



Upper Barataria Basin, Louisiana



Draft Feasibility Report with Integrated Environmental Impact Statement Second Draft

December 11, 2020

Executive Summary

The U.S. Army Corps of Engineers (USACE), Mississippi River Valley Division, New Orleans District (MVN), Regional Planning and Environment Division South (RPEDS), has prepared this second draft Integrated Feasibility Report and Environmental Impact Statement (IFR-EIS) for the Upper Barataria Basin, Louisiana study. This report supersedes the previously issued 2019 Draft Integrated Feasibility Report and Environmental Impact Statement (DIFR-EIS) and represents the most current and complete findings of this study effort. After careful review of the engineering design, the PDT determined that there was a need to go back out to public review because a significant increase in environmental impacts was noted. This report includes input from the non-Federal sponsor, natural resource agencies, federally recognized Indian Tribes, and the public. The Upper Barataria Basin, Louisiana Feasibility Study (UBB) is a Coastal Storm Risk Management (CSRМ) study that evaluates impacts to people, cultural resources, and the environment. Going forward in this document, this study will be referred to as the Upper Barataria Basin, Louisiana Feasibility Study (UBB).

Study Area – The study area includes communities in the southeast Louisiana parishes of Ascension, Assumption, Jefferson, Lafourche, St. Charles, St. James, and St. John the Baptist (Figure ES-1). The study area is bounded on the north and east by the Mississippi River Levee, on the west by Bayou Lafourche, and on the south it extends slightly past U.S. Highway 90. The study area covers approximately 800 square miles and is characterized by low, flat terrain with wetlands, numerous navigation channels, drainage canals, and natural bayous that drain into Lake Salvador and eventually into the Gulf of Mexico. The study area is a diverse ecosystem inhabited by a variety of species of birds, mammals, reptiles, and amphibians, as well as fresh, brackish, and saltwater fish.

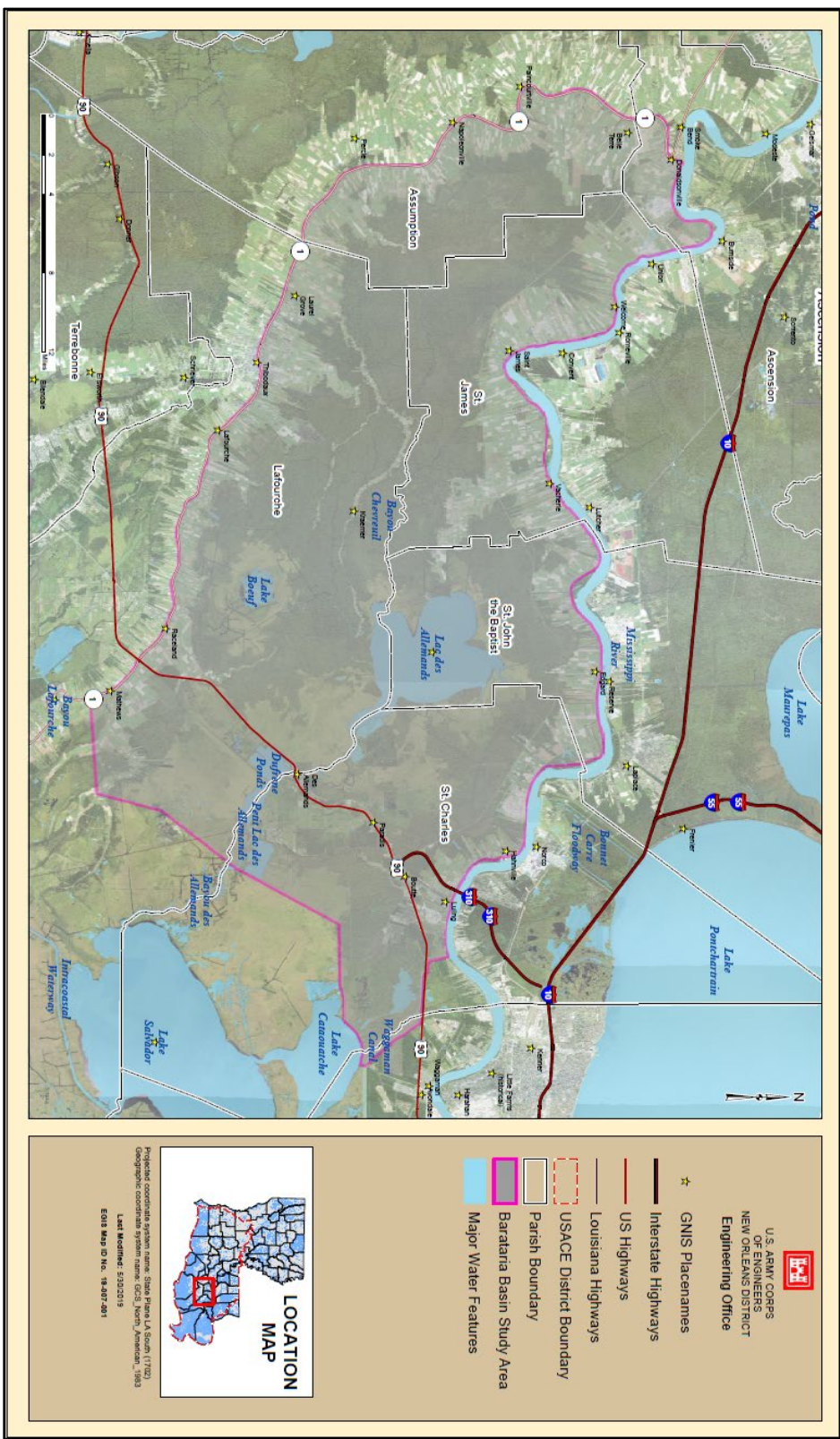


Figure ES-1. Upper Barataria Basin Feasibility Study Area

Problem – The study area is prone to coastal storm damages from tidal surges, storm surges, and rainfall. The headwater flooding from rainfall is intensified by tidal and surge events, resulting in flood damages to industrial, commercial, and agricultural facilities as well as residential structures and critical evacuation routes such as US Highway 90 in the basin. Additionally, tidal events can create a backwater effect that does not allow rainfall to drain from within the basin.

Planning Objectives – The national objective, which is to maximize National Economic Development (NED), is the overarching goal for this study; however, it is not specific enough for direct use in plan formulation. The water and related land resource problems and opportunities identified in this study are stated as specific planning objectives to provide focus for the formulation of alternatives. These planning objectives reflect the problems and opportunities in the study area and represent desired positive changes from the future without project condition. Within the study area and over the 50-year period of analysis, the planning objectives are:

- Reduce the risk to human life, health, and safety by reducing flood impacts to structures, evacuation routes, and critical infrastructure
- Reduce the risks of economic impacts due to storm inundation of structures, evacuation routes, and critical infrastructure in the study area
- Increase community resiliency before, during, and after flooding events

Constraints – A planning constraint is a restriction that limits plan formulation and should be avoided or worked around when possible. Planning constraints for the UBB study area are:

- The project features cannot increase flood risk to adjacent areas
- Oil and gas infrastructure (wells) must be avoided
- Impacts to cultural resources must be minimized
- Vessel traffic in and out of the interior basin must not be impeded
- Maintain the hydrological regime through the basin to support targeted habitats
- Do not induce development within a flood plain – Executive Order (EO)-11988
- Minimize the impact to threatened or endangered species existing in the area

Tentatively Selected Plan (TSP)/National Economic Development (NED) Plan – Per USACE Guidance, the Project Delivery Team (PDT) selected the alternative that maximizes net benefits as the Tentatively Selected Plan (TSP, also called the National Economic Development [NED] Plan) for this study. In order to determine which alternative is the NED Plan, the costs and benefits for the Final Array of Alternatives were compared. The alternative with the greatest net benefits is the apparent NED Plan, and thus the TSP. The TSP identified from the final array is Alternative 1, Hwy 90 – Segment 1 Extension.

The UBB TSP is a structural alignment constructed to a 1 percent Annual Exceedance Probability (AEP) (100-year future design) and totaling a little over 161,300 feet (30.6 miles) in length. The system would start in Luling, Louisiana where it would connect the Mississippi River Levee through the Davis Pond Diversion Structure West Guide Levee. Continuing south, the TSP would improve upon and update deficiencies in the St. Charles Parish Levee, cross Bayou Des Allemands with a 270 feet barge gate structure, and continue parallel to

US Highway 90 before tying into high ground across the Barataria Basin near Raceland. The proposed levee is designed to Hurricane and Storm Damage Risk Reduction System (HSDRRS) specifications with a 1V:4H and a 10 foot crown and multiple levee lifts authorized over the initial 50 years. The first lift would be projected to occur in 2026 and would raise the levee to an elevation of 14 feet except in hydraulic reaches F and H where it would be constructed to 16 feet elevation after settlement. Subsequent lifts would sustain the 1 percent AEP over the initial 50 years of the authorized project. Material settlement over this period has also been incorporated into the material quantities for each of the alignment's hydraulic reaches.

The TSP is estimated to produce nearly \$90 million in average annual benefits at an average annual cost of nearly \$69 million (total project cost of little less than \$2.0 Billion), for a Benefit to Cost Ratio (BCR) of 1.3 at the current Federal Discount Rate (FDR) of 2.5 percent. Of the approximately 1,074 acres of land needed for Alternative 1, approximately 292 acres of bottomland hardwood forest (BLH) impacts, 168 acres of cypress-tupelo swamp impacts, 267 acres of fresh marsh impacts, and 95 acres of water bottom would be impacted as a result of construction.

Timeline – This second draft Integrated Feasibility Report and Environmental Impact Statement (IFR-EIS) for the Upper Barataria Basin, Louisiana study is for public review and comment beginning December 15, 2020. The official closing date for receiving comments is January 29, 2021, which is 45 days from the date on which the notice of availability of this draft IFR-EIS is published in the Federal Register during the review period. Comments may be mailed to the address listed below or dropped off in person during business hours (Monday through Friday 8am to 5pm local time). Comments may also be emailed to the email address listed below.

U.S. Army Corps of Engineers
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Appendix B - Economics

Appendix C - Environmental (Supporting Information)

Appendix D - Real Estate

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Appendix F – Agency Coordination

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Section 1

Introduction

The U.S. Army Corps of Engineers (USACE), Mississippi River Valley Division, New Orleans District (MVN), Regional Planning and Environment Division South (RPEDS), has prepared this second draft Integrated Feasibility Report and Environmental Impact Statement (IFR-EIS) for the Upper Barataria Basin, Louisiana study. This report supersedes the previously issued 2019 Draft Integrated Feasibility Report and Environmental Impact Statement (DIFR-EIS) and represents the most current and complete findings of this study effort. After careful review of the engineering design, the PDT determined that there was a need to go back out to public review because a significant increase in environmental impacts was noted. This report includes input from the non-Federal sponsor, natural resource agencies, federally recognized Indian Tribes, and the public. The Upper Barataria Basin, Louisiana Feasibility Study (UBB) is a Coastal Storm Risk Management (CSRM) study that evaluates impacts to people, cultural resources, and the environment.

