommended projects that best address injuries to natural resources and services and meet the selection criteria under OPA as “preferred alternatives,” which the Texas TIG put forth to the public for review and comment in the Draft RP/EA. For the Water Quality (Nutrient Reduction) category, the Texas TIG determined additional restoration planning is necessary, and did not propose any restoration projects in the Draft RP/EA. The Texas TIG’s Restoration Project Evaluation Sheet is included in the administrative record for this RP/EA.

2. Comment: Commenter suggested welded wire gabions be used in the proposed projects where appropriate for erosion control, oyster reef, and sea turtle habitat restoration.

   Response: The Texas TIG and its contractors will evaluate multiple types of erosion control products and methods in relevant projects.

3. Comment: Commenter recommended the consideration of utilizing youth work in conservation and internships in project implementation.

   Response: The Texas TIG will utilize the appropriate procurement procedures to select the contractors/organizations to implement the selected projects. The Texas TIG encourages youth conservation organizations to develop partnerships with implementing organizations to develop project concepts and implementation arrangements and will consider using youth work to implement portions of the selected projects.

4. Comment: Commenters suggest that the Texas TIG consider the proposed Ike Dike in the evaluation of the cumulative impact of projects in Galveston Bay.[18]

   Response: The Texas TIG considered reasonably foreseeable future projects in the evaluation of cumulative impacts. The Ike Dike is currently a planning level concept with no finalized plan or funding mechanism; therefore, anticipating the effects of this concept on the proposed projects is difficult and unnecessary as part of NEPA review of cumulative effects. The Texas TIG does not consider the Ike Dike as a past, present, or reasonably foreseeable project that could have an effect on the success of the projects evaluated in the RP/EA. The Texas TIG selected the projects it considered most capable of meeting the PDARP restoration priorities and compliance with OPA and NEPA.

5. Comment: Commenter proposed a methodology for oyster restoration site selection.

   Response: The Texas TIG and its contractors will evaluate available data in siting oyster restoration projects that will maximize the ecological function of restored oyster reefs.

6. Comment: Commenter proposed that the Texas TIG work with TPWD and an oyster industry advisory panel.

   Response: TPWD is member of the Texas TIG and will be involved with project development. The Texas TIG regularly accepts project ideas from third party organizations and has done so in the development of this restoration plan. While an oyster advisory panel is not proposed at this time, members of the oyster industry are welcome to participate in public meetings and are invited to continue to propose projects for the development of oyster habitat in the next restoration plan.

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[18] For reference, the Ike Dike project is a proposed enhancement of the existing Seawall in Galveston which would extend across Galveston Island and the Bolivar Peninsula and would provide a barrier against all Gulf surges into the bay. The commenter suggests that the proposed project, if implemented, could significantly alter the hydrodynamics and ecology of the Bay, and therefore affect the viability of the restoration projects proposed in this RP/EA.

7. Comment: Commenter suggested that the Texas TIG should develop a strategic framework for oyster restoration.

   Response: The DWH Trustees have developed a Strategic Framework for oyster restoration located at [http://www.gulfspillrestoration.noaa.gov/sites/default/files/wp-content/uploads/Oyster_Strategic_Framework_06.23.17.pdf. This framework guides restoration planning within the Texas TIG.](http://www.gulfspillrestoration.noaa.gov/sites/default/files/wp-content/uploads/Oyster_Strategic_Framework_06.23.17.pdf)

7.2.3 Comments received offering assistance or expertise

1. Comment: Commenters offered support and partnership in implementing restoration plans, utilizing industry experts and existing partners involved in Gulf restoration.

   Response: The Texas TIG appreciates the offer of assistance and will consider this during project engineering and design.

2. Comment: Commenter recognized the importance of land protection focused on critical watersheds and offers assistance in implementing land conservation goals in the restoration plan.

   Response: The Texas TIG appreciates the offer of assistance and is working with state and federal agencies, local land trusts, and other land conservation organizations to identify land conservation that can have the greatest benefits and where land conservation opportunities exist that would meet the OPA guidelines and framework established in the PDARP. The preferred alternatives for land acquisitions in this RP/EA are near other conserved areas and target critical watersheds and natural habitats. For example, the Laguna Atascosa, Mid-Coast, and Bahia Grande Coastal Corridor Acquisitions will all be transferred to the USFWS refuge system for conservation in perpetuity; two of these to the same refuge complex. Additionally, the Follets Island property will be transferred to the TPWD system for conservation.

7.2.4 Comments received in support of specific projects

1. Comment: Commenters expressed support for the McFaddin Beach and Dune Restoration project, Dredged Material Planning for Wetland Restoration Project, Bahia Grande Hydrologic Restoration Project, Bahia Grande Coastal Corridor Acquisition Project, Laguna Atascosa Habitat Acquisition Project, Follets Island Habitat Acquisition Project, Oyster Restoration Engineering Project, Mid-Coast Habitat Acquisition Project, Bessie Heights Wetland Restoration Project, Essex Bayou Habitat Restoration Project, and the Pierce Marsh Wetland Restoration Project.

   Response: The Texas TIG acknowledges and appreciates this support.

2. Comment: Commenters expressed support for the Matagorda Peninsula Habitat Acquisition Project.

Response: The Texas TIG acknowledges and appreciates this support. However, this project is not ready for implementation at this time and may be considered in future restoration plans.

3. Comment: Commenters expressed support for the Landscape Scale Approach to Oyster Reef restoration project or project of similar scope and scale.

   Response: The Texas TIG acknowledges and appreciates this support. The Texas TIG selected the Oyster Engineering Project that will provide it with information to maximize ecological function from oyster restoration in Galveston Bay.

7.2.5 Comments received proposing alternative projects

1. Comment: Commenter suggested funding an alternative project, "Safe Gauge," to address petrochemical safety and prevent future major incidents rather than funding the restoration of habitat after incidents occur.

   Response: The Texas TIG notes that no such project was proposed. There will be opportunities in future DWH funding cycles to propose restoration projects for implementation within the DWH PDARP/PEIS framework. Any project considered in restoration planning will be screened and evaluated under the relevant requirements of OPA, NEPA, and the PDARP/PEIS. In addition to NRDA funding, there are other *Deepwater Horizon* funding sources, such as the RESTORE Act, that may be available for petrochemical safety and prevention. For example, the Centers of Excellence funded through the RESTORE Act may address disciplines such as (1) coastal and deltaic sustainability, restoration, and protection, including solutions and technology that allow citizens to live in a safe and sustainable manner in a coastal delta in the Gulf Coast Region, (2) offshore energy development, including research and technology to improve the sustainable and safe development of energy resources in the Gulf of Mexico, and (3) sustainable and resilient growth, economic and commercial development in the Gulf Coast Region.

2. Comment: Commenter suggested a need for science and restoration projects on Padre Island for sea turtles.

   Response: This restoration plan was focused on two restoration types: Oysters and Wetlands, Coastal, and Nearshore Habitats. The Texas TIG currently is implementing portions of a 10-year, Gulf-wide $45 million sea turtle restoration project as a part of Early Restoration, which includes supporting work on Padre Island. There are additional restoration funds available to support additional sea turtle work for which the Texas TIG will propose restoration projects in future plans.

3. Comment: Commenter suggested an alternative project for a biological pump to reduce nutrient loading leading to red algal blooms.

Response: The Texas TIG screened and evaluated all project submittals under the relevant requirements of OPA and the PDARP and selected the projects that would best restore oysters and wetlands, coastal and nearshore habitats. This project did not satisfy project screening criteria under OPA, and, as a result, was not selected for evaluation in this plan. The Texas TIG has initiated additional restoration planning for water quality and nutrient reduction, which will help the Texas TIG focus on nutrient reduction efforts in a future restoration plan.

4. Comment: Commenter suggested the Texas TIG should restore water quality.

   Response: A sum of $22.5 million has been allocated to the Texas TIG for restoration of water quality through nutrient reduction on the Texas coast. In light of this limited funding, the Texas TIG has initiated additional restoration planning for water quality and nutrient reduction, which will help the Texas TIG focus on nutrient reduction efforts in a future restoration plan.

5. Comment: Commenter suggested the Texas TIG should fund chemical testing of oysters.

   Response: The Oil Pollution Act mandates that NRDA funds be used to restore impacted resources; in this case, resources directly affected by the *Deepwater Horizon* oil spill. This project proposal does not satisfy this particular OPA requirement and therefore was not considered in this restoration plan. Additionally, this project does not fit into one of the Restoration Types specified in the PDARP/PEIS.

6. Comment: Commenter suggested all oyster restoration funds should be allocated to Texas Parks and Wildlife Department and to all active commercial oyster license holders to fund monitoring of current public reefs.

   Response: The Deepwater Horizon funds are jointly managed by all Trustees on the Texas TIG. The Texas TIG will select and oversee the engineering, design, and implementation of all selected restoration projects. Currently, the Oyster Restoration Engineering project selected in this RP/EA would consist of an initial alternatives analysis to identify the best management practices (BMPs) for rehabilitating oyster reefs buried by sediment and for constructing intertidal oyster reefs within the Galveston Bay System. The identification of BMPs resulting from the Oyster E&D project will further increase the likelihood of success of future restoration actions.

7. Comment: Commenter provided the Texas TIG with elements of a proposed oyster restoration management plan.

   Response: The Texas TIG appreciates the input. We will be considering many of the factors suggested as we move forward with project engineering, design, and management.

7.2.6 Comments received on the monitoring and adaptive management planning process

1. Comment: Commenters offered support for the DWH Trustee's Monitoring and Adaptive Management Manual and its use to address consistency across TIG restoration plans. The commenters recommended that robust MAM plans be included in this restoration plan, and that more information be included regarding each project's budget for MAM expenses.

   Response: The Texas TIG has included complete Monitoring and Adaptive Management plans for each project in the Final RP/EA. Each of these management plans includes the planned monitoring parameters and methodology for each selected project in this RP/EA. The Texas TIG is committed to implementing these monitoring plans, and has set aside $2,175,000 to devote to this effort. The ultimate scope and scale of projects selected in this RP/EA may change in the time leading up to and during implementation. To compensate, the Texas TIG has budgeted an additional $3,293,754 for contingencies, if the initial sum is insufficient to achieve the Texas TIG's monitoring and adaptive management goals and objectives.

2. Comment: Commenter recommended that Texas TIG evaluate the long-term viability of projects within the context of anticipated changes in sea level rise or climatic changes that could affect long-term benefits of the restoration.

   Response: The Texas TIG has included (or will include in the case of engineering and design projects) sea level rise and climatic changes as a design parameter in the selected construction projects.

7.2.7 Comments received on the public comment process

1. Comment: Commenters expressed appreciation for the opportunity to offer public comment and noted the importance of restoration in Texas.

   Response: The Texas TIG acknowledges and appreciates this support.

2. Comment: Commenter expressed appreciation for the public's opportunity to express concerns and add input from industry members who bring experience in the field. Commenter also recommended that public notices be circulated outside of the Federal Register, specifically using TPWD and NOAA email to broaden advertisement with more advance notice to encourage public participation.

   Response: The notice of the Draft RP/EA was circulated in the *Federal Register* and announced via NOAA's email service, as well posted to Texas' DWH website restorethetexascoast.org and announced via news releases. The plan was made available for public review throughout the duration of the public comment period on NOAA's *Deepwater Horizon* web portal. The Texas TIG will consider additional outreach avenues in future plans. The Texas TIG considers public input to be vital to the restoration planning process.

3. Comment: The commenter inquired about the next opportunity for the public to propose a project idea in the restoration plan.

   Response: This is the first *Deepwater Horizon* Restoration Plan released by the Texas TIG. Over the next 15 years, the TIG will receive approximately $124.8 million to support additional restoration planning. The Texas TIG considers public input to be vital to the restoration planning process, and will be accepting restoration project ideas from the public in future plans. In order to stay abreast of opportunities to provide restoration project ideas or public comment, the public is welcome to visit NOAA's and Texas' *Deepwater Horizon* spill restoration websites at www.gulfspillrestoration.noaa.gov and restorethetexascoast.org.

8 Preferred and Non-Preferred Alternatives

This chapter provides an overview of the projects that are selected as preferred alternatives by the Texas TIG. Projects were initially screened based on OPA-defined criteria and then an EA was conducted to determine the type and severity of potential environmental impacts that might result from the projects. As stated in the Final PDARP/PEIS, the No Action alternative "does not meet the purpose and need for restoration of injured resources and services" and therefore, was not identified as a preferred alternative. The OPA and NEPA analyses demonstrated that the other 16 proposed alternatives would provide benefits to the physical environment, biological environment, and human uses and socioeconomics resources without causing major adverse impacts. Ultimately the Texas TIG has identified projects that are preferred for implementation in the RP/EA based on the OPA evaluation of cost-effectiveness or likelihood of success.

On May 18, 2017, The Texas TIG released the Draft RP/EA to the public for review during a public review period that ended on June 19, 2017. The Texas TIG also held two public meetings in Corpus Christi (June 7, 2017) and La Marque (June 8, 2017). The TIG considered the public comments received during this time, which informed the TIG's analyses and selection of the restoration projects in this document, the Final RP/EA. A summary of the public comments received and the Trustees' responses to those comments is included in Chapter 7. After consideration of the comments received from the public during the review period, the Texas TIG selects the original thirteen projects preferred projects proposed in the Draft RP/EA.

Projects not selected as preferred in this RP/EA could be identified as preferred in the future. Thirteen projects have been selected by the Texas TIG as preferred for implementation (Table 7-1).

Table 7-1. The alternative name, Restoration Type, type of restoration action, and proposed preferred and non-preferred projects

Alternative	Preferred/ Not Preferred	Project Costs
Replenish and Protect Oysters (Living Coastal and Marine Resources)		
Oyster Restoration Engineering*	Preferred	$309,000
Landscape Approach to Oyster Reef Restoration	Not Preferred	$15,258,000
Restore and Conserve Wetlands, Coastal, and Nearshore Habitats		
Bird Island Cove Habitat Restoration Engineering*	Preferred	$206,000
Essex Bayou Habitat Restoration Engineering*	Preferred	$372,000
Dredged Material Planning for Wetland Restoration*	Preferred	$1,964,000
McFaddin Beach and Dune Restoration	Preferred	$15,874,000
Bessie Heights Wetland Restoration	Preferred	$4,905,000
Pierce Marsh Wetland Restoration	Preferred	$3,095,000

Alternative	Preferred/ Not Preferred	Project Costs
Dollar Bay and Moses Lake Wetland Restoration	Not Preferred	$4,225,000
Indian Point Shoreline Erosion Protection	Preferred	$2,199,000
Bahia Grande Hydrologic Restoration	Preferred	$5,050,000
Follets Island Habitat Acquisition	Preferred	$2,037,000
Mid-Coast Habitat Acquisition	Preferred	$2,082,000
Matagorda Peninsula Habitat Acquisition	Not Preferred	$3,012,000
Bahia Grande Coastal Corridor Habitat Acquisition	Preferred	$2,271,000
Laguna Atascosa Habitat Acquisition	Preferred	$5,397,000

Note: **Alternatives proposing only E&D activities.*

The OPA analysis showed that the cost-effectiveness of the Landscape Approach to Oyster Reef Restoration alternative is currently unknown. The preferred oyster alternative would generate information to evaluate cost-effectiveness for other oyster projects. Therefore, only the Oyster Restoration Engineering alternative is preferred at this time. Additionally, the Dollar Bay and Moses Lake Wetland Restoration alternative is not as cost-effective in comparison to alternatives that are restoring similar resources in this RP/EA. The likelihood of success for the Matagorda Peninsula Habitat Acquisition alternative is unknown at this time because willing sellers have not been identified. The complete OPA analyses can be reviewed in Chapter 3.

Completion of similar nearby projects or further development of E&D documents may refine cost estimates and non-preferred project may be reconsidered in a later restoration plan. There will be additional opportunities for consideration of restoration projects as the NRDA restoration planning process moves forward. Public input and comment will be considered throughout the restoration process.

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10 List of Repositories

Galveston, Texas
Jack K. Williams Library
Texas A&M University at Galveston
200 Seawolf Parkway Building #3010
Galveston, TX 77554

Port Arthur, Texas
Port Arthur Public Library
4615 9th Ave.
Port Arthur, TX 77672

Corpus Christi, Texas
Mary and Jeff Bell Library
Texas A&M Corpus Christi
6300 Ocean Drive
Corpus Christi, TX 78412

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Appendix A: Project Screening Rubric and Table

TEXAS TRUSTEE IMPLEMENTATION GROUP (TIG)

EVALUATION CRITERIA SHEET

Restoration planning to address natural resource and service injuries resulting from the *Deepwater Horizon* Oil Spill

REVIEWERS: Evaluate project submittals using the selection criteria and guidance below. Scores are given as either Yes / No (Y/N) or on a (+ / 0 / -) scale. Where insufficient information is provided to make a clear score determination in the latter scale, score the project a "0" for that particular category, then highlight the cell in yellow to indicate that there was insufficient information to make a clear determination. Criteria scores that would disqualify a project from further consideration are identified in ALL CAPS. Where multiple qualifying criteria are identified within each scoring category, only one must be satisfied to attain the given score.

PROJECT INFORMATION
Record project information exactly as it appears in the project proposal (Columns A – F).
A. **Entry ID** • Assign chronological ID number to project entry.
B. **Project Name** • Record the project name exactly as it appears on the project application.
C. **Project No./ID** • Record the project identification number as it appears on the project application.
D. **Submitted by/Primary Lead** • Record the name and organization of the project proponent (i.e. the individual or entity to which funding will be granted).
E. **Location** • Record any relevant locational information provided with the project proposal (e.g., city, county, conservational area, park). Where relevant, record all GPS waypoints in decimal degrees.
F. **Submitted via** • Record the name of the web system the project was submitted through (RestoretheTexasCoast.org or NOAA NRDA website)

RESTORATION TYPE IDENTIFICATION

Identify which of the restoration types outlined in the PDARP (Programmatic Damage Assessment and Restoration Plan) are addressed in the project proposal (Columns G - L). Further detail on the Restoration Types listed in the PDARP is provided below.

G. **Project directly contributes to the restoration of water quality through nutrient reduction (nonpoint source).**

- The project reduces nutrient loads to coastal watersheds, reduces pollution and hydrologic degradation to coastal watersheds; or,
- creates, restores, and enhances coastal wetlands; or,
- Protects and conserves marine, coastal estuarine, and riparian habitat.

H. **Project provides direct ecological benefits to wetland, coastal, and nearshore habitats.**

- The project creates, restores, and enhances coastal wetlands, oyster reef habitat, barrier and coastal islands, or headlands; or,
- restores and enhances dunes, beaches, and submerged aquatic vegetation; or, protects and conserves marine, coastal, estuarine, and riparian habitats.

I. **Project replenishes and protects identified living coastal and marine resources: Oysters.**

- Project restores oyster reef habitat.

J. **Project replenishes and protects identified living coastal and marine resources: Birds.**

- Project creates, restores, and conserves bird nesting and foraging habitat, including but not limited to: dunes and beaches, coastal wetland, barrier and coastal islands, and coastal headlands;
- protects and conserves marine, coastal, estuarine, and riparian habitats; restores and enhances submerged aquatic vegetation; or,
- establishes or re-establishes breeding colonies; or prevents incidental bird mortality.

K. **Project replenishes and protects identified living coastal and marine resources: Sea Turtles.**

- Project reduces sea turtle bycatch in commercial and/or recreational fisheries through identification and implementation of conservation measures;
- reduces bycatch in commercial fisheries through enhanced training/outreach in the community or enhanced state enforcement effort to improve compliance with existing requirements;
- enhances sea turtle hatchling productivity and restores/conserves beach nesting habitat;
- increases sea turtle survival through enhanced mortality investigation and early detection of and response to anthropogenic threats and emergency events; or,
- reduces injury and mortality of sea turtles from vessel strikes.

L. Provides for monitoring, adaptive management, and administrative oversight to support restoration implementation

MINIMUM CRITERIA: project must meet the following criteria in order be further considered for inclusion in the DARP		
Evaluate the extent to which the project is consistent with criteria outlined in the PDARP (Column M).		
M. PROJECT IS CONSISTENT WITH PROGRAMMATIC RESTORATION GOALS. • Project is consistent with one or more of the programmatic restoration types, goals, and approaches for which funding was allocated in the PDARP.	(Y) Restoration goals and objectives of this project are focused on one of the above categories outlined in the PDARP.	(N) RESTORATION GOALS AND OBJECTIVES OF THIS PROJECT DOES NOT FIT INTO ONE OF THE CATEGORIES OUTLINED IN THE PDARP.
Evaluate the extent to which the project is consistent with criteria identified in the public notice (Column N).		
N. PROJECT IS CONSISTENT WITH CRITERIA IDENTIFIED IN THE PUBLIC NOTICE. • Project benefits Selected Restoration Types and Approaches for the RP/EA. • Project restores and conserves wetland, coastal, and nearshore habitat. • Project restores water quality through nutrient reduction (nonpoint sources). • Project replenishes and protects identified living coastal and marine resources: Oysters. • Project presents unique opportunities for restoration that benefits sea turtles and birds.	(Y) Project benefits one of the Selected Restoration Types and Approaches identified for the RP/EA.	(N) PROJECT DOES NOT BENEFIT ONE OF THE SELECTED RESTORATION TYPES AND APPROACHES IDENTIFIED FOR THE RP/EA.

Evaluate the extent to which the project meets Oil Pollution Act (OPA) Criteria (Columns O – Q).			
O. **PROJECT PREVENTS FUTURE AND COLLATERAL INJURY TO NATURAL RESOURCES AND SERVICES.** • Project activities should prevent future injury as a result of the incident, should not result in significant losses of natural resources, and should minimize the potential to adversely affect surrounding habitats and resources during implementation • Project should be compatible with surrounding land use and project activities should not contaminate the surrounding area or conflict with the viability of endangered species populations.	(-) PROJECT WOULD CAUSE SIGNIFICANT COLLATERAL DAMAGE OR WOULD CAUSE FUTURE INJURY TO NATURAL RESOURCES.	(0) Project has minimal potential for collateral damage to natural resources and future injury.	(+) Project fully avoids collateral damage to natural resources and fully prevents future injury from occurring.
P. **Project has reasonable probability of success: TECHNICAL FEASIBILITY** • There is an acceptable level of uncertainty or risk involved in implementing the project. • Factors for Trustees to consider: whether the project site is adequately protected, difficulties in project implementations, acquisition of state or federal permits, self-sustaining potential, whether long-term maintenance of project features is likely to be necessary and feasible.	(-) SIMILAR PROJECTS OR METHODOLOGY HAVE BEEN IMPLEMENTED BEFORE, BUT WITH LIMITED OR NO SUCCESS. THE PROJECT IS NOT ADEQUATELY PROTECTED. PROVISIONS FOR MAINTENANCE OF THE PROJECT IS LIMITED. PERMITS MAY BE UNOBTAINABLE OR DIFFICULT TO OBTAIN. FOR ACQUISITIONS, NO WILLING SELLER APPARENT.	(0) Similar projects or methodology have successfully been implemented before or project utilizes a novel approach that has a good probability of success. The project is adequately protected. And provides for short-term maintenance. Permits have not been obtained. For acquisitions, willingness of sellers at appraised value uncertain.	(+) Project follows well established methodology that has a proven record of success. The project is adequately protected and provides for long-term maintenance, including the costs. Permits have already been obtained or are readily obtainable. For acquisitions, there are known willing sellers at appraised value.

<table>
<tr><td>Q. THE EFFECT OF THE PROJECT ALTERNATIVE ON PUBLIC HEALTH AND SAFETY
• Projects that would negatively affect public health or safety are not appropriate.
• Project is compatible with any ongoing remedial actions and/or other projects in the area.</td><td colspan="2">(-)
PROJECT WOULD RESULT IN SIGNIFICANT NEGATIVE AFFECTS ON HUMAN HEALTH AND SAFETY OR ANY ONGOING OR ANTICIPATED REMEDIAL ACTIONS.</td><td colspan="2">(0)
Project has minimal potential to adversely impact human health and safety and any ongoing or anticipated remedial actions in the project area.</td><td>(+)
Project fully avoids adverse impacts to human health and safety and any ongoing or anticipated remedial actions in the project area.</td></tr>
<tr><td colspan="6">Evaluate the extent to which the project meets additional criteria (Columns R – T).</td></tr>
<tr><td>R. PROJECT IS NOT ALREADY REQUIRED BY EXISTING REGULATIONS.
• The proposed project should not already be required by existing laws, regulations, permits, settlements, or enforcement orders, including anticipated requirements such as mitigation requirements of draft permits unrelated to this request for scopes of work.</td><td colspan="3">(Y)
Project is not already required by existing laws, regulations, permits, settlements or enforcement orders.</td><td colspan="2">(N)
PROJECT IS REQUIRED BY EXISTING LAWS, REGULATIONS, PERMITS, SETTLEMENTS OR ENFORCEMENT ORDERS.</td></tr>
<tr><td>S. PROJECT HAS NOT ALREADY BEEN FUNDED.
• Project has not already been fully funded or implemented by other means.</td><td colspan="3">(Y)
Project has not already been fully funded, and is still eligible for consideration through this program.</td><td colspan="2">(N)
PROJECT HAS ALREADY BEEN FULLY FUNDED AND NO LONGER NEEDS FUNDING.</td></tr>
<tr><td>T. PROJECT READINESS
• It is anticipated to take a reasonable/acceptable amount of time to derive ecological or public benefits from planned project activities.
• The Trustees should consider the time it takes for benefits to be provided to the Natural Resource or Service and/or public and fiscal efficiency and scheduling of the project.</td><td colspan="2">(-)
BENEFITS, IF ANY EXIST, OF PROJECT ACTIVITIES WILL TAKE AN UNREASONABLE AMOUNT OF TIME TO COME TO FRUITION.</td><td colspan="2">(0)
Project benefits will not be immediately derived from project activities; some time may lapse between completion of project and the benefit to Natural Resources or Services in the area.</td><td>(+)
Project benefits will quickly be realized soon during project or soon after project completion. Project provides timely benefit to Natural Resources or services to the public.</td></tr>
</table>

EVALUATION CRITERIA: If the project satisfies the minimum criteria outlined above, Trustees should evaluate the project based on the following criteria.

<table>
<tr><td colspan="4">Evaluate the extent to which the project is consistent with criteria outlined in the PDARP (Column U).</td></tr>
<tr><td>U. Project is considerate of strategic frameworks.
• To the extent that they exist, the project proposal is consistent with strategic frameworks.</td><td>(Y)
This project considers strategic frameworks.</td><td>(N)
This project does not consider strategic frameworks.</td><td>(NA)
Strategic frameworks have not been developed for this restoration type.</td></tr>
<tr><td colspan="4">Evaluate the extent to which the project meets Oil Pollution Act (OPA) Criteria (Columns V – Y).</td></tr>
<tr><td>V. Project delivers benefits cost-effectively.[1]
• Project utilizes most cost-efficient approach and greatest cost to benefit ratio.
• Application describes how funds are managed and accounted for to ensure compliance with appropriate state and federal requirements for fiscal controls.
• Factors for Trustees to consider: project management costs, costs of personnel, overhead, land acquisition, project location, project scale, complexity of construction and access, potential liability from project construction, likelihood that a match is available to fund the project.</td><td>(-)
Project budget is unreasonable and not cost-effective considering benefits of the project relative to its cost and also considering the timeline provided to complete the project activities; potential issues with state and federal funding requirements for fiscal controls.</td><td>(0)
Project budget is reasonable and relatively cost-effective considering benefits of the project relative to its cost and also considering the timeline provided to complete the project activities.</td><td>(+)
Project budget is reasonable and very cost-effective considering benefits of the project relative to its cost and also considering the timeline provided to complete the project activities.</td></tr>
</table>

W. **Project meets Trustees' goals.**[1] • Project alternative is expected to meet the Trustees' goals and objectives in restoring natural resources and services. • Trustees should evaluate the ability of the restoration project to provide comparable resources and service. They should consider the potential relative productivity of the restored resource or habitat in order to quantify the provision of resources and services.	(-) The project does not provide for good quality restoration for the Required Resource. Project is not consistent with the programmatic restoration types, goals, and approaches for which funding was allocated in the PDARP	(0) Project provides for good quality restoration for the Required Resource. Project alternative is consistent with the programmatic restoration types, goals, and approaches for which funding was allocated in the PDARP.	(+) Project provides for excellent quality restoration for the Required Resource. Project alternative is consistent with the programmatic restoration types, goals, and approaches for which funding was allocated in the PDARP.
X. **Project has reasonable probability of success: organizational feasibility** • Factors for Trustees to consider: the capacity and track record of project proponents and teams, including if management measures being implemented are likely to be maintained after project completion, and/or will lead to further implementation actions being completed in the future; project partners, if any, are willing to invest time and/or money for project activities. • Application specifically and clearly defines the roles and responsibilities of project partners, if any, in carrying out activities; application quantifies how the project will measure success during implementation efforts and can relate these measures back to project goals and objectives.	(-) The Organization, project manager, and or staff have little or no previous experience. Project may be financially unviable. Project is dependent upon factors outside of the implementer's control. There is no plan for future actions and management.	(0) The Organization, project manager, and or staff have previous experience. Project is financially viable. Project success may be dependent upon factors outside of the implementer's control. There is a commitment for future actions and management.	(+) The Organization, project manager, and or staff are leaders in the technique. Project is financially viable. Project has high chance for success. There is a commitment for future actions and management, including financial means and support from partners.