1.1 STUDY SCOPE

The UBB Feasibility Study investigated alternatives for CSRM and has identified and evaluated a full range of reasonable alternatives including a No Action alternative. In accordance with USACE's Planning Guidance Notebook (Engineer Regulation [ER]:1105-2-100), the product of this study is a decision document in the form of an integrated Feasibility Report and National Environmental Policy Act of 1969 (NEPA) Environmental Impact Statement.

1.2 STUDY AUTHORITY

The Bipartisan Budget Act of 2018 (Public Law 115-123), Division B, Subdivision 1, Title IV, (BBA 2018) appropriated supplemental funds, which included \$135,000,000 in Supplemental Investigations Funds for Long Term Disaster Recovery Investment Plans (LDRIPs) related to the completion, or initiation and completion, of previously authorized flood and storm damage risk reduction studies, including shore protection. As a result, feasibility studies that are predominately for flood and storm damage risk reduction, as well as comprehensive studies and watershed studies that are predominately for flood and storm damage risk reduction (even if there are ancillary purposes) are eligible for supplemental funding consideration. In conducting an authorized study, both structural and non-structural measures must be considered. Studies may address long-range measures to reduce exposure to risks from floods and coastal storms.

In order for a feasibility study to be undertaken using supplemental funds, the study must be federally-authorized. Enclosure 4, dated July 5, 2018, to the MEMORANDUM FOR Deputy Commanding General for Civil and Emergency Operations, SUBJECT: Policy Guidance on Implementation of Supplemental Appropriations of the Bipartisan Budget Act of 2018, dated

August 9, 2018, identified the UBB Study as a feasibility study to be funded with Supplemental Investigations funds as part of the LDRIP.

The UBB Feasibility Study was federally-authorized pursuant to a Resolution of the Committee on Transportation and Infrastructure of the United States House of Representatives, 105th Congress, Docket 2554, "Donaldsonville, Louisiana to the Gulf of Mexico," adopted May 6, 1998. That Resolution (at Docket 2554), requested the Secretary of the Army to review the Report of the Chief of Engineers on the Mississippi River and Tributaries, published as House Document 308, 88th Congress, 2nd Session, and other pertinent reports to determine whether modifications of the recommendations in the Chief's Report were advisable, in the interest of flood control, navigation, wetlands conservation and restoration, wildlife habitat, commercial and recreational fishing, salt water intrusion and fresh water and sediment diversion, and other purposes, in the area between Bayou Lafourche and the Mississippi River System, from Donaldsonville, Louisiana, to the Gulf of Mexico.

Notwithstanding Section 105(a) of the Water Resources Development Act of 1986 (33 U.S.C. 2215(a)), which specifies the cost-sharing requirements generally applicable to feasibility studies, BBA 2018 authorizes the Government to conduct the Study at full federal expense to the extent that appropriations provided under the Investigations heading of the BBA 2018 are available and used for such purpose. Thereafter, Headquarters USACE (HQUSACE) developed and approved a model Feasibility Cost Sharing Agreement (FCSA), as set forth in the MEMORANDUM FOR DISTRIBUTION, SUBJECT: Bipartisan Budget Act of 2018 (BBA 2018) - Model Agreement for New Feasibility Studies dated August 10, 2018, which also provided that the responsibility for review and approval of an (FCSA) agreement that does not deviate from the model is delegated to the MSC Commander and may not be further delegated. Furthermore, Division Counsel's concurrence that the (FCSA) agreement does not deviate from the subject model, and is appropriate for use for the particular study, is required prior to approval. The authority to execute an (FCSA) agreement may be delegated to the District Commander after it is approved by the MSC Commander.

On September 27, 2018, MVN submitted the (model) FCSA package (with no deviations) for review and approval to the Mississippi Valley Division (MVD), with a request that the signature authority for the FCSA be delegated to the MVN Commander. On September 29, 2018, MVD approved the FCSA and the delegation of signature authority in the MEMORANDUM FOR Commander, New Orleans District, SUBJECT: Request for Review and Approval to Execute the Model Feasibility Cost Share Agreement (FCSA) between the Department of the Army and the Coastal Protection and Restoration Authority Board of Louisiana for the UBB Study. The FCSA for the UBB Study between the Department of the Army and the Coastal Protection and Restoration Authority Board of Louisiana was executed on October 9, 2018.

This study was undertaken in accordance with Sections 1001 and 1002 of the Water Resources Reform Development Act (WRRDA) of 2014, applicable existing USACE Civil Work regulations, Policies and Guidance (P&G), and has incorporated SMART Planning principles. See MEMORANDUM FOR COMMANDING GENERAL, U.S. ARMY CORPS OF ENGINEERS, SUBJECT: Revised Implementation Guidance for Section 1001 of the Water

Resources Reform and Development Act of 2014, Vertical Integration and Acceleration of Studies as amended by Section 1330(b) of the Water Resources Development Act of 2018, dated March 25, 2019.

1.3 NON-FEDERAL SPONSOR

The Louisiana Coastal Protection and Restoration Authority Board (CPRAB) is the cost-sharing non-Federal sponsor (NFS) of the study. The feasibility study is 100 percent federally funded. The FCSA for this study was executed on October 9, 2018.

1.4 STUDY AREA AND MAP

The study area includes communities in the southeast Louisiana parishes of Ascension, Assumption, Jefferson, Lafourche, St. Charles, St. James, and St. John the Baptist (Figure 1-1). The study area includes a very small unpopulated area of Jefferson Parish. Since there are no structures included in this area it will be left out of the Economic analysis. The study area is bounded on the north and east by the Mississippi River Levee, on the west by Bayou Lafourche, and on the south it extends slightly past U.S. Highway 90. The study area covers approximately 800 square miles and is characterized by low, flat terrain with wetlands, numerous navigation channels, drainage canals, and natural bayous that drain into Lake Salvador and eventually the Gulf of Mexico. The study area is a diverse ecosystem inhabited by a variety of species of birds, mammals, reptiles, and amphibians, as well as fresh, brackish, and saltwater fish.

1.5 PRIOR REPORTS, EXISTING WATER PROJECTS, AND ONGOING PROGRAMS

The study area is a very large region with many former, current, and planned projects, studies, and programs that are being or have been prepared by USACE; other Federal, state, and local agencies; research institutions; and individuals. Previous Federal and non-Federal studies have established a reasonable database for this report. The most relevant studies, reports, and projects in the study area are:

- The Center for Wetland Resources, Louisiana State University, performed studies of the hydrologic and geologic characteristics of coastal Louisiana under a contract with USACE. The studies examined and identified trends in the coastal area resulting from natural processes and human activities, identified significant environmental parameters, determined the fresh water required to implement changes for fish and wildlife enhancement, and developed management and structural approaches to problem solving in the estuarine environment. The findings and recommendations of the studies are included in a series of 18 published reports, the last one published in 1973.
- USACE prepared a report title “Freshwater Diversion to the Barataria and Breton Sound Basins” in April 1983. The report recommends diverting Mississippi River water into Breton Sound Basin near Caernarvon and into Barataria Basin near Davis Pond to enhance habitat conditions and improve fish and wildlife resources. The Caernarvon Freshwater Diversion Structure was completed in January 1991.