Y. Project benefits more than one natural resource and/or service. - Project should restore, rehabilitate, replace, enhance, or acquire the equivalent of the resources and services injured by the spill. Projects that provide benefits to more than one resource and/or service yield more benefits. - Evaluate the extent to which the proposed project meets Trustees' goals for multiple Resource or Service types, paying particular attention to those highlighted in the Public Notice as Selected Resource Types.	(-) The project alternative does not benefit more than one natural resource and/or service provision. The project benefits another type of natural resource or service.	(0) The project alternative marginally benefits more than one Resource or Service type. However, the benefits do not fully meet the Trustees' goals as outlined in section W, above.	(+) The project alternative has multiple benefits for several different natural resources and or services.
Evaluate the extent to which the project meets additional criteria (Columns Z – AD).			
Z. Project complies with all applicable laws and regulations. - Project activities should be consistent with federal, state, or local laws, regulations, or policies.	(Y) Project is consistent with federal, state, or local laws, regulations, or policies.		(N) Project is inconsistent with federal, state, or local laws, regulations, or policies.
AA. Project supports existing regional or local conservation efforts or plans - Project will be directly supporting the conservation goals of an existing local, regional, state, or federal plan or restoration effort.	(Y) Project supports an existing local, regional, state, or federal plan or restoration effort. Project goals and outcomes directly contribute to the conservation goals of a region.		(N) Project does not support existing local, regional, state, or federal plan or ongoing restoration effort.

AB. Sustainability/long-term benefit of project - Evaluate the expected longevity of project outcomes. Projects which are capable of providing long-term, sustainable benefits are most favorable. - Trustees should consider resiliency of project outcomes to changing environmental or fiscal conditions; the ability of project management to provide long-term protection and maintenance of project alternative; any barriers to future management that may arise (e.g., potential permit or management limitations).	(-) Proposed project makes little or no provisions for future management of project area. Goals outlined in proposal are only short-term and are bounded by the start and end dates of the project. Project may require a significant amount of money to continue operation/maintenance.	(0) Project will be sustainably managed for a defined amount of time after activities are completed. Project requires minimal funding to continue in perpetuity.	(+) Proposed project presents a viable, detailed plan for long-term management of project area. No further funding or minimal management is required to derive project benefits in perpetuity. Project benefits can sustainably continue into the future.
AC. Project is time critical. - Project activities provide a remedy to a time-sensitive Natural Resource or Service injury. - Trustees should evaluate the risk of waiting to implement the project now versus future implementation.	(-) Project outcome is not time-sensitive. There is no necessary immediacy to project implementation. Project can occur during any time and a similar Natural Resource benefit would be derived.	(0) Project activities are time-sensitive. The cost of implementation of the proposed project may increase in the near future due to planned land use, rate of erosion, or other source of immediacy.	(+) It is critical that the project be implemented as soon as possible in order to derive benefit to a particular Natural Resource or Service. Project presents a unique opportunity that is time-dependent.

AD. Project offers opportunities for external funding and collaboration - Proposed project leverages opportunities for sharing of expertise and costs amongst other project proponents. - Project proponents are leveraging other sources of funding to achieve project outcomes. - Trustees should consider the possibility of matching funds, in-kind services, volunteer assistance, and coordination with other ongoing/proposed projects. External funding and in-kind support and services that reduce costs or extend benefits are favorable.	(-) Project does not propose opportunities for collaboration with other projects, external funding sources, or sharing of expertise. Beyond cost-efficiency, no internal strategies for cost-reduction are proposed. Project proponent has requested additional funds from external sources, but does not have those funds in-hand.	(0) Project leverages some additional matching funds or in-kind services that contribute to project activities. Project proponents offer some or minimal short-lived collaborative opportunities with other ongoing or proposed projects. Volunteer assistance is planned, but is not a significant portion of carrying out project objectives.	(+) Project incorporates many opportunities for long-term, significant collaboration with other ongoing or proposed projects. Project proponent is leveraging significant matching funds, volunteer assistance, and/or in-kind services.

[1] This criterion is a primary guiding principle in the scope of the project evaluation. Special weight should be placed on the scoring of this requirement.

Project Information							Restoration Types Addressed					
Entry ID	Project Name	Project No.	Submitted By/Primary Lead	Cost	Location	Submitted via	Water Quality (Y / N)	Wetland, Coastal, and Nearshore Habitat (Y / N)	Oyster Reef (Y / N)	Birds (Y / N)	Sea Turtles (Y / N)	Monitoring, Adaptive Management, and Administrative Oversight to Support Restoration Implementation (Y / N)

Minimum Criteria							
Programmatic Damage Assessment and Restoration Plan (PDARP) Criteria		Public Notice		Oil Pollution Act (OPA) Criteria (15 CFR 990.54)		Additional Criteria	
PROJECT IS CONSISTENT WITH PROGRAMMATIC RESTORATION GOALS (Y/N)	PROJECT IS CONSISTENT WITH CRITERIA IDENTFIED IN THE PUBLIC NOTICE (Y/N)	PROJECT PREVENTS FUTURE AND COLLATERAL INJURY TO NATURAL RESOURCES AND SERVICES (+ / 0 / -)	Project has reasonable probability of success: TECHNICAL FEASIBILITY (+ / 0 / -)	THE EFFECT OF THE PROJECT ALTERNATIVE ON PUBLIC HEALTH AND SAFETY (+ / 0 / -)	PROJECT IS NOT ALREADY REQUIRED BY EXISTING REGULATIONS (Y/N)	PROJECT HAS NOT ALREADY BEEN FUNDED (Y/N)	PROJECT READINESS (+ / 0 / -)

Evaluation Criteria									
Programmatic Damage Assessment and Restoration Plan (PDARP) Criteria			Oil Pollution Act (OPA) Criteria (15 CFR 990.54)			Additional Criteria			
Project is considerate of strategic frameworks (Y/N/NA)	**Project delivers benefits cost-effectively** (+ / 0 / -)	**Project meets Trustees' goals** (+ / 0 / -)	Project has reasonable probability of success: organizational feasibility (+ / 0 / -)	Project benefits more than one natural resource and/or service (+ / 0 / -)	Project complies with all applicable laws and regulations (Y/N)	Project supports existing regional or local conservation efforts or plans (Y/N)	Sustainability / Long-term Benefit of project (+ / 0 / -)	Project is time critical (+ / 0 / -)	Project offers opportunities for external funding and collaboration (+ / 0 / -)

Appendix B: Construction Site Air Quality Best Management Practices

The following best management practices (BMPs) should be used to limit dust and emissions at construction sites, where practicable:

- Stabilize heavily used unpaved construction roads with a non-toxic soil stabilizer or soil weighting agent that will not result in loss of vegetation, or increase other environmental impacts.
- As needed during grading, use water, on disturbed areas in construction sites to control visible plumes.
- Vehicle Speed
    - Limit speeds to 25 miles per hour on stabilized unpaved roads as long as such speeds do not create visible dust emissions.
    - Limit speeds to 10 miles per hour or less on unpaved areas within construction sites on un-stabilized (and unpaved) roads.
    - Post visible speed limit signs at construction site entrances.
- Inspect and wash construction equipment vehicle tires, as necessary, so they are free of dirt before entering paved roadways, if applicable.
- Provide gravel ramps of at least 20 feet in length at tire washing/cleaning stations, and ensure construction vehicles exit construction sites through treated entrance roadways, unless an alternative route has been approved by appropriate lead agencies, if applicable.
- Use sandbags or equivalent effective measures to prevent run-off to roadways in construction areas adjacent to paved roadways. Ensure consistency with the project's Storm Water Pollution Prevention Plan, if such a plan is required for the project.
- Sweep the first 500 feet of paved roads exiting construction sites, other unpaved roads en route from the construction site, or construction staging areas whenever dirt or runoff from construction activity is visible on paved roads, or at least twice daily (less during periods of precipitation).
- Stabilize disturbed soils (after active construction activities are completed) with a non-toxic soil stabilizer, soil weighting agent, or other approved soil stabilizing method.
- Cover or treat soil storage piles with appropriate dust suppressant compounds and disturbed areas that remain inactive for longer than 10 days. Provide vehicles (used to transport solid bulk material on public roadways and that have potential to cause visible emissions) with covers. Alternatively, sufficiently wet and load materials onto the trucks in a manner to provide at least one foot of freeboard.
- Use wind erosion control techniques (such as windbreaks, water, chemical dust suppressants, and/or vegetation) where soils are disturbed in construction, access and maintenance routes, and materials stock pile areas. Keep related windbreaks in place until the soil is stabilized or permanently covered with vegetation.
- Plan construction scheduling to minimize vehicle trips.
- Limit idling of heavy equipment to less than 5 minutes and verify through unscheduled inspections.
- Develop a construction traffic and parking management plan that maintains traffic flow and plan construction to minimize vehicle trips.

- Identify any sensitive receptors in the project area, such as children, elderly, and the infirm, and specify the means by which impacts to these populations will be minimized (e.g. locate construction equipment and staging zones away from sensitive receptors and building air intakes).
- Include provisions for monitoring fugitive dust in the fugitive dust control plan and initiate increased mitigation measures to abate any visible dust plumes.
- Consider resource conservation measures and technology to reduce energy use

Appendix C: Guidelines for NEPA Impact Determinations

Table C-1. Guidelines to determine NEPA impact intensity definitions used in this RP/EA and consistent with the Final PDARP/PEIS.

Resource	Impact Duration	Minor Impact Intensity	Moderate Impact Intensity	Major Impact Intensity
Physical Resources				
Geology and Substrates	Short-term: During construction period. Long-term: Over the life of the project or longer.	Disturbance to geologic features or soils could be detectable, but could be small and localized. There could be no changes to local geologic features or soil characteristics. Erosion and/or compaction could occur in localized areas.	Disturbance could occur over local and immediately adjacent areas. Impacts to geology or soils could be readily apparent and result in changes to the soil character or local geologic characteristics. Erosion and compaction impacts could occur over local and immediately adjacent areas.	Disturbance could occur over a widespread area. Impacts to geology or soils could be readily apparent and could result in changes to the character of the geology or soils over a widespread area. Erosion and compaction could occur over a widespread area. Disruptions to substrates or soils maybe 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 groundwater 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 (CWA) could not be exceeded.	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 groundwater 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	Hydrology: The effect on hydrology could be measurable and widespread. The effect could permanently alter hydrologic patterns including surface and groundwater 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 waterbody. Floodplains: Impacts could result in a change to natural and beneficial

Resource	Impact Duration	Minor Impact Intensity	Moderate Impact Intensity	Major Impact Intensity
		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.	quality standards as required by the CWA. 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.	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 the Environmental Protection Agency's (EPA's) *de minimis* criteria for a general conformity determination under the Clean Air Act (40 CFR §93.153).	The impact on air quality could be measurable and limited to local and adjacent areas. Emissions of criteria pollutants could be at EPA's *de minimis* criteria levels for general conformity determination.	The impact on air quality could be measurable over a widespread area. Emissions are high, such that they could exceed EPA's *de minimis* criteria for a general conformity determination.

Resource	Impact Duration	Minor Impact Intensity	Moderate Impact Intensity	Major Impact Intensity
Noise	<u>Short-term</u>: During construction period. <u>Long-term</u>: Over the life of the project or longer.	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.
<u>Biological Resources</u>				
Habitats	<u>Short-term</u>: Lasting less than two growing seasons. <u>Long-term</u>: Lasting longer than two growing seasons.	Impacts on native vegetation may be detectable, but could not alter natural conditions and could be limited to localized areas. Infrequent disturbance to individual plants could be expected, but would not affect local or range-wide population stability. Infrequent or insignificant one-time disturbance to locally suitable habitat could occur, but sufficient habitat could remain functional at both the local and regional scales to maintain the viability of the species. Opportunity for increased spread of non- native species could be detectable but temporary and localized and could not displace native species populations and distributions.	Impacts on native vegetation could be measureable 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 range- wide population stability. Some impacts might occur in key habitats, and habitat impacts could negatively affect the viability of the species both locally and throughout its range. Actions could result in the widespread increase of non-native species, resulting in broad and permanent changes to native species populations and distributions.

Resource	Impact Duration	Minor Impact Intensity	Moderate Impact Intensity	Major Impact Intensity
Wildlife Species (Including Birds)	Short-term: Lasting up to two breeding seasons, depending on length of breeding season. Long-term: Lasting more than two breeding seasons.	Impacts to native species, their habitats, or the natural processes sustaining them could be detectable, but localized, and could not measurably alter natural conditions. Infrequent responses to disturbance by some individuals could be expected, but without interference to feeding, reproduction, resting, migrating, or other factors affecting population levels. Small changes to local population numbers, population structure, and other demographic factors could occur. Sufficient habitat could remain functional at both the local and range-wide scales to maintain the viability of the species. Opportunity for increased spread of non-native species could be detectable but temporary and localized, and these species could not displace native species populations and distributions.	Impacts on native species, their habitats, or the natural processes sustaining them could be measureable but limited to local and adjacent areas. Occasional responses to disturbance by some individuals could be expected, with some negative impacts to feeding, reproduction, resting, migrating, or other factors affecting local population levels. Some impacts might occur in key habitats. However, sufficient population numbers or habitat could retain function to maintain the viability of the species both locally and throughout its range. Opportunity for increased spread of non-native species could be detectable and limited to local and adjacent areas, but could only result in temporary changes to native species population and distributions.	Impacts on native species, their habitats, or the natural processes sustaining them could be detectable and widespread. Frequent responses to disturbance by some individuals could be expected, with negative impacts to feeding, reproduction, migrating, or other factors resulting in a decrease in both local and range-wide population levels and habitat type. Impacts could occur during critical periods of reproduction or in key habitats and could result in direct mortality or loss of habitat that might affect the viability of a species. Local population numbers, population structure, and other demographic factors might experience large changes or declines. Actions could result in the widespread increase of non-native species resulting in broad and permanent changes to native species populations and distributions.

Resource	Impact Duration	Minor Impact Intensity	Moderate Impact Intensity	Major Impact Intensity
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 wide-scale area, possibly river-basin-wide. Disturbances could result in a decrease in fish species diversity and populations. The viability of some species could be affected. Species movements could be seasonally constrained or eliminated. Actions could result in the widespread increase of non-native species resulting in broad and permanent changes to native species populations and distributions.
Protected Species	Short-term: Lasting up to one breeding/growing season. Long-term: Lasting more than one breeding/growing season.	Impacts on protected species, their habitats, or the natural processes sustaining them could be detectable, but small and localized, and could not measurably alter natural conditions. Impacts could likely result in a “may affect, not likely to adversely affect” determination for at least one listed species.	Impacts on protected species, their habitats, or the natural processes sustaining them could be detectable and some alteration in the numbers of protected species or occasional responses to disturbance by some individuals could be expected, with some negative impacts to feeding, reproduction, resting, migrating, or other factors affecting local and adjacent population levels. Impacts	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.

Resource	Impact Duration	Minor Impact Intensity	Moderate Impact Intensity	Major Impact Intensity
			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.	Results in an "is likely to jeopardize proposed or listed species/adversely modify proposed or designated critical habitat (impairment)" determination for at least one listed species.
Socioeconomic Resources				
Socioeconomics and Environmental Justice*	Short-term: During construction period. Long-term: Over the life of the project or longer.	A few individuals, groups, businesses, properties, or institutions could be affected. Impacts could be small and localized. These impacts are not expected to substantively alter social and/or economic conditions. Actions could not disproportionately affect minority and low-income populations.	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. Actions could disproportionately affect minority and low-income populations. However, the impact could be temporary and localized.	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. Actions could disproportionately affect minority and low-income populations, and this impact could be permanent and widespread.

Resource	Impact Duration	Minor Impact Intensity	Moderate Impact Intensity	Major Impact Intensity
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	Moderate Impact Intensity	Major Impact Intensity
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.

Resource	Impact Duration	Minor Impact Intensity	Moderate Impact Intensity	Major Impact Intensity
Marine Transportation	<u>Short-term</u>: During construction period. <u>Long-term</u>: 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	<u>Short-term</u>: During construction period. <u>Long-term</u>: Over the life of the project or longer.	There could be a change in the viewshed 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 viewshed that was readily apparent and attracts attention. Changes could not dominate the viewscape, although they could detract from the current user activities or experiences.	Changes to the characteristic views could dominate and detract from current user activities or experiences.
Public Health and Safety, Including Flood and Shoreline Protection	<u>Short-term</u>: During construction period. <u>Long-term</u>: Over the life of the project or longer.	Actions could not result in 1) soil, groundwater, 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, groundwater,	Project construction and operation could result in 1) exposure, mobilization and/or migration of existing contaminated soil, groundwater, or surface water to an extent that requires mitigation; and/or 2) could introduce detectable levels of contaminants to soil, groundwater, and/or surface water in localized areas	Actions could result in 1) soil, groundwater, 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, groundwater, or surface water, resulting in exposure of humans or other

Resource	Impact Duration	Minor Impact Intensity	Moderate Impact Intensity	Major Impact Intensity
		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.	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.	sensitive receptors such as plants and wildlife to contaminant levels that could result in health effects; and 3) the presence of contaminated soil, groundwater, 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.

*Notes * Evaluation of potential environmental justice issues will be fully address in future tiered documents.*

Appendix D: Monitoring and Adaptive Management (MAM) Plans

Table of Contents

1 McFaddin Beach and Dune Restoration Monitoring and Adaptive Management Plan

1.1 Introduction

This project Monitoring and Adaptive Management (MAM) plan identifies the monitoring needed to evaluate progress toward meeting project objectives and to support any necessary adaptive management of the restoration project. This plan was developed according to a draft version of the Monitoring and Adaptive Management (MAM) Template and was adapted to fit the needs of the McFaddin Beach and Dune Restoration project.

This MAM Plan is a living document and may be updated as needed to reflect changing conditions and/or new information. Any future revisions to this document will be made publicly available through the DIVER Restoration Portal (https://www.diver.orr.noaa.gov/web/guest/home) and accessible through the Deepwater Horizon NRDA Trustees website (http://www.restoration.noaa.gov/dwh/storymap/).

1.1.1 Project Overview

The McFaddin Beach and Dune Restoration project as presented in the RP/EA, would include placement of sand along approximately 17 miles of shoreline in northeastern Texas. The Texas TIG would partner with other funding sources to complete construction implementation, monitoring, and/or planning activities. This project would provide important ecological benefits by restoring lost beach and dune habitat and by helping to slow or stop marsh and land loss in McFaddin NWR's interior marshes. This project is being implemented as restoration for the *Deepwater Horizon* oil spill Natural Resource Damage Assessment (NRDA), consistent with the PDARP/PEIS.

- Programmatic goal: Restore and Conserve Habitat
- Restoration type: Wetlands, Coastal, and Nearshore Habitats
- Restoration approach: Restore and Enhance Dunes and Beaches
- Restoration technique: Renourish Beaches through Sediment Additional
- TIG: Texas TIG
- Restoration plan: Texas Trustee Implementation Group Final 2017 Restoration Plan/Environmental Assessment: Restoration of Wetlands, Coastal, and Nearshore Habitats; and Oysters

This restoration project is being implemented along the Gulf of Mexico shoreline within the Chenier Plain of southeast Texas. The Chenier Plain was formed over many years by the reworking of riverine sediments. Higher ridges were comprised of the coarse, large-grained sediments while the mudflats and marshes were formed by the fine-grained materials. The project includes the construction of a dune ridge that borders and protects the largest contiguous estuarine marsh complex in Texas. The estuarine marsh complex includes freshwater to estuarine marsh, coastal prairie grasslands, oak ridges, tidal flats, lakes, creeks, basins, and associated aquatic vegetation. The project is located on the upper Texas coast, south of the JD Murphree WMA and Sea Rim State Park, along the beach face of McFaddin NWR (Figure 1-1).

Figure 1-1. Map showing the location of the McFaddin Beach and Dune Restoration project in Jefferson County.

1.1.2 Restoration Type Goals and Project Restoration Objectives

The restoration goals to restore and conserve wetland and nearshore habitats were established in the PDARP. The McFaddin Beach and Dune Restoration project objective and goal is to continue ongoing efforts to restore beach and dune habitat along the seaward side of the McFaddin National Wildlife Refuge (NWR) to historical elevations to reduce the frequency of seawater overwash into the fresh to intermediate salinity wetland habitats within the refuge behind the beach. This project goal was evaluated in Section 3.3.4.4.2 of the RP/EA (TX TIG 2017) and determined to be consistent with the programmatic restoration goals as presented in the PDARP.

1.1.3 Conceptual Setting and Anticipated Outcomes

Historically, the beach ridge separating the Gulf of Mexico from interior marshes was much higher in elevation than it is today. Human activities and natural processes have resulted in the loss of dunes and removal of sand from the beach face on the shoreline near McFaddin NWR. Currently, the project area consists of clay overlain at most by a thin sand veneer. This project is anticipated to restore the dunes and sandy beach habitat.

Based on previous restoration experience by the Texas TIG with similar projects in this area, the outcomes anticipated for this project are typical of this restoration type. As such, performance parameters identified in subsequent sections are sufficient to describe anticipated outcomes.

1.1.4 Sources of Uncertainties

The uncertainties associated with the project and how they would be addressed are discussed in Sections 3.3.4.1 and 3.3.4.4.3 of the RP/EA. The largest sources of uncertainty with this project are future relative sea level rise and the impact of hurricanes. The variability in predicted future increases in eustatic sea level rise combined with potential regional and localized subsidence could result in lowering of elevations of the restoration site resulting in an increase in the frequency of maintenance events needed to maintain adequate elevations. Erosion from hurricanes could cause significant geomorphic change to the restored beach. If monitoring indicates lower than predicted elevations following initial construction and after storm impacts, then provisions through other funding sources could be made to add additional material to the restoration site to adjust the project grade to the desired elevation range.

1.2 Adaptive Management

As discussed in the PDARP/PEIS, adaptive management is a form of structured decision-making applied to the management of natural resources in the face of uncertainty (Pastorok et al. 1997; Williams 2011). It is an iterative process that integrates monitoring and evaluation of management actions with flexible decision-making, where adjustments are made to management approaches based on observed outcomes (NRC 2004). Within the context of ecological restoration, adaptive management addresses key uncertainties by linking science to restoration decision-making (Steyer and Llewellyn 2000; Thom et al. 2005).

Although adaptive management is an important component of the restoration plan as a whole, the need for adaptive management will vary on a project by project basis. The need for adaptive management will be evaluated once construction is complete and will be implemented through an iterative process based on the results of a recent pilot project in this immediate area and nearby on Bolivar Peninsula and Galveston Island. Monitoring parameters will be evaluated as the information is gathered. Based upon this evaluation, the need for corrective action will be determined through Trustee consensus. The outcomes anticipated for this project are anticipated to be typical of this restoration technique. Data, analysis, and information obtained from monitoring may be used to help inform future Restoration Plan development, priorities, and project selection.

1.3 Project Monitoring

The monitoring plan for this restoration project was developed to evaluate project performance. For each of the identified monitoring parameters, information is provided on the intended purpose of each monitoring parameter, monitoring methods, timing and frequency, duration, sample size, and sites. The parameters listed below may or may not be tied to performance criteria.

Parameter #1: Physical Site Characteristics and Infrastructure

a) Purpose: To monitor number of acres and elevation of dunes and beach restored; to verify that dunes were built to the height designed.

b) Method:
   1. A final inspection and post construction as-built survey by a professional engineer (PE) will be performed to document completion, including total number of acres constructed
   2. Topographic survey to verify elevation
   3. Visual inspections of specific physical features such as dune location, beach habitat, dune height, etc.

c) Timing, Frequency, and Duration:
   1. A final inspection will occur once, post construction.
   2. A topographic survey will occur once, post construction.
   3. Visual inspections of specific physical features will occur at least once annually during the 5-year monitoring period by at least one member of the project team.

d) Sample Size: Construction area

Sites: Construction area

Parameter #2: Elevation

a) Purpose: To determine the stability of the beach sand, determine shoreline position, and establish the schedule for re-nourishment maintenance events. This is determined by tracking changes in volume and elevations along the upper and lower beach. Monitoring for this parameter will also track sediment transport via natural processes over time and detect changes that might cause significant changes to the project’s intended purpose.

b) Method:
   1. The Implementing Trustee will work with the project partners, project engineer, and construction contractor to review interim topographic survey data within the footprint of the engineered beach template during construction to verify design criteria have been met. A final inspection and a post construction as-built topographic survey by a professional Engineer (PE) will be performed to document successful completion.
   2. Bi-annual post-construction topographic surveys will be conducted by a PE to document project area conditions and monitor project area elevations. Surveys should be completed using the coordinate system NAD83, Texas South Central Plane or Texas South Plane as appropriate, NAVD88, units feet. Topographic and bathymetric data should be surveyed every 1,000 feet along the shoreline. Topographic surveys should begin at the landward edge of the base of the dune, or the edge of vegetation if no dune is present, or on the landward edge of a hard coastal defense structure such as a revetment or seawall, and extend seaward along the transect line until 0 ft. NAVD88 is surveyed or to wading depth, whichever is further seaward. Survey data should be continuous along the transect lines with no appreciable gaps. Additionally, the location of the Mean Higher High Water (MHHW) elevation should be noted in every survey transect. Surveys should be completed along the baseline specified for each reach.

Transect lines should be perpendicular to the baseline. The bathymetric survey transects should extend seaward perpendicular to the baseline, overlap the topographic transect, and extend to the depth of closure of -23 ft. NAVD88. Bathymetric data should be corrected for wave and tidal influences if applicable.

3. Annual visual inspections of specific physical features such as the beach platform and dunes will be conducted by project managers. Bi-annual field and aerial imagery (which could include drone, UAV platforms, or satellites) will be taken to document features and conditions post construction and over the 5-year monitoring period.

c) Timing, Frequency, and Duration:
   1. Design criteria will be evaluated during construction and upon completion of construction of the physical infrastructure and all punch list items have been adequately addressed prior to issuance of the certificate of substantial completion.
   2. As-built topographic survey, visual inspection, and field and aerial imagery will be conducted at the completion of construction.
   3. Bi-annual topographic-bathymetric surveys, annual visual inspections, and bi-annual field and aerial imagery will be conducted over the 5-year monitoring period. Surveys should be conducted at the same time of year, ideally in May, to reduce seasonal variations in the beach morphology and shoreline position. May was also selected since the weather is generally calm and is prior to hurricane season, which allows for a pre-storm beach survey to document conditions if a storm were to occur.

d) Sample Size: Construction area.

e) Sites:
   1. The entire construction area will be covered by aerial imagery.
   2. As-built and monitoring topographic-bathymetric survey data will be collected on transects spaced at a minimum every 1,000 feet along the shoreline with survey points recorded at a minimum of every 50 feet of the transect line. Transect lines established during the as-built survey will be reoccupied during subsequent monitoring survey events.
   3. Ground photo locations will be determined prior to the initiation of the monitoring period with additional photographs collected as needed during monitoring visits.

Parameter #3: Planted vegetation survival

a) Purpose: To ensure planted dune vegetation is surviving.

b) Method: No less than forty 50 m^2 subplots will be established within the area(s) planted with dune vegetation. The number of plants placed within each subplot will be documented within 10 days of planting. Survival monitoring will occur within 80 to 100 days post-planting at which time the number of living and “dead-looking” individuals with in each subplot will be documented. If the number of living individuals within a subplot at the time of survival monitoring is less than 80% of the number planted, then a minimum of “dead-looking” individuals from the quadrant will be exhumed for visual inspection for live roots or shoots.

“Dead-looking” individuals with live roots or shoots will be considered as living and replanted.

c) Timing, Frequency, and Duration: Between 80 to 100 days after planting.
d) Sample Size: 50 m^2 subplots
e) Sites: Up to forty-50 m^2 subplots within the area(s) planted

Parameter #4: Acres of dune habitat created

a) Purpose: To monitor aerial extent of restored dune habitat and to verify that structures (sediment placement locations) were built as designed. Data will also be used to monitor for any changes such as erosion that might cause significant changes to the project’s intended purpose.
b) Method:
    1. Aerial photography (including drone/UAV platforms) will be taken to document features and conditions post construction and over the 5-year monitoring period. Aerial photography collected for monitoring events will be analyzed via geographic information system to determine the extent of vegetated marsh habitat.
    2. Visual site inspections of specific physical features such as dune restoration areas will be conducted by project managers. Field photography will be used to document site conditions at the time of visual site inspections.
c) Timing, Frequency, and Duration:
    1. Four annual monitoring visual site inspections and aerial photographic surveys will be conducted over the 5-year monitoring period near the end of the growing season. The first annual monitoring visual site inspection and aerial photographic survey will occur during the first growing season no earlier than one year post-construction.
d) Sample Size: Construction area.
e) Sites:
    1. The entire construction area will be covered by aerial photography.
    2. Ground photo locations will be determined prior to the initiation of the monitoring period with additional photographs collected as needed during monitoring visits.

1.4 Evaluation

The proposed analysis methods for each of the monitoring parameters are included below and will be updated as necessary:

Physical Site Characteristics and Infrastructure: Pre-construction engineering documents which may include project location, planned elevation, etc., will be compared with post-construction site inspection and survey documents to verify the substrate was restored to planned specifications. Visual inspections will be used as an additional evaluation method to determine if the constructed features are functioning as designed.

Elevation: This parameter will be evaluated through collaborative interaction among the project stakeholders during, at the completion of construction, and over the five-year monitoring period.

Topographic surveys will be conducted during construction to verify the structures were built as designed and target elevations for sediment fill material were achieved. Periodic meetings will be held during construction with the construction contractor project manager, project engineer, and Implementing Trustee to monitor construction progress and review interim topographic survey data to determine if any changes in construction methodology or design criteria are needed to ensure that the specified volume of sand is placed within the engineered beach template. The Implementing Trustee will work with the project partners, project engineer, and contractor to verify that all construction deficiencies have been adequately addressed prior to issuance of the certificate of substantial completion. A final inspection and post construction as-built topographic survey by a PE will be performed to document successful completion of construction.

As-built and monitoring topographic survey data will be collected on shore-perpendicular transects spaced at 1,000-foot intervals with survey points recorded at a minimum of every 50 feet of the transect line. Transect lines established during the as-built survey will be reoccupied during subsequent monitoring survey events. Aerial photography (including drone/UAV platforms) will be collected after construction to document site features. The Implementing Trustee will conduct four biannual monitoring topographic-bathymetric surveys and aerial photography collection events over the five-year monitoring period with the first monitoring survey and aerial photo collection beginning one year post construction. The Implementing Trustee and project partners will review the monitoring data results to determine if project performance criteria have been met or if any corrective action is warranted. Elevation data will also be compared with data from nearby tide gauges to and visual observations determine if any overwash events occurred between monitoring surveys.

Planted vegetation survival: The Implementing Trustees will work with the project partners and vegetation planting contractor to ensure adequate survival of planted dune vegetation. A minimum of forty 50 m^2 subplots will be established within the area(s) planted with vegetation. The number of plants placed within each subplot will be documented within 10 days of planting. Survival monitoring will occur within 80 to 100 days post-planting at which time the number of living and “dead-looking” individuals with in each subplot will be documented. If the number of living individuals within a subplot at the time of survival monitoring is less than 80% of the number planted, then a minimum of “dead-looking” individuals from the subplot will be exhumed for visual inspection for live roots or shoots. “Dead-looking” individuals with live roots or shoots will be considered as living and replanted. The Implementing Trustees will work with the project partners and vegetation planting contractor to review vegetation survivability data to determine if additional plantings of vegetation or other corrective action is warranted.

Acres of dune habitat created: Aerial photography, site visits, and ground photography will be used to monitor the aerial extent of restored dune habitat and to verify that structures (sediment placement locations) were built as designed. Monitoring data will also be used to detect any changes such as erosion that might cause significant changes to the project’s intended purpose. Areas considered dune habitat consist of areas defined in engineering and design documents. The primary method of determining the amount of dune habitat created will be through the digital processing of aerial photography data via GIS. Site visits and ground photography will be used to ground-truth the air photo and GIS data and determine if project performance criteria have been met.

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

This project will be considered successful when up to 20 miles of shoreline and beach and dune habitat have been restored with 70% vegetation coverage at the end of the five-year monitoring period. Project monitoring parameters will be evaluated based upon project design, contractual obligations, and project performance criteria. The need for corrective action will be determined by consensus of the Texas TIG to ensure that project performance criteria in Table 1-1 are adhered to and the project is performing as intended.

Table 1-1. Summary of project monitoring parameters, performance criteria, and potential corrective actions

Monitoring Parameter	Final Performance Criteria	Interim Performance Criteria	Potential corrective actions or mid-course corrections*
Physical site characteristics and infrastructure	The project is constructed per design specifications. At the end of the 5-year monitoring period, the infrastructure is stable and is performing as expected.	The project is constructed per design specifications.	Reshaping of sediments, adding additional sediments
Elevation	Distance from baseline to MHHW contour is greater than 50% of distance recorded at time of as-built survey. Beach platform at base of dunes at design elevation and dune crest elevations no more than 2 feet less than as-built elevations. Reduce the frequency of overwash events.	Distance from baseline to MHHW contour. Beach platform and dunes constructed to design elevations.	Additional sediments
Planted vegetation survival	Percent of surviving planted individuals at or above 75 %, between 80 to 100 calendar days after planting event(s)	75 % survival between 80 to 100 calendar days after planting event(s)	Replanting/reseeding
Acres of Dune Habitat Created	Final goal acreage will be determined in engineering and design phase.	As documented in engineering and design phase.	Additional sediments

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

1.6 Monitoring Schedule

The schedule for the project monitoring activities is shown in Table 1-2. Pre-execution monitoring will occur before construction, if applicable. Execution monitoring occurs post construction (Year 0). This timeframe may vary for different parameters. Performance monitoring (PM) will occur in the years following initial project execution (Years 1 - 5).

Table 1-2. Monitoring Schedule

Monitoring Parameter	Pre-execution Monitoring	Execution Monitoring (as built)	PM Year 1	PM Year 2	PM Year 3	PM Year 4	PM Year 5
Physical Site Characteristics and Infrastructure	N/A	X	X	X	X	X	X
Elevation	X	X	N/A	X	N/A	X	N/A
Planted Vegetation Survival	X	X	N/A	N/A	N/A	N/A	N/A
Acres of dune habitat created	N/A	X	X	X	X	X	X

1.7 Data Management

1.7.1 Data Description

Data collected with this project will be generated through site visits, topographic surveys, aerial imagery, ground photography, and vegetation surveys. Monitoring data collection will occur as shown in Table 1-2 and be included in the Annual Activity Summaries supplied to the NOAA Diver Restoration Portal. The data collection will occur as described in Section 2. To the extent practicable, all environmental and biological data generated during monitoring activities will be documented using standardized field datasheets. If standardized datasheets are unavailable or not readily amendable to record project-specific data, then project-specific datasheets will be drafted prior to conducting any project monitoring activities. Original hardcopy data, digital data, and photographs will be retained by the GLO as the Implementing Trustee.

1.7.2 Data Review and Clearance

Relevant project data that are handwritten on hardcopy datasheets or notebooks will be transcribed into standard digital format. After transcription of the data, the electronic data sheets will be verified against the original hardcopy datasheets and/or notebooks, and any validation and transcription errors will be corrected as appropriate before data are used for any analyses published to the DIVER Restoration Portal. The GLO will verify and validate MAM data and information and will ensure that all data are i) entered or converted into agreed upon/commonly used digital format; and ii) labeled with metadata to the extent practicable and in accordance with GLO agency requirements.

After all identified errors are addressed, data are considered to be QA/QC'd. The implementing Trustee will give the other 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.

1.7.3 Data Storage and Accessibility

Once all data have been QA/QC'd and appropriate metadata has been developed, the data will be submitted to DIVER. In addition to geospatial data following FGDC/ISO standards, appropriate metadata could include a data dictionary (defines codes and fields used in the dataset), and/or a Readme file as appropriate (e.g., how data was collected, QA/QC procedures, other information about data such as meaning, relationships to other data, origin, usage, and format – can reference different documents).

1.7.4 Data Sharing

Data will be made publicly available, in accordance with the Federal Open Data Policy, through the DIVER Explorer Interface within one year of when the data collection occurred. In the event of a public records request related to data and information on a project that is not already publicly available, the trustee to whom the request is addressed will provide notice to the other TIG trustees as soon as is practicable after releasing any project data that is the subject of the request.

1.8 Reporting

Within a year of data collection, monitoring data will be provided on the annual activity update within the DIVER Restoration Portal. One final summary report will be generated for this project within one year of monitoring activities being concluded. This report will be made publicly available through the DIVER Restoration Portal.

1.9 Roles and Responsibilities

GLO is the Implementing Trustee for this project and will be responsible execution of the monitoring and adaptive management plan.

1.10 References

Pastorok, R. A., A. MacDonald, J. R. Sampson, P. Wilber, D. J. Yozzo, and J. P. Titre. 1997. An ecological decision framework for environmental restoration projects. Ecological Engineering 9:89-107.

Steyer, G. D. and D. W. Llewellyn, Coastal Wetlands Planning, Protection, and Restoration Act: A programmatic application of adaptive management: Ecological Engineering [Ecol. Eng.], vol. 15, no. 3-4, pp. 385-395, Jul 2000.

Texas Trustee Implementation Group (TX TIG). 2017. *Deepwater Horizon Oil Spill* Natural Resource Damage Assessment, Texas Trustee Implementation Group, Final 2017 Texas Restoration Plan/Environmental Assessment: Restoration of Wetlands, Coastal, and Nearshore Habitats; and Oysters.

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Coastal Research, Special Issue No. 40. Coastal restoration: Where have we been, where are we now, and where should we be going? pp 94-108.

Williams, B.K. 2011. Adaptive management of natural resources: framework and issues. J. Environ. Manag. 92, 1346–1353.

2 Bessie Heights Wetland Restoration Monitoring and Adaptive Management Plan

2.1 Introduction

This project Monitoring and Adaptive Management (MAM) plan identifies the monitoring needed to evaluate progress toward meeting project objectives and to support any necessary adaptive management of the restoration project. This plan was developed according to a draft version of the MAM Template and was adapted to fit the needs of the Bessie Heights Wetland Restoration project.

This MAM Plan is a living document and may be updated as needed to reflect changing conditions and/or new information. Any future revisions to this document will be made publicly available through the DIVER Restoration Portal (https://www.diver.orr.noaa.gov/web/guest/home) and accessible through the Deepwater Horizon NRDA Trustees website (http://www.restoration.noaa.gov/dwh/storymap/).

2.1.1 Project Overview

The Bessie Heights Wetland Restoration project would restore wetlands in Bessie Heights Marsh located within the Lower Neches Wildlife Management Area (WMA) in Orange County, Texas. The project as presented in the RP/EA would beneficially use sediment obtained from dredging of the federally managed Sabine-Neches Waterway (SNWW), and mining dredged material from dredged material placement areas (DMPAs) and private navigation channels and berths to restore coastal wetlands. The placement of dredged material, construction of containment levees, and associated planting would restore up to 900 acres of intertidal marsh. This project is being implemented as restoration for the *Deepwater Horizon* oil spill Natural Resource Damage Assessment (NRDA) and is consistent with the PDARP/PEIS.

This project is intended to restore habitats and resources injured from the *Deepwater Horizon* oil spill, including estuarine wetlands. Additional ecosystem services that may be provided include habitat restoration for a variety of ecologically and economically important fauna such as birds, fish, crabs, and many other species. Information specific to this project is listed below.

- Programmatic goal: Restore and Conserve Habitat
- Restoration type: Wetlands, Coastal, and Nearshore Habitats
- Restoration approach: Create, Restore, or Enhance Coastal Wetlands
- Restoration technique: Create or enhance coastal wetlands through placement of dredged material
- TIG: Texas TIG
- Restoration plan: Texas Trustee Implementation Group Final 2017 Restoration Plan/Environmental Assessment: Restoration of Wetlands, Coastal, and Nearshore Habitats; and Oysters

This project will be implemented in the Nelda Stark Unit of the Lower Neches WMA in Orange County, which comprises approximately 3,375 acres and is located along the eastern bank of the Neches River approximately 5 miles north of the confluence of the Neches and Sabine Rivers at Sabine Lake (Figure 2-1). This project would route up to 4.8 million cubic yards of hydraulically dredged material excavated from US Army Corps of Engineers (USACE) maintenance dredging at several stations along the SNWW to sediment containment levees (cells) in Bessie Heights. Sediment would be placed within these containment areas to build bottom elevations suitable for marsh growth as determined from adjacent natural wetlands. Portions of the dredged material would be placed above intertidal elevation for restoration of salt flat marsh/sand flat habitat in addition to intertidal smooth cordgrass marsh and would also allow for the migration of intertidal marsh to higher elevations in response to sea level rise. Project actions would restore up to 900 acres of intertidal wetland habitat.

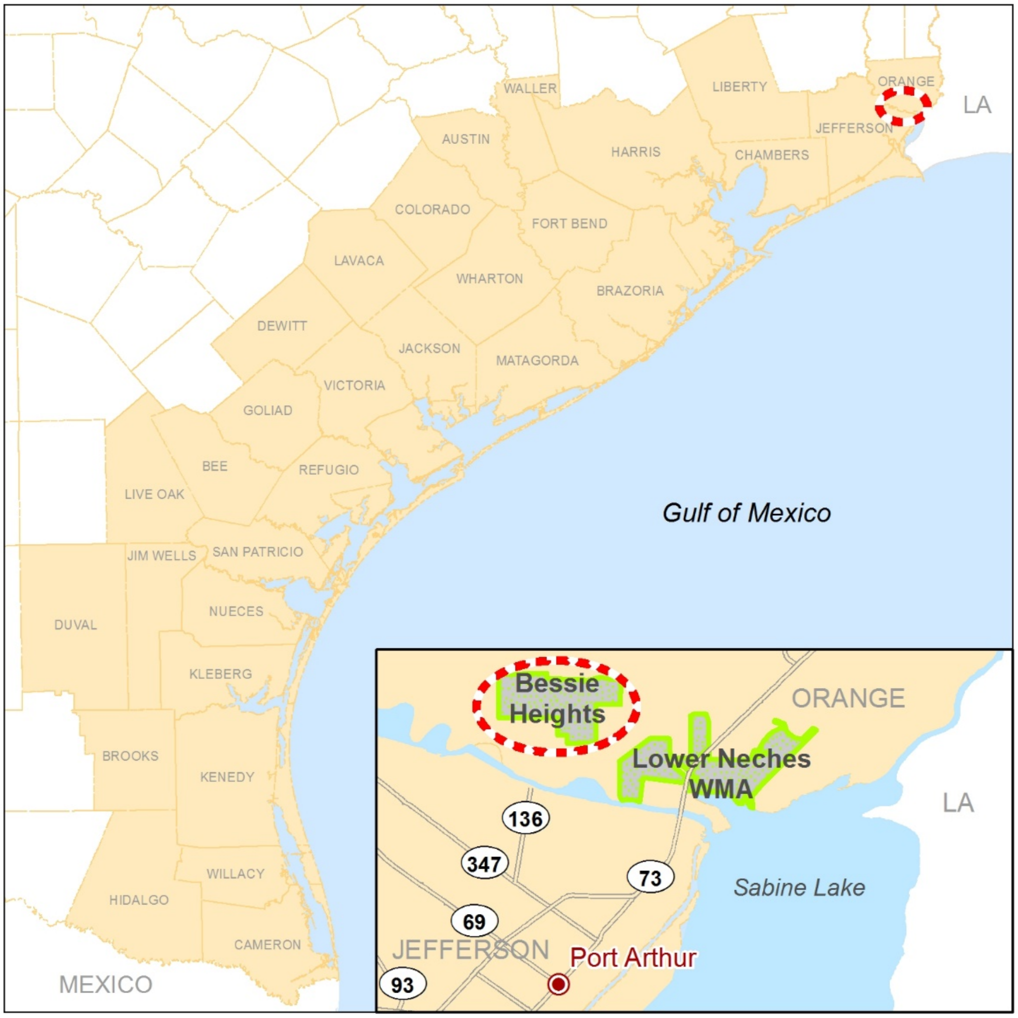

Figure 2-1. Map showing the location of the Bessie Heights Wetland Restoration project in Orange County.

2.1.2 Restoration Goals and Objectives

The restoration goals to restore and conserve wetland and nearshore habitats were established in the PDARP. The Bessie Heights Wetland Restoration project objective and goal is to continue ongoing efforts to return current open-water habitat in the Lower Neches WMA to marsh elevations to support habitat restoration and revegetation with smooth cordgrass (i.e., *Spartina alterniflora)*. This project goal was evaluated in Section 3.3.5.4.2 of the RP/EA (TX TIG 2017) and determined to be consistent with the programmatic restoration goals as presented in the PDARP.

2.1.3 Conceptual Setting and Anticipated Outcomes

This project would contribute to an ongoing, large-scale conservation effort to restore marsh and wetland habitat in the Lower Neches WMA. For the lower Neches River, from Beaumont to Sabine Lake, significant systematic change occurred between the 1950s and the 2000s as marsh was lost (reduced from 10,184 hectares (ha) to 4,279 ha) and converted to open water (increased from 694 ha to 5,080 ha). The largest degree of marsh loss was in the vicinity of the Lower Neches WMA where oil and gas production in the Port Neches Oil field caused subsidence via the activation of a pair of high-angle faults that promoted marsh flooding and conversion to open water. The proposed project would be a continuation of other marsh restoration efforts in the area. Subsidence rates would be considered during the design of the project. The anticipated outcome is the creation of up to 900 acres of intertidal and high marsh.

2.1.4 Sources of Uncertainty

The uncertainties associated with the project and how they would be addressed are discussed in Sections 3.3.5.1 and 3.3.5.4.3 of the RP/EA. This project is technically feasible and has a high probability of success with few uncertainties. Remaining uncertainties that can be resolved through adaptive management are addressed through the corrective actions described below.

2.2 Adaptive Management

As discussed in the PDARP/PEIS, adaptive management is a form of structured decision-making applied to the management of natural resources in the face of uncertainty (Pastorok et al. 1997; Williams 2011). It is an iterative process that integrates monitoring and evaluation of management actions with flexible decision-making, where adjustments are made to management approaches based on observed outcomes (NRC 2004). Data, analysis, and information obtained from monitoring may be used to help inform future Restoration Plan development, priorities, and project selection.

Adaptive management beyond standard corrective actions will most likely not be necessary for this project because the Texas TIG has experience with similar projects in this immediate area and the outcomes anticipated for this project are typical of this restoration technique.

2.3 Project Monitoring

The monitoring plan for this restoration project was developed to evaluate project performance. For each of the identified monitoring parameters, information is provided on the intended purpose of each monitoring parameter, monitoring methods, timing and frequency, duration, sample size, and sites. The parameters listed below may or may not be tied to performance criteria.

Parameter #1: Physical Site Characteristics and Infrastructure

a) Purpose: To monitor number of acres and elevation of marsh restored; to verify that structures (containment berms, water control structures, sediment placement locations, etc.) were built and are functioning as designed.

b) Method:
   1. A final inspection and post construction as-built survey by a professional engineer (PE) will be performed to document completion, including total number of acres constructed
   2. Topographic survey to verify elevation
   3. Visual inspections of specific physical features such as containment berms, water control structures, sediment placement locations, marsh restoration areas, etc.

c) Timing, Frequency, and Duration:
   1. A final inspection will occur once, post construction.
   2. A topographic survey will occur once, post construction.
   3. Visual inspections of specific physical features will occur at least once annually during the 5-year monitoring period by at least one member of the project team.

d) Sample Size: Construction area

e) Sites: Construction area

Parameter #2: Vegetation survival

a) Purpose: To verify survival of planted vegetation

b) Method: Estimates of vegetation survival obtained by visual inspection and documented through the use of photography may be used as a first check to determine if performance criteria is met. If these estimates are not sufficient to accurately determine if performance criteria have been met, then subplot stations will be established within the areas(s) planted with vegetation.

c) Timing, Frequency, and Duration: Initial inspection to occur one time between 80 to 100 days after planting. Additional inspections may be conducted as needed

d) Sample Size: construction area

e) Sites: Number and location of sites (e.g., plots, survey areas, observation stations) will be finalized prior to the initiation of the monitoring period

Parameter #3: Percent vegetation cover

a) Purpose: To monitor vegetation cover over time

b) Method: Estimates of vegetation cover obtained by visual inspection and documented through the use of photography may be used as a first check to determine if performance criteria is met. If these estimates are not sufficient to accurately determine if performance criteria have been met, then a more detailed sampling method will be developed. Methods may include the use of aerial imagery, photography, quadrats, or preselected stations, as necessary.

c) Timing, Frequency, and Duration: Annual vegetation percent cover field observation surveys will be conducted during the 5-year monitoring period. The first vegetation percent cover survey will occur during the first growing season approximately one year after planting. Aerial imagery may be collected as available, no more than annually, throughout the duration of the monitoring period.

d) Sample Size: construction area

e) Sites: construction area

Parameter #4: Non-native Invasive plant species

a) Purpose: To monitor for presence of non-native invasive species
b) Method: Record the presence of non-native invasive plant species using presence/absence surveys. Presence and absence of non-native invasive plant cover obtained by visual inspection will be documented and may be used as a first check to determine if performance criteria is met. If non-native invasive species are determined to be present, then a more detailed sampling method will be developed. Methods may include the use of aerial imagery, photography, quadrats, or preselected stations, as necessary.
c) Timing, Frequency, and Duration: Annual surveys will be conducted during the 5-year monitoring period
d) Sample Size: construction area
e) Sites: construction area

Table 2-1. Summary of project monitoring parameters, performance criteria, and potential corrective actions

Monitoring Parameter	Final Performance Criteria	Interim Performance Criteria	Potential corrective actions or mid-course corrections*
Physical site characteristics and infrastructure	The project is constructed per design specifications. At the end of the 5-year monitoring period, the infrastructure is stable and is performing as expected.	The project is constructed per design specifications.	Reshaping of sediments, adding additional sediments, breaching of containment berms, and removal of water containment structures
Vegetation survival	Percent of surviving planted individuals at or above 75 %, between 80 to 100 calendar days after planting event(s)	75% survival between 80 to 100 calendar days after planting event(s)	Replanting/reseeding
Percent vegetation cover	Percent cover would be maintained at or above 70% of noninvasive species, 5 years after planting activities initiated	50% aerial coverage of the targeted vegetation 3 years post-planting	Replanting/reseeding, invasive species removal
Non-native Invasive plant species	Less than 5% plant cover of non-native invasive plant species	Less than 5% plant cover of non-native invasive plant species	Removal of non-native invasive plant species to 5% cover

** Potential corrective actions are not limited to those listed*

2.4 Evaluation

The proposed evaluation methods for each of the monitoring parameters are included below. Monitoring data will be compared with performance criteria to determine whether a corrective action should be considered.

Physical Site Characteristics and Infrastructure: Pre-construction engineering documents which may include project location, planned elevation, levee and berm design, etc., will be compared with post-construction site inspection and survey documents to verify the substrate was restored to planned specifications. Visual inspections will be used as an additional evaluation method to determine if the constructed features are functioning as designed.

Vegetation Survival: Number of surviving plantings will be divided by the total number of plantings to determine the percent survival.

Percent vegetation cover: Visual observations from field stations, photography, or aerial imagery may be used to estimate percent cover. If quadrats are used to determine percent cover for the entire site, an appropriate sampling design and analysis method will be determined at that time. Information about the sampling design and analysis method will be provided on DIVER.

Non-Native Invasive plant species: Monitoring data will be reviewed for the presence of invasive plant species. If invasive plant species are observed, a more detailed review or sampling will occur to determine if presence is greater than 5%. This could involve more detailed on the ground visual observations.

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

This project will be considered successful when up to 900 acres of estuarine marsh habitat is created with up to 70% vegetation coverage with no more than 5% non-native invasive plant coverage at the end of the five-year monitoring period. Project monitoring parameters will be evaluated based upon project design, contractual obligations, and project performance criteria. The need for corrective action will be determined by consensus of the Texas TIG to ensure that project design criteria in Table 2-1 are adhered to and the project is performing as intended.

2.6 Monitoring Schedule

The schedule for the project monitoring activities is shown in Table 2-2. Execution monitoring occurs post construction (Year 0). Post-construction monitoring will occur as the various construction components (defined in the work contracts) are finalized. Implementation of this project may span multiple dredging cycles and monitoring schedules may be staggered accordingly.

After construction completion, a professional Engineer (PE) will perform a final inspection and submit a final construction report, including a post construction as-built survey to document final completion. Performance monitoring will begin after receipt of the construction completion report and after vegetation planting. Performance monitoring (PM) will occur annually following project construction (Years 1-5) after vegetation planting has been completed. The occurrence of a significant storm event may initiate additional ad-hoc surveys.

Table 2-2. Monitoring schedule

Monitoring Parameter	Pre-execution Monitoring	Execution Monitoring (as built)	PM Year 1	PM Year 2	PM Year 3	PM Year 4	PM Year 5
Physical site characteristics and infrastructure	N/A	X	X	X	X	X	X
Vegetation survival	N/A	N/A	X	N/A	N/A	N/A	N/A
Percent vegetation cover	N/A	N/A	X	X	X	X	X
Non-native Invasive plant species	N/A	N/A	X	X	X	X	X

2.7 Data Management

2.7.1 Data Description

Data may be generated through site visits, topographic surveys, aerial photography, ground photography, or vegetation surveys. Data collection will occur as shown in Table 2-2 above and a summary of monitoring activities will be available on the DIVER Restoration Portal. The data collection will occur as described in Section 2.

2.7.2 Data Review and Clearance

If appropriate, project data that are handwritten will be transcribed into a standard digital format. Generated electronic data sheets will be verified against the original hardcopy, and any validation and transcription errors will be corrected as appropriate before data are used for any analyses or published to the DIVER Restoration Portal. Implementing Trustees will verify and validate MAM data and information and will ensure that all data are: i) entered or converted into a commonly used digital format; ii) labeled with metadata to the extent practicable and in accordance with Implementing Trustee agency requirements.

The implementing Trustee will give the other TIG members time to review the data before making such information publicly available in DIVER.

2.7.3 Data Storage and Accessibility

Original hardcopy data, digital data, and photographs will be retained by the Implementing Trustee. In addition to geospatial data following FGDC/ISO standards, appropriate metadata could include a data dictionary (defines codes and fields used in the dataset), and/or a Readme file as appropriate (e.g., how data was collected, QA/QC procedures, other information about data such as meaning, relationships to other data, origin, usage, and format – can reference different documents).

2.7.4 Data Sharing

Data will be made publicly available, in accordance with the Federal Open Data Policy, through the DIVER Restoration Portal. Prior to being made publicly available, any personal identifiable information will be redacted. In the event of a public records request related to data and information on a project that is not already publicly available, the trustee to whom the request is addressed will provide notice to the other TIG trustees as soon as is practicable.

2.8 Reporting

Monitoring data will be provided on an annual basis. One final summary report will be generated for this project within one year of monitoring activities being concluded. This report will include the number of acres restored. These reports will be made publicly available through the DIVER Restoration Portal.

2.9 Roles and Responsibilities

TPWD is the Implementing Trustee for this project and will be responsible execution of this monitoring and adaptive management plan.

2.10 References

Pastorok, R. A., A. MacDonald, J. R. Sampson, P. Wilber, D. J. Yozzo, and J. P. Titre. 1997. An ecological decision framework for environmental restoration projects. Ecological Engineering 9:89-107.

Texas Trustee Implementation Group (TX TIG). 2017. *Deepwater Horizon Oil Spill* Natural Resource Damage Assessment, Texas Trustee Implementation Group, Final *2017* Texas Restoration Plan/Environmental Assessment: Restoration of Wetlands, Coastal, and Nearshore Habitats; and Oysters.

Williams, B. K., 2011. Adaptive management of natural resources: framework and issues. J. Environ. Manag. 92, 1346–1353.

3 Pierce Marsh Wetland Restoration Monitoring and Adaptive Management Plan

3.1 Introduction

This project Monitoring and Adaptive Management (MAM) plan identifies the monitoring needed to evaluate progress toward meeting project objectives and to support any necessary adaptive management of the restoration project. This plan was developed according to a draft version of the Monitoring and Adaptive Management (MAM) Template and was adapted to fit the needs of the Pierce Marsh Wetland Restoration project.

This MAM Plan is a living document and may be updated as needed to reflect changing conditions and/or new information. Any future revisions to this document will be made publicly available through the DIVER Restoration Portal (https://www.diver.orr.noaa.gov/web/guest/home) and accessible through the Deepwater Horizon NRDA Trustees website (http://www.restoration.noaa.gov/dwh/storymap/).

3.1.1 Project Overview

The Pierce Marsh Wetland Restoration project as presented in the RP/EA would restore and conserve wetlands and coastal habitats by beneficially using dredged material to create a viable, vegetated, wetland habitat for a variety of plants, fish, birds, and other wildlife that frequent the area. The placement of dredged material and associated planting would restore up to 150 acres of marsh and contribute to an ongoing effort to restore the wetland complex in West Galveston Bay. This project is being implemented as restoration for the *Deepwater Horizon* oil spill Natural Resource Damage Assessment (NRDA), consistent with the PDARP/PEIS.

- Programmatic goal: Restore and Conserve Habitat
- Restoration type: Wetlands, Coastal, and Nearshore Habitats
- Restoration approach: Create, Restore, or Enhance Coastal Wetlands
- Restoration technique: Create or enhance coastal wetlands through placement of dredged material
- TIG: Texas TIG
- Restoration plan: Texas Trustee Implementation Group Final 2017 Restoration Plan/Environmental Assessment: Restoration of Wetlands, Coastal, and Nearshore Habitats; and Oysters

This restoration project is being implemented within the intertidal and high salt marsh complex adjacent to Highland Bayou in Hitchcock, Texas, on the north side of West Bay of the Galveston Bay System (Figure 3-1). Restoration activities involve the beneficial use of dredged material (BUDM) to restore estuarine marsh complex (intertidal fringe marsh, salt flat marsh, sand flat, and protected shallow water) within a 364-acre area in Pierce Marsh. This project is intended to restore habitats and resources injured from the *Deepwater Horizon* oil spill, including estuarine wetlands. Additional ecosystem services that may be provided include habitat restoration for a variety of ecologically and economically important fauna such as birds, fish, crabs, and many other species.

Figure 3-2 Map showing the location of the Pierce Marsh Wetland Restoration project in Galveston County. Approximate latitude and longitude: 29.307682°, -94.967297°.

3.1.2 Restoration Type Goals and Project Restoration Objectives

The restoration goals to restore and conserve wetland and nearshore habitats were established in the PDARP. The Pierce Marsh Wetland Restoration goal and objective is to continue ongoing efforts to return current open-water habitat in Pierce Marsh to historical marsh elevations to support habitat restoration and revegetation with smooth cordgrass (i.e., *Spartina alterniflora)*. The project goal was evaluated in Section 3.3.6.3.2 of the RP/EA (TX TIG 2017) and determined to be consistent with the programmatic restoration goals as presented in the PDARP.

3.1.3 Conceptual Setting and Anticipated Outcomes

This project would contribute to an ongoing, large-scale conservation effort to restore marsh and wetland habitat in the Galveston Bay system. Historical subsidence in the Galveston Bay area has inundated thousands of acres of coastal marsh. Wetland loss in coastal Texas has been rated by the EPA as severe and is greater in the Galveston Bay system than other areas of the state (Moulton et al., 1997). It is estimated that between 1953 and 1989, Galveston Bay experienced a net loss of approximately 35,100 acres of wetlands (White et al. 1993). Subsidence in the greater Houston area has slowed considerably since groundwater pumping was severely limited beginning in 1975 (Holzer 1989). To implement this project, the Texas TIG would partner with the USACE to use dredged material from the Gulf Intracoastal Waterway (GIWW) to increase elevations in leveed open water areas of Pierce Marsh and make them suitable for the establishment and long-term sustainability of a shallow intertidal wetland. It is anticipated that the next opportunity to partner with USACE to receive dredged material for restoration purposes would be between 2018 and 2020. Depending on availability of funding, this project may involve more than one GIWW maintenance dredging cycle.

Based on a BUDM placement and marsh restoration project completed in in this area, the outcomes anticipated for this project are typical of this restoration type. As such, performance parameters identified in subsequent sections are sufficient to describe anticipated outcomes.