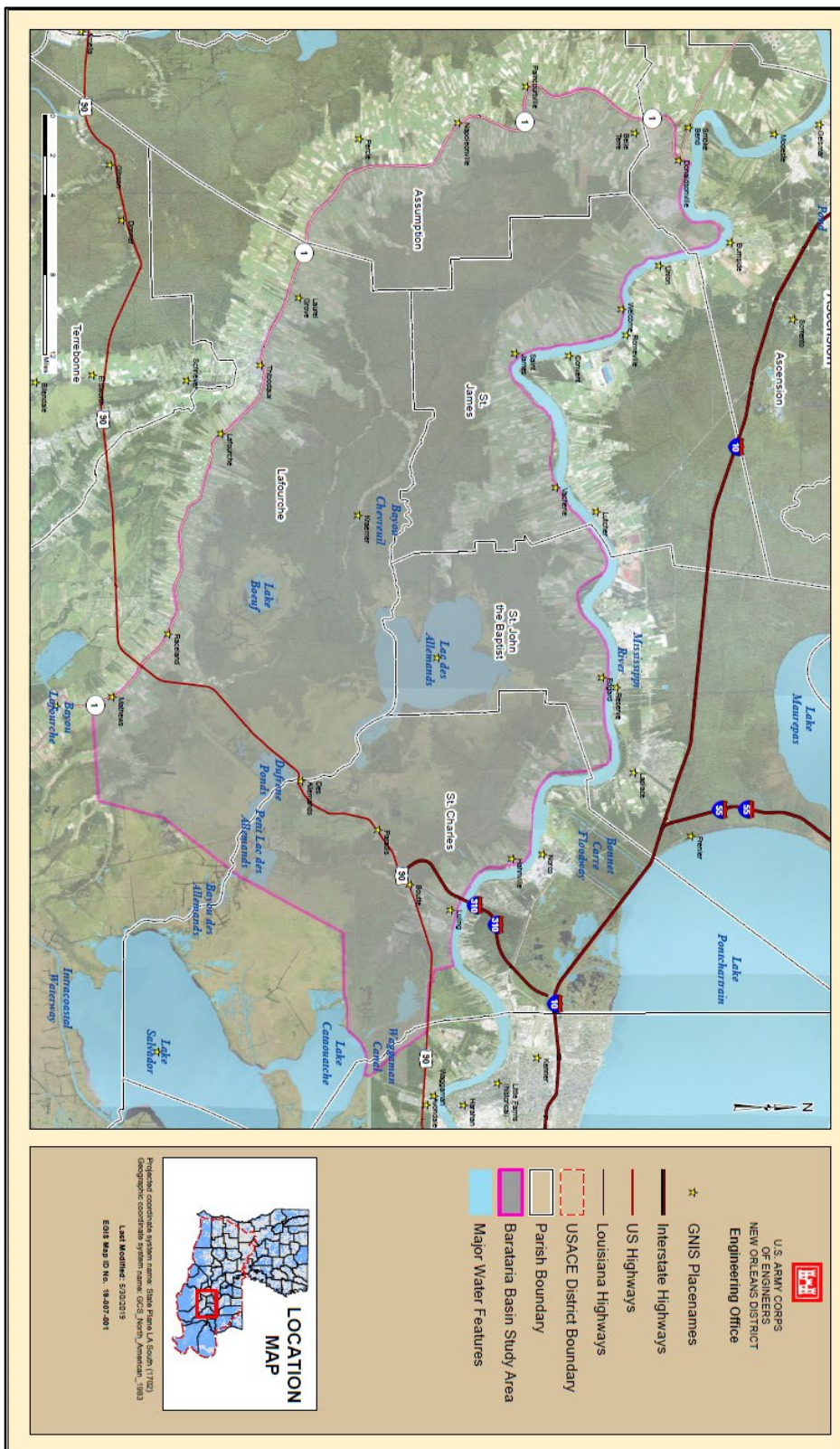


Figure 1-1. Upper Barataria Basin Feasibility Study Area

- An initial USACE evaluation study entitled “Louisiana Coastal Area, Louisiana, Shore and Barrier Island Erosion,” and dated September 1984, reports investigative findings that indicate that Louisiana’s beaches and barrier islands act as buffers for coastal marshes and communities, absorbing much of the wave action from the Gulf of Mexico. However, most of the shoreline is receding. Continued retreat will expose valuable marshes to direct attack from the gulf. Loss of the marshes would have a severe impact on existing coastal development and fish and wildlife resources important to the state and nation.
- USACE conducted a reconnaissance study under the Louisiana Coastal Authority entitled “Mississippi River Delta Study.” The purpose of this study was to determine the feasibility of realigning the lower Mississippi River channel to increase its marsh-building capacity. The general study finding was that there are no economically justified alternatives for making realignments to the Mississippi River.
- An initial evaluation report, “Louisiana Coastal Area, Louisiana, Water Supply,” prepared in September 1984, investigated the advisability of improvements or modification of existing improvements, in the interest of water supply, in the coastal area of Louisiana. The report recommends that five of the six problem areas identified be further investigated in the cost-shared feasibility phase of the study.
- USACE prepared a reconnaissance report on hurricane protection in March 1988. “The Louisiana Coastal Area Hurricane Protection Reconnaissance Report” details the feasibility of providing hurricane protection for coastal Louisiana between the Pearl River on the east and the Sabine River on the west. For this report, concentration was placed on the Barataria Basin portion of the Louisiana Coastal Area. The report recommends proceeding to the feasibility phase to investigate a hurricane protection alternative for the Luling area of St. Charles Parish on the west bank of the Mississippi River.
- A USACE report entitled “New Orleans-Baton Rouge Metropolitan Area, Louisiana,” was completed in 1981. The report contains a comprehensive plan for development and conservation of water and related land resources in a 21-parish area.
- The U.S. Fish and Wildlife Service (USFWS) produced a report entitled “Mississippi Deltaic Plain Region Ecological Characterization.” Published in 1980, the report supplies information about the biological, social, and physical parameters in the Mississippi Deltaic Plain region of Louisiana.
- A report sponsored by USFWS, “An Ecological Characterization Study of the Chenier Plain Coastal Ecosystem of Louisiana and Texas,” was published in 1979. This report contains information on the biological, social, and physical parameters in the Chenier Plain of Louisiana and Texas.
- “Bayou Chevreuil and Grand Bayou, Louisiana, Continuing Authorities Program Section 205 Preliminary Evaluation” was conducted by USACE in March 1993. During this evaluation, nonstructural means of flood protection for structures within the Bayou Chevreuil and Grand Bayou drainage basins were analyzed. Nonstructural flood control measures include temporary closures to impacted

structures, ring levees, structure raising, and structure relocation. The preliminary evaluation recommended additional Federal studies on nonstructural flood control measures in the study area.

- The Davis Pond Diversion Project started diverting water into the basin from the Mississippi River in July of 2002. It is located on the south east border of the study area. The project consists of a gated, four barrel, 14 foot x 14 foot reinforced concrete culvert with corresponding inflow and outflow channels, approximately 19 miles of guide levees, 1.8 miles of Rock weir, a 570 cfs pumping station and a Ponding Area. The project area is 10,084 acres; 9,311 of these acres are in the Ponding Area. The purpose of the diversion is to divert fresh water, with its accompanying nutrients and sediments, from the Mississippi River into the Barataria Basin in turn reducing saltwater intrusion and establishing favorable salinity conditions in the area, thus combating land loss.
- The most recent documented study of the area is the “Donaldsonville to the Gulf of Mexico Feasibility Study.” This Final Letter Report was released June of 2012 with a negative finding. The Coastal Protection and Restoration Authority Board has an existing study within the study area. The structural plan is currently being pursued by the St. Charles Levee District. It incorporates a levee along U.S. Highway 90 between the West Bank and Larose, of which, St. Charles has constructed one segment.

Section 2

Problems and Opportunities (Purpose and Need)

2.1 SPECIFIC PROBLEMS AND OPPORTUNITIES

The primary problem identified in the study area is the risk of flood damage from tidal surges, storm surges, and rainfall.

Flood Risk - The headwater flooding in the area from rainfall is intensified by tidal events, resulting in flood damages to industrial, commercial, and agricultural facilities as well as residential structures and critical evacuation routes, such as US Highway 90. Tidal events can create a backwater effect that does not allow rainfall to drain from the basin. A coastal storm risk management project in the study area could reduce the risk of flooding for residential and commercial structures, major transportation routes, and many other commercially and culturally significant places and activities vital to the economy of the region and nation.

Sea Level Rise - Sea level rise (SLR) and subsidence are expected to increase in the future, causing more frequent storm surge inundation and flood events.

Ecosystem - Saltwater intrusion associated with frequent storm surge events would also impact the diverse, ecologically important fresh water habitat within the study area. Aquaculture, commercial fishing, crawfish farming, fishing, hunting, and tourism industries would be significantly impacted by more frequent storm surge events. Coastal flooding also subjects the habitat to changes in water salinity. The economic impacts affect fishers, processors, suppliers, grocers, and restaurants at the regional and national level.

This study is specific to CSR and formulation focuses on minimizing damages due to coastal storms.

Opportunities to address the identified problems for the UBB study area include:

- Decrease the risk to human life due to flooding
- Reduce flood risk and damages to residential, commercial, historic, cultural, and critical assets and infrastructure
- Limit economic damages and improve economic resiliency of the local economy and communities
- Increase the resiliency and reliability of critical infrastructure (airports, industrial, and power facilities)
- Convert flood zones to help minimize insurance expenses
- Increase community awareness about flooding risks
- Reduce recovery time from high water events that make evacuation routes and other critical roadways impassable
- Sustain the unique heritage of coastal Louisiana by minimizing impacts from coastal storm events

2.2 PURPOSE AND NEED

Per the authority referenced in Section 1, the UBB study's purpose is to address the flooding problems discussed in Section 2.1.

Without a project to address flooding risks, the UBB study area would continue to be at risk of damages from storm events. These impacts would be exacerbated due to heavy rainfall coupled with increases in relative sea level change.

2.3 PLANNING OBJECTIVES

The National Economic Development (NED) Plan is the alternative plan that reasonably maximizes net economic benefits consistent with protecting the nation's environment. The NED plan will be calculated explicitly, including uncertainties in the key variables specified in the risk register. The national objective to maximize NED is the overarching goal for this study. However, it is not specific enough for direct use in plan formulation. The water and related land resource problems and opportunities identified in this study are stated as specific planning objectives to provide focus for the formulation of alternatives. These planning objectives reflect the problems and opportunities in the study area and represent desired positive changes from the future without project condition. Within the study area and over the 50-year period of analysis, the planning objectives are:

- Reduce the risk to human life, health, and safety by reducing flood impacts to structures, evacuation routes, and critical infrastructure
- Reduce the risk of economic impacts due to storm inundation in the study area; structures, evacuation routes, and critical infrastructure
- Increase community resiliency before, during, and after flooding events

2.4 PLANNING CONSTRAINTS

A planning constraint is a restriction that limits plan formulation and should be avoided or worked around when possible. Planning constraints for the UBB study area are:

- The project features cannot increase flood risk to adjacent areas
- Oil and gas infrastructure (wells) must be avoided
- Impacts to cultural resources must be minimized
- Vessel traffic in and out of the interior basin must not be impeded
- Maintain the hydrological regime through the basin to support targeted habitats
- Do not induce development within a flood plain – EO-11988
- Minimize the impact to threatened or endangered species existing in the area

2.5 PUBLIC SCOPING SUMMARY

NEPA coordination with the NFS, stakeholders, Federal and state agencies (United States Fish and Wildlife Services (USFWS) and the National Marine Fisheries Service (NMFS)) and federally-recognized Tribes was performed prior to issuance of the Notice of Intent (NOI) and afterwards through interagency meetings, public meetings, social media, and the MVN website. Per the Water Resources Reform and Development Act (WRRDA) of 2014, general scoping meetings were hosted by USACE within 90 days of the start of the study. A public website page

with the study information and a request for feedback was established in December of 2018. A scoping report is included in the Appendix C - Environmental, which has copies of all written feedback received.

The collaborative stakeholders associated with this USACE study are the Lafourche Basin Levee District, the St. Charles Levee District, and the CPRAB. Resource agencies engaged with this study include the USFWS and NMFS. In partial fulfillment of USACE's responsibilities under Executive Order (EO) 13175, early NEPA coordination was initiated on December 4, 2018 with these Tribes:

- Alabama-Coushatta Tribe of Texas (ACTT)
- Caddo Nation of Oklahoma
- Chitimacha Tribe of Louisiana (CTL)
- Choctaw Nation of Oklahoma (CNO)
- Coushatta Tribe of Louisiana (CT)
- Jena Band of Choctaw Indians (JBCI)
- Mississippi Band of Choctaw Indians (MBCI)
- Muscogee (Creek) Nation (MCN)
- Seminole Nation of Oklahoma (SNO)
- Seminole Tribe of Florida (STF)
- Tunica-Biloxi Tribe of Louisiana (TBTL)

Additionally, a general scoping meeting requesting feedback was conducted on January 10, 2019, at MVN, with Facebook Live Streaming, which requested feedback as well. Feedback received during the public scoping meeting did not result in formulation of additional measures, but gave suggestions to where flooding was being experienced in the study area.

In accordance with NEPA, a NOI to prepare an EIS was published in the Federal Register (Volume 84, No. 63) on April 2, 2019. Two public scoping meetings were conducted within the study area on May 1, 2019 at the Thibodaux Library and on May 2, 2019 at the St. Charles Parish Emergency Operations Center in Hahnville, with Facebook Live Streaming. Comments were accepted via written correspondence and emails. Approximately 40 non-USACE people attended the meetings in person and the Facebook Live Streaming had nearly 600 views. People that attended were concerned about flooding due to combined rainfall and coastal storm effects. Feedback from the public scoping meeting resulted in modifications to the alternatives and addition of an alternative to prevent rainfall damages within the basin. An additional meeting was conducted on October 22, 2019, with collaborative stakeholders and the NFS to present the final array of alternatives and the screening rationale of the alternatives that were screened. All public comments can be found within the Public Scoping Report contained within Appendix C.