3.1.4 Sources of Uncertainties

The uncertainties associated with the project and how they would be addressed are discussed in Sections 3.3.6.1 and 3.3.6.3.3 of the RP/EA. The Texas TIG aims to propose and select projects that are feasible and have a high probability of success. Projects that are frequently implemented for this restoration type are technically feasible and have a high probability of success with few, if any, uncertainties. Monitoring can inform the selection of appropriate corrective actions in the event a project is not meeting its performance criteria and can also inform the selection, design, and implementation of future projects. However, not all uncertainties may be resolvable.

The largest source of uncertainty with this project is future relative sea level rise of one to four feet over the next century. The variability in predicted future increases in eustatic sea level rise combined with potential regional and localized subsidence could result in lowering of elevations of the restoration site (Melillo et al. 2014). If monitoring indicates lower than predicted elevations following consolidation of dredged material, then provisions could be made to add additional material from subsequent navigation dredging events or mechanically re-distribute sediments within the restoration site to adjust the project grade to the desired elevation range.

3.2 Adaptive Management

As discussed in the PDARP/PEIS, adaptive management is a form of structured decision-making applied to the management of natural resources in the face of uncertainty (Pastorok et al. 1997; Williams 2011). It is an iterative process that integrates monitoring and evaluation of management actions with flexible decision-making, where adjustments are made to management approaches based on observed outcomes (NRC 2004). Within the context of ecological restoration, adaptive management addresses key uncertainties by linking science to restoration decision-making (Steyer and Llewellyn 2000; Thom et al. 2005).

Although adaptive management is an important component of the restoration plan as a whole, the need for adaptive management will vary on a project by project basis. The need for adaptive management will be evaluated once construction is complete and will be implemented through an iterative process. Monitoring parameters will be evaluated as the information is gathered. Based upon this evaluation, the need for corrective action will be determined through Trustee consensus. Data, analysis, and information obtained from monitoring may be used to help inform future Restoration Plan development, priorities, and project selection.

3.3 Project Monitoring

The monitoring plan for this restoration project was developed to evaluate project performance. For each of the identified monitoring parameters, information is provided on the intended purpose of each monitoring parameter, monitoring methods, timing and frequency, duration, sample size, and sites. The parameters listed below may or may not be tied to performance criteria.

Parameter #1: Elevation

a) Purpose: To verify the structures (containment berms and water control structures) were built as designed and target elevations for sediment fill material were achieved. Target elevations for sediment fill material will be based on the observed elevation range of elevations in nearby native marsh habitats. Monitoring for this parameter will also track settlement of sediment fill over time and detect changes that might cause significant changes to the project's intended purpose.

b) Method:

   1. The Implementing Trustee will work with the project partners, project engineer, and construction contractor to review interim topographic survey data during construction to verify design criteria have been met. A final inspection and a post construction as-built topographic survey by a professional Engineer (PE) will be performed to document successful completion.
   2. Annual post-construction topographic surveys will be conducted by a PE to document project area conditions and monitor project area elevation as the dredged material dewaters and consolidates.
   3. Visual inspections of specific physical features such as containment berms, water control structures, and marsh restoration areas will be conducted by project managers. Field and aerial photography (including drone/UAV platforms) will be taken to document features and conditions post construction and over the 5-year monitoring period.

c) Timing, Frequency, and Duration:

   1. Design criteria will be evaluated during construction and upon completion of construction of the physical infrastructure and all punch list items have been adequately addressed prior to issuance of the certificate of substantial completion.
   2. As-built topographic survey, visual inspection, and field and aerial photographic documentation will be conducted at the completion of construction.

    3. Annual topographic surveys, visual inspections, and field and aerial photographic documentation will be conducted over the 5-year monitoring period near the end of the growing season.
- d) Sample Size: Construction area.
- e) Sites:
    1. The entire construction area will be covered by aerial photography.
    2. As-built and monitoring topographic survey data will be collected on a grid composed of perpendicular transects spaced at a minimum of 300-foot intervals with survey points recorded at a minimum of every 100 feet of the transect line. Transect lines established during the as-built survey will be reoccupied during subsequent monitoring survey events.
    3. Ground photo locations will be determined prior to the initiation of the monitoring period with additional photographs collected as needed during monitoring visits.

Parameter #2: Planted vegetation survival

- a) Purpose: To ensure transplanted vegetation is surviving.
- b) Method: Estimates of vegetation survival obtained by visual inspection or the use of photography may be used as a first check to determine if performance criteria is met. If these estimates are not sufficient to accurately determine if performance criteria have been met, then a more detailed sampling method will be developed
- c) Timing, Frequency, and Duration: Between 80 to 100 days after planting.
- d) Sample Size: 50 m^2 subplots
- e) Sites: Up to four-50 m^2 subplots within the area(s) planted.

Parameter #3: Acres of marsh habitat created

- a) Purpose: To monitor aerial extent of restored marsh habitat and to verify that structures (containment berms, water control structures, and sediment placement locations) were built as designed. Data will also be used to monitor for any changes such as breaches, erosion, and hydrologic impairment that might cause significant changes to the project’s intended purpose.
- b) Method:
    1. Aerial photography (including drone/UAV platforms) will be taken to document features and conditions post construction and over the 5-year monitoring period. Aerial photography collected for monitoring events will be analyzed via geographic information system to determine the extent of vegetated marsh habitat.
    2. Visual site inspections of specific physical features such as containment berms, water control structures, and marsh restoration areas will be conducted by project managers. Field photography will be used to document site conditions at the time of visual site inspections.
- c) Timing, Frequency, and Duration:

    1. Four annual monitoring visual site inspections and aerial photographic surveys will be conducted over the 5-year monitoring period near the end of the growing season. The first annual monitoring visual site inspection and aerial photographic survey will occur during the first growing season no earlier than one year post-construction.

d) Sample Size: Construction area.

e) Sites:
    1. The entire construction area will be covered by aerial photography.
    2. Ground photo locations will be determined prior to the initiation of the monitoring period with additional photographs collected as needed during monitoring visits.

Parameter #4: Percent vegetation cover

a) Purpose: To monitor vegetation coverage and species composition over time.

b) Method:
    1. Estimates of vegetation cover obtained by visual inspection and documented through the use of photography may be used as a first check to determine if performance criteria is met. If these estimates are not sufficient to accurately determine if performance criteria have been met, then a more detailed sampling method will be developed. Methods may include the use of aerial imagery, photography, quadrats, or preselected stations, as necessary.
    2. Field photography of subplots will be taken to document conditions over the 5-year monitoring period.

c) Timing, Frequency, and Duration:
    1. Four annual vegetation coverage surveys will be conducted near the end of the growing season during the 5-year monitoring period. The first vegetation coverage survey will occur during the first growing season no earlier than one year post-construction.

d) Sample Size: 1m^2 subplots

e) Sites: A total of up to 24-1m^2 subplots established along six designated survey transects

3.4 Evaluation

The proposed analysis methods for each of the monitoring parameters are included below and will be updated as necessary:

Elevation: This will be evaluated through collaborative interaction among the project stakeholders during, at the completion of construction, and over the five-year monitoring period. Interim construction verification topographic surveys will be conducted during construction to verify the structures were built as designed and target elevations for sediment fill material were achieved. Periodic in-progress-review meetings will be held during construction with the construction contractor project manager, project engineer, and Implementing Trustee to monitor construction progress and review interim topographic survey data to determine if any changes in construction methodology or design criteria are needed. The Implementing Trustee will work with the project partners, project engineer, and construction contractor to verify that all punch list items have been adequately addressed prior to issuance of the certificate of substantial completion. A final inspection and post construction as-built topographic survey by a PE will be performed to document successful completion of construction.

As-built and monitoring topographic survey data will be collected on a grid composed of perpendicular transects spaced at a minimum of 300-foot intervals with survey points recorded at a minimum of every 50 feet of the transect line. Transect lines established during the as-built survey will be reoccupied during subsequent monitoring survey events. Aerial photography (including drone/UAV platforms) will be collected after construction to document site features. The Implementing Trustee will conduct four annual monitoring topographic surveys and aerial photography collection events over the five-year monitoring period with the first monitoring survey and aerial photo collection beginning one year post construction. The Implementing Trustee and project partners will review the monitoring data results to determine if project performance criteria have been met or if any corrective action is warranted.

Planted vegetation survival: Vegetation Survival: Number of surviving plantings will be divided by the total number of plantings to determine the percent survival.

Acres of marsh habitat created: Aerial photography, site visits, and ground photography will be used to monitor the aerial extent of restored marsh habitat and to verify that structures (containment berms, water control structures, and sediment placement locations) were built as designed. Monitoring data will also be used to detect any changes such as breaches, erosion, and hydrologic impairment that might cause significant changes to the project's intended purpose. Areas considered marsh habitat consist of areas of emergent marsh vegetation with up to 30% of the interstitial area composed of open water. The primary method of determining the amount of marsh habitat created will be through the digital processing of aerial photography data via GIS. Site visits and ground photography will be used to ground-truth the air photo and GIS data and determine if project performance criteria have been met.

Percent vegetation cover: Visual observations from field stations, photography, or aerial imagery may be used to estimate percent cover. If quadrats are used to determine percent cover for the entire site, an appropriate sampling design and analysis method will be determined at that time. Information about the sampling design and analysis method will be provided on DIVER.

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

This project will be considered successful when up to 150 acres of estuarine marsh habitat have been created with up to 70% vegetation coverage at the end of the five-year monitoring period. Project monitoring parameters will be evaluated based upon project design, contractual obligations, and project performance criteria. The need for corrective action will be determined by consensus of the Texas TIG to ensure that project performance criteria in Table 3-1 are adhered to and the project is performing as intended.

Table 3-1. Summary of project monitoring parameters, performance criteria, and potential corrective actions

Monitoring Parameter	Final Performance Criteria	Interim Performance Criteria	Potential corrective actions or mid-course corrections*
Elevation	70% of sediment fill area within target elevation range 5 years post construction	Containment berms and sediment fill constructed to design elevations. 60% of sediment fill area is within target elevation range for estuarine emergent marsh one year post construction	Reshaping of sediments, adding additional sediments, breaching of containment berms, and removal of water containment structures
Planted vegetation survival	Percent of surviving transplanted individuals at or above 75 %, between 80 to 100 calendar days after planting event(s)	75 % survival between 80 to 100 calendar days after planting event(s)	Replanting/reseeding
Acres of marsh habitat created	150 acres of marsh habitat established five-years post-construction	20 acres of marsh habitat established one year post-construction, 80 acres of marsh habitat established three years post-construction	Reshaping of sediments, adding additional sediments, breaching of containment berms, removal of water control structures, hydrologic modifications (construct ponds and channels)
Percent vegetation cover	Percent cover would be maintained at or above 70% in monitoring subplots, five years after planting activities initiated	10 % aerial coverage of the targeted vegetation in monitoring subplots one year post-planting and 40% aerial coverage of the targeted vegetation three years post-planting	Replanting/reseeding, invasive species removal

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

3.6 Monitoring Schedule

The schedule for the project monitoring activities is shown in Table 3-2. Pre-execution monitoring will occur before construction, if applicable. Execution monitoring occurs post construction (Year 0). This timeframe may vary for different parameters. Performance monitoring (PM) will occur in the years following initial project execution (Years 1 - 5).

Table 3-2. Monitoring Schedule

Monitoring Parameter	Pre-execution Monitoring	Execution Monitoring (as built)	PM Year 1	PM Year 2	PM Year 3	PM Year 4	PM Year 5
Elevation	X	X	X	X	X	X	N/A
Planted vegetation survival	X	X	N/A	N/A	N/A	N/A	N/A
Acres of marsh habitat created	N/A	X	X	X	X	X	N/A
Percent vegetation cover	N/A	N/A	X	X	X	X	N/A

3.7 Data Management

3.7.1 Data Description

Data collected with this project will be generated through site visits, topographic surveys, aerial photography, ground photography, and vegetation surveys. Monitoring data collection will occur as shown in Table 3-2 above and be included in the Annual Activity Summaries supplied to the NOAA Diver Restoration Portal. The data collection will occur as described in Section 2. To the extent practicable, all environmental and biological data generated during monitoring activities will be documented using standardized field datasheets. If standardized datasheets are unavailable or not readily amendable to record Project-specific data, then Project-specific datasheets will be drafted prior to conducting any Project monitoring activities. Original hardcopy data, digital data, and photographs will be retained by the GLO as the Implementing Trustee.

3.7.2 Data Review and Clearance

Relevant Project data that are handwritten on hardcopy datasheets or notebooks will be transcribed (entered) into standard digital format. After transcription of the data, the electronic data sheets will be verified against the original hardcopy datasheets and/or notebooks, and any transcription errors will be corrected as appropriate before data are used for any analyses published to the DIVER Restoration Portal. The GLO will verify and validate MAM data and information and will ensure that all data are i) entered or converted into agreed upon/commonly used digital format; and ii) labeled with metadata to the extent practicable and in accordance with GLO agency requirements.

After all identified errors are addressed, data are considered to be QA/QC'd. The implementing Trustee will give the other 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.

3.7.3 Data Storage and Accessibility

Once all data have been QA/QC'd and appropriate metadata has been developed, the data will be submitted to DIVER. In addition to geospatial data following FGDC/ISO standards, appropriate metadata could include a data dictionary (defines codes and fields used in the dataset), and/or a Readme file as appropriate (e.g., how data was collected, QA/QC procedures, other information about data such as meaning, relationships to other data, origin, usage, and format – can reference different documents). Data will be made publicly available, in accordance with the Federal Open Data Policy, through the DIVER Explorer Interface within one year of when the data collection occurred. Prior to being made publicly available, any personal identifiable information will be redacted.

3.7.4 Data Sharing

Data will be made publicly available, in accordance with the Federal Open Data Policy, through the DIVER Explorer Interface within one year of when the data collection occurred. In the event of a public records request related to data and information on a project that is not already publicly available, the trustee to whom the request is addressed will provide notice to the other TIG trustees as soon as is practicable after releasing any project data that is the subject of the request.

3.8 Reporting

Within a year of data collection, monitoring data on the annual activity updates will be uploaded to the DIVER Portal. One final summary report will be generated for this project within one year of monitoring activities being concluded. This report will be made publicly available through the DIVER Restoration Portal.

3.9 Roles and Responsibilities

GLO is the Implementing Trustee for this project and will be responsible execution of the monitoring and adaptive management plan.

3.10 References

Holzer, T. L. 1989. State and local response to damaging land subsidence in United States urban areas. Engineering Geology 27: 449-466.

Melillo, J., T. Richmond, and G. Yohe, Eds., 2014: Climate Change Impacts in the United States: The Third National Climate Assessment. U.S. Global Change Research Program, 841 pp. doi:10.7930/J0Z31WJ2.

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Pastorok, R. A., A. MacDonald, J. R. Sampson, P. Wilber, D. J. Yozzo, and J. P. Titre. 1997. An ecological decision framework for environmental restoration projects. Ecological Engineering 9:89-107.

Steyer, G. D. and D. W. Llewellyn, Coastal Wetlands Planning, Protection, and Restoration Act: A programmatic application of adaptive management: Ecological Engineering [Ecol. Eng.], vol. 15, no. 3-4, pp. 385-395, Jul 2000.

Texas Trustee Implementation Group (TX TIG). 2017. *Deepwater Horizon Oil Spill* Natural Resource Damage Assessment, Texas Trustee Implementation Group, Final *2017* Texas Restoration Plan/Environmental Assessment: Restoration of Wetlands, Coastal, and Nearshore Habitats; and Oysters.

Thom, R. M., Williams, G., Borde, A., Southard, J., Sargeant, S., Woodruff, D., Laufle, J.C., and Glasoe, S. (2005). Adaptively addressing uncertainty in estuarine and near coastal restoration projects. *Journal of Coastal Research*, Special Issue No. 40. Coastal restoration: Where have we been, where are we now, and where should we be going? pp 94-108.

White, W. A., T. A. Tremblay, E.G. Wermund, and L.R. Handley. 1993. Trends and status of wetland and aquatic habitats in the Galveston Bay system, Texas. Webster, Texas, Galveston Bay National Estuary Program Publication GBNEP-31. Available: https://repositories.tdl.org/tamugir/handle/1969.3/25289

Williams, B. K., 2011. Adaptive management of natural resources: framework and issues. J. Environ. Manag. 92, 1346–1353.

4 Indian Point Shoreline Erosion Protection Monitoring and Adaptive Management Plan

4.1 Introduction

This project Monitoring and Adaptive Management (MAM) plan identifies the monitoring needed to evaluate progress toward meeting project objectives and to support any necessary adaptive management of the restoration project. This plan was developed per the Monitoring and Adaptive Management (MAM) Template in the MAM Manual and was adapted to fit the needs of the Indian Point Shoreline Erosion Protection project.

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

4.1.1 Project Overview

The Indian Point Shoreline Erosion Protection project as presented in the RP/EA would protect existing shoreline from wind and wave driven erosion, and protect the remaining marsh and associated coastal habitats adjacent to the shoreline. The project would achieve this by constructing approximately 2,800 linear-feet of segmented breakwaters to protect 50 acres of critical seagrass, coastal marsh, lagoons, and associated upland habitats within Indian Point on Corpus Christi Bay in San Patricio County. This project is being implemented as restoration for the *Deepwater Horizon* oil spill Natural Resource Damage Assessment (NRDA), consistent with the PDARP/PEIS.

- Programmatic goal: Restore and Conserve Habitat
- Restoration type: Wetlands, Coastal, and Nearshore Habitats
- Restoration approach: Create, restore, and enhance coastal wetlands
- Restoration technique: Construct breakwaters
- TIG: Texas TIG
- Restoration plan: Texas Trustee Implementation Group Final 2017 Restoration Plan/Environmental Assessment: Restoration of Wetlands, Coastal, and Nearshore Habitats; and Oysters

This restoration project is being implemented within the Indian Point Park in Portland, San Patricio Texas which is in the Nueces Estuary system (Figure 4-1). Restoration activities involve the placement of 2,800 linear feet of graded riprap segmented breakwaters in shallow water to protect existing seagrass and coastal wetlands. This project is intended to restore habitats and resources injured from the *Deepwater Horizon* oil spill, including shell beaches, dunes, seagrass beds, tidal flats, scrub/shrub uplands, intertidal and high salt marsh, and lagoons. Additional ecosystem services that may be restored by this project include habitat for a variety of ecologically and economically important fauna, such as birds, fish, crabs, fishery species, and oysters. While these additional ecosystem services contributed to the selection of this project as a preferred restoration alternative, they are not the primary goals of this project, and will not be monitored.

Figure 4-3 Map showing the location of the Indian Point Shoreline Erosion Protection project at Indian Point Park in Nueces County. Lat. 27.852038° Lon. -97.352467°

4.1.2 Restoration Type Goals and Project Restoration Objectives

The restoration goals to restore and conserve wetland and nearshore habitats were established in the PDARP. The Indian Point Shoreline Erosion Protection project objective and goal is to protect, restore, and conserve estuarine habitats in Indian Point Park and the Nueces Estuary System through the construction of a series of breakwaters. The project goal was evaluated in Section 3.3.8.4.2 of the RP/EA (TX TIG 2017) and determined to be consistent with the programmatic restoration goals as presented in the PDARP.

4.1.3 Conceptual Setting and Anticipated Outcomes

This project will extend from a previously constructed shoreline revetment and two breakwaters. Without the breakwaters in this plan, the sensitive marsh and lagoon habitats are susceptible to continued erosion and saltwater intrusion. The project would protect an extensive mosaic of estuarine marsh, tidal lagoons, and sand/shell water interfaces that are crucial habitat to numerous commercial and recreational inter-jurisdictional estuarine fish species.

Based on the results from the 2015 breakwater construction in Indian Point Park, the outcomes anticipated for this project are typical of this restoration type. As such, performance parameters identified in subsequent sections are sufficient to describe anticipated outcomes.

4.1.4 Sources of Uncertainties

The uncertainties associated with the project and how they would be addressed are discussed in Sections 3.3.8.1 and 3.3.8.4.3 of the RP/EA. Projects that are frequently implemented for this restoration type are technically feasible and have a high probability of success with few, if any, uncertainties. Project engineering documents account for and considers significant storm events since 1930, and anticipated sea level rise (Turner Collie and Braden Inc. 2002). Monitoring can inform the selection of appropriate corrective actions in the event a project is not meeting its performance criteria and can also inform the selection, design, and implementation of future projects. However, not all uncertainties may be resolvable.

4.2 Adaptive Management

As discussed in the PDARP/PEIS, adaptive management is a form of structured decision-making applied to the management of natural resources in the face of uncertainty (Pastorok et al. 1997; Williams 2011). It is an iterative process that integrates monitoring and evaluation of management actions with flexible decision-making, where adjustments are made to management approaches based on observed outcomes (NRC 2004). Within the context of ecological restoration, adaptive management addresses key uncertainties by linking science to restoration decision-making (Steyer and Llewellyn 2000; Thom et al. 2005).

Although adaptive management is an important component of the restoration plan, the need for adaptive management will vary on a project by project basis. Adaptive management will be implemented through an iterative process following construction. Monitoring parameters will be evaluated as the information is gathered. The Texas TIG has experience with breakwater construction projects directly adjacent to the project location, and the outcomes anticipated for this project are typical of this restoration technique, including the construction of two breakwaters at this location in 2015. Data, analysis and information obtained from monitoring may be used to help inform future Restoration Plan development, priorities and project selection. Based upon this evaluation, the need for corrective actions will be determined through Trustee consensus.

4.3 Project Monitoring

The monitoring plan for this restoration project was developed to evaluate project performance. For each of the identified monitoring parameters, information is provided on the intended purpose of each monitoring parameter, monitoring methods, timing and frequency, duration, sample size, and sites. The parameters listed below may or may not be tied to performance criteria.

Parameter #1: Breakwater Geometry

a) Purpose: To verify the structures (rock breakwaters) were built as designed.
b) Method:
   1. The Implementing Trustees will work with the project partners to review construction documents and will verify final construction. A final inspection and post construction as-built survey by a professional Engineer (PE) will be performed to document completion.
   2. Annual post-construction topographic surveys will be conducted by a PE to document project area conditions.
   3. Crest elevation, cross-section, length, location, and gradation will meet the engineering and design specifications
c) Timing, Frequency, and Duration:
   1. Design criteria will be evaluated once at the completion of construction of the physical infrastructure, and annually for 5 years.
   2. After completion of the as-built survey, visual inspections of specific physical features to ensure the structural integrity of the breakwater, will be conducted at least once every year during the 5-year monitoring period. Conditions will be documented with photographs.
d) Sample Size: Entire length of each installed breakwater.
e) Sites:
   1. N/A
   2. Photo locations will be determined prior to the initiation of the monitoring period.

Parameter #2: Shoreline Position

a) Purpose: To determine if shoreline erosion has been reduced within the area protected by the breakwaters.
b) Method: Potential methods may include but are not limited to:
   1. Aerial photographs (including drone/UAV platforms) will be taken to document features and conditions pre- and post- construction and over the 5-year monitoring period. Aerial photographs will be analyzed with a geographic information system to determine the extent of shoreline erosion.
   2. LiDAR: Airborne topographic LiDAR (Light Detection and Ranging or Laser Imaging Detection and Ranging). This is an optical remote sensing technology that measures the distance and angle of surface reflectance. Ground control points should be established to calculate accuracy and ground surveys may be needed to develop ecosystem specific correction factors in densely vegetated marshes. For additional information on the use of LiDAR, see Brock et al (2002), Heidemann (2014), Hladik (2012), and Schmid et al. (2011).

   c) Timing and Frequency: The initial data collection would occur prior to construction to document pre-construction conditions, and data collection would occur annually, during the same time of year, during the 5-year monitoring period. The rate of erosion/accretion would be calculated at least once during the project monitoring period.
   d) Sample Size: project area
   e) Sites: project area

Parameter #3: Aerial Extent of Vegetative Cover

a) Purpose: To measure the habitat types and areas in the area protected by the breakwaters
b) Method:
   1. Aerial photographs (including drone/UAV platforms) will be taken to document features and conditions pre- and post- construction and over the 5-year monitoring period. Aerial photographs will be analyzed with a geographic information system to determine the habitat type in the area protected by the breakwater.
   2. LiDAR: Airborne topographic LiDAR (Light Detection and Ranging or Laser Imaging Detection and Ranging). This is an optical remote sensing technology that measures the distance and angle of surface reflectance. Ground control points should be established to calculate accuracy and ground surveys may be needed to develop ecosystem specific correction factors in densely vegetated marshes. For additional information on the use of LiDAR, see Brock et al (2002), Heidemann (2014), Hladik (2012), and Schmid et al. (2011).
c) Timing and Frequency: The initial data collection would occur prior to construction to document pre-construction conditions, and data collection would occur annually, after the growing season, during the 5-year monitoring period. The rate of erosion/accretion would be calculated at least once during the project monitoring period.
d) Sample Size: project area
e) Sites: Project Area

4.4 Evaluation

The proposed analysis methods for each of the monitoring parameters are included below and will be updated as necessary:

Breakwater Geometry: This parameter will be evaluated through collaborative interaction among the project stakeholders during construction, at the completion of construction, and over the five-year monitoring period. Interim construction verification topographic surveys will be conducted during construction to verify the structures were built as designed and target elevations for rock breakwaters were achieved. Periodic in-progress-review meetings will be held during construction with the construction contractor project manager, project engineer, and Implementing Trustee to monitor construction progress and review interim topographic survey data to determine if any changes in construction methodology or design criteria are needed. The Implementing Trustee will work with the project partners, project engineer, and construction contractor to verify that all punch list items have been adequately addressed prior to issuance of the certificate of substantial completion. A final inspection and post construction as-built topographic survey by a PE will be performed to document successful completion of construction.

Riprap should not be loose, displaced, cracked, or deteriorating. Crest elevation, cross-section, length, location, and graduation will be measured. Photographs of the breakwater from a boat will be used to estimate the structural integrity and measurements of the constructed breakwater. Inspection will also include confirmation the breakwaters are not experiencing slope failure or general degradation. The Implementing Trustee and project partners will review the monitoring data results to determine if project performance criteria have been met or if any corrective action is warranted.

Shoreline Position: Aerial photographs will be used to "trace the shoreline, and is expected to provide the most accurate representation of shoreline erosion or lack thereof, as the project area includes a sand/shell beach front face, which protects marsh, which is visually distinguishable. Ortho-rectified digital aerial photographs will be provided.

A topographic survey will be conducted by a Registered Professional Land Surveyor along the shoreline as a secondary measure to document shoreline change post-breakwater construction. Survey data and drawings will be provided.

If the erosion rate at 5 years is greater than the preconstruction rate of approximately 2 feet per year (Turner Collie and Braden Inc. 2002), Trustees will evaluate if the breakwaters or other factors are contributing to erosion. Structures may require modification or removal if shown to contribute to erosion.

Aerial Extent of Vegetative Cover: Aerial photographs will be used to identify and trace visually distinguishable habitat boundaries. Ortho-rectified digital aerial photographs will be provided.

Coastal vegetative habitats, including wetland, upland, coastal mangroves, seagrasses, and scrub-shrub habitat types will be identified based on the U.S. Fish and Wildlife Service Wetland and Deepwater Habitats Classification System (Cowardin et al. 1979). The total area of vegetative cover protected by the breakwaters will be summed.

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

This project will be considered successful when 2,800 linear feet of segmented rock breakwater have been placed and remain within design specifications at the end of the five-year monitoring period, and the rate of shoreline retreat within the project area has decreased. Project monitoring parameters will be evaluated based upon project design, contractual obligations, and project performance criteria. The need for corrective actions will be determined by consensus of the Implementing Trustee and project stakeholders to ensure that performance criteria in Table 4-1 are adhered to and the project is performing as intended.

Table 4-1. Summary of project monitoring parameters, performance criteria, and potential corrective actions

Monitoring Parameter	Final Performance Criteria	Interim Performance Criteria	Potential corrective actions or mid-course corrections*
Breakwater Geometry	Breakwater geometry within design criteria at end of 5-year monitoring period.	Construction of breakwaters completed per the design.	Adjusting the breakwater to meet engineering specifications
Shoreline Position	Shoreline retreat rate decreased from documented pre-construction rate of 2 feet per year.	Shoreline retreat rate decreased from documented pre-construction rate of 2 feet per year.	Initiate investigation to determine cause of increased shoreline retreat, evaluate potential solutions for future project.
Aerial Extent of Vegetative Cover	Coastal habitat areas increased from documented pre-construction areas.	Coastal habitat areas increasing from documented pre-construction areas.	Initiate investigation to determine cause of continued habitat loss. Evaluate potential solutions for future project.

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

4.6 Monitoring Schedule

The schedule for project monitoring activities is shown in Table 4-2, separated by monitoring activity. Pre-execution monitoring will occur before project construction, if applicable. Execution monitoring occurs post construction (Year 0). This timeframe may vary for different parameters. Performance monitoring (PM) will occur in the years following initial project execution (Years 1-5).

Table 4-2. Monitoring Schedule

Monitoring Parameter	Pre-execution Monitoring	Execution Monitoring (as built)	PM Year 1	PM Year 2	PM Year 3	PM Year 4	PM Year 5
Breakwater Geometry	X	X	X	X	X	X	X
Shoreline Position	X	X	X	X	X	X	X
Aerial Extent of Vegetative Cover	X	X	X	X	X	X	X

4.7 Data Management

4.7.1 Data Description

Data collected with this project will be generated through site visits, topographic surveys, aerial photography, and ground photography. Monitoring data collection will occur as shown in Table 4-2 above and be included in the Annual Activity Summaries supplied to the NOAA Diver Restoration Portal. The data collection will occur as described in Section 4. To the extent practicable, all environmental and biological data generated during monitoring activities will be documented using standardized field datasheets. If standardized datasheets are unavailable or not readily amendable to record Project-specific data, then Project-specific datasheets will be drafted prior to conducting any Project monitoring activities. Original hardcopy data, digital data, and photographs will be retained by the GLO as the Implementing Trustee.

4.7.2 Data Review and Clearance

Relevant Project data that are handwritten on hardcopy datasheets or notebooks will be transcribed (entered) into standard digital format. After transcription of the data, the electronic data sheets will be verified against the original hardcopy datasheets and/or notebooks, and any transcription errors will be corrected as appropriate before data are used for any analyses published to the DIVER Restoration Portal. The GLO will verify and validate MAM data and information and will ensure that all data are i) entered or converted into agreed upon/commonly used digital format; and ii) labeled with metadata to the extent practicable and in accordance with GLO agency requirements.

After all identified errors are addressed, data are considered to be QA/QC'd. The implementing Trustee will give the other 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.

4.7.3 Data Storage and Accessibility

Once all data have been QA/QC'd and appropriate metadata has been developed, the data will be submitted to DIVER. In addition to geospatial data following FGDC/ISO standards, appropriate metadata could include a data dictionary (defines codes and fields used in the dataset), and/or a Readme file as appropriate (e.g., how data was collected, QA/QC procedures, other information about data such as meaning, relationships to other data, origin, usage, and format – can reference different documents). Data will be made publicly available, in accordance with the Federal Open Data Policy, through the DIVER Explorer Interface within one year of when the data collection occurred. Prior to being made publicly available, any personal identifiable information will be redacted.

4.7.4 Data Sharing

Data will be made publicly available, in accordance with the Federal Open Data Policy, through the DIVER Explorer Interface within one year of when the data collection occurred. In the event of a public records request related to data and information on a project that is not already publicly available, the trustee to whom the request is addressed will provide notice to the other TIG trustees as soon as is practicable after releasing any project data that is the subject of the request.

4.8 Reporting

Monitoring data will be uploaded to the DIVER Portal annually. A final summary report will be generated for this project within one year of monitoring activities being concluded. This report will be made publicly available through the DIVER Restoration Portal.

4.9 Roles and Responsibilities

GLO is the Implementing Trustee for this project and will be responsible execution of the monitoring and adaptive management plan.

4.10 References

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5 Bahia Grande Hydrological Restoration Monitoring and Adaptive Management Plan

5.1 Introduction

This project Monitoring and Adaptive Management (MAM) plan identifies the monitoring needed to evaluate progress toward meeting project objectives and to support any necessary adaptive management of the restoration project. This plan was developed according to a draft version of the Monitoring and Adaptive Management (MAM) Template and was adapted to fit the needs of the Bahia Grande Hydrological Restoration project.

This MAM Plan is a living document and may be updated as needed to reflect changing conditions and/or new information. Any future revisions to this document will be made publicly available through the DIVER Restoration Portal (https://www.diver.orr.noaa.gov/web/guest/home) and accessible through the Deepwater Horizon NRDA Trustees website (http://www.restoration.noaa.gov/dwh/storymap/).

5.1.1 Project Overview

The Bahia Grande Hydrological Restoration project would restore and conserve the Bahia Grande wetland complex in the Laguna Atascosa National Wildlife Refuge (LANWR) near Brownsville, Texas. This project would enlarge and stabilize a pilot channel that would increase tidal flow into the Bahia Grande, restoring the system's natural tidal exchange and creating habitat for a variety of fish, shellfish, and migratory waterfowl. This project is being implemented as restoration for the *Deepwater Horizon* oil spill Natural Resource Damage Assessment (NRDA), consistent with the PDARP/PEIS.

- Programmatic goal: Restore and Conserve Habitat
- Restoration type: Wetlands, Coastal, and Nearshore Habitats
- Restoration approach: Create, Restore, or Enhance Coastal Wetlands
- Restoration technique: Restore hydrologic connections to enhance coastal habitats
- TIG: Texas TIG
- Restoration plan: Texas Trustee Implementation Group Final 2017 Restoration Plan/Environmental Assessment: Restoration of Wetlands, Coastal, and Nearshore Habitats; and Oysters

This restoration project is being implemented in Cameron County west of Port Isabel, Texas. Part of the Tamaulipan Biotic Province, the Bahia Grande Unit is close to the Gulf of Mexico and consists of wind tidal flats and high ground that includes brush-covered clay dunes (lomas) that attain heights of up to 30 feet. This matrix of stabilized clay dunes is interspersed with grass and brush-covered uplands, saline flats, marshes, and shallow bays. Historically, the Bahia Grande area was rich in biological resources and contained important waterfowl habitat, especially for wintering waterfowl. Bahia Grande was also an important estuarine nursery area, contributing to a productive sport and commercial fishery. A small island within the bay provided nesting habitat for more than 10,000 terns, gulls and black skimmers (USFWS 2005).

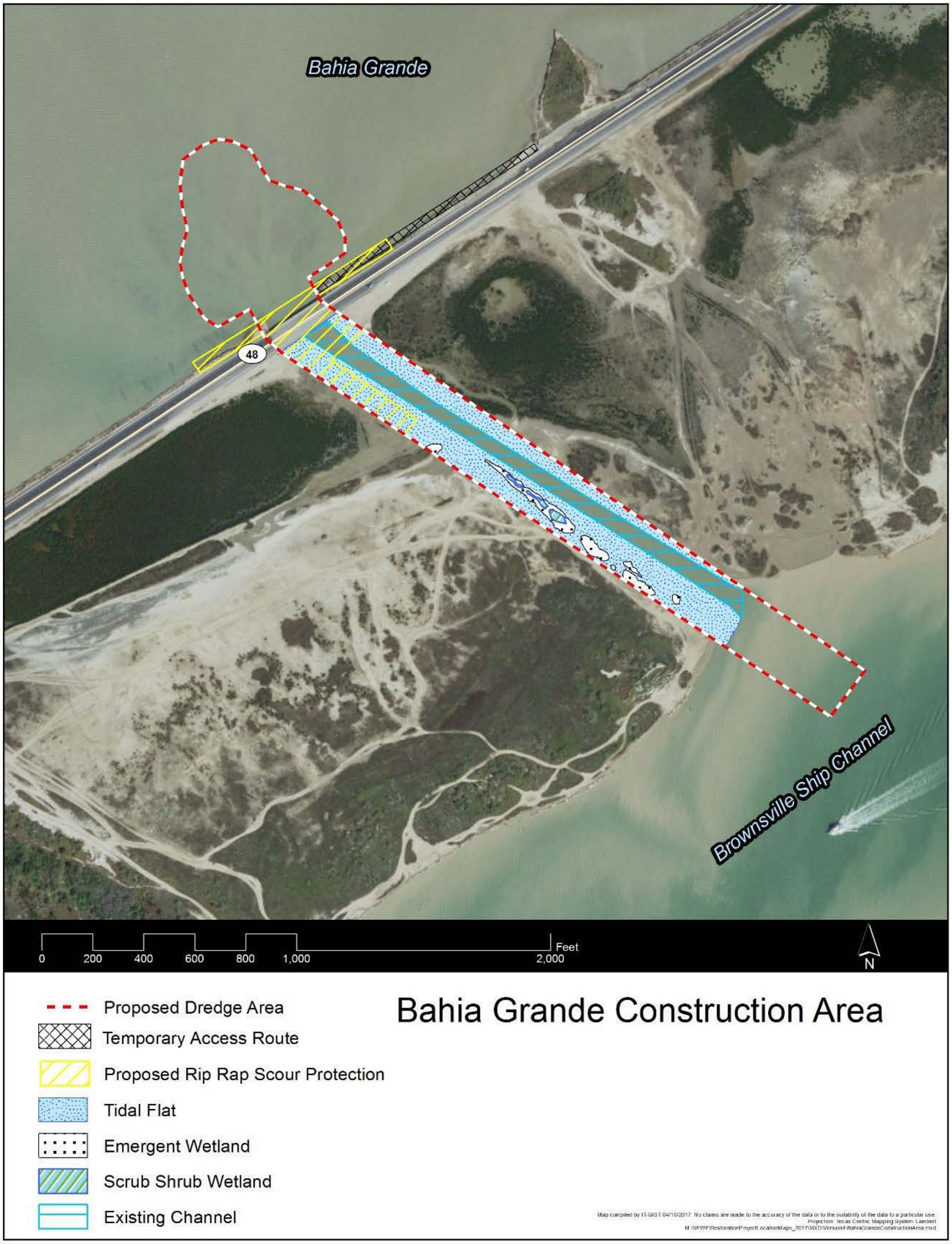

Figure 5-4. Map showing the location of the existing pilot channel and proposed expansion of the channel.

5.1.2 Restoration Type Goals and Project Restoration Objectives

The restoration goals to restore and conserve wetland and nearshore habitats were established in the PDARP. The Bahia Grande Hydrologic Restoration project objective and goal is to restore the natural hydrology to a once healthy wetland ecosystem and to contribute to the ongoing landscape-scale effort to restore the Bahia Grande Unit of LANWR. Project actions would create a viable wetland habitat for a variety of plants, fish, birds, and other wildlife that frequent the area, and would contribute to an ongoing effort to restore the 10,000-acre wetland complex. This project goal was evaluated in Section 3.3.9.4.2 of the RP/EA (TX TIG 2017) and determined to be consistent with the programmatic restoration goals as presented in the PDARP.

5.1.3 Conceptual Setting and Anticipated Outcomes

The Bahia Grande is a federally protected 10,000-acre coastal ecosystem estuary and wetland complex, consisting of three shallow water basins (Bahia Grande, Little Laguna Madre, Laguna Larga) located within the LANWR near Port Isabel, Texas (Figure 5-2). The Bahia Grande was naturally formed and frequently inundated with tidal waters from the nearby Gulf of Mexico, making the Bahia Grande an ecologically rich wetland. It served as a natural nursery for fish, shellfish, wildlife, and waterfowl in the South Texas coastal region until the basin was modified by the placement of dredged sediments from the construction of the Brownsville Ship Channel in the mid-1930s and subsequently by the construction of State Highway (SH) 48 in the mid-1950s.

The dredged material and constructed highway essentially cut-off and removed the historic tidal connections, resulting in rapid evaporation of the saline water from the Bahia Grande that eventually led to the formation of a near-permanently dry salt basin, which no longer supported coastal wetlands and is currently characterized by reduced biodiversity. Occasionally heavy rain fills the basin, but the area has been essentially dry and barren for almost 70 years due to strong evaporation and lack of regular tidal exchange with the Laguna Madre.

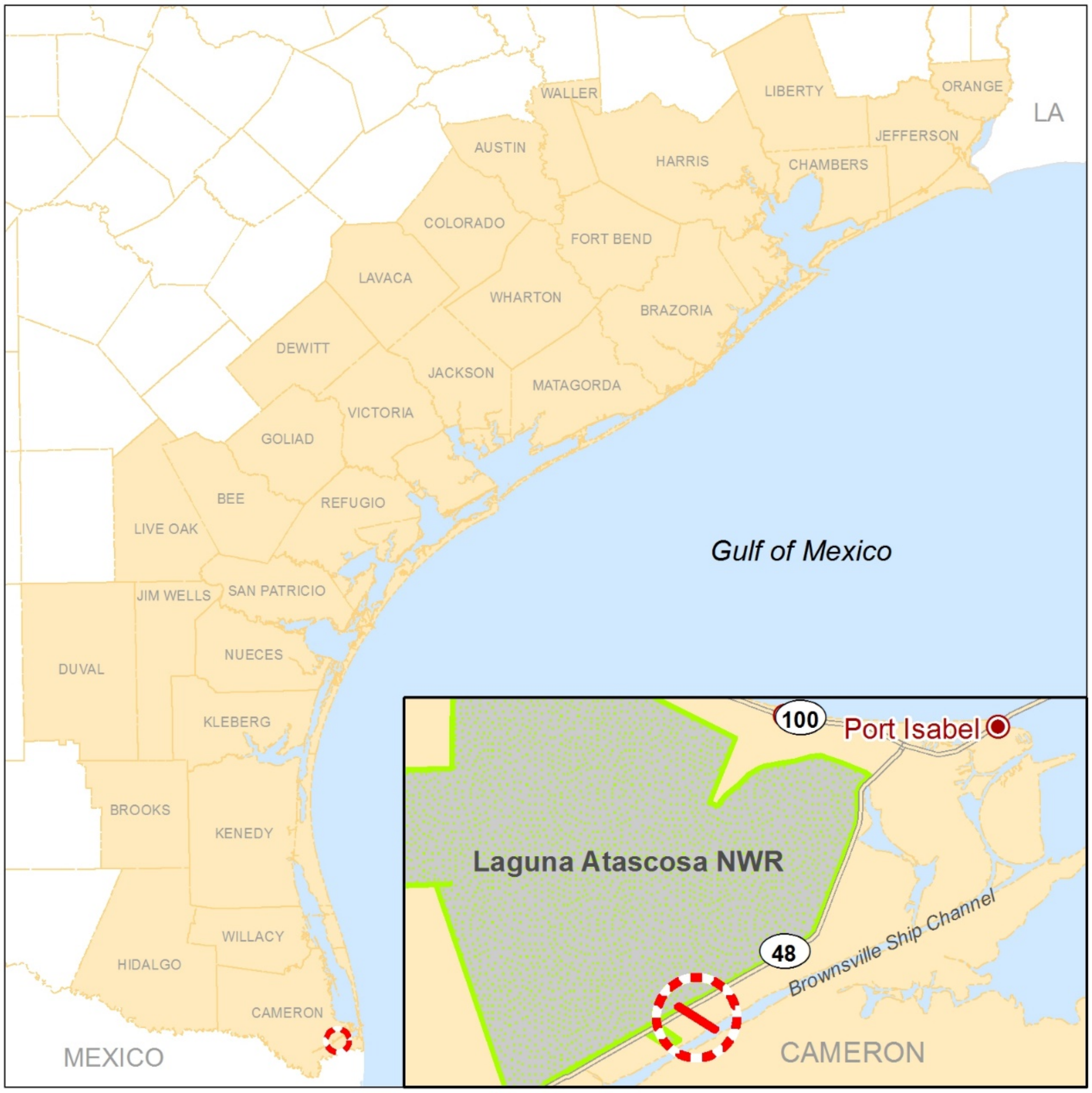

Figure 5-2 Map showing the location of the channel project area in Cameron County, Texas.

Based on previous restoration experience by the Texas TIG with the pilot channel dredging project in 2005, the outcomes anticipated for this project are typical of this restoration type. As such, performance Project activities would build upon the progress and efforts of numerous organizations including public and private groups, and state and federal agencies. This project is part of larger initiative to preserve and restore critical habitats within the Bahia Grande ecosystem corridor in South Texas. In addition to the pilot channel, several smaller channel projects within the Bahia Grande were constructed to restore hydrological connections within the estuary. This project is critical to the overall success of the restoration of the Bahia Grande estuary because the channel is the basin's main hydrological connection to the Gulf of Mexico and would enhance the tidal exchange throughout the system.

5.1.4 Sources of Uncertainties

The uncertainties associated with the project and how they would be addressed are discussed in Sections 3.3.9.1 and 3.3.9.4.3 of the RP/EA. The Texas TIG aims to propose and select projects that are feasible and have a high probability of success. Projects that are frequently implemented for this restoration type are technically feasible and have a high probability of success with few, if any, uncertainties. Based on the progress and outcomes of the pilot channel dredging project in 2005, the Trustees are familiar with projects of this type, in this area. Monitoring can inform the selection of appropriate corrective actions in the event a project is not meeting its performance criteria and can also inform the selection, design, and implementation of future projects. However, not all uncertainties may be resolvable.

5.2 Adaptive Management

As discussed in the PDARP/PEIS, adaptive management is a form of structured decision-making applied to the management of natural resources in the face of uncertainty (Pastorok et al. 1997; Williams 2011). It is an iterative process that integrates monitoring and evaluation of management actions with flexible decision-making, where adjustments are made to management approaches based on observed outcomes (NRC 2004). Within the context of ecological restoration, adaptive management addresses key uncertainties by linking science to restoration decision-making (Steyer and Llewellyn 2000; Thom et al. 2005).

Although adaptive management is an important component of the restoration plan as a whole, the need for adaptive management will vary on a project by project basis. Adaptive management will be implemented through an iterative process following construction. Monitoring parameters will be evaluated by the project stakeholders as the information is gathered. Based upon this evaluation, the need for corrective actions will be determined through Trustee consensus. The Texas TIG has experience with similar projects in this immediate area and the outcomes anticipated for this project are typical of this restoration technique. Data, analysis and information obtained from monitoring may be used to help inform future Restoration Plan development, priorities and project selection. Restoration techniques or project components that are more innovative or which may result in a higher degree of uncertainty may require a more active approach to adaptive management.

5.3 Project Monitoring

The monitoring plan for this restoration project was developed to evaluate project performance. For each of the identified monitoring parameters, information is provided on the intended purpose of each monitoring parameter, monitoring methods, timing and frequency, duration, sample size, and sites. The parameters listed below may or may not be tied to performance criteria.

Parameter #1: Construction verification

a) Purpose: To verify the channel was constructed per design specifications
b) Method:
    1. The Implementing Trustee will work with the project partners, project engineer, and construction contractor to review as built plans. A final inspection and a post construction as-built survey by a professional Engineer (PE) will be performed to document successful completion.
    2. Visual inspections of the rock shore stabilization structure will be conducted by project managers annually for 5 years.

c) Timing, Frequency, and Duration:
  1. The rock stabilization structure and channel banks will be evaluated post construction and annually during the 5-year monitoring period.
  2. As-built survey, visual inspection, and field documentation will be conducted at the completion of construction. Visual inspections will document mis-placed or missing rocks.
  3. Visual inspections and field photographic documentation will be conducted annually over the 5-year monitoring period.

d) Sample Size: Construction area.

e) Sites:
  1. The entire construction area will be covered.
  2. As-built survey data and photos will be collected along the length of the channel.
  3. Ground photo locations will be determined prior to the initiation of the monitoring period with additional photographs collected as needed during monitoring visits.

Parameter #2: Structural integrity of the channel

a) Purpose: To ensure benefits continue for the life of the project.

b) Method: Qualitative visual survey to inspect for sloughing of rock structure, missing rocks, shoreline erosion, or sedimentation within the channel.

c) Timing, Frequency, and Duration: Once annually for the duration of the 5-year monitoring period.

d) Sample Size: N/A

e) Sites: Entire length of channel and 500 feet of shoreline adjacent to the channel openings.

Parameter #3: Flow rate

a) Purpose: Document continued hydrological connection from the Ship Channel into the Bahia Grande

b) Method:
  1. Flow monitoring station attached to the State Highway 48 Bridge or tidal monitoring station placed in the channel.
  2. Data will be collected through cellular signal or other method.

c) Timing, Frequency, and Duration: Hourly data collected daily during the 5-year monitoring period

d) Sample Size: Single point station in channel.

e) Sites: Construction area

Parameter #4: Water Quality

a) Purpose: Monitor water quality in the Bahia Grande

b) Method:

   1. Water quality would be measured using a multiparameter meters such as a YSI or Hydrolab. Data including salinity, dissolved oxygen, pH, and temperature will be collected.
   2. Data collected from a boat or shoreline by university researchers or field staff.

c) Timing, Frequency, and Duration:
   1. Data collected on monthly site visits conducted by university researchers or field staff.
   2. Pre-construction monitoring data will be acquired from University of Texas Rio Grande Valley Studies and previously established Texas Coastal Oceanic Observation Network (TCOON) stations.

d) Sample Size: Three stations within the Bahia Grande Unit.

e) Sites: Sites identified at a later date

5.4 Evaluation

The proposed analysis methods for each of the monitoring parameters are included below and will be updated as necessary:

Construction verification: This will be evaluated through collaborative interaction among the project stakeholders during, at the completion of construction, and over the five-year monitoring period. Interim surveys will be conducted during construction to verify the structures were built as designed. Periodic in-progress-review meetings will be held during construction with the construction contractor project manager, project engineer, and Implementing Trustee to monitor construction progress and review the survey data to determine if any changes in construction methodology or design criteria are needed. The Implementing Trustee will work with the project partners, project engineer, and construction contractor to verify that all punch list items have been adequately addressed prior to issuance of the certificate of substantial completion. A final inspection and post construction as-built survey will be conducted by a PE to document successful completion of construction.

As-built survey data will be collected along the length of the channel. The Implementing Trustee will review the data results to determine if project performance criteria have been met or if any corrective action is warranted.

Structural integrity of the channel: The Implementing Trustees will work with the project partners to inspect the structural integrity of the channel, the adjacent shorelines, and sedimentation within the channel. The trustees and project partners will walk along the channel and visually inspect the rock revetment. Photographs will be taken to document the placement and condition of the shoreline. Depth measurements or bathymetry will be measured to ensure hydrologic exchange is maintained. Written notations will be made of any sloughing of the revetment, missing rocks, and shoreline erosion within 500 feet of the channel openings into the ship channel and the Bahia Grande.

Flow rate: Flow velocity will be measured by a flow meter that is attached to the State Highway 48 Bridge that crosses the channel. Data will be uploaded by cellular network or other method. The implementing trustee will contract with a local university or project partner to monitor the station, conduct QA/QC and analysis of the data, and house the data files. Flow rate over a tidal cycle will be calculated as it was in the Bahia Grande Restoration Phase I: Final Technical Memorandum on Coastal Engineering Analysis (Coast and Harbor Engineering 2011).

Water Quality: Water quality will data will be collected by a local university or project partner using a multiparameter meter (data sonde). The data will be collected by boat or at specific shoreline stations. Data including salinity, dissolved oxygen, pH, and temperature will be measured. Sites will be visited bi-annually by university researchers or field staff at three stations within the Bahia Grande Unit. Pre-execution monitoring data is available per previously existing TCOON stations, and data will be used to set baseline for comparison.

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

This project will be considered successful when the channel construction is complete and hydrological connection to the Bahia Grande is enhanced. Project monitoring parameters will be evaluated based upon project design, contractual obligations, and project performance criteria. The need for corrective action will be determined by consensus of the Texas TIG to ensure that project design criteria in Table 5-1 are adhered to and the project is performing as intended.

Table 5-1. Summary of project monitoring parameters, performance criteria, and potential corrective actions

Monitoring Parameter	Final Performance Criteria	Interim Performance Criteria	Potential corrective actions or mid-course corrections*
Construction verification	The project is constructed per design specifications	N/A	reshaping of channel and replacement of rocks
Structural integrity of the channel	N/A	N/A	Reshaping of channel, repositioning of rocks, replacement of missing rocks, installing additional channel stabilization features
Flow rate	Post-construction flow rate is higher than pre-construction flow rate, approaching 90 million ft^3 of water exchange in a tidal cycle	Post-construction flow rate is higher than pre-construction flow rate, approaching 90 million ft^3 of water exchange in a tidal cycle	Reshaping of channel, initial investigations to inform future channel widening projects
Water quality	Post-construction water quality is improved by decreasing salinity in the Bahia Grande and decreasing incidents of low DO and pH fluctuations	Post-construction water quality is improved by decreasing salinity in the Bahia Grande and decreasing incidents of low DO and pH fluctuations	Reshaping of channel, initial investigations to inform future channel widening projects

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

5.6 Monitoring Schedule

The schedule for the project monitoring is shown in Table 5-2, separated by monitoring activity. Pre-execution monitoring will occur before project execution, if applicable. Execution monitoring occurs post construction (Year 0). This timeframe may vary for different parameters. Performance monitoring (PM) will occur in the years following initial project execution (Years 1 - 5).

Table 5-2. Monitoring Schedule

Monitoring Parameter	Pre-execution Monitoring	Execution Monitoring (as built)	PM Year 1	PM Year 2	PM Year 3	PM Year 4	PM Year 5
Construction verification	X	X	X	N/A	N/A	N/A	N/A
Structural integrity of the channel	X	X	X	X	X	X	X
Flow rate	N/A	X	X	X	X	X	X
Water quality	N/A	X	X	X	X	X	X

5.7 Data Management

5.7.1 Data Description

Data collected with this project will be generated through site visits, surveys, ground photography, flow meters, and water quality equipment. Monitoring data collection will occur as shown in Table 5-2 above and be included in the Annual Activity Summaries supplied to the NOAA DIVER Restoration Portal. The data collection will occur as described in Section 2. To the extent practicable, all environmental and biological data generated during monitoring activities will be documented using standardized field datasheets. If standardized datasheets are unavailable or not readily amendable to record Project-specific data, then Project-specific datasheets will be drafted prior to conducting any Project monitoring activities. Original hardcopy data, digital data, and photographs will be retained by the GLO as the Implementing Trustee.

5.7.2 Data Review and Clearance

Relevant Project data that are handwritten on hardcopy datasheets or notebooks will be transcribed (entered) into standard digital format. After transcription of the data, the electronic data sheets will be verified against the original hardcopy datasheets and/or notebooks, and any transcription errors will be corrected as appropriate before data are used for any analyses published to the DIVER Restoration Portal. The GLO will verify and validate MAM data and information and will ensure that all data are i) entered or converted into agreed upon/commonly used digital format; and ii) labeled with metadata to the extent practicable and in accordance with GLO agency requirements.

After all identified errors are addressed, data are considered to be QA/QC'd. The implementing Trustee will give the other 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.

5.7.3 Data Storage and Accessibility

Once all data have been QA/QC'd and appropriate metadata has been developed, the data will be submitted to DIVER. In addition to geospatial data following FGDC/ISO standards, appropriate metadata could include a data dictionary (defines codes and fields used in the dataset), and/or a Readme file as appropriate (e.g., how data was collected, QA/QC procedures, other information about data such as meaning, relationships to other data, origin, usage, and format – can reference different documents). Data will be made publicly available, in accordance with the Federal Open Data Policy, through the DIVER Explorer Interface within one year of when the data collection occurred. Prior to being made publicly available, any personal identifiable information will be redacted.

5.7.4 Data Sharing

Data will be made publicly available, in accordance with the Federal Open Data Policy, through the DIVER Explorer Interface within one year of when the data collection occurred. In the event of a public records request related to data and information on a project that is not already publicly available, the trustee to whom the request is addressed will provide notice to the other TIG trustees as soon as is practicable after releasing any project data that is the subject of the request.

5.8 Reporting

Within a year of data collection, monitoring data will be provided on the annual activity update and will be available through DIVER. One final summary report will be generated for this project within one year of monitoring activities being concluded. This report will be made publicly available through the DIVER Restoration Portal.

5.9 Roles and Responsibilities

GLO is the Implementing Trustee for this project and will be responsible execution of the monitoring and adaptive management plan.

5.10 References

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6 Follets Island Habitat Acquisition Monitoring and Adaptive Management Plan

6.1 Introduction

This project Monitoring and Adaptive Management (MAM) plan identifies the monitoring needed to evaluate progress toward meeting project objectives and to support any necessary adaptive management of the restoration project. This plan was developed according to a draft version of the Monitoring and Adaptive Management (MAM) Template and was adapted to fit the needs of the Follets Island Habitat Acquisition project.

This MAM Plan is a living document and may be updated as needed to reflect changing conditions and/or new information. Any future revisions to this document will be made publicly available and accessible through the DIVER Restoration Portal and the Deepwater Horizon NRDA Storymap website (https://www.diver.orr.noaa.gov/web/guest/home, http://www.restoration.noaa.gov/dwh/storymap/, respectively).

6.1.1 Project Overview

The Follets Island Habitat Acquisition project as presented in the RP/EA would acquire and conserve approximately 300 acres of wetland and coastal habitats on Follets Island between San Luis Pass and Drum Bay in Brazoria County, Texas. The project would conserve dune, coastal strand prairie, and marsh habitat in perpetuity through fee simple acquisition and appropriate protective legal mechanisms. Once acquired, the land would be transferred to and managed by the Texas Parks and Wildlife Department (TPWD) for the purpose of habitat preservation. TPWD will implement land stewardship practices that are typical of TPWD-managed properties through the development of a management and conservation plan for on-site resources. A management plan will be developed and submitted to the Texas TIG for approval within 90 days of acquisition of the property. See Figure 6-1, below, for a map of the general project area of the Follets Island Habitat Acquisition.

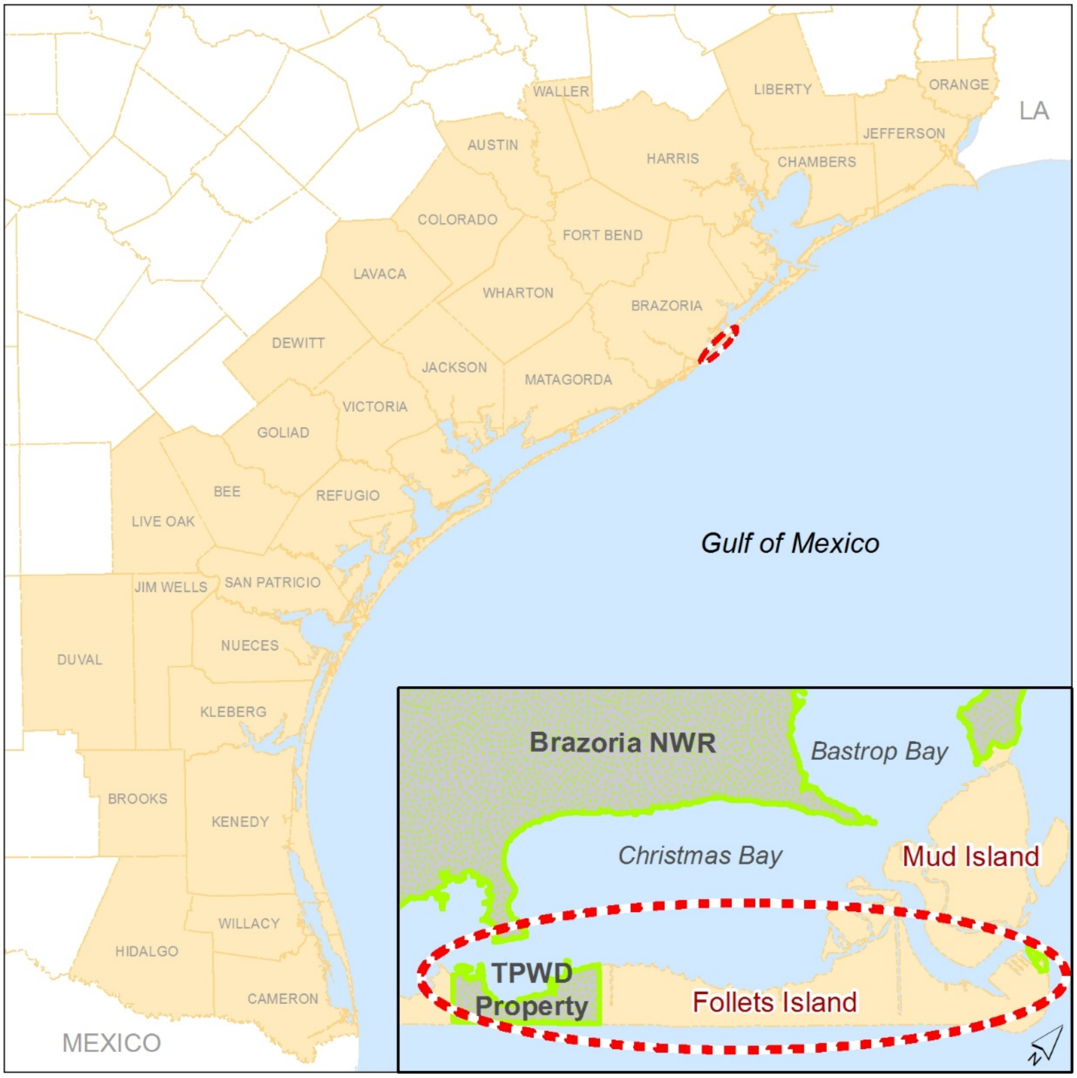

Figure 6-5 Map showing the general project area of the proposed Follets Island habitat acquisition project in Brazoria county, Texas.