Section 3

Inventory and Forecast Conditions

3.1 HISTORIC AND EXISTING CONDITIONS (AFFECTED ENVIRONMENT)

The environmental settings section describes the climate, geology, and historic and existing conditions for significant environmental resources including: soils; water quality; vegetative resources; wildlife resources (including birds, mammals, amphibians, and reptiles); fisheries; essential fish habitat (EFH); water bottoms; threatened and endangered species (T&E); historic and cultural resources; socioeconomic and human resources (population; infrastructure; employment and income); aesthetics (visual resources); recreation; and air quality. In addition, noise and hazardous, toxic, and radioactive waste (HTRW) are also considered. A resource is considered important if it is recognized by statutory authorities including laws, regulations, Executive Orders (EO), policies, rules, or guidance; if it is recognized as important by some segment of the general public; or if it is determined to be important based on technical or scientific criteria.

3.1.1 Study Area

The study area is located within the Barataria Basin, an irregularly shaped area located in south-central Louisiana. The basin is bounded on the north and east by the Mississippi River, on the south by the Gulf of Mexico, and on the west by Bayou Lafourche. The entire Barataria Basin encompasses approximately 1,565,000 acres and contains approximately 152,120 acres of swamp, 173,320 acres of fresh marsh, 59,490 acres of intermediate marsh, 102,720 acres of brackish marsh, and 133,600 acres of saline marsh (CWPPRA). It is also divided into nine subbasins: Fastlands, Des Allemands, Salvador, Central Marsh, Grande Cheniere, L'Ours, North Bay, Bay, and Empire.

The UBB, covers 800 square miles of the upper portion of the Barataria Basin and includes the following Louisiana parishes: Ascension, Assumption, Jefferson, Lafourche, St. Charles, St. James, and St. John the Baptist. The UBB is a region dominated by extensive coastal wetlands created by the deltaic processes of the Mississippi River. Because of its deltaic history, the study area is characterized by a number of former distributary channels extending into the basin from either Bayou Lafourche or from the Mississippi River. Because the highest land elevations occur on the banks of those former distributary channels, developed areas are generally located there. The remainder of the upper portion of the basin consists of coastal forested wetlands, marshes, and associated water bodies. The Barataria Basin exhibits a northwest-southeast salinity gradient with fresh or low-salinity conditions toward the northwest, and more saline conditions nearer the Gulf of Mexico. Given that the study area is located within the upper portion of the basin, it is characterized by freshwater conditions, with low-salinity, brackish conditions occurring infrequently in the more tidally influenced southern portion of the study area.

Forested and herbaceous wetlands within the study area are suffering from increased inundation due to the combined effects of subsidence, sea level rise, and loss of suspended sediment inputs from the Mississippi River. As a result, the existing study area cypress-tupelo swamps are no longer sustainable. Bottomland hardwoods at higher elevations are converting to cypress-tupelo swamp or marsh. Marshes in the upper portion of the basin have remained healthy and are expected to remain relatively healthy, provided that area salinities do not increase and that the middle and lower basin marshes remain intact. Through the Coastal Wetlands Planning, Protection, and Restoration Act (CWPPRA), USACE, and other Federal and state agencies have jointly developed strategies to protect and restore Louisiana’s coastal wetlands, including those within the UBB.

3.1.1.1 Local Protection Measures

The study area includes local levee systems, which are maintained by local communities. These systems have inconsistent levels of storm surge protection and mainly serve as a method of removing rainfall via pumps when gravity drainage is not sufficient. Table 3-1 provides a list of the communities with local levee systems and the type of protection each has.

Table 3-1. Local Levee Districts

Local Levee System	Communities Protected	Description:
Backwater Protection Levee in South Vacherie	Vacherie	Levee
Golden Star Plantation Levee	Vacherie (Ag)	Levee
Sunset Drainage District	Bayou Gauche, Des Allemands, and Paradis	Levee and pump
Ellington Plantation	Boutte Mimosa Park	2 existing pump stations
Willowridge	Willowdale Willowridge Estates	1 existing pump station

3.1.2 Climate and Climate Change

The 2014 USACE Climate and Resiliency Policy Statement states that “USACE shall continue to consider potential climate change impacts when undertaking long-term planning, setting priorities, and making decisions affecting its resources, programs, policies, and operations.” The most significant impact on coastal wetlands resulting from climate change is sea level change.

The climate in the study area is influenced by the many water surfaces of the nearby wetlands, rivers, lakes, and streams. Warm, moist, southeasterly winds from the Gulf of Mexico prevail throughout most of the year, with occasional cool, dry fronts dominated by northeast high pressure systems.

In the past century, temperatures in Southeast Louisiana have increased approximately

0.5 degrees Fahrenheit (EPA 2016). Louisiana has generally warmed less than other states in the U.S., but climate patterns in Louisiana are anticipated to become warmer with more severe flooding events and droughts. Increasing sea temperatures also would increase the likelihood of more intense tropical storm events as well as accelerating land loss and decline of coastal marsh (EPA 2016).

Based on climate change review (VijayaVenkataRaman et al. 2012), global climate change trends that could impact the project include but are not limited to increased cyanobacteria production (i.e. resulting from eutrophication), reduced water quality, wildlife population impacts, impacts to commercial fisheries, impacts to regional air quality, and adverse impacts to human health. Increases in average annual air temperature would also be expected to outweigh other factors such as precipitation, resulting in greater risk of droughts around the project area (White & Arnold 2015).

Extreme changes in climate (temperature, rain, evaporation, wind) could result in conditions that cannot support the types of habitat restored, reducing the effectiveness of the proposed plan and any associated mitigation. Extreme climate change could essentially eliminate the benefits of any constructed flood risk reduction in the basin. Additional information regarding climate in the UBB may be found in Appendix C.

3.1.3 Sea Level Change

Engineering Regulation 1100-2-8162 (ER 1100-2-8162) provides guidance for incorporating direct and indirect physical effects of projected future sea level change across the project life cycle in managing, planning, engineering, designing, constructing, operating, and maintaining USACE projects and systems of projects. Potential relative sea level change must be considered in every USACE coastal activity as far inland as the extent of estimated tidal influence.

Potential increases in sea level could affect the performance and therefore ability of a mitigation project to achieve replacement of the services and functions of the impacted habitat types. Because all of the mitigation projects were designed based on the intermediate sea level rise (SLR) scenario to account for potential uncertainties in future SLR impacts, the risk of the proposed projects not successfully meeting the mitigation requirement due to SLR has been minimized.

Using USACE-predicted future water levels under the SLR scenarios, those water levels were converted into relative sea level rise (RSLR) rates, incorporating sea level rise effects measured at the gauges and specific land loss experienced in the extended project area for each alternative. No operations and maintenance activities were planned for any of the alternatives in relation to future elevation changes. The wetland value assessment (WVA) then utilized the RSLR rates and project design to predict Future with Project (FWP) acres left at the end of the 50-year period of analysis. Long-term sustainability (percent land left at the end of the period of analysis) was used to analyze the impact that different SLR scenarios had on the project areas. Comparison between the long-term sustainability numbers experienced under the intermediate and high SLR scenarios for all of the mitigation alternatives in the final array supported the choice of the TSPs, that is, all the TSPs for all

habitat types performed the best under the influence of both the intermediate and high SLR scenarios.

Climate change analysis required by ECB 2018-14 for the inland hydrology and this analysis is contained within the Climate Hydrology Report in Annex 8 of Appendix A. This analysis speaks to relative sea level rise and subsidence among other concerns of climate change. Also, following ER 1100-2-8162, the TSP will be evaluated under a low, intermediate, and high SLR scenario.

3.1.4 Geology and Soils

Most of the present landmass of southeast Louisiana was formed by deltaic processes of the Mississippi River. Over the past 7,000 years, the Mississippi River deposited massive volumes of sediment in five deltaic complexes: Teche, Atchafalaya, Lafourche, Plaquemines, and St. Bernard.

The study area lies within the Mississippi Deltaic Plain, which is comprised of highly organic soils with floating marshes and peat deposits also prevalent in the area. It contains natural levee ridges, man-made levees, forested wetlands, lakes and bays, barrier islands, estuaries, and fresh, intermediate, brackish, and saline marshes. Subsidence rates are one of the most critical problems in this area. Combined with wave action along coastal Louisiana and loss of river-borne sediment supply, subsidence constitutes the primary cause of severe land loss in the marshlands. The disappearance of exterior marshes, swamps, and barrier islands is causing the degradation of inland marshes because of wave and saltwater inundation.

A portion of study area is located in the coastal marshes of south Louisiana's Lafourche Parish. This area of Louisiana is characterized by extensive coastal marshes with residential and commercial development primarily limited to the communities and scattered development adjacent to Louisiana State Highways LA 1, LA 3090, and LA 3235.

Upper basin marshes are characterized by highly organic substrates that in many areas are floating or semi-floating because of the lack of mineral sediment accretion. These marshes are vulnerable to potential catastrophic degradation and loss if exposed to brackish water conditions. Additionally, floating marshes are more susceptible to storm surge impacts than heavier mineral soil marshes.

Riverine freshwater and sediment inputs once available to the study area via Bayou Lafourche were eliminated when the bayou was damned in 1903. Seasonal freshwater and suspended sediment inputs from the Mississippi River were eliminated by construction of flood protection levees along the Mississippi River following the catastrophic 1927 Mississippi River flood. The elimination of the riverine suspended sediment inputs has resulted in net subsidence as sediment inputs are no longer available to counteract subsidence and sea level rise. Currently, this problem, manifested in wetland loss, is most severe in the middle and lower basin (CPRA 2017); however, with additional time it may impact the upper basin as well. To address this coastal wetland loss crisis, the Davis Pond Freshwater Diversion Project was authorized and began operating in 2002. Additionally, the

Mid-Barataria Sediment Diversion Project, currently in engineering and design, is planned to introduce large amounts of Mississippi River water and sediments into the middle basin.

3.1.5 Relevant Resources

Table 3-2 provides a summary of the institutional, technical, and public importance of relevant resources. The resources described in this section are those recognized as significant by laws, Executive Orders (EOs), regulations, and other standards of Federal, state, or regional agencies and organizations; technical or scientific agencies, groups, or individuals; and the general public.