This project is being implemented as restoration for the *Deepwater Horizon* oil spill Natural Resource Damage Assessment (NRDA), consistent with the PDARP/PEIS.

- Programmatic goal: Restore and Conserve Habitat
- Restoration type: Wetlands, Coastal, and Nearshore Habitats
- Restoration approach: Protect and conserve marine, coastal, estuarine, and riparian habitats
- Restoration technique: Conserve lands for natural resource values or ecological services
- TIG: Texas
- Restoration plan: Texas Trustee Implementation Group Final 2017 Restoration Plan/Environmental Assessment: Restoration of Wetlands, Coastal, and Nearshore Habitats; and Oysters

This restoration project is being implemented within the Gulf Prairies and Marshes Ecological Region on Follets Island, between Drum and Christmas Bay. Restoration activities involve the conservation of approximately 300 acres of wetland and coastal habitat through acquisition and conveying it to TPWD for management in perpetuity. This project would conserve habitats including dune, coastal strand prairie, and marsh habitat. Additional ecosystem services that may be provided include protection of habitat for a diversity of wildlife, protection of nesting habitat for threatened and endangered sea turtles and birds, and protection for the local watershed by preventing future development to the land.

6.1.2 Restoration Goals and Objectives

The restoration goal to restore and conserve habitat was established in the PDARP. The Follets Island Habitat Acquisition project objective and goal is to conserve coastal habitat and prevent future development by the preservation of beach to bay habitat on Follets Island. The project goal was evaluated in Section 3.3.10.3.2 of the RP/EA (TX TIG 2017) and determined to be consistent with the programmatic restoration goals as presented in the PDARP. This project would remedy harm to beaches, dunes, marshes, and mudflats affected by the *Deepwater Horizon* oil spill.

6.1.3 Conceptual Setting and Anticipated Outcomes

Conveying this property to TPWD would conserve coastal habitat with a high development risk in perpetuity. By acquiring and preserving land on a coastal island, this project would benefit multiple resources such as sea turtles, shorebirds, coastal marshes, dunes, and beaches. This project will benefit flora and fauna by enlarging the amount of protected habitat adjacent to Christmas Bay. This acquisition will protect existing habitat corridors and prevent any future development. This project would also enhance the human experience by providing access to passive recreational activities (e.g., fishing from the shore and wildlife viewing). The diversity of habitats on this tract increases the longevity of benefits derived from this project in consideration of coastal sea level rise.

6.1.4 Sources of Uncertainty evaluated in this MAM Plan

The uncertainties associated with the project and are discussed in Sections 3.3.10.1 and 3.3.10.3.3 of the RP/EA. Due to the project planning process and documented legal protections, there are no anticipated sources of uncertainty that would affect adaptive management in the implementation of this project.

6.2 Adaptive Management

The need for adaptive management varies on a project by project basis. Adaptive management on specific land acquisition activities being implemented is not anticipated for this project. Stewardship activities are the responsibility of TPWD or subsequent receiving conservation entity.

6.3 Project Monitoring

The monitoring plan for this restoration project was developed to evaluate project performance. For each of the identified monitoring parameters, information is provided on the intended purpose of each monitoring parameter, monitoring methods, timing and frequency, duration, sample size, and sites. The parameters listed below may or may not be tied to performance criteria.

Parameter #1: Number of acres protected

a) Purpose: To document the amount of habitat acquired for protection
b) Method: The Implementing Trustees will provide the closing documents which includes documentation of the transfer of the property from current owner(s) to TPWD including the boundary survey. Acreage would be determined during the required boundary survey as reflected in the closing documents. The data product would include electronic scans of the closing documents and a shapefile. This project will include multiple closings with different landowners and therefore have multiple sets of documents associated with each seller.
c) Timing, Frequency, and Duration: The acreage of land protected will be calculated one time after the property has been purchased and transferred.
d) Sample Size: Area of the property acquired.
a) Sites: Area of the property acquired. Boundary information for the land acquired will be documented.

Parameter #2: Acreage of each habitat type

a) Purpose: To document baseline conditions of the natural resources (acreage of habitat types) associated with the land parcel acquired for protection
b) Method: Evaluation of habitat on the property will occur by using any of the following techniques or combination of techniques or similar methods listed below:
    - Texas Ecosystem Analytical Mapper (http://tpwd.texas.gov/landwater/land/programs/landscape-ecology/ems/)
    - Soil survey
    - National Wetlands Inventory
    - Aerial photography
    - Ground truth field surveys

   The data product would include a shapefile.
c) Timing and Frequency: The data collection and report would occur once the property has been transferred to TPWD, within one year after closing
d) Sample Size: Area of the property acquired
e) Sites: Area of the property acquired

6.4 Evaluation

Data analysis is not necessary to meet the project objective or performance criteria.

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

This project will be considered successful when the property is transferred to TPWD and the TX TIG has reviewed and accepted the management plan proposed by TPWD. As there are no post-execution monitoring activities planned, corrective actions are not necessary for this project.

Table 6-1. List of project monitoring parameters, performance criteria, and potential corrective actions

Monitoring Parameter	Final Performance Criteria	Interim Performance Criteria	Potential corrective actions or mid-course corrections*
Number of acres protected	Number of acres protected by acquisition is identified and recorded.	N/A	N/A
Acreage of each habitat type	Acreage of each habitat type on the acquired property is determined and mapped.	N/A	N/A

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

6.6 Monitoring Schedule

The schedule for the project monitoring is shown in Table 6-2, separated by monitoring activity. Pre-execution monitoring will occur before project execution, if applicable. Execution monitoring occurs when project has been fully executed as planned (Year 0). Performance monitoring (PM) would occur in the years following initial project execution under the purview of TPWD management, but is not within the scope of this project. Execution monitoring occurs post construction (Year 0). This timeframe may vary for different parameters.

Table 6-2: Monitoring Schedule

Monitoring Parameter	Pre-execution Monitoring	Execution Monitoring (as built)	PM Year 1	PM Year 2	PM Year 3	PM Year 4	PM Year 5
Number of acres protected	N/A	X	N/A	N/A	N/A	N/A	N/A
Acreage of each habitat type	N/A	X	N/A	N/A	N/A	N/A	N/A

6.7 Data Management

6.7.1 Data Description

Data collected with the project will include documents associated with title transfer; i.e. closing and data associated with a description of habitats associated with the subject tract(s). Original copies of the closing documents will be retained by the Implementing Trustee.

6.7.2 Data Review and Clearance

Relevant project data that are handwritten on hardcopy datasheets or notebooks will be transcribed (entered) into a standard digital format. After transcription of the data, the electronic data sheets will be verified against the original hardcopy datasheets and/or notebooks, and any transcription errors will be corrected as appropriate before data are used for any analyses or published to the DIVER Restoration Portal. Implementing Trustees will verify and validate MAM data and information and will ensure that all data are: i) entered or converted into a commonly used digital format; ii) labeled with metadata to the extent practicable and in accordance with Implementing Trustee agency requirements.

After any and all identified errors are addressed, data are considered to be QA/QC'd. The implementing Trustee will give the other TIG members time to review the data before making such information publicly available (as described below).

6.7.3 Data Storage and Accessibility

Once all data have been QA/QC'd and appropriate metadata has been developed, the data will be submitted to DIVER. In addition to geospatial data following FGDC/ISO standards, appropriate metadata could include a data dictionary (defines codes and fields used in the dataset), and/or a Readme file as appropriate (e.g., how data was collected, QA/QC procedures, other information about data such as meaning, relationships to other data, origin, usage, and format – can reference different documents). Data will be made publicly available, in accordance with the Federal Open Data Policy, through the DIVER Explorer Interface within one year of when the data collection occurred. Prior to being made publicly available, any personal identifiable information will be redacted.

6.7.4 Data Sharing

Data will be made publicly available through the DIVER Restoration Portal, in accordance with the Federal Open Data Policy. In the event of a public records request related to data and information on a project that is not already publicly available, the trustee to whom the request is addressed will provide notice to the other TIG Trustees prior to releasing any project data that is the subject of the request.

6.8 Reporting

One final summary report will be generated for this project within one year of monitoring activities being concluded. This report will be made publicly available through the DIVER Restoration Portal.

6.9 Roles and Responsibilities

TPWD is the implementing trustee for this project and is responsible for the execution of this monitoring and adaptive management plan.

6.10 References

Texas Trustee Implementation Group (Texas TIG). 2017. *Deepwater Horizon* Oil Spill Natural Resource Damage Assessment, Texas Trustee Implementation Group, Final 2017 Texas Restoration Plan/Environment: Restoration of Wetlands, Coastal, and Nearshore Habitats; and Oyster..

7 Mid-coast Habitat Acquisition Monitoring and Adaptive Management Plan

7.1 Introduction

This project Monitoring and Adaptive Management (MAM) plan identifies the monitoring needed to evaluate progress toward meeting project objectives and to support any necessary adaptive management of the restoration project. This plan was developed according to a draft version of the Monitoring and Adaptive Management (MAM) Template and was adapted to fit the needs of the Mid-coast Habitat Acquisition project.

This MAM Plan is a living document and may be updated as needed to reflect changing conditions and/or new information. Any future revisions to this document will be made publicly available and accessible through the DIVER Restoration Portal and the Deepwater Horizon NRDA Storymap website (https://www.diver.orr.noaa.gov/web/guest/home, http://www.restoration.noaa.gov/dwh/storymap/, respectively).

7.1.1 Project Overview

The Mid-coast Habitat Acquisition project as presented in the RP/EA would acquire and conserve approximately 800 acres of wetland and coastal habitats near East Matagorda Bay in Matagorda County, Texas. The project would conserve estuarine wetlands, palustrine emergent wetlands and salty prairie habitat in perpetuity through fee simple acquisition and appropriate legal mechanisms. Once acquired, the land would be transferred to and managed by the United States Fish and Wildlife Service (USFWS) for the purpose of habitat preservation. USFWS will implement land stewardship practices that are currently being used at the Mid-coast Refuge Complex and described in the Comprehensive Conservation Plan (USFWS 2012). See Figure 7-1, below, for a map of the general project area of the Mid-coast Habitat Acquisition.

Figure 7-6 Map showing the general project area of the proposed Mid-coast Habitat Acquisition project in Matagorda County, Texas.

This project is being implemented as restoration for the Deepwater Horizon oil spill Natural Resource Damage Assessment (NRDA), consistent with the PDARP/PEIS.

- Programmatic goal: Restore and Conserve Habitat
- Restoration type: Wetlands, Coastal, and Nearshore Habitats
- Restoration approach: Protect and conserve marine, coastal, estuarine, and riparian habitats
- Restoration technique: Conserve lands for natural resource values or ecological services
- TIG: Texas

- Restoration plan: Texas Trustee Implementation Group Final 2017 Restoration Plan/Environmental Assessment: Restoration of Wetlands, Coastal, and Nearshore Habitats; and Oysters

This restoration project is being implemented within the Gulf Prairies and Marshes Ecological Region near East Matagorda Bay. Restoration activities involve the conservation of approximately 800 acres of wetland and coastal habitat through acquisition and conveying it to USFWS for management in perpetuity. This project would conserve habitats including estuarine and palustrine wetlands as well as salty prairie. Additional ecosystem services that may be provided include protection of habitat for a diversity of wildlife and protection for the local watershed by preventing future development to the land.

7.1.2 Restoration Goals and Objectives

The restoration goal to restore and conserve habitat was established in the PDARP. The Mid-coast Habitat Acquisition project objective and goal is to conserve coastal habitat and prevent future development by the preservation of coastal habitats in Matagorda County. This would remedy harm to estuarine wetlands affected by the *Deepwater Horizon* oil spill. This project goal was evaluated in Section 3.3.11.3.2 of the RP/EA (TX TIG 2017) and determined to be consistent with the programmatic restoration goals as presented in the PDARP.

7.1.3 Conceptual Setting and Anticipated Outcomes

Conveying this property to USFWS would conserve coastal habitat with a high development risk in perpetuity. By acquiring and preserving land on near coastal lands, this project would benefit multiple resources such as shorebirds, coastal marshes, mudflats, wading birds, and estuarine aquatic species. This project will benefit flora and fauna by enlarging the amount of protected habitat adjacent to Big Boggy National Wildlife Refuge (BBNWR). The diversity of habitats on this tract increases the longevity of benefits derived from this project in consideration of coastal sea level rise. This acquisition will protect existing habitat corridors and prevent any future development.

7.1.4 Sources of Uncertainty

The uncertainties associated with the project and are discussed in Sections 3.3.11.1 and 3.3.11.3.3 of the RP/EA. There are no anticipated sources of uncertainty that would affect adaptive management in the implementation of this project.

7.2 Adaptive Management

The need for adaptive management varies on a project by project basis. Adaptive management on specific land acquisition activities being implemented is not anticipated for this project. Stewardship activities are the responsibility of USFWS or subsequent receiving conservation entity.

7.3 Project Monitoring

The monitoring plan for this restoration project was developed to evaluate project performance. For each of the identified monitoring parameters, information is provided on the intended purpose of each monitoring parameter, monitoring methods, timing and frequency, duration, sample size, and sites. The parameters listed below may or may not be tied to performance criteria.

Parameter #1: Number of acres protected

a) Purpose: To document the amount of habitat acquired for protection
b) Method: The Implementing Trustees will provide the closing documents which include documentation of the transfer of the property from current owner(s) to USFWS including the boundary survey. Acreage would be determined during the required boundary survey as reflected in the closing documents. The data product would include electronic scans of the closing documents and a shapefile showing the boundary of the acquired parcel. This project will include multiple closings with different landowners and therefore have multiple sets of documents associated with each seller.
c) Timing, Frequency, and Duration: This will occur one time after the property has been purchased and transferred.
d) Sample Size: Area of the property acquired.
e) Sites: Area of the property acquired. Boundary information for the land acquired will be documented.

Parameter #2: Acreage of each habitat type

a) Purpose: To document baseline conditions of the natural resources (acreage of habitat types) associated with the land parcel acquired for protection
b) Method: Evaluation of habitat on the property will occur by using any of the following techniques or combination of techniques or similar methods listed below.
    - Texas Ecosystem Analytical Mapper (http://tpwd.texas.gov/landwater/land/programs/landscape-ecology/ems/)
    - Soil survey
    - National Wetlands Inventory
    - Aerial photography
    - Ground truth field surveys

   The data product would include a shapefile with habitat types classified.
c) Timing and Frequency: The data collection and report would occur once the property has been transferred to USFWS, within one year after closing
d) Sample Size: Area of the property acquired
e) Sites: Area of the property acquired

7.4 Evaluation

Data analysis is not necessary to meet the project objective or performance criteria.

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

This project will be considered successful when the property is transferred to USFWS and the TX TIG has reviewed and accepted the management plan proposed by USFWS. As there are no post-execution monitoring activities planned, corrective actions are not necessary for this project.

Table 7-1. List of project monitoring parameters, performance criteria, and potential corrective actions

Monitoring Parameter	Final Performance Criteria	Interim Performance Criteria	Potential corrective actions or mid-course corrections*
Number of acres protected	Number of acres protected by acquisition is identified and recorded.	N/A	N/A
Acreage of each habitat type	Acreage of each habitat type on the acquired property is determined and mapped.	N/A	N/A

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

7.6 Monitoring Schedule

The schedule for the project monitoring is shown in Table 7-2, separated by monitoring activity. Pre-execution monitoring will occur before project execution, if applicable. Execution monitoring occurs when project has been fully executed as planned (Year 0). Performance monitoring (PM) would occur in the years following initial project execution under the purview of USFWS management, but is not within the scope of this project.

Table 7-2: Monitoring Schedule

Monitoring Parameter	Pre-execution Monitoring	Execution Monitoring (as built)	PM Year 1	PM Year 2	PM Year 3	PM Year 4	PM Year 5
Number of acres protected	N/A	X	N/A	N/A	N/A	N/A	N/A
Acreage of each habitat type	N/A	X	N/A	N/A	N/A	N/A	N/A

7.7 Data Management

7.7.1 Data Description

Data collected with the project will include documents associated title transfer; i.e. closing and data associated with a description of habitats associated with the subject tract(s). Original copies of the closing documents will be retained by the Implementing Trustee.

7.7.2 Data Review and Clearance

Relevant Project data that are handwritten on hardcopy datasheets or notebooks will be transcribed (entered) into a standard digital format. After transcription of the data, the electronic data sheets will be verified against the original hardcopy datasheets and/or notebooks, and any transcription errors will be corrected as appropriate before data are used for any analyses or published to the DIVER Restoration Portal. Implementing Trustees will verify and validate MAM data and information and will ensure that all data are: i) entered or converted into a commonly used digital format; ii) labeled with metadata to the extent practicable and in accordance with Implementing Trustee agency requirements.

Data will be reviewed and corrected using quality assurance and quality control (QA/QC) procedures. These data will be considered final. The implementing Trustee will give the other TIG members time to review the data before making such information publicly available (as described below). Before submitting the monitoring data and information package, co-Implementing Trustees shall confirm with one another that the package is approved for submission.

7.7.3 Data Storage and Accessibility

Once all data have been considered final and appropriate metadata has been developed, the data will be submitted to DIVER. In addition to geospatial data following FGDC/ISO standards, appropriate metadata could include a data dictionary (defines codes and fields used in the dataset), and/or a Readme file as appropriate (e.g., how data was collected, QA/QC procedures, other information about data such as meaning, relationships to other data, origin, usage, and format – can reference different documents). Data will be made publicly available, in accordance with the Federal Open Data Policy, through the DIVER Explorer Interface within one year of when the data collection occurred. Prior to being made publicly available, any personal identifiable information will be redacted.

7.7.4 Data Sharing

In the event of a public records request related to data and information on a project that is not already publicly available, the trustee to whom the request is addressed will provide notice to the other TIG Trustees prior to releasing any project data that is the subject of the request.

7.8 Reporting

One final summary report will be generated for this project within one year of monitoring activities being concluded. This report will be made publicly available through the DIVER Restoration Portal.

7.9 Roles and Responsibilities

USFWS is the implementing trustee for this project and is responsible for the execution of this monitoring and adaptive management plan.

7.10 References

Texas Trustee Implementation Group (Texas TIG). 2017. *Deepwater Horizon Oil Spill* Natural Resource Damage Assessment, Texas Trustee Implementation Group, Final 2017 Texas Restoration Plan/Environment: Restoration of Wetlands, Coastal, and Nearshore Habitats; and Oyster.

8 Bahia Grande Coastal Corridor Habitat Acquisition Monitoring and Adaptive Management Plan

8.1 Introduction

This project Monitoring and Adaptive Management (MAM) plan identifies the monitoring needed to evaluate progress toward meeting project objectives and to support any necessary adaptive management of the restoration project. This plan was developed according to a draft version of the Monitoring and Adaptive Management (MAM) Template and was adapted to fit the needs of the Bahia Grande Coastal Corridor Habitat Acquisition project.

This MAM Plan is a living document and may be updated as needed to reflect changing conditions and/or new information. Any future revisions to this document will be made publicly available and accessible through the DIVER Restoration Portal and the Deepwater Horizon NRDA Storymap website (https://www.diver.orr.noaa.gov/web/guest/home, http://www.restoration.noaa.gov/dwh/storymap/, respectively).

8.1.1 Project Overview

The Bahia Grande Coastal Corridor Habitat Acquisition project as presented in the RP/EA would acquire and conserve approximately 1,322 acres of wetland, grassland, and upland habitats on and adjacent to the Lower Laguna Madre in Cameron County, Texas. The project would conserve tidal wetlands, thornscrub, and coastal prairie habitat in perpetuity through fee simple acquisition and appropriate legal mechanisms. Once acquired, the land would be transferred to U.S. Fish and Wildlife Service (USFWS) and managed by the Laguna Atascosa National Wildlife Refuge (LANWR) for the purpose of habitat preservation. USFWS will implement land stewardship and management practices in accordance with the LANWR Comprehensive Conservation Plan and the LANWR Expansion and Conceptual Management Plan. See Figure 8-1, below, for a map of the general project area of the Bahia Grande Coastal Corridor Habitat.

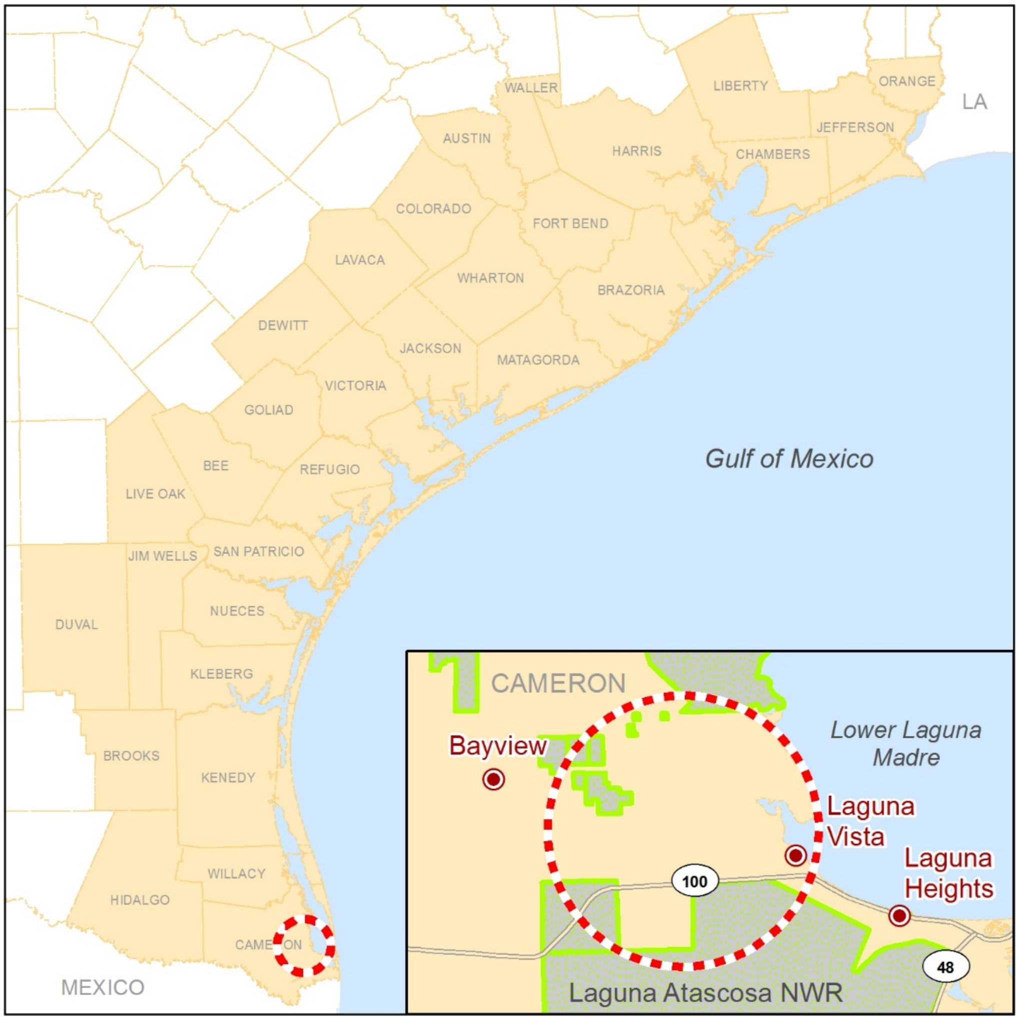

Figure 8-7 Map showing the general project area of the proposed Bahia Grande Coastal Corridor habitat acquisition project in Cameron County, Texas.

This project is being implemented as restoration for the *Deepwater Horizon* oil spill Natural Resource Damage Assessment (NRDA), consistent with the PDARP/PEIS.

- Programmatic goal: Restore and Conserve Habitat
- Restoration type: Wetlands, Coastal, and Nearshore Habitats
- Restoration approach: Protect and conserve marine, coastal, estuarine, and riparian habitats
- Restoration technique: Conserve lands for natural resource values or ecological services
- TIG: Texas
- Restoration plan: Texas Trustee Implementation Group Final 2017 Restoration Plan/Environmental Assessment: Restoration of Wetlands, Coastal, and Nearshore Habitats; and Oysters

This restoration project is being implemented within the Gulf Prairies and Marshes Ecological Region in Cameron County, Texas on and adjacent to the Lower Laguna Madre. Restoration activities involve the conservation of approximately 1,322 acres of wetland and coastal habitat through acquisition and conveying it to USFWS for management in perpetuity. This project would restore habitats including tidal wetlands, mudflats, emergent tidal marshes, seagrass beds, coastal prairie, and thornscrub habitat. Additional ecosystem services that may be provided include protection of habitat for a diversity of wildlife, protection of nesting habitat for threatened and endangered birds, protection of corridor and potential denning habitat for the endangered ocelot, and protection for the local watershed by preventing future development to the land.

8.1.2 Restoration Goals and Objectives

The restoration goals to restore and conserve wetland and nearshore habitats were established in the PDARP. The Bahia Grande Coastal Corridor project objective and goal is to conserve coastal habitat and prevent future development by the preservation of tidal wetlands, emergent and submergent wetlands, and transitional habitats (coastal prairie and thornscrub) in south Texas. This project would remedy harm to tidal wetlands, mudflats, emergent tidal marshes, and seagrass beds affected by the *Deepwater Horizon* oil spill. The project goal was evaluated in Section 3.3.13.3.2 of the RP/EA (TX TIG 2017) and determined to be consistent with the programmatic restoration goals as presented in the PDARP.

8.1.3 Conceptual Setting and Anticipated Outcomes

Conveying this property to USFWS would conserve coastal habitat with a high development risk in perpetuity. By acquiring and preserving land along the Lower Laguna Madre, this project would benefit multiple resources such as sea turtles, shorebirds, coastal marshes, tidal flats, coastal prairie, and native thornscrub. The diversity of habitats on this tract increases the longevity of benefits derived from this project in consideration of coastal sea level rise. This project will benefit flora and fauna by enlarging the amount of protected habitat adjacent to other tracts owned, protected, and managed by LANWR. This acquisition will protect existing habitat corridors and prevent any future development.

8.1.4 Sources of Uncertainty

The uncertainties associated with the project and how they would be addressed are discussed in Sections 3.3.13.1 and 3.3.13.3.3 of the RP/EA. There are no anticipated sources of uncertainty that would affect adaptive management in the implementation of this project.

8.2 Adaptive Management

The need for adaptive management varies on a project by project basis. Adaptive management on specific land acquisition activities being implemented is not anticipated for this project. Stewardship activities are the responsibility of USFWS or subsequent receiving conservation entity.

8.3 Project Monitoring

The monitoring plan for this restoration project was developed to evaluate project performance. For each of the identified monitoring parameters, information is provided on the intended purpose of each monitoring parameter, monitoring methods, timing and frequency, duration, sample size, and sites. The parameters listed below may or may not be tied to performance criteria.

Parameter #1: Number of acres protected

a) Purpose: To document the amount of habitat acquired for protection
b) Method: The Implementing Trustees will provide the closing documents which includes documentation of the transfer of the property from current owner(s) to USFWS including the boundary survey. Acreage would be determined during the required boundary survey as reflected in the closing documents. The data product would include electronic scans of the closing documents and a shapefile detailing the boundary of the acquired parcels. This project will include multiple closings with different landowners and therefore have multiple sets of documents associated with each seller.
c) Timing, Frequency, and Duration: This will occur one time after the property has been purchased and transferred.
d) Sample Size: Area of the property acquired.
e) Sites: Area of the property acquired. Boundary information for the land acquired will be documented.

Parameter #2: Acreage of each habitat type

a) Purpose: To document baseline conditions of the natural resources (acreage of habitat types) associated with the land parcel acquired for protection
b) Method: Evaluation of habitat on the property will occur by using any of the following techniques or combination of techniques or similar methods listed below. The data product would include a shapefile classified by habitat type.
    - Texas Ecosystem Analytical Mapper (http://tpwd.texas.gov/landwater/land/programs/landscape-ecology/ems/)
    - Soil survey
    - National Wetlands Inventory
    - Aerial photography
    - Ground truth field surveys
c) Timing and Frequency: The data collection and report would occur once the property has been transferred to USFWS, within one year after closing
d) Sample Size: Area of the property acquired
e) Sites: Area of the property acquired

8.4 Evaluation

Data analysis is not necessary to meet the project objective or performance criteria.