Table 3-2. List of Relevant Resources

Resource	Institutionally Important	Technically Important	Publicly Important
Wetlands	Clean Water Act of 1977, as amended; Executive Order 11990 of 1977, Protection of Wetlands; Coastal Zone Management Act of 1972, as amended; and the Estuary Protection Act of 1968., EO 11988, and Fish and Wildlife Coordination Act.	They provide necessary habitat for various species of plants, fish, and wildlife; they serve as ground water recharge areas; they provide storage areas for storm and flood waters; they serve as natural water filtration areas; they provide protection from wave action, erosion, and storm damage; and they provide various consumptive and non-consumptive recreational opportunities.	The high value the public places on the functions and values that wetlands provide. Environmental organizations and the public support the preservation of marshes.
Aquatic Resources/ Fisheries/Water Bottoms	Fish and Wildlife Coordination Act of 1958, as amended; Clean Water Act of 1977, as amended; Coastal Zone Management Act of 1972, as amended; and the Estuary Protection Act of 1968.	They are a critical element of many valuable freshwater and marine habitats; they are an indicator of the health of the various freshwater and marine habitats; and many species are important commercial resources.	The high priority that the public places on their esthetic, recreational, and commercial value. Environmental organizations and the public support the preservation of water quality and fishery resources.
Essential Fish Habitat (EFH)	Magnuson-Stevens Fishery Conservation and Management Act of 1996, Public Law 104-297	Federal and state agencies recognize the value of EFH. The Act states, EFH is "those waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity."	Public places a high value on seafood and the recreational and commercial opportunities EFH provides.
Wildlife	Fish and Wildlife Coordination Act of 1958, as amended and the Migratory Bird Treaty Act of 1918	They are a critical element of many valuable aquatic and terrestrial habitats; they are an indicator of the health of various aquatic and terrestrial habitats; and many species are important commercial resources.	The high priority that the public places on their esthetic, recreational, and commercial value.
Threatened and Endangered Species	The Endangered Species Act of 1973, as amended; the Marine Mammal Protection Act of 1972; and the Bald Eagle Protection Act of 1940.	USACE, USFWS, NMFS, NRCS, EPA, LDWF, and LDNR cooperate to protect these species. The status of such species provides an indication of the overall health of an ecosystem.	The public supports the preservation of rare or declining species and their habitats.
Cultural Resources	National Historic Preservation Act of 1966, as amended; the Native American Graves Protection and Repatriation Act of 1990; and the Archeological Resources Protection Act of 1979	State and Federal agencies document and protect sites. Their association or linkage to past events, to historically important persons, and to design and construction values; and for their ability to yield important information about prehistory and history.	Preservation groups and private individuals support protection and enhancement of historical resources.

Resource	Institutionally Important	Technically Important	Publicly Important
Recreation Resources	Federal Water Project Recreation Act of 1965 as amended and Land and Water Conservation Fund Act of 1965 as amended	Provide high economic value of the local, state, and national economies.	Public makes high demands on recreational areas. There is a high value that the public places on fishing, hunting, and boating, as measured by the large number of fishing and hunting licenses sold in Louisiana; and the large per-capita number of recreational boat registrations in Louisiana.
Aesthetics	USACE ER 1105-2-100, and National Environmental Policy Act of 1969, the Coastal Barrier Resources Act of 1990, Louisiana's National and Scenic Rivers Act of 1988, and the National and Local Scenic Byway Program.	Visual accessibility to unique combinations of geological, botanical, and cultural features that may be an asset to a study area. State and federal agencies recognize the value of beaches and shore dunes.	Environmental organizations and the public support the preservation of natural pleasing vistas.
Air Quality	Clean Air Act of 1963, as amended, Louisiana Environmental Quality Act of 1983.	State and federal agencies recognize the status of ambient air quality in relation to the NAAQS.	Virtually all citizens express a desire for clean air.
Water Quality	Clean Water Act of 1977, Fish and Wildlife Coordination Act, Coastal Zone Mgt Act of 1972, and Louisiana State & Local Coastal Resources Act of 1978.	USACE, USFWS, NMFS, NRCS, EPA, and State DNR and wildlife/fishery offices recognize value of fisheries and good water quality and the national and state standards established to assess water quality.	Environmental organizations and the public support the preservation of water quality and fishery resources and the desire for clean drinking water.

3.1.5.1 Natural Environment

3.1.5.1.1 Hydraulics and Hydrology

Historically, wetlands in the Barataria Basin were nourished by the fresh water, sediments, and nutrients delivered via overbank flooding of the Mississippi River and through its many distributary channels such as Bayou Lafourche, Bayou Barataria, and Bayou Grand Cheniere. As the flow of fresh water and sediments from the Mississippi River was restricted by flood protection levees and the closure of Bayou Lafourche, the basin began to gradually deteriorate from saltwater intrusion, subsidence, wave action, and sediment deprivation.

Previously, Bayou Perot, and the longer, narrower Bayou Dupont-Bayou Barataria-Bayou Villars channels provided limited hydrologic connection between the upper and lower basin. The hydrologic connections between the Upper and Lower Barataria Basin are much greater today, due to the Barataria Bay Waterway, Bayou Segnette Waterway, Harvey Cutoff, and the substantial erosion and interior marsh loss that has occurred along Bayou Perot and the Rigolettes. The frequency of high salinity events has also increased in the Barataria Basin, probably as a result of the increased tidal connectivity (Swenson and Turner 1998). From 1932 to 1990, the basin lost over 245,000 acres of marsh (LCWCRTF 1993) and from 1978 to 1990 it experienced the highest rate of wetland loss along the entire Louisiana Coast (Barras et al. 2003).

The Mississippi River's influence on the basin has now been reduced to freshwater diversion projects (e.g., Davis Pond Freshwater Diversion Project) and the periodic opening of locks

which connect the river to navigation channels. The Davis Pond Freshwater Diversion Project (Davis Pond Project), located on the west bank of the Mississippi River near Luling, would most likely have the most significant impact on the hydrology of the Barataria Basin since federal flood protection levees were constructed along the Mississippi River in the early 1900s.

Davis Pond Project

The Davis Pond Project impacts the hydrology and salinity in the study area and also influences localized land creation, all which have varying impacts on the ecology. The existing Davis Pond Project was completed in 2002 and has a maximum operating capacity of 10,650 cubic feet per second. It has been operated as a salinity management feature by adjusting Mississippi River diversion discharges to meet basin salinity targets.

For more information on the hydrological influences within the study area, see the hydrology report as Annex 8 to Appendix A.

3.1.5.1.2 Wetlands

The study area includes marsh and forested wetlands. Bottomland hardwood (BLH) forests are located within the extreme upper basin and also exist adjacent to or near developed areas where forest elevations are sometimes higher.

The marshland in the Barataria Basin can be broken down into four general types: saline marsh, brackish marsh, intermediate marsh, and fresh marsh. The major factors that influence the type of wetland community are elevation, hydrology, salinity, and soil type. Elevation is critical to the type of wetland occurring in an area and small elevation changes can result in major shifts in community type (Connor et al, 1981). Freshwater habitats generally have salinities less than 0.5 parts per thousand (ppt), salinities in intermediate marsh range between 0.5-5.0 ppt, brackish marsh has salinities of 5-18 ppt, and saline marsh salinities vary between 18-30 ppt.

The upper portion of the Barataria Basin is largely a freshwater-dominated system of natural levee ridges, swamps, and fresh marsh habitats. Freshwater marsh is found surrounding bodies of open water and is located in the study area, specifically along the edge of Lac des Allemands, Lake Boeuf, Bayou des Allemands, and Dufrene Ponds. Bottomland hardwood (BLH) forests are typically found along the slopes of natural distributary ridges. These wetland forests may be occasionally or seasonally flooded and they typically occupy higher elevation areas than cypress-tupelo swamps which experience more flooding. These coastal forests provide critically important stopover habitat for numerous species of trans-Gulf migrating songbirds (including the at-risk golden-winged warbler), nesting bald eagles and osprey, colonial nesting waterbirds, as well as habitat for a variety of other fish and wildlife species.

Coastal wetland forests like those in the upper Barataria Basin, once used to receive annual sediment inputs during flood events on the Mississippi and/or Atchafalaya Rivers. However, construction of flood protection levees during the early 1900s has eliminated those annual sediment inputs resulting in increased inundation due to the continuing effects of subsidence

and sea level rise (Conner and Day 1988). The resulting chronic inundation affects not only tree mortality and forest composition, but also tree growth rates (Kozlowski 2002).

The basin is continually saturated with freshwater, which is at the soil surface or as much as 8 to 10 inches above the surface. During extremely dry periods, the area may not have any surface water at low tide. During storm tides, the basin may have as much as 3 feet of water. These variations cause temporary shifts in kinds, amounts, and proportions of vegetation from species that are typically associated with fresh marsh to those that are generally associated with intermediate marsh conditions.

The basin is also subject to flooding from Gulf of Mexico storms. Abnormally high tides that occasionally flood the basin are the primary source of soil salinity. The extremely flat slopes and dense vegetation restrict water runoff. Reduced runoff, abundant rainfall, and low evapotranspiration cause the soil to be saturated to the surface most of the year. During the winter months, the soil may have up to 3 inches of water on the surface. During the summer months, increased evapotranspiration rates and higher temperatures may cause the water table to drop to 2 to 10 inches below the soil surface.

Invasive Plants

Invasive plants include water hyacinth (*Eichhornia crassipes*), alligatorweed (*Alternanthera philoxeroides*), hydrilla (*Hydrilla verticillata*), common salvinia (*Salvinia minima*), giant salvinia (*Salvinia molesta*), Chinese tallow (*Triadica sebifera*), Chinese privet (*Ligustrum sinense*), Cogon grass (*Imperata cylindrical*), Johnsongrass (*Sorghum halepense*), Japanese privet (*Ligustrum japonicum*), Japanese honeysuckle (*Lonicera japonica*), common ragweed (*Ambrosia artemisiifolia*), rescuegrass (*Bromus catharticus*), Sticky chickweed (*Cerastium glomeratum*), purple nutsedge (*Cyperus rotundus*), and mimosa tree (*Albizia julibrissin*). These invasive species compete with native flora for resources such as nutrients, light, community structure and composition, and ecosystem processes. Water hyacinth, common salvinia, giant salvinia, and hydrilla all limit the amount of light penetrating the water column, which affects plankton biomass production. Alligatorweed, Chinese tallow, and Chinese privet are of minimal wildlife value and can proliferate until they become the only dominant plant species in the area, limiting food available for wildlife.

Control of these species is typically accomplished through herbicide application and physical removal.

Wetland Loss

The processes of wetland loss can result from the gradual decline of marsh vegetation due to inundation and saltwater intrusion, as well as from storm surge events, both of which can eventually lead to complete loss of marsh vegetation. In coastal bottomland hardwood forests stressed by prolonged inundation, the less water tolerant tree species gradually die out leaving the more water tolerant bald cypress and water tupelo, if they were originally present (Kiem et al. 2013). If flooding is not permanent, seeds from prior existing cypress and tupelo may germinate and recruitment of young trees may occur. However, nutria herbivory and other factors may preclude recruitment of cypress and/or tupelo, or prolonged flooding may preclude seeds from

germinating (Kozłowski 2002), often resulting in the conversion of the dying hardwood forests to emergent marsh.

As marsh vegetation is lost, underlying soils are more susceptible to erosion and are typically lost as well, leading to deeper water and precluding marsh regeneration. Significant accretion of sediments is then required in order for marsh habitat to reestablish.

Perhaps the most serious and complex problem in the study area is the rate of land and habitat loss. Coastal Louisiana wetlands are one of the most critically threatened environments in the United States. "These wetlands are in peril because Louisiana currently experiences greater coastal wetland loss than all other states in the contiguous United States combined." (Couvillion, et al., 2017). Proximity to the Gulf of Mexico makes this area susceptible to degradation by several natural and human actions. Hurricanes and tropical storms can cause entire plant communities to be destroyed in a very short period of time. Constant wind action and low topographic relief make shoreline erosion a constant threat. Those areas with a long fetch of open water are especially vulnerable to wave action. Oil and gas development, including oil exploration, site preparation, site access, drilling, production, pipeline installation, spill control and cleanup, and site closure can disrupt the natural hydrologic regime in the Mississippi Delta and in turn affect plant health and sediment dynamics.

The Louisiana coastal plain accounts for 90 percent of the total coastal marsh loss in the nation (USACE 2004). Couvillion et al. (2011) analyses shows coastal Louisiana has undergone a net change in land area of about -1,883 square miles of wetlands from 1932 to 2010. Trend analyses from 1985 to 2010 show a wetland loss rate of about 16.57 square miles per year.

Appendix C contains a more detailed description of the types of wetlands and other flora found in the study area.

3.1.5.1.3 Wildlife

There are a variety of habitats in the study area for wildlife species use including: open fields used for foraging, forested wetlands, fresh marsh, and lines of trees and shrubs along drainage ditches and denser tree growth along waterways that provide cover and connectivity. Flooded fields are especially valuable to wildlife when they are located adjacent to flooded bottomland hardwood forests because they provide nocturnal roosting sites for many species. The study area is located within the Mississippi Flyway, an area that experiences significant seasonal migrations of waterfowl species, which are of particular interest to recreational hunters.

Tables 3-3 through 3-6 provide a lists of wildlife species found in the study area. Appendix C contains more information on wildlife utilizing the study area.

Table 3-3. Waterfowl Species

Representative Waterfowl Species Found in the Study Area	
Common Name	Scientific Name
Northern shoveler	<i>Anas clypeata</i>
Wood duck	<i>Aix sponsa</i>
Hooded-merganser	<i>Lophodytes cucullatus</i>
Blue-winged teal	<i>Spatula discors</i>
Green-winged teal	<i>Anas crecca</i>
Mallard	<i>Anas platyrhynchos</i>
Canvasback	<i>Aythya valisineria</i>
Northern pintail	<i>Anas acuta</i>
Gadwall	<i>Mareca strepera</i>
American wigeon	<i>Mareca americana</i>
Mottled duck	<i>Anas fulvigula</i>
Lesser Scaup	<i>Aythya affinis</i>
Redhead duck	<i>Aythya americana</i>
Ring-necked duck	<i>Aythya collaris</i>
Red-breasted merganser	<i>Mergus serrator</i>

Source: USFWS

Table 3-4. Bird Species

Representative Nongame Species Found in the Study Area	
Common Name	Scientific Name
Little blue heron	<i>Egretta caerulea</i>
Great blue heron	<i>Ardea herodias</i>
Green-backed heron	<i>Butorides virescens</i>
Yellow-crowned night heron	<i>Nyctanassa violacea</i>
Black-crowned night heron	<i>Nycticorax</i>
Tricolored heron	<i>Egretta tricolor</i>
Great egret	<i>Ardea alba</i>
Snowy egret	<i>Egretta thula</i>
Cattle egret	<i>Bubulcus ibis</i>
White ibis	<i>Eudocimus albus</i>
Killdeer	<i>Charadrius vociferus</i>
Black-necked stilt	<i>Himantopus mexicanus</i>
Boat-tailed grackle	<i>Quiscalus major</i>
Red-winged blackbird	<i>Agelaius phoeniceus</i>
Northern harrier	<i>Circus hudsonius</i>
Glossy ibises	<i>Plegadis falcinellus</i>
Bald eagle	<i>Haliaeetus leucocephalus</i>
Screech owl	<i>Megascops asio</i>
Great horned owl	<i>Bubo virginianus</i>
Barred owl	<i>Strix varia</i>
Common snipe	<i>Gallinago</i>
Belted kingfisher	<i>Megaceryle alcyon</i>
Mockingbird	<i>Mimus polyglottos</i>
Yellow-billed cuckoo	<i>Coccyzus americanus</i>
Northern parula	<i>Setophaga americana</i>
Yellow-rumped warbler	<i>Setophaga coronata</i>
Prothonotary warbler	<i>Protonotaria citrea</i>
White-eyed vireo	<i>Vireo griseus</i>
Carolina chickadee	<i>Poecile carolinensis</i>
Tufted titmouse	<i>Baeolophus bicolor</i>
American woodcock	<i>Scolopax minor</i>
Common flicker	<i>Colaptes auratus</i>
Brown thrasher	<i>Toxostoma rufum</i>
Pileated woodpecker	<i>Dryocopus pileatus</i>
Red-headed woodpecker	<i>Melanerpes erythrocephalus</i>
Downy woodpecker	<i>Picoides pubescens</i>
Common grackle	<i>Quiscalus quiscula</i>
Common crow	<i>Corvus brachyrhynchos</i>
Red-tailed hawk	<i>Buteo jamaicensis</i>
Red-shouldered hawk	<i>Buteo lineatus</i>
Mississippi kite	<i>Ictinia mississippiensis</i>

Source: USFWS

Table 3-5. Reptile and Amphibian Species

Representative Reptile & Amphibian Species Found in the Study Area	
Common Name	Scientific Name
American alligator	<i>Alligator mississippiensis</i>
Green anole	<i>Anolis carolinensis</i>
Water moccasin	<i>Agkistrodon piscivorus</i>
Speckled kingsnake	<i>Lampropeltis getula</i>
Copperhead	<i>Agkistrodon contortrix</i>
Southern leopard frog	<i>Lithobates sphenoccephalus</i>
Ground skink	<i>Scincella lateralis</i>
Five-lined skink	<i>Plestiodon fasciatus</i>
Broad-headed skink	<i>Plestiodon laticeps</i>
Gulf coast ribbon snake	<i>Thamnophis proximus</i>
Yellow-bellied water snake	<i>Nerodia erythrogaster</i>
Western cottonmouth	<i>Agkistrodon piscivorus leucostoma</i>
Pygmy rattlesnake	<i>Sistrurus miliarius</i>
Broad-banded water snake	<i>Nerodia fasciata confluens</i>
Diamond-backed water snake	<i>Nerodia rhombifer</i>
Spiny softshell turtle	<i>Apalone spinifera</i>
Red-eared turtle	<i>Trachemys scripta elegans</i>
Southern painted turtle	<i>Chrysemys picta</i>
Mississippi mud turtle	<i>Kinosternon subrubrum</i>
Stinkpot turtle	<i>Sternotherus odoratus</i>
Common snapping turtle	<i>Chelydra serpentina</i>
Alligator snapping turtle	<i>Macrochelys temminckii</i>
Dwarf salamander	<i>Eurycea quadridigitata</i>
Three-toed amphiuma	<i>Amphiuma tridactylum</i>
Lesser western siren	<i>Siren intermedia</i>
Central newt	<i>Notophthalmus viridescens</i>
Gulf coast toad	<i>Incilius valliceps</i>
Eastern narrow-mouthed toad	<i>Gastrophryne carolinensis</i>
Green treefrog	<i>Hyla cinerea</i>
Squirrel treefrog	<i>Hyla squirella</i>
Pig frog	<i>Lithobates grylio</i>
Bullfrog	<i>Lithobates catesbeianus</i>
Bronze frog	<i>Rana clamitans</i>
Upland chorus frog	<i>Pseudacris feriarum</i>
Southern cricket frog	<i>Acris gryllus</i>
Spring peeper	<i>Pseudacris crucifer</i>

Source: USFWS

Table 3-6. Mammal Species

Representative Mammal Species Found in the Study Area	
Common Name	Scientific Name
Muskrat	<i>Ondatra zibethicus</i>
American mink	<i>Neovison vison</i>
River otter	<i>Lontra canadensis</i>
Raccoon	<i>Procyon lotor</i>
Swamp rabbit	<i>Sylvilagus aquaticus</i>
White-tailed deer	<i>Odocoileus virginianus</i>
Coyote	<i>Canis latrans</i>
Virginia Opossum	<i>Didelphis virginiana</i>
Nine-banded armadillo	<i>Dasypus novemcinctus</i>
Eastern cottontail	<i>Sylvilagus floridanus</i>
Gray squirrel	<i>Sciurus carolinensis</i>
Fox squirrel	<i>Sciurus niger</i>
Nutria	<i>Myocastor coypus</i>
Striped skunk	<i>Mephitis</i>
Bobcat	<i>Lynx rufus</i>
Gray fox	<i>Urocyon cinereoargenteus</i>
Red bat	<i>Lasiurus borealis</i>
Marsh rice rat	<i>Oryzomys palustris</i>
White-footed mouse	<i>Peromyscus leucopus</i>
Eastern wood rat	<i>Neotoma floridana</i>
Harvest mouse	<i>Micromys minutus</i>
Least shrew	<i>Cryptotis parva</i>
Southern flying squirrel	<i>Glaucomys volans</i>

Source: USFWS

3.1.5.1.4 Threatened and Endangered Species and Other Protected Species

To aid the USACE in complying with proactive consultation responsibilities under the Endangered Species Act, the USFWS provided a Planning Aid Letter dated 31 January 2019, which lists those threatened and endangered species and their critical habitats within the study area. Species addressed as being of concern for the overall study area include the pallid sturgeon, the eastern black rail and the West Indian manatee.

Although pallid sturgeon are a riverine species and are found in the study area, they are not likely to be of concern within the project area. The USFWS expressed concern about any potential dredging that may occur in the Mississippi River, which could potentially impact the species. There is no dredging associated with any of the proposed alternatives.