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

This project will be considered successful when the property is transferred to USFWS and the TX TIG has reviewed and accepted the management plan proposed by USFWS. As there are no post-execution monitoring activities planned, corrective actions are not necessary for this project.

Table 8-1. List of project monitoring parameters, performance criteria, and potential corrective actions

Monitoring Parameter	Final Performance Criteria	Interim Performance Criteria	Potential corrective actions or mid-course corrections*
Number of acres protected	Number of acres protected by acquisition is identified and recorded.	N/A	N/A
Acreage of each habitat type	Acreage of each habitat type on the acquired property is determined and mapped.	N/A	N/A

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

8.6 Monitoring Schedule

The schedule for the project monitoring is shown in Table 8-2, separated by monitoring activity. Pre-execution monitoring will occur before project execution, if applicable. Execution monitoring occurs when project has been fully executed as planned (Year 0). Performance monitoring would occur in the years following initial project execution under the purview of USFWS management, but is not within the scope of this project.

Table 8-2: Monitoring Schedule

Monitoring Parameter	Pre-execution Monitoring	Execution Monitoring (as built)	PM Year 1	PM Year 2	PM Year 3	PM Year 4	PM Year 5
Number of acres protected	N/A	X	N/A	N/A	N/A	N/A	N/A
Acreage of each habitat type	N/A	X	N/A	N/A	N/A	N/A	N/A

8.7 Data Management

8.7.1 Data Description

Data collected with the project will include documents associated title transfer; i.e. closing and data associated with a description of habitats associated with the subject tract(s). Original copies of the closing documents will be retained by the Implementing Trustee.

8.7.2 Data Review and Clearance

Relevant Project data that are handwritten on hardcopy datasheets or notebooks will be transcribed (entered) into a standard digital format. After transcription of the data, the electronic data sheets will be verified against the original hardcopy datasheets and/or notebooks, and any transcription errors will be corrected as appropriate before data are used for any analyses or published to the DIVER Restoration Portal. Implementing Trustees will verify and validate MAM data and information and will ensure that all data are: i) entered or converted into a commonly used digital format; ii) labeled with metadata to the extent practicable and in accordance with Implementing Trustee agency requirements.

After all identified errors are addressed, data are considered to be QA/QC'd. The implementing Trustee will give the other 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.

8.7.3 Data Storage and Accessibility

Once all data have been QA/QC'd and appropriate metadata has been developed, the data will be submitted to DIVER. In addition to geospatial data following FGDC/ISO standards, appropriate metadata could include a data dictionary (defines codes and fields used in the dataset), and/or a Readme file as appropriate (e.g., how data was collected, QA/QC procedures, other information about data such as meaning, relationships to other data, origin, usage, and format – can reference different documents). Data will be made publicly available, in accordance with the Federal Open Data Policy, through the DIVER Explorer Interface within one year of when the data collection occurred. Prior to being made publicly available, any personal identifiable information will be redacted.

8.7.4 Data Sharing

In the event of a public records request related to data and information on a project that is not already publicly available, the trustee to whom the request is addressed will provide notice to the other TIG Trustees prior to releasing any project data that is the subject of the request.

8.8 Reporting

One final summary report will be generated for this project within one year of monitoring activities being concluded. This report will be made publicly available through the DIVER Restoration Portal.

8.9 Roles and Responsibilities

USFWS is the implementing trustee for this project and is responsible for the execution of this monitoring and adaptive management plan.

8.10 References

Texas Trustee Implementation Group (Texas TIG). 2017. *Deepwater Horizon Oil Spill* Natural Resource Damage Assessment, Texas Trustee Implementation Group, Final 2017 Texas Restoration Plan/Environment: Restoration of Wetlands, Coastal, and Nearshore Habitats; and Oyster.

9 Laguna Atascosa Habitat Acquisition Monitoring and Adaptive Management Plan

9.1 Introduction

This project Monitoring and Adaptive Management (MAM) plan identifies the monitoring needed to evaluate progress toward meeting project objectives and to support any necessary adaptive management of the restoration project. This plan was developed according to a draft version of the Monitoring and Adaptive Management (MAM) Template and was adapted to fit the needs of the Laguna Atascosa Habitat Acquisition project.

This MAM Plan is a living document and may be updated as needed to reflect changing conditions and/or new information. Any future revisions to this document will be made publicly available and accessible through the DIVER Restoration Portal and the Deepwater Horizon NRDA Storymap website (https://www.diver.orr.noaa.gov/web/guest/home, http://www.restoration.noaa.gov/dwh/storymap/, respectively).

9.1.1 Project Overview

The Laguna Atascosa Habitat Acquisition project as presented in the RP/EA would acquire and conserve approximately 1,682 acres of beach, dune, and tidal habitats on South Padre Island, Texas. The project would conserve beach, dune, and tidal habitat in habitat in perpetuity through fee simple acquisition and appropriate legal mechanisms. Once acquired, the land would be transferred to U.S. Fish and Wildlife Service (USFWS) and managed by the Laguna Atascosa National Wildlife Refuge (LANWR) for the purpose of habitat preservation. USFWS will implement land stewardship and management practices in accordance with the LANWR Comprehensive Conservation Plan and the LANWR Expansion and Conceptual Management Plan. See Figure 9-1, below, for a map of the general project area of the Laguna Atascosa Habitat Acquisition.

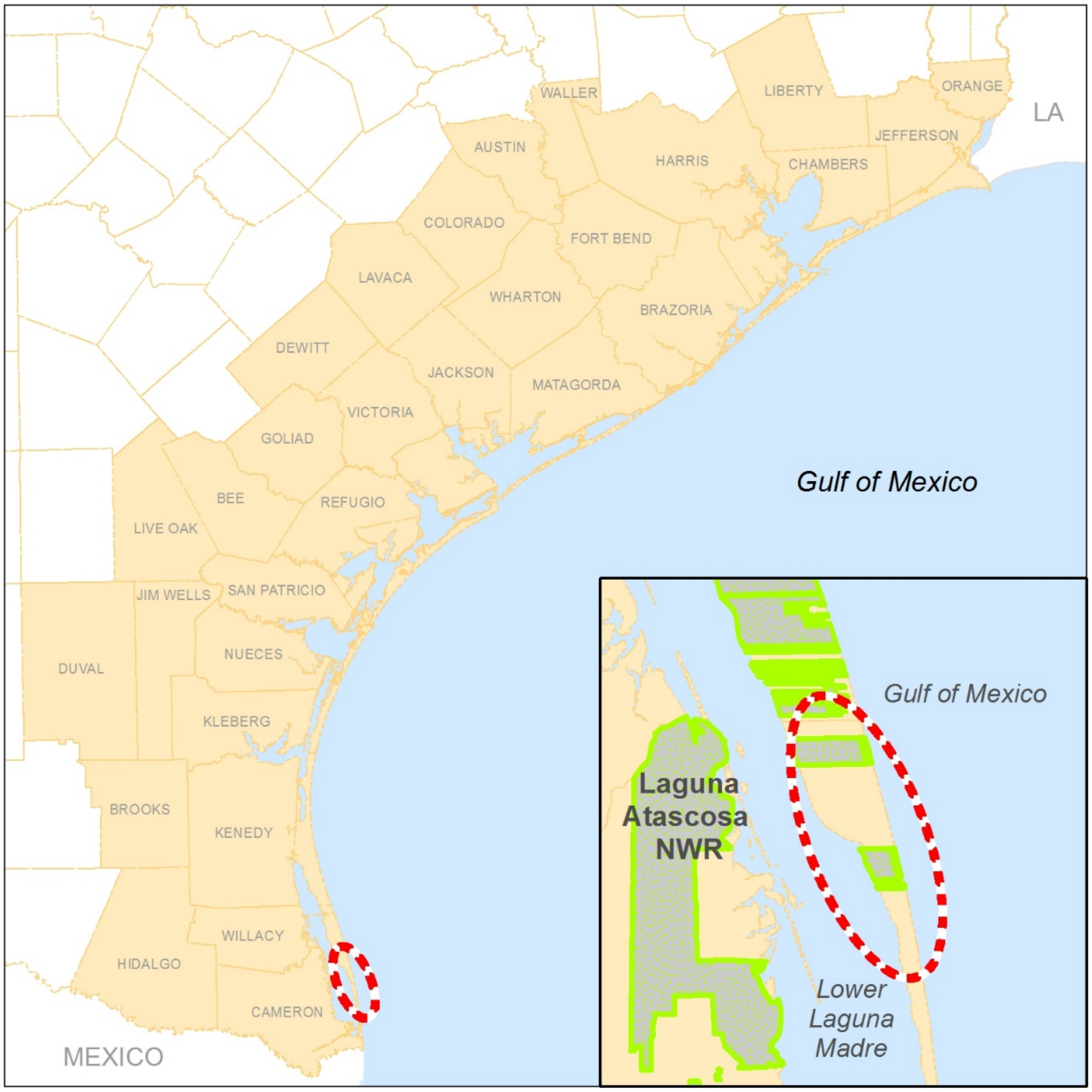

Figure 9-1. Map showing the general location of the proposed Laguna Atascosa Habitat Acquisition project area in Willacy and Cameron counties.

This project is being implemented as restoration for the *Deepwater Horizon* oil spill Natural Resource Damage Assessment (NRDA), consistent with the PDARP/PEIS.

- Programmatic goal: Restore and Conserve Habitat
- Restoration type: Wetlands, Coastal, and Nearshore Habitats
- Restoration approach: Protect and conserve marine, coastal, estuarine, and riparian habitats
- Restoration technique: Conserve lands for natural resource values or ecological services
- TIG: Texas
- Restoration plan: Texas Trustee Implementation Group Final 2017 Restoration Plan/Environmental Assessment: Restoration of Wetlands, Coastal, and Nearshore Habitats; and Oysters

This restoration project is being implemented within the Gulf Prairies and Marshes Ecological Region on South Padre Island, Texas. Restoration activities involve the conservation of approximately 1,682 acres of wetland and coastal habitat through acquisition and conveying it to USFWS for management in perpetuity. This project would restore habitats including beach, dune, and tidal marsh habitats. Additional ecosystem services that may be provided include protection of habitat for a diversity of wildlife, protection of nesting habitat for threatened and endangered sea turtles and birds, and protection for the barrier island by preventing future development to the land.

9.1.2 Restoration Goals and Objectives

The restoration goals to restore and conserve wetland and nearshore habitats were established in the PDARP. The Laguna Atascosa Habitat Acquisition project objective and goal is to conserve coastal habitat and prevent future development by the preservation of beach to bay habitat on South Padre Island. This project would remedy harm to beaches, dunes, and tidal flats affected by the *Deepwater Horizon* oil spill. The project goal was evaluated in Section 3.3.14.3.2 of the RP/EA (TX TIG 2017) and determined to be consistent with the programmatic restoration goals as presented in the PDARP.

9.1.3 Conceptual Setting and Anticipated Outcomes

Conveying this property to USFWS would conserve coastal habitat with a high development risk in perpetuity. By acquiring and preserving land on a coastal barrier island, this project would benefit multiple resources such as sea turtles, shorebirds, falcons, wading birds, waterfowl, neotropical migrants, waterfowl, tidal flats, dunes, and beaches. This project will benefit flora and fauna by enlarging the amount of protected habitat currently under USFWS ownership and management on South Padre Island. The diversity of habitats on this tract increases the longevity of benefits derived from this project in consideration of coastal sea level rise. This acquisition will protect existing habitat corridors and prevent any future development.

9.1.4 Sources of Uncertainty

The uncertainties associated with the project and how they would be addressed are discussed in Sections 3.3.14.1 and 3.3.14.3.3 of the RP/EA. There are no anticipated sources of uncertainty that would affect adaptive management in the implementation of this project.

9.2 Project Monitoring

The monitoring plan for this restoration project was developed to evaluate project performance. For each of the identified monitoring parameters, information is provided on the intended purpose of each monitoring parameter, monitoring methods, timing and frequency, duration, sample size, and sites. The parameters listed below may or may not be tied to performance criteria.

Parameter #1: Number of acres protected

a) Purpose: To document the amount of habitat acquired for protection
b) Method: The Implementing Trustees will provide the closing documents which includes documentation of the transfer of the property from current owner(s) to USFWS including the boundary survey. Acreage would be determined during the required boundary survey as

reflected in the closing documents. The data product would include electronic scans of the closing documents and a shapefile showing the boundary of the acquired parcel. This project will include multiple closings with different landowners and therefore have multiple sets of documents associated with each seller.

c) Timing, Frequency, and Duration: This will occur one time after the property has been purchased and transferred.
d) Sample Size: Area of the property acquired.
e) Sites: Area of the property acquired. Boundary information for the land acquired will be documented.

Parameter #2: Acreage of each habitat type

a) Purpose: To document baseline conditions of the natural resources (acreage of habitat types) associated with the land parcel acquired for protection
b) Method: Evaluation of habitat on the property will occur by using any of the following techniques or combination of techniques or similar methods listed below.
    - Texas Ecosystem Analytical Mapper (http://tpwd.texas.gov/landwater/land/programs/landscape-ecology/ems/)
    - Soil survey
    - National Wetlands Inventory
    - Aerial photography
    - Ground truth field surveys
c) Timing and Frequency: The data collection and report would occur once the property has been transferred to USFWS, within one year after closing
d) Sample Size: Area of the property acquired
e) Sites: Area of the property acquired
The data product would include a shapefile classified by habitat type.

9.3 Adaptive Management

The need for adaptive management varies on a project by project basis. Adaptive management on specific land acquisition activities being implemented is not anticipated for this project. Stewardship activities are the responsibility of USFWS or subsequent receiving conservation entity.

9.4 Evaluation

Data analysis is not necessary to meet the project objective or performance criteria.

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

This project will be considered successful when the property is transferred to USFWS and the TX TIG has reviewed and accepted the management plan proposed by USFWS. As there are no post-execution monitoring activities planned, corrective actions are not necessary for this project.

Table 9-1. List of project monitoring parameters, performance criteria, and potential corrective actions

Monitoring Parameter	Final Performance Criteria	Interim Performance Criteria	Potential corrective actions or mid-course corrections*
Number of acres protected	Number of acres protected by acquisition is identified and recorded.	N/A	N/A
Acreage of each habitat type	Acreage of each habitat type on the acquired property is determined and mapped.	N/A	N/A

9.6 Monitoring Schedule

The schedule for the project monitoring is shown in Table 9-2, separated by monitoring activity. Pre-execution monitoring will occur before project execution, if applicable. Execution monitoring occurs when project has been fully executed as planned (Year 0). Performance monitoring (PM) would occur in the years following initial project execution under the purview of USFWS management, but is not within the scope of this project.

Table 9-2: Monitoring schedule

Monitoring Parameter	Pre-execution Monitoring	Execution Monitoring (as built)	PM Year 1	PM Year 2	PM Year 3	PM Year 4	PM Year 5
Number of acres protected	N/A	X	N/A	N/A	N/A	N/A	N/A
Acreage of each habitat type	N/A	X	N/A	N/A	N/A	N/A	N/A

9.7 Data Management

9.7.1 Data Description

Data collected with the project will include documents associated title transfer; i.e. closing and data associated with a description of habitats associated with the subject tract(s). Original copies of the closing documents will be retained by the Implementing Trustee.

9.7.2 Data Review and Clearance

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After all identified errors are addressed, data are considered to be QA/QC'd. The implementing Trustee will give the other 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.

9.7.3 Data Storage and Accessibility

Once all data have been QA/QC'd and appropriate metadata has been developed, the data will be submitted to DIVER. In addition to geospatial data following FGDC/ISO standards, appropriate metadata could include a data dictionary (defines codes and fields used in the dataset), and/or a Readme file as appropriate (e.g., how data was collected, QA/QC procedures, other information about data such as meaning, relationships to other data, origin, usage, and format – can reference different documents). Data will be made publicly available, in accordance with the Federal Open Data Policy, through the DIVER Explorer Interface within one year of when the data collection occurred. Prior to being made publicly available, any personal identifiable information will be redacted.

9.7.4 Data Sharing

In the event of a public records request related to data and information on a project that is not already publicly available, the trustee to whom the request is addressed will provide notice to the other TIG Trustees prior to releasing any project data that is the subject of the request.

9.8 Reporting

One final summary report will be generated for this project within one year of monitoring activities being concluded. This report will be made publicly available through the DIVER Restoration Portal.

9.9 Roles and Responsibilities

USFWS is the implementing trustee for this project and is responsible for the execution of this monitoring and adaptive management plan.

9.10 References

Texas Trustee Implementation Group (Texas TIG). 2017. *Deepwater* Horizon *Oil Spill* Natural Resource Damage Assessment, Texas Trustee Implementation Group, Final 2017 Texas Restoration Plan/Environment: Restoration of Wetlands, Coastal, and Nearshore Habitats; and Oyster.

Appendix E: Coastal Zone Management Act Correspondence

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Silver Spring, MD 20910

MAY 1 1 2017

Texas General Land Office
Allison Buchtien
Coastal Protection Division
1700 North Congress Avenue, Room 330
Austin, Texas 78701-1495

Dear Ms. Buchtien,

The Texas Trustee Implementation Group (TX TIG) is responsible for restoring the natural resources and services within the Texas Restoration Area that were injured by the April 20, 2010 *Deepwater Horizon* (*DWH*) oil spill and associated spill response efforts. The TX TIG is proposing thirteen (13) natural resource restoration projects for selection, if approved by the TX TIG after consideration of public review and comment, in the "Texas Trustee Implementation Group Draft 2017 Restoration Plan/Environmental Assessment: Wetlands, Coastal, and Nearshore Habitats; and Oysters" (Draft RP/EA).

The TX TIG is comprised of the Texas Department of Parks and Wildlife (TPWD); the Texas Commission on Environmental Quality (TCEQ); the Texas General Land Office (GLO); the National Oceanic and Atmospheric Administration (NOAA), on behalf of the U.S. Department of Commerce (DOC); the United States Department of the Interior (DOI), as represented by the U.S. Fish and Wildlife Service (FWS); the United States Department of Agriculture (USDA); and the United States Environmental Protection Agency (EPA). The Federal Trustees (NOAA, DOI, USDA, and EPA) have reviewed the restoration plan and proposed projects for consistency with the Texas Coastal Management Program (TCMP) and have found that, as proposed, these restoration actions are consistent to the maximum extent practicable with the applicable, enforceable policies of the State's federally-approved TCMP. This letter submits that determination for State review on behalf of all Federal Trustees.

Background

After the *DWH* oil spill the state and federal natural resources trustees (the Trustees) conducted a NRDA to assess impacts to the Gulf's natural resources, and a comprehensive, integrated ecosystem restoration approach was proposed to address the potential magnitude and breadth of restoration for injuries resulting from the oil spill. In February 2016, the *DWH* Trustee Council issued a Final Programmatic Damage Assessment and Restoration Plan/Programmatic Environmental Impact Statement (PDARP/PEIS) under the Oil Pollution Act (OPA) and the National Environmental Policy Act (NEPA) to analyze alternative approaches to implementing restoration and to guide restoration decisions consistently across the Gulf of Mexico region. The purpose of restoration is to make the environment and the public whole for injuries resulting from the incident by implementing restoration actions that return injured natural resources and services to baseline conditions and compensate for interim losses, in accordance with OPA and associated NRDA regulations.

On April 4, 2016, the United States District Court for the Eastern District of Louisiana entered a Consent Decree resolving civil claims by the Trustees against BP Exploration and Production Inc. (BP) arising from the *DWH* oil spill. This historic settlement resolves the Trustees' claims against BP for natural resources damages under OPA. The Draft RP/EA prepared by the TX TIG tiers from the PDARP/PEIS and proposes restoration projects to be funded in the 2016-2017 funding cycle in the Texas Restoration Area.

Federally-approved TCMP Consistency Review

The federally-approved TCMP is comprised of a network of agencies with authority in the state's coastal zone. The primary authority guiding the TCMP is the Texas General Land Office. The TCMP is built around the following goals:

1) To protect, preserve, restore and enhance the diversity, quality, quantity, functions and values of coastal natural resource areas;
2) To ensure sound management of all coastal resources by allowing for compatible economic development and multiple human uses of the coastal zone;
3) To minimize loss of human life and property due to the impairment and loss of protective features of coastal natural resource areas;
4) To ensure and enhance planned public access to and enjoyment of the coastal zone in a manner that is compatible with private property rights and other uses of the coastal zone;
5) To balance the benefits from economic development and multiple human uses of the coastal zone; the benefits from protecting, preserving, restoring and enhancing coastal natural resource areas; the benefits from minimizing loss of human life and property; and the benefits from public access to and enjoyment of the coastal zone;
6) To coordinate agency and subdivision decision-making affecting coastal natural resource areas by establishing clear, objective policies for the management of coastal natural resource areas;
7) To make agency and subdivision decision-making affecting coastal natural resource areas efficient by identifying and addressing duplication and conflicts among local, state and

federal regulatory and other programs for the management of coastal natural resource areas;

8) To make agency and subdivision decision-making affecting coastal natural resource areas more effective by employing the most comprehensive, accurate and reliable information and scientific data available and by developing, distributing for public comment, and maintaining a coordinated, publicly accessible geographic information system of maps of the coastal zone and coastal natural resource areas at the earliest possible date;
9) To make coastal management processes visible, coherent, accessible and accountable to the people of Texas by providing for public participation in the ongoing development and implementation of the Texas CMP; and
10) To educate the public about the principal coastal problems of state concern and technology available for the protection and improved management of coastal natural resource areas.

The principle policies of the TCMP that are potentially relevant to restoration actions described in the RP/EA are those at 31 T.A.C. §501.15 Policy for Major Actions, §501.20 Policies for Prevention, Response and Remediation of Oil Spills, §501.22 Policies for Nonpoint Source (NPS) Water Pollution, §501.23 Policies for Development in Critical Areas, §501.24 Policies for Construction of Waterfront Facilities and Other Structures on Submerged Lands, §501.25 Policies for Dredging and Dredged Material and Placement, §501.26 Policies for Construction in the Beach/Dune System, §501.27 Policies for Development in Coastal Hazard Areas, §501.28 Policies for Development Within Coastal Barrier Resource System Units and Otherwise Protected Areas on Coastal Barriers, §501.29 Policies for Development in State Parks, Wildlife Management Areas or Preserves, §501.30 Policies for Alteration of Coastal Historic Areas, §501.31 Policies for Transportation Projects, §501.32 Policies for Emission of Air Pollutants, and §501.34 Policies for Levee and Flood Control Projects.

Proposed Restoration Projects in the Texas TIG Draft RP/EA:

Descriptions of the proposed projects are provided below.

1. McFaddin Beach and Dune Restoration- This project would place sand to restore the beach and dune system along an 18-mile section of shoreline in northeastern Texas. This project is proposing to fund about 1/3 of the estimated $45,000,000 total project costs. The Texas TIG would partner with other funding sources to complete the project, which would provide important ecological benefits by restoring lost beach and dune habitat and by helping to slow or stop marsh/land loss and protect the interior marshes of the McFaddin NWR. Indirectly, this project would benefit the entire Salt Bayou system (flora and fauna) by preventing regular influxes of salt water, which causes a shift in species utilization and a conversion of marsh to open water (i.e., land loss). Adverse impacts would be caused by the dredging and placement of sediments. These actions could cause

increases in turbidity, burial of organisms, generation of GHG emissions and noise from the temporary use of heavy equipment, enough disturbance such that protected species as well as other fauna may need to relocate from the project area, temporary closures of recreation areas (including driving on beaches) to maintain public safety, and the presence of construction activities could negatively affect the viewshed. The impacts from the proposed project are largely beneficial and the adverse impacts are minor to moderate. Benefits to the physical, biological, and human uses and socioeconomics would result if this project was implemented. Best Management Practices required in the permit, consultations, or environmental reviews would be followed. Additionally, BMPs described in Appendix 6.A of the Final PDARP/PEIS as well as BMPs identified in the RP/EA would be considered and applied where appropriate, to reduce or eliminate impacts to the environment.

2. Bessie Heights Wetland Restoration- This project would restore and conserve wetlands and coastal habitats in the Lower Neches Wildlife Management Area (WMA) in Orange County and within the J.D. Murphree WMA in Jefferson County, Texas. This project would also provide benefit to a variety of fauna injured by the Incident (e.g., crab, birds, fish, etc.) that use the interconnected habitats (intertidal fringe marsh, salt marsh, sand flat, and protected shallow water) in the project area. The project would beneficially use sediment obtained from dredging of navigation channels to restore and conserve degraded coastal wetlands. The placement of dredge material and associated planting would restore up to 500 acres of intertidal marsh. The impacts from the proposed project are largely beneficial and the adverse impacts are minor. Benefits to the biological, physical, and human uses and socioeconomics environment would result if this project was implemented. Best Management Practices (BMP) required in the permit, consultations, or environmental reviews would be followed. Additionally, BMPs described in the RP/EA would be considered and applied where appropriate, to reduce or eliminate impacts to the environment.

3. Pierce Marsh Wetland Restoration- The Pierce Marsh Wetland Restoration project would restore and conserve wetlands and coastal habitats by constructing levees and beneficially using dredged material to create a viable, vegetated, wetland habitat for a variety of plants, fish, birds, and other wildlife that frequent the area. The Galveston Bay watershed provides important habitat for wildlife, including migratory waterfowl, ducks, and wading birds and also serves as a valuable nursery and breeding habitat for numerous estuarine-dependent sport and commercial fish and shellfish. The placement of dredge material and associated planting would restore up to 150 acres of marsh and contribute to an ongoing effort to restore the wetland complex in West Galveston Bay. The potential environmental effects from the project would be largely minor, localized, and often of short duration. In addition, any BMPs and measures to avoid and minimize impacts that are identified during the permitting process or during consultations and reviews with natural resource agencies would be implemented. As a result, collateral injury would be

avoided or minimized during project implementation. Anticipated project outcomes (marsh creation) would increase the ability of the coastline to mitigate storm surges, which would greatly benefit the public.

4. Indian Point Shoreline Erosion Protection Project- The Indian Point Shoreline Erosion Protection project would construct 2,800 linear-feet of segmented breakwaters to protect 50 acres of critical seagrass, coastal marsh, lagoons and associated upland habitats within Indian Point on Corpus Christi Bay in San Patricio County. The project would protect the existing shoreline from wind and wave driven erosion and protect the remaining marsh and associated coastal habitats adjacent to the shoreline. The project would protect an extensive mosaic of estuarine marsh, tidal lagoons, and sand/shell water interfaces that are crucial habitat to numerous commercial and recreational inter-jurisdictional estuarine fishery species. This includes species such as brown and white shrimp, blue crab, Gulf menhaden, sand seatrout, southern flounder, red drum, bay anchovy, and other marine organisms. This project would minimize future and collateral injury by implementing techniques as defined in the existing project manual and utilizing BMPs to minimize injury during construction.

5. Bahia Grande Hydrologic Restoration- The Bahia Grande Hydrologic Restoration project would restore and conserve the Bahia Grande wetland complex in the Laguna Atascosa National Wildlife Refuge near Brownsville, Texas. This project would enlarge and stabilize a pilot channel that would increase tidal flow into Bahia Grande, restoring the system's natural tidal exchange and creating habitat for a variety of fish, shellfish, and migratory waterfowl. The construction of the channel would provide tidal exchange of 32% of total water volume into Bahia Grande and restore its ecosystem functions as a major fish, wildlife, and waterfowl nursery and habitat for the South Texas Coast. The Bahia Grande Hydrologic Restoration project would restore the natural hydrology to a once healthy wetland ecosystem and would contribute the ongoing landscape-scale effort to restore the Bahia Grande Unit of Laguna Atascosa NWR. Project actions would create a viable wetland habitat for a variety of plants, fish, birds, and other wildlife that frequent the area, and would contribute to an ongoing effort to restore the 10,000-acre wetland complex. Adverse effects from the project would largely be minor, localized, and often of short duration.

6. Follets Island Habitat Acquisition- This project would acquire and conserve around 300 acres of wetland and coastal habitats on Follets Island between San Luis Pass and Drum Bay in Brazoria County, Texas. The project would conserve dune, coastal strand prairie, and marsh habitat in perpetuity through fee-simple acquisition. This project would increase protection for the coastal ecosystem and it would complement the existing Follets Island Conservation Initiative (property owned and managed by TPWD), the Christmas Bay Coastal Preserve (jointly managed by TPWD and TGLO), and other adjacent coastal preservation activities. Once acquired, the land would be transferred to

and managed by the Texas Parks and Wildlife Department for the purpose of habitat preservation. This proposed project would avoid collateral injury.

7. Mid-Coast Habitat Acquisition- The Mid-Coast National Wildlife Refuge Habitat Acquisition project would acquire a coastal estuarine land tract that would be conveyed to the USFWS to be managed as part of the Texas Mid-Coast National Wildlife Refuge Complex in Matagorda County. The proposed tract is around 800 acres, including 555 acres of mostly estuarine wetlands. The restoration action would protect the tract and provide a protective buffer to estuarine and bay waters from future land use changes. This proposed project would avoid collateral injury.

8. Bahia Grande Coastal Corridor Habitat Acquisition- This acquisition project would acquire important coastal habitat that would be conveyed to the USFWS to be managed as part of the Laguna Atascosa National Wildlife Refuge in Cameron County, Texas. This tract includes 1,322 acres of tidal wetlands, thorn scrub, and coastal prairie with more than a mile of frontage on the Lower Laguna Madre and almost 2 miles frontage on a tidal inlet called Laguna Vista Cove. This proposed project would avoid collateral injury.

9. Laguna Atascosa Habitat Acquisition- The Laguna Atascosa Habitat Acquisition project would acquire important coastal habitat that would be conveyed to the USFWS to be managed as part of the Laguna Atascosa National Wildlife Refuge. This tract includes 1,682 acres of beach, dune, and tidal habitats on South Padre Island, Texas. This proposed project would avoid collateral injury.