A recent survey was conducted by Audubon Louisiana between May 2017 and March 2019. The survey team detected the presence of the Eastern Black Rail in Vermillion and Jefferson parishes, with a concentration of Black Rail detections centered around Calcasieu Pass in Cameron Parish. While this survey indicates a year round Black Rail population in Louisiana,

it is believed that the Black Rail's restriction to a narrow habitat type make it unlikely to be found in the study area.

The West Indian manatee is sometimes seen in the coastal waters of Louisiana, as their range extends throughout the coast of the Gulf of Mexico, into the waters off the Yucatan peninsula, and throughout the Caribbean.

More information on these and other at-risk species is presented in Appendix C.

3.1.5.1.5 Aquatic Resources and Water Bottoms

Primary fresh and intermediate water bodies in the Barataria Basin include Lake Salvador, Lake Des Allemands, Lake Cataouatche, The Pen, Lake Boeuf, Bayou Boeuf, Bayou Des Allemands, Bayou Chevreuil, Grand Bayou, Bayou Citamon, Bayou Segnette, and Bayou Verret. Average water depths of the lakes and bayous ranges from 4 feet to 10 feet. In addition, there are many miles of manmade canals throughout the basin including the Gulf Inter-Coastal Waterway (GIWW) and Barataria Waterway.

Wetlands throughout the study area abound with small resident fishes and shellfishes, including but not limited to: least killifish (*Heterandria Formosa*), rainwater killifish (*Lucania parva*), sheepshead minnow (*Cyprinodon variegatus variegatus*), mosquitofish (*Gambusia affinis*), sailfin molly (*Poecilia latipinna*), and grass shrimp (*Palaemonetes sp.*). These species are typically found along marsh edges and among submerged aquatic vegetation and provide forage for a variety of fish and wildlife.

Freshwater and low-salinity marshes provide habitat for commercially and recreationally important resident freshwater fishes such as largemouth bass (*Micropterus salmoides*), yellow bass (*Morone mississippiensis*), black crappie (*Pomoxis nigromaculatus*), bluegill (*Lepomis macrochirus*), redear sunfish (*Lepomis microlophus*), warmouth (*Lepomis gulosus*), blue catfish (*Ictalurus furcatus*), channel catfish (*Ictalurus punctatus*), freshwater drum (*Aplodinotus grunniens*), bowfin (*Amia calva*), and gar (*Lepisosteidae*). Water bodies having minimal water exchange and heavy cover of floating vegetation may exhibit low dissolved oxygen conditions and reduced fisheries abundance.

The study area fresh marshes also provide nursery habitat for estuarine-dependent commercial and recreational fishes and shellfishes that are tolerant of fresh water such as blue crab (*Callinectes sapidus*), white shrimp (*Litopenaeus setiferus*), Gulf menhaden (*Brevoortia patronus*), Atlantic croaker (*Micropogonias undulates*), red drum (*Sciaenops ocellatus*), southern flounder (*Paralichthys lethostigma*), bay anchovy (*Anchoa mitchilli*), striped mullet (*Mugil cephalus*), and others. Fresh marshes also provide habitat for largemouth bass (*Micropterus salmoides*), warmouth (*Lepomis gulosus*), black crappie (*Pomoxis nigromaculatus*), blue catfish (*Ictalurus furcatus*), bowfin (*Amia calva*), and gar (*Lepisosteidae*).

3.1.5.1.6 Essential Fish Habitat (EFH)

As required by the Magnuson-Stevens Fishery Conservation and Management Act, all marine and estuarine waters of the northern Gulf of Mexico have been designated as

Essential Fish Habitat (EFH) through regulations promulgated by the National Marine Fisheries Service (NMFS) and the Gulf of Mexico Fishery Management Council. EFH is described as waters and substrates necessary for federally-managed species to spawn, breed, feed, and grow to maturity. In the northern Gulf of Mexico, EFH has generally been defined as “areas where individual life-stages of specific federally-managed species are common, abundant or highly abundant.”

Under the Magnuson-Stevens Fishery Conservation and Management Act, EFH in estuarine areas is defined as “all estuarine waters and substrates (mud, sand, shell, rock and associated biological communities), including the subtidal vegetation (submerged aquatic vegetation and algae) and adjacent intertidal vegetation (marshes and mangroves).” To assist in meeting consultation requirements, the NMFS local field office reviewed the study area and provided comments on January 30, 2019, that identified brown shrimp, white shrimp, and red drum as species of concern for the UBB study.

A portion of the study area is located in an area that has been identified as essential fish habitat (EFH) for various life stages of federally managed species, including postlarval and juvenile life stages of brown shrimp, white shrimp, and red drum. In addition to being designated as EFH for brown shrimp, white shrimp, and red drum, wetlands in the study area provide nursery and foraging habitats supportive of a variety of economically-important marine fishery species, including spotted seatrout, sand seatrout, southern flounder, black drum, gulf menhaden, and blue crab. Some of these species serve as prey for other fish species managed under the Magnuson-Stevens Act by the Gulf of Mexico Fishery Management Council (e.g., mackerels, snappers, and groupers) and highly migratory species managed by NMFS (e.g., billfishes and sharks). These wetlands also produce nutrients and detritus, important components of the aquatic food web, which contribute to the overall productivity of the Louisiana’s estuaries.

Categories of EFH in the study area include mud and shell substrates, submerged aquatic vegetation, estuarine water column, and estuarine emergent wetlands.

Table 3-7 shows the EFH for the managed species expected in those areas. Table 3-8 lists the expected salinity zones of the managed species expected. Appendix C contains more information on EFH that may be found in the study area.

Table 3-7. Aquatic Resource Species

Species	Life Stage	EFH
Brown Shrimp <i>(Farfantepenaeus aztecus)</i>	Juvenile	<18m; SAV, sand/shell/soft bottom, emergent marsh, oyster reef
White Shrimp <i>(Litopenaeus setiferus)</i>	Larvae/postlarvae	<82m; pelagi, soft bottom, emergent marsh
	Juvenile	<30m; soft bottom, emergent marsh
Red Drum <i>(Sciaenops ocellatus)</i>	Larvae/postlarvae	all estuaries planktonic, SAV, sand/shell/soft bottom, emergent marsh
	Juvenile	GOM, <5m Vermilion Bay & E; all estuaries SAV, sand/shell/soft/hard bottom, emergent
	Adults	OM 1-46 m Vermilion Bay & E; SAV, sand/shell/soft/hard bottom, emergent marsh

Table 3-8. Salinity Zones and Abundance for Federally Managed Species

Salinity Zone	Life Stage	Brown Shrimp	White Shrimp	Red Drum
0 -0.5 ppt.	Adults			
	Eggs			
	Juveniles			
	Larvae			
	Spawners			
0.5 - 5 ppt.	Adults	R	R	R to C
	Eggs			
	Juveniles	C to HA	C to A	C
	Larvae			
	Spawners			
5 -15 ppt.	Adults	R	C	R to C
	Eggs			
	Juveniles	C to HA	C to A	C
	Larvae			
	Spawners			
Relative Abundance: Blank: Not Present A: Abundant C: Common R: Rare HA: Highly Abundant (Variation in abundance due to seasonality) (NMFS, 1998)				

3.1.5.1.7 Water Quality

The dominant bodies of water in the basin are Lac Des Allemands, Lake Cataouatche, Lake Salvador, Barataria Bay, and Caminada Bay. Numerous bayous, canals, and channels cross through the basin. The basin's hydrology is greatly affected by the fact that its elevation hovers right at sea level, plus or minus a foot.

Water quality in the main channels of the basin is greatly influenced by non-point source agricultural runoff and to a lesser extent by residential and commercial point sources (LDEQ, 2004, 2007). Water quality in the interior wetlands; however, is often quite different because of hydrological modifications, mainly low levee spoil banks formed from drainage canal and pipeline construction, which have isolated surrounding wetlands from the main drainage channels. Spoil banks have been found to decrease the net flux of materials to and from nearby wetlands, making these areas prone to excessive inundation (Swenson and Turner, 1987; Bryant and Chabreck, 1998).

3.1.5.2 Human Environment

3.1.5.2.1 Geographic Location

The study area extends from the City of Donaldsonville south to the City of Mathews and includes the watersheds of Bayou Chevreuil-Lac des Allemands, Bayou Verrett, and the northwestern portion of Bayou Des Allemands-Lake Salvador. An inventory of residential and non-residential structures was developed using the National Structure Inventory (NSI) for the portions of the seven parishes impacted by storm surge associated with the future without project condition. The inventory consists of a little less than 25,000 structures, with 90 percent categorized as residential and 10 percent categorized as commercial. Figure 3-1 shows the structure inventory and the study area boundary.



Figure 3-1. Upper Barataria Basin Louisiana National Structure Inventory

3.1.5.2.2 Land Use

The total number of acres of developed, agricultural, and undeveloped land in the study area are shown in Table 3-9. As shown in the table, the majority of the study area is undeveloped land; with only 8 percent of the total acres in the study area currently developed land.

Table 3-9. Upper Barataria Basin Louisiana Land Use in the Study Area

Land Class Name	Acres	Percentage of Total
Developed Land	159,197	8%
Agricultural Land	523,431	25%
Undeveloped Land	1,397,531	67%
Total	2,080,159	100%

Source: USGS National Land Cover Database

3.1.5.2.3 Flood History

Tropical Flood Events

Coastal Louisiana experiences localized flooding from both excessive rainfall events, which leads to riverine flooding, and storm surge events from tropical storms and hurricanes. Since 1851, NOAA reported 62 tropical events that have made landfall along the south central portion of the Louisiana coast. Table 3-10 displays the Federal Emergency Management Agency (FEMA) disaster declarations from 1964 to 2016 that involved the seven parishes of the study area. During that timeframe, there were 22 disaster declarations related to hurricane and tropical storm incidents in the study area and 19 disaster declarations related to flooding incidents. Table 3-11 provides information on the top tropical storms in the study area based on the dollar amount paid by FEMA.

Table 3-10 Upper Barataria Basin FEMA Disaster Declaration by Parish 1964-2016

Parish	Hurricane and Tropical Storm Incidents	Flooding Incidents
Ascension	18	16
Assumption	16	8
Lafourche	20	8
St. Charles	20	8
St. James	16	7
St. John the Baptist	18	6
Source: Federal Emergency Management Agency (FEMA)		

Source: Federal Emergency Management Agency (FEMA)

Table 3-11. Upper Barataria Basin Top Tropical Storms by Amount Paid by FEMA

Event	Month & Year	Number of Paid Claims	Total Amount Paid (millions)
2016 Louisiana Floods	August 2016	26,909	\$2,455.7
Tropical Storm Lee	September 2011	9,900	\$462.2
Hurricane Ike	September 2008	46,684	\$2,700.1
Hurricane Gustav	September 2008	4,545	\$112.6
Hurricane Rita	September 2005	9,354	\$466.2
Hurricane Andrew	August 1992	5,587	\$169.1

Source: Federal Emergency Management Agency (FEMA)

Note 1: Total amount paid is at price level at time of the event.

Note 2: Claims and amount paid are for entire event, which may include areas outside of the study area.

FEMA Flood Claims

As of the 2019 season, the most recent named storms to affect the study area include, Tropical Storm Lee in 2011 and Hurricanes Ike and Gustav, both in 2008. Table 3-12 displays the number of flood claims by relevant parish. Table 3-13 displays the FEMA severe repetitive loss properties by relevant parish.

Table 3-12. Upper Barataria Basin FEMA Flood Claims by Parish 1978-2018

Parish	Total Number of Claims	Number of Paid Claims	Total Payments (millions)
Ascension	6,607	5,658	\$336.89
Assumption	979	785	\$4.45
Lafourche	5,335	3,920	\$66.93
St. Charles	5,963	4,130	\$101.05
St. James	249	204	\$6.19
St. John the Baptist	4,942	3,996	\$264.24
Total	24,075	18,693	\$780*
Source: Federal Emergency Management Agency (FEMA)			
*rounded			

Table 3-13. Upper Barataria FEMA Severe Repetitive Loss Properties by Parish

Parish	Number of Structures
Ascension	394
Assumption	84
Lafourche	450
St. Charles	643
St. James	19
St. John the Baptist	230
Total	1,820

Source: Federal Emergency Management Agency (FEMA)

3.1.5.3 Socio-economics

3.1.5.3.1 Transportation

The transportation infrastructure includes major roads, highways, railroads, and navigable waterways that have developed historically to meet the needs of the public. Highway 90 (Hwy-90), an east-west, bi-coastal thoroughfare that connects Houston, Texas and Baton Rouge, Louisiana, crosses the south-eastern part of the area, and is a primary route for hurricane evacuation and post-storm emergency response. Rail and aviation facilities are spread throughout.

3.1.5.3.2 Community Cohesion

Community cohesion is based on the characteristics that keep the members of the group together long enough to establish meaningful interactions, common institutions, and agreed upon ways of behavior. These characteristics include race, education, income, ethnicity, religion, language, and mutual economic and social benefits. The study area, which was originally settled in the 1700s, is comprised of communities with established public and social institutions including places of worship, schools, and community interaction. The construction of water resource projects can impact community cohesion in different ways. For example, prior to the Great Flood of 1927, the area was subject to periodic riverine flood damage events from the Mississippi River. However, with the construction of the MR&T levee system, the risk of inundation from the river has been greatly reduced and the community cohesion of the area was positively impacted.

3.1.5.3.3 Population and Housing

Tables 3-14, 3-15, and 3-16 display the population, number of households, and the employment (number of jobs) for each of the six populated parishes for the years 2000, 2010, and 2019, as well as projections for the years 2025 and 2045. The 2000, 2010, and 2019 estimates for population and number of households are from the U.S. Census Bureau. The 2001, 2010, and 2019 estimates for employment are from the U.S. Bureau of Labor Statistics. All projections were developed by Moody's Analytics, which has projections to the

year 2045. The study area also includes a very small section of Jefferson Parish, but since this area is unpopulated and undeveloped, Jefferson Parish is not included in these tables.

Table 3-17 shows the actual and projected per capita personal income levels for the six populated parishes from 2000 to 2025. The 2000, 2010, and 2018 estimates are from the U.S Bureau of Economic Analysis and the projection for 2025 is from the Moody's Analytics Forecast.

Table 3-14. Upper Barataria Basin Louisiana Historical and Projected Population by Parish

Parish	2000	2010	2019	2025	2045
Ascension	77,335	107,850	126,604	136,988	161,973
Assumption	23,324	23,352	21,891	22,408	21,733
Lafourche	89,775	96,681	97,614	98,970	99,479
St. Charles	48,118	52,845	53,100	55,339	58,101
St. James	21,201	22,006	21,096	22,599	23,727
St. John the Baptist	43,248	45,621	42,837	45,713	47,995
Total	303,001	348,355	363,142	382,017	413,008

Sources: 2000, 2010, 2019 from U.S. Census Bureau; 2025, 2045 from Moody's Analytics Forecast

Table 3-15. Upper Barataria Basin Existing Condition and Projected House Households by Parish

Parish	2000	2010	2019	2025	2045
Ascension	26,995	38,050	42,649	51,815	66,244
Assumption	8,234	8,719	8,802	8,946	9,336
Lafourche	32,054	35,654	36,449	39,070	42,122
St. Charles	16,473	18,598	18,762	21,099	23,960
St. James	7,002	7,691	7,906	8,561	9,727
St. John the Baptist	14,381	15,875	15,418	17,249	19,602
Total	105,139	124,587	129,986	146,740	170,991

Sources: 2000, 2010, 2019 from U.S. Census Bureau; 2025 and 2045 from Moody's Analytics Forecast

Table 3-16. Upper Barataria Basin Existing Condition and Projected Employment by Parish

Parish	2001	2010	2019	2025	2045
Ascension	30,124	34,207	46,953	57,390	74,840
Assumption	5,661	4,410	3,911	4,410	4,680
Lafourche	30,969	36,784	34,202	35,360	35,090
St. Charles	19,629	23,100	23,615	30,330	34,670
St. James	7,058	7,735	8,206	9,310	10,650
St. John the Baptist	12,645	15,214	14,460	16,460	18,810
Total	106,086	121,450	131,347	153,260	178,740

Sources: 2001, 2010, 2019 from U.S. Bureau of Labor Statistics; 2025 and 2045 from Moody's Analytics Forecast

Table 3-17. Upper Barataria Basin per Capita Income (\$) by Parish

Parish	2000	2010	2018	2025
Ascension	24,052	39,416	49,829	60,180
Assumption	19,613	32,771	46,788	54,195
Lafourche	23,485	40,391	47,096	56,959
St. Charles	24,634	39,557	49,353	63,678
St. James	18,722	38,421	48,484	60,576
St. John the Baptist	20,002	33,894	40,573	57,423

Sources: 2000, 2010, 2018 from U.S. Bureau of Economic Analysis; 2025 from Moody's Analytics Forecast

3.1.5.3.4 Public Facilities and Services

Public facilities and services have historically grown to meet population demands. The area includes a mixture of community centers, schools, hospitals, airports, colleges, and fire protection.

3.1.5.3.5 Tax Revenues and Property Values

Historically, damages from storm surge events have adversely impacted business and industrial activity, agricultural activity, and local employment and income, which then led to commensurate negative impacts to property values and the tax base upon which government revenues rely.

3.1.5.3.6 Employment, Business, and Industrial Activity (Including Agriculture)

The leading employment sectors are trade, transportation, utilities, government, local government, and office using industries. Table 3-18 shows actual and projected unemployment rates from December 1990 to December 2040 for the study area. As shown in the table, the unemployment rate in three of the six parishes (Assumption, St. John, and

St. James) is higher than the State of Louisiana unemployment rate. Additional information related to employment can be found in the Economic Appendix, Appendix B.

Table 3-18. Upper Barataria Basin Louisiana Unemployment Rates

Unemployment Rate (%)						
BLS; Moody's Analytics (ECCA) Forecast						
	Dec-1990	Dec-2000	Dec-2010	Dec-2020	Dec-2030	Dec-2040
Ascension Parish (LA)	6.45	5.29	7.45	5.90	6.20	5.99
Assumption Parish (LA)	6.56	6.43	11.57	8.14	8.01	7.64
Lafourche Parish (LA)	4.09	4.49	6.14	5.87	6.50	6.42
St. Charles Parish (LA)	6.07	5.58	7.41	6.69	6.83	6.39
St. James Parish (LA)	7.87	8.59	11.66	9.45	9.64	9.02
St. John the Baptist Parish	7.95	6.79	10.60	8.61	8.78	8.22
Louisiana	6.20	5.30	7.97	6.88	7.06	6.71

3.1.5.3.7 Environmental Justice and Other Social Effects

Environmental Justice (EJ) is institutionally significant because of Executive Order 12898 of 1994 (E.O. 12898) and the Department of Defense's Strategy on Environmental Justice of 1995, which directs Federal agencies to identify and address any disproportionately high, adverse human health or environmental effects of Federal actions to minority and/or low-income populations. Minority populations are those persons who identify themselves as Black, Hispanic, Asian American, American Indian/Alaskan Native, Pacific Islander, some other race, or a combination of two or more races. A minority population exists where the percentage of minorities in an affected area either exceeds 50 percent or is meaningfully greater than in the general population. Low-income populations as of 2017 are those whose income is at or below \$25,094 for a family of four and are identified using the Census Bureau's statistical poverty threshold. The Census Bureau defines a "poverty area" as a census tract or block group with 20 percent or more of its residents below the poverty threshold and an "extreme poverty area" as one with 40 percent or more below the poverty level.

An EJ analysis focuses on the potential for disproportionately high and adverse impacts to minority and low-income populations during the construction and normal operation of the Federal action. A detailed assessment identifies specific EJ communities near structural alternatives and will assess if EJ communities are disproportionately exposed to high and adverse effects of the Federal action. If the impact is appreciably more severe or greater in magnitude on minority or low-income populations than the adverse effect suffered by the non-minority or non-low-income populations after taking offsetting benefits into account, then there may be a disproportionate finding.

If a disproportionate impact is found, mitigation measures should be developed specifically to address potential disproportionately high and adverse effects to minority and/or low-

income communities. When identifying and developing potential mitigation measures to address environmental justice concerns, members of the affected communities would be consulted. Enhanced public participation efforts would also be conducted to ensure that effective mitigation measures are identified and that the effects of any potential mitigation measures are fully analyzed and compared. Mitigation measures may include a variety of approaches for addressing potential effects and balancing the needs and concerns of the affected community with the requirements of the action or activity.

The communities in the study area include Luling, Boutte, Paradis, Des Allemands, and Bayou Gauche, all in St. Charles Parish and Mathews and Raceland in Lafourche Parish. All seven of these communities are identified by the U.S. Census Bureau as Census of Designated Places (CDP).

An analysis was conducted utilizing CDP data, obtained from the U.S. Census Bureau's American Community Survey (ACS). The following information was collected for the seven communities in the study area.

Racial and Ethnic Characteristics

Race and ethnic populations in each CDP were characterized using the following racial categories: White, Black or African American, American Indian and Alaska Native, Asian, Native Hawaiian and Other Pacific Islander, Some Other Race, and Two or more Races. Persons of Hispanic Origin are also identified. These categories are consistent with the affected populations requiring study under Executive