10. Bird Island Cove Habitat Restoration Engineering- The Bird Island Cove Habitat Restoration Engineering project (Phase I) will develop plans to restore and conserve wetlands and coastal habitats in Galveston Bay during a subsequent phase of restoration. Phase II, if and when funded at a later time, would protect and restore wetlands habitats by implementing restoration actions, such as building breakwaters or planting marsh vegetation, to increase the longevity of up to 170 acres of estuarine marsh complex (marsh, sand flat, and protected shallow water). Permits and consultations for E&D activities would be secured when necessary. Adherence to permit conditions and other requirements would minimize adverse impacts.

11. Essex Bayou Habitat Restoration Engineering- The Essex Bayou Habitat Restoration Engineering project would evaluate the factors that contribute to high salinities within the Slop Bowl Marsh system in Brazoria County and develop solutions that would create a more stable estuarine system. Subsequent phases, if and when funded at a later time, would implement restoration actions to increase the stability and diversity of the estuarine habitats, such as improving tidal flow, closing channels, enhancing watershed inflows, and planting vegetation. Any permits or environmental consultations required for E&D

activities would be secured prior to starting those activities. Adherence to permit conditions and implementation of recommended best management practices would minimize adverse impacts.

12. Dredged Material Planning for Wetland Restoration- The Dredged Material Planning for Wetland Restoration project would develop a Master Plan for the Texas coast which would prioritize and streamline the process to beneficially reuse material from planned dredging operations for wetland restoration. This project would coordinate efforts to identify sites and produce guidelines for restoration. Future restoration work, if and when funded at a later time, would use the dredge material to restore and conserve currently degrading intertidal habitats. Any permits or environmental consultations required for E&D activities would be secured prior to starting those activities. Adherence to permit conditions and other requirements would minimize adverse impacts.

13. Oyster Restoration Engineering- This proposed Oyster E&D project includes activities that would characterize the affected environment of this project and determine the best approach for oyster restoration from an ecological and engineering standpoint. This would involve development of necessary permits and environmental consultations. Project-planning actions for this project fall within the scope of the evaluation of environmental consequences in the Final PDARP/PEIS. Any permits or environmental consultations required for E&D activities would be secured prior to starting those activities. Adherence to permit conditions and other requirements would minimize adverse impacts if and when construction is implemented in future phases.

The restoration goal of the proposed McFaddin Beach and Dune Restoration, Bessie Heights Wetlands Restoration, Pierce Marsh Wetlands Restoration, Indian Point Shoreline Erosion Protection Project, Bahia Grande Hydrologic Restoration, Follets Island Habitat Acquisition, Mid-Coast Habitat Acquisition, Laguna Atascosa Habitat Acquisition, Bahia Grande Coastal Corridor Habitat Acquisition, Bird Island Cove Habitat Restoration Engineering, Essex Bayou Habitat Restoration Engineering, and Dredged Material Planning for Wetland Restoration projects is to "Restore and Conserve Habitat" (Restoration Type "Wetlands, Coastal, and Nearshore Habitats") and the proposed projects are consistent with the PDARP/PEIS.

Consistent with the goals of the TCMP (Title 31, Part 16, Chapter 501, Subchapter B, Rule S501.12) the proposed projects will:

Protect, preserve, restore and enhance the diversity, quality, quantity, functions and values of coastal natural resource areas, and ensure and enhance planned public access to and enjoyment of the coastal zone in a manner that is compatible with private property rights and other uses of the coastal zone.

The Oyster Restoration Engineering project is consistent with the"Replenish and Protect Oysters" Restoration Type of the PDARP/PEIS.

Consistent with the goals of the TCMP (Title 31, Part 16, Chapter 501, Subchapter B, Rule S501.12) the proposed project will study actions to:

Protect, preserve, restore and enhance the diversity, quality, quantity, functions and values of coastal natural resource areas, and ensure and enhance planned public access to and enjoyment of the coastal zone in a manner that is compatible with private property rights and other uses of the coastal zone.

Additionally, the Bird Island Cove Habitat Restoration Engineering, Essex Bayou Habitat Restoration Engineering, Dredged Material Planning for Wetland Restoration, and Oyster Restoration Engineering projects are proposed for engineering and design only at this time, and therefore have at most de minimis impacts under the CZMA.

Conclusion:

Based on the review of each project the federal Trustees of the TX TIG have determined that the 13 proposed restoration projects are consistent to the maximum extent practicable with all of the applicable, enforceable policies of the State's coastal management program. If selected and implemented, the proposed projects will comply and be implemented in a manner consistent with the TCMP. We submit this determination letter for State review and concurrence, and thank you in advance for your assistance.

Sincerely,

FOR

Christopher D. Doley
Designated Trustee Representative for Deepwater Horizon
National Oceanic and Atmospheric Administration

Cc: Don Pitts, Principal Representative for Texas
Homer Wilkes, Principal Representative for USDA
Kevin Reynolds, Principal Representative for DOI
Gale Bonanno, Principal Representative for EPA

TEXAS GENERAL LAND OFFICE
GEORGE P. BUSH, COMMISSIONER

July 21, 2017

Christopher D. Doley
Designated Trustee Representative for Deepwater Horizon
National Oceanic and Atmospheric Administration
1315 East West Highway
Silver Spring, MD 20910

Re: Texas Trustee Implementation Group Draft 2017 Restoration Plan/Environmental Assessment: Wetlands, Coastal, and Nearshore Habitats; and Oysters
CMP#: 17-1231-F2

Dear Mr. Doley:

Pursuant to Title 31 Natural Resources and Conservation, Part 16 Coastal Coordination Council rules, Section 506.30, the project referenced above has been reviewed for consistency with the Texas Coastal Management Program (CMP).

It has been determined that there are no significant unresolved consistency issues with respect to the project. Therefore, this project is consistent with the CMP goals and policies.

Please note that this letter does not authorize the use of Coastal Public Land. No work may be conducted or structures placed on State-owned land until you have obtained all necessary authorizations, including any required by the General Land Office and the U.S. Army Corps of Engineers.

If you have any questions or concerns, please contact me at (409) 741-4057 or at federal.consistency@glo.texas.gov

Sincerely,

Allison Buchtien
Coastal Protection
Texas General Land Office

email cc: Ray Newby, Texas General Land Office

1700 North Congress Avenue, Austin, Texas 78701-1495
P.O. Box 12873, Austin, Texas 78711-2873
512-463-5001 glo.texas.gov

Appendix F: Finding of No Significant Impact (FONSI)

FINDING OF NO SIGNIFICANT IMPACT (FONSI)
from Implementation of the
Texas Trustee Implementation Group 2017 Restoration Plan/Environmental Assessment

Introduction

The "Texas Trustee Implementation Group Final 2017 Restoration Plan/Environmental Assessment: Restoration of Wetlands, Coastal, and Nearshore Habitats; and Oysters" (RP/EA) fulfills the restoration plan requirement under the Oil Pollution Act (OPA) and the implementing regulations, and the environmental assessment requirement for compliance with the National Environmental Policy Act (NEPA). It was prepared by the Texas Trustee Implementation Group (Texas TIG) to partially address injuries to natural resources and services in the Texas Restoration Area caused by the *Deepwater Horizon* (DWH) oil spill using Natural Resource Damages as set forth in the DWH post-settlement Consent Decree.[1]

In accordance with OPA, and as set forth in the DWH Consent Decree and as described in the DWH Trustees' 2016 Programmatic Damage Assessment and Restoration Plan/Programmatic Environmental Impact Statement (PDARP/PEIS), the Texas TIG comprises the following state and federal Natural Resource Trustee Agencies: Texas Commission on Environmental Quality (TCEQ); Texas Parks and Wildlife Department (TPWD); Texas General Land Office (TGLO); United States Department of Commerce, represented by the National Oceanic and Atmospheric Administration (NOAA); United States Department of the Interior (DOI), represented by the National Park Service, United States Fish and Wildlife Service (FWS), and Bureau of Land Management; United States Department of Agriculture (USDA); and United States Environmental Protection Agency (EPA).

The RP/EA tiers from the PDARP/PEIS, which is a programmatic document developed by the DWH Trustees to guide and direct the DWH oil spill restoration effort. The PDARP/PEIS was prepared in accordance with OPA, NEPA, Council on Environmental Quality (CEQ) NEPA regulations, and the NEPA procedures and guidance applicable to federal Trustees. The PDARP/PEIS includes a portfolio of Restoration Types that addresses the diverse suite of injuries that occurred at both regional and local scales. Consistent with that programmatic restoration plan, the RP/EA focuses on implementing projects to completion or providing funding for engineering and design in the Texas Restoration Area to address two of the five overarching goals set forth in the PDARP/PEIS (Restore and Conserve Habitat; and Replenish and Protect Living Coastal and Marine Resources) and two restoration types associated with

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[1] On April 4, 2016, the Court entered the final Consent Decree negotiated among BP and the Trustees. The Consent Decree settles damages, including natural resource damages as defined under the Oil Pollution Act (OPA) of 1990, in a federal case arising from matters related to the DWH oil spill: *United States v. BPXP et al., Civ. No. 10-4536, centralized in MDL 2179, In re: Oil Spill by the Oil Rig "Deepwater Horizon" in the Gulf of Mexico, on April 20, 2010 (E.D. La.)*

these goals: Oysters; and Wetlands, Coastal and Nearshore Habitats (WCNH). Engineering and design projects selected in the RP/EA would undergo additional OPA and NEPA analyses before a decision would be made to select them for implementation, when sufficient detail is available to determine their environmental impacts.

Lead and Cooperating Agencies

The Council on Environmental Quality's NEPA implementing regulations (40 CFR 1500-1508) require a federal agency to serve as lead agency to supervise the NEPA analysis when more than one federal agency is involved in the same action (40 CFR 1501.5(a)). The Texas TIG designated NOAA as the lead agency responsible for NEPA analysis for the RP/EA. Each of the other federal and state co-Trustees is participating as a cooperating agency pursuant to NEPA (40 CFR § 1508.5) and the "*Trustee Council Standard Operating Procedures for Implementation of the Natural Resource Restoration for the Deepwater Horizon (DWH) Oil Spill*" (page 27, and Appendix F, pages 2 and 3).

Public Participation

On May 18, 2017, the Texas TIG published a Draft RP/EA, and encouraged the public to review and comment on the Draft RP/EA during the comment period that closed on June 19, 2017. A Notice of Availability for the Draft RP/EA was published in the *Federal Register* and the following websites:

- http://restorethetexascoast.org
- http://www.gulfspillrestoration.noaa.gov/

Comments were accepted via an online public comment portal, email delivery, and U.S. Postal Service mail. The Texas TIG received submissions from private citizens, state and local agencies, and non-governmental organizations. The Texas TIG reviewed the comments and considered them prior to finalization of the RP/EA. Chapter 8 of the RP/EA provides further detail on the public comment process, including a summary of all public comments received on the Draft RP/EA and the Texas TIG's responses.

Adoption of the RP/EA NEPA analysis by Federal Agency members of the Texas TIG

Each federal agency on the Texas TIG must make its own independent evaluation of the NEPA analysis in support of its decision-making responsibilities. In accordance with 40 CFR 1506.3(a) and the SOP (Appendix F, Page 4), each of the federal agencies participating on the Texas TIG has reviewed the RP/EA, found that it meets the standards set forth in its own NEPA implementing procedures, and accordingly has adopted the RP/EA NEPA analysis.

Description of Proposed Actions and Alternatives Considered

The CEQ NEPA regulations require the federal agency decision maker to consider the environmental effects of the Proposed Action and a reasonable range of alternatives, including the No Action Alternative (40 CFR § 1502.14). The RP/EA analyzes 16 alternatives (13 of which are preferred by the Texas TIG) as well as a No Action alternative (Table 1). The Texas TIG has determined that implementation of the preferred alternatives and projects associated with those alternatives (Proposed Action) best meets the OPA selection criteria and supplemental criteria developed by the TIG.

Table 1. Alternatives Considered in the RP/EA

Alternative	Preferred/ Not Preferred
Replenish and Protect Oysters (Living Coastal and Marine Resources)	
Oyster Restoration Engineering*	Preferred
Landscape Approach to Oyster Reef Restoration	Not Preferred
Natural Recovery/No Action	Not Preferred
Restore and Conserve Wetlands, Coastal, and Nearshore Habitats	
Bird Island Cove Habitat Restoration Engineering*	Preferred
Essex Bayou Habitat Restoration Engineering*	Preferred
Dredged Material Planning for Wetland Restoration*	Preferred
McFaddin Beach and Dune Restoration	Preferred
Bessie Heights Wetland Restoration	Preferred
Pierce Marsh Wetland Restoration	Preferred
Dollar Bay and Moses Lake Wetland Restoration	Not Preferred
Indian Point Shoreline Erosion Protection	Preferred
Bahia Grande Hydrologic Restoration	Preferred
Follets Island Habitat Acquisition	Preferred
Mid-Coast Habitat Acquisition	Preferred
Matagorda Peninsula Habitat Acquisition	Not Preferred
Bahia Grande Coastal Corridor Habitat Acquisition	Preferred
Laguna Atascosa Habitat Acquisition	Preferred
Natural Recovery/No Action	Not Preferred

Note: **Alternatives proposing only engineering and design activities.*

Replenish and Protect Oysters (Living Coastal and Marine Resources)

Oyster Restoration Engineering

The Oyster Restoration Engineering project would consist of an initial alternatives analysis to identify the best management practices (BMPs) for rehabilitating oyster reefs buried by sediment and for constructing intertidal oyster reefs within the Galveston Bay System. Results of this analysis would then be used to develop location-specific engineering, design, and environmental permitting documents for one or more oyster restoration projects that could be readily implemented. The estimated cost for the project is $309,000.

Landscape Approach to Oyster Reef Restoration
The goal of the Landscape Approach to Oyster Reef Restoration project is to restore up to 150 acres of degraded Galveston Bay oyster reefs using a landscape approach to create a network of oyster populations. A combination of source and harvestable sink oyster reefs would be created in Upper Galveston Bay to allow for increased oyster population sustainability and oyster habitat resiliency. The estimated cost for the project is $15,258,000.

Natural Recovery/No Action
Under a natural recovery alternative, no additional restoration would be done by Trustees to accelerate the recovery of oysters in the Texas Restoration Area using DWH NRDA funding at this time. The Trustees 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.

Restore and Conserve Wetlands, Coastal, and Nearshore Habitats

Bird Island Cove Habitat Restoration Engineering
The Bird Island Cove Habitat Restoration project would conduct E&D necessary to restore and conserve wetlands and coastal habitats in Galveston Bay. This phase of the project (Phase I) would investigate ongoing issues associated with habitat degradation and develop strategies to protect and restore existing estuarine habitats with the goal of increasing the productivity and longevity of up to 170 acres of estuarine marsh complex (marsh, sand flat, and protected shallow water). The estimated cost for the project (Phase I) is $206,000.

Essex Bayou Habitat Restoration Engineering
The Essex Bayou Habitat Restoration Engineering project would include the E&D necessary to restore and conserve coastal and nearshore habitats. The E&D is necessary to understand the factors that contribute to high salinities within Essex Bayou and the Slop Bowl Marsh system and develop solutions that would create a more stable estuarine system. Subsequent phases, to be considered for funding at a later time, would implement restoration actions, such as improving tidal flow, closing man-made channels, enhancing watershed inflows, and/or planting marsh vegetation, to increase the stability and diversity of the estuarine habitats. The estimated cost for this phase of the project is $372,000.

Dredged Material Planning for Wetland Restoration
The Dredged Material Planning for Wetland Restoration project would identify priority locations, develop up to 60% design work, and prepare permit application packages for BUDM for marsh restoration at eight sites along the Texas coast. This project would coordinate efforts to prioritize sites and produce guidelines to restore currently degrading intertidal habitats. The

estimated cost for the project is $1,964,000. Implementation of the BUDM to construct intertidal wetlands would take place in subsequent phases of the project.

McFaddin Beach and Dune Restoration
The McFaddin Beach and Dune Restoration project would include placement of sand along approximately 17 miles of shoreline in northeastern Texas. This project is proposing to fund about one-third of the estimated $45,000,000 total project cost. The Texas TIG would partner with other funding sources to complete construction implementation, monitoring, and/or planning activities. This project would provide important ecological benefits by restoring lost beach and dune habitat. The estimated cost of the Texas TIG proposed contribution towards this project is $15,874,000.

NOTE: Immediately prior to publication of the Final RP/EA, the Texas TIG learned that, based on the results of a recently completed pilot study, it may be necessary to expand the existing sand borrow area or identify an additional borrow area for the McFaddin Beach Project. The environmental impacts analysis in the Final RP/EA and the determinations in this FONSI reflect the project as originally planned and are *not* inclusive of an expanded/additional borrow area. If that change becomes necessary, the Texas TIG will revisit its impacts analysis and determine whether any supplemental analysis or NEPA documentation is required.

Bessie Heights Wetland Restoration
The Bessie Heights Wetland Restoration project would restore wetlands in Bessie Heights Marsh located within the Lower Neches Wildlife Management Area (WMA) in Orange County, Texas. The project would beneficially use sediment obtained from dredging of the federally managed Sabine-Neches Waterway (SNWW), and mining dredged material from dredged material placement areas (DMPAs) and private navigation channels and berths to restore coastal wetlands. The placement of dredged material, construction of containment levees, and associated planting would restore up to 900 acres of intertidal marsh. The estimated cost for the project is $4,905,000.

Pierce Marsh Wetland Restoration
The Pierce Marsh Wetland Restoration project would restore and conserve wetlands and coastal habitats by beneficially using dredged material to create a viable, vegetated, wetland habitat for a variety of plants, fish, birds, and other wildlife that frequent the area. The placement of dredged material and associated planting would restore up to 150 acres of marsh and contribute to an ongoing effort to restore the wetland complex in West Galveston Bay. The estimated cost for the project is $3,095,000.

Dollar Bay and Moses Lake Wetlands Restoration
The Dollar Bay and Moses Lake Wetlands Restoration (Phase IV) project would restore subsided marsh habitat in Dollar Bay and Moses Lake by creating about 15 acres of marsh terraces and protecting them with about 4,200 linear feet of rock breakwaters. This project would include

construction implementation and the completion of planning documents which includes environmental reviews and final engineering designs. The estimated cost for the project is $4,225,000.

Indian Point Shoreline Erosion Protection
The Indian Point Shoreline Erosion Protection project would construct approximately 2,800 linear-feet of segmented breakwaters to protect 50 acres of critical seagrass, coastal marsh, lagoons and associated upland habitats within Indian Point on Corpus Christi Bay in San Patricio County. The project would protect the existing shoreline from wind and wave driven erosion and protect the remaining marsh and associated coastal habitats adjacent to the shoreline. The estimated cost for the project is $2,199,000.

Bahia Grande Hydrologic Restoration
The Bahia Grande Hydrologic Restoration project would restore and conserve the Bahia Grande wetland complex in the Laguna Atascosa National Wildlife Refuge (LANWR) near Brownsville, Texas. This project would enlarge and stabilize a pilot channel that would increase tidal flow into Bahia Grande, restoring the system's natural tidal exchange and creating habitat for a variety of fish, shellfish, and migratory waterfowl. The estimated cost for the project is $5,050,000.

Follets Island Habitat Acquisition
The Follets Island Habitat Acquisition project would include the acquisition and conservation of approximately 300 acres of wetland and coastal habitats on Follets Island between San Luis Pass and Drum Bay, Texas. The project would conserve dune, coastal strand prairie, and marsh habitat in perpetuity through fee-simple acquisition. Once acquired, the land would be transferred to and managed by the TPWD for the purpose of habitat preservation. The estimated cost for the project is about $2,037,000.

Mid-Coast Habitat Acquisition
The Mid-Coast Habitat Acquisition project would acquire a coastal estuarine land tract that would be conveyed to the USFWS to be managed as part of the Texas Mid-Coast National Wildlife Refuge Complex (Texas Mid-Coast NWR) in Matagorda County. The tract is around 800 acres, including 555 acres of mostly estuarine wetlands. The restoration action would protect the tract, thereby providing a protective buffer to estuarine and bay waters from future land use changes. The estimated cost for the project is $2,082,000.

Matagorda Peninsula Habitat Acquisition
The Matagorda Peninsula Habitat Acquisition project would acquire and conserve up to 3,000 acres of wetland and coastal habitats on Matagorda Peninsula east of the Colorado River between Driftwood Drive and property owned by TPWD in Matagorda County, Texas. The project would conserve beach to bay barrier island habitat in perpetuity through fee-simple acquisition. Once acquired, the land would be transferred to and managed by the TPWD for the purpose of habitat preservation. The estimated cost for the project is about $3,012,000.

Bahia Grande Coastal Corridor Habitat Acquisition
The Bahia Grande Coastal Corridor Habitat Acquisition project would include acquisition of important coastal habitat that would be conveyed to the USFWS to be managed as part of the LANWR. This tract includes 1,322 acres of tidal wetlands, thorn scrub, and coastal prairie with more than a mile of frontage on the Lower Laguna Madre and almost 2 miles frontage on a tidal inlet called Laguna Vista Cove. The estimated cost for the project is $6,900,000 of which the Texas TIG is providing $2,271,000.

Laguna Atascosa Habitat Acquisition
The Laguna Atascosa Habitat Acquisition project would include acquisition of important coastal habitat that would be conveyed to the USFWS to be managed as part of the LANWR. This tract includes 1,682 acres of beach, dune, and tidal habitats on South Padre Island, Texas. The estimated cost for the project is $5,397,000.

Natural Recovery/No Action
Under a natural recovery alternative, no additional restoration would be done by Texas Trustees to accelerate the recovery of Wetlands, Coastal, and Nearshore Habitat in the Texas Restoration Area using DWH NRDA funding at this time. The Texas Trustees 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.

Analysis Summary

Section 4.0 of the RP/EA provides the analysis needed to assess the significance of the impacts of the Proposed Action.

In the RP/EA, the Texas TIG addressed NEPA requirements by tiering from environmental analyses conducted in the Final PDARP/PEIS, evaluating existing analyses, incorporating by reference relevant analyses from existing project environmental assessments (EAs) and conservation plans, and preparing environmental consequences analyses for projects as appropriate. The RP/EA evaluated both beneficial and adverse impacts of the Proposed Action, which is to implement the thirteen preferred alternatives and associated projects described and analyzed in the RP/EA. Project implementation will provide many benefits to the environment; however, because there is potential to adversely affect one type of resource while improving the condition of another resource, there may at times be minor to moderate site-specific adverse environmental effects.

- The Proposed Action is not expected to result in significant adverse effects on public health or safety. The restoration measures/management activities will provide long-term beneficial impacts to improve natural ecosystem functions, and best practices will be implemented on a site-specific basis to mitigate the potential for adverse effects to occur to public health and safety during implementation.

- The Proposed Action will have no significant adverse impacts to unique characteristics of the geographic areas. The Proposed Action is not expected to have any significant adverse effects on wetlands, floodplains, municipal water sources, ecologically critical areas, wild and scenic river corridors, park lands, wilderness, wilderness research areas, research natural areas, inventoried roadless areas, national recreation areas, or prime farmlands, particularly on a regional basis. The purpose of the Proposed Action is to improve the condition of natural resources damaged by the DWH oil spill.

- The effects of the Proposed Action on the quality of the human environment are not controversial. The Proposed Action is supported by the public. No public comments indicated opposition to the Proposed Action.

- There are no highly uncertain, unique, or unknown risks associated with the Proposed Action. The land acquisition, habitat restoration and management activities, and conservation practices are successful, well-established, and commonly used practices for habitat restoration and land conservation.

- The Proposed Action neither establishes a precedent for future Texas TIG actions with significant effects nor represents a decision in principle about a future consideration. Future Texas TIG actions will be determined through separate planning processes.

- The Proposed Action will not result in significant adverse cumulative impacts. As discussed in the RP/EA, the Proposed Action is intended to benefit natural resources. Though some minor, primarily short-term adverse effects may occur in some locations, the cumulative effects of these actions on the quality of the human environment are not expected to be regionally significant, particularly when focusing on the significant adverse impacts that NEPA is intended to help decision makers avoid, minimize, or mitigate.

- Based on information in the RP/EA, the Proposed Action is not expected to threaten a violation of Federal, state, or local laws, or requirements imposed for environmental protection. However, projects will be monitored appropriately, and approaches and designs may be applied, adopted, or modified from other similar projects as deemed necessary.

- The Proposed Action will not adversely affect vulnerable marine or coastal ecosystems.

- The Proposed Action is not expected to adversely affect biodiversity or ecosystem functioning (e.g., benthic productivity, predator-prey relationships, etc.).

- The Proposed Action is not expected to result in the introduction or spread of a non-indigenous species. All projects with an identified potential for invasive species colonization include provisions for invasive species management and best practices to minimize the risk of the introduction or spread of nonindigenous species.

- The Proposed Action is expected to be in compliance with all applicable federal laws and regulations relevant to the preferred projects. A summary of the status of the federal regulatory compliance reviews and approvals (as of 9/18/17) is described in the table below. For all projects in which the compliance status is labeled as complete, no significant or adverse affects were found. Environmental reviews and consultations not yet completed, will be finalized prior to the initiation of the relevant project activities.

Table 6-1. This table reflects the current status of federal regulatory compliance reviews and approvals.

Alternative	Bald and Golden Eagle Protection Act (USFWS)	Coastal Barrier Resources Act (CRA) (USFWS)	Coastal Zone Management Act (CZMA)	Endangered Species Act (ESA) Section 7 (NMFS)	Endangered Species Act (ESA) Section 7 (USFWS)	Essential Fish Habitat (EFH) (NMFS)	Marine Mammal Protection Act (MMPA) (NMFS)	Marine Mammal Protection Act (MMPA) (USFWS)	Migratory Bird Treaty Act (MBTA) (USFWS)	National Historic Preservation Act (NHPA)	Rivers and Harbors Act/Clean Water Act (USACE permit)
Oyster Restoration Engineering	Complete	Complete	Complete	Complete	Complete	Complete	Complete	Complete	Complete	In Progress	N/A
Bird Island Cove Habitat Restoration	Complete	Complete	Complete	Complete	Complete	Complete	Complete	N/A	Complete	In Progress	N/A
Essex Bayou Habitat Restoration Engineering	Complete	Complete	Complete	Complete	Complete	Complete	Complete	Complete	Complete	In Progress	N/A
Dredged Material Planning for Wetland Restoration	Complete	Complete	Complete	Complete	Complete	Complete	Complete	Complete	Complete	In Progress	N/A
McFaddin Beach and Dune Restoration	Complete	Complete	Complete	In Progress	Complete	Complete	Complete	Complete	Complete	In Progress	Complete

Alternative	Bald and Golden Eagle Protection Act (USFWS)	Coastal Barrier Resources Act (CRA) (USFWS)	Coastal Zone Management Act (CZMA)	Endangered Species Act (ESA) Section 7 (NMFS)	Endangered Species Act (ESA) Section 7 (USFWS)	Essential Fish Habitat (EFH) (NMFS)	Marine Mammal Protection Act (MMPA) (NMFS)	Marine Mammal Protection Act (MMPA) (USFWS)	Migratory Bird Treaty Act (MBTA) (USFWS)	National Historic Preservation Act (NHPA)	Rivers and Harbors Act/Clean Water Act (USACE permit)
Bessie Heights Wetland Restoration	Complete	Complete	Complete	Complete	Complete	Complete	Complete	Complete	Complete	In Progress	In Progress
Pierce Marsh Wetland Restoration	Complete	Complete	Complete	Complete	Complete	Complete	Complete	Complete	Complete	In Progress	In Progress
Indian Point Shoreline Erosion Protection	Complete	Complete	Complete	In Progress	Complete	Complete	Complete	N/A	Complete	In Progress	Complete
Bahia Grande Hydrologic Restoration	Complete	Complete	Complete	In Progress	Complete	Complete	Complete	Complete	Complete	In Progress	Complete
Follets Island Habitat Acquisition	Complete	Complete	Complete	Complete	Complete	Complete	Complete	N/A	Complete	In Progress	N/A
Mid-Coast Habitat Acquisition	Complete	Complete	Complete	Complete	Complete	Complete	Complete	Complete	Complete	In Progress	N/A

Alternative	Bald and Golden Eagle Protection Act (USFWS)	Coastal Barrier Resources Act (CRA) (USFWS)	Coastal Zone Management Act (CZMA)	Endangered Species Act (ESA) Section 7 (NMFS)	Endangered Species Act (ESA) Section 7 (USFWS)	Essential Fish Habitat (EFH) (NMFS)	Marine Mammal Protection Act (MMPA) (NMFS)	Marine Mammal Protection Act (MMPA) (USFWS)	Migratory Bird Treaty Act (MBTA) (USFWS)	National Historic Preservation Act (NHPA)	Rivers and Harbors Act/Clean Water Act (USACE permit)
Bahia Grande Coastal Corridor Habitat Acquisition	Complete	Complete	Complete	Complete	Complete	Complete	Complete	N/A	Complete	In Progress	N/A
Laguna Atascosa Habitat Acquisition	Complete	Complete	Complete	Complete	Complete	Complete	Complete	N/A	Complete	In Progress	N/A

DETERMINATION

In view of the information presented in this document and the analysis contained in the RP/EA, it is hereby determined that implementation of the Restoration Plan will not significantly impact the quality of the human environment, as described above. Therefore, an EIS will not be prepared.

SEPARATE ELECTRONIC SIGNATURE PAGE FOR EACH TRUSTEE BELOW______________________________

[Decision Makers]

Date: 10/12/17

Signature: Kevin D. Reynolds
Kevin Reynolds
Deepwater Horizon NRDAR Case Manager, U.S. Department of the Interior

Date: 10/12/17

Signature:

David G. Westerholm
Director, Office of Response and Restoration
National Ocean Service
National Oceanic and Atmospheric Administration

Date: 10/11/17

Signature:

for · Patricia A. Montanio
Director, Office of Habitat Conservation
National Marine Fisheries Service
National Oceanic and Atmospheric Administration

Date: 10/13/17

Signature: Homer L. Wilkes

Homer Wilkes
Principal Representative for the U.S. Department of Agriculture

Date: 10/13/17

Signature: Mary K Lynch

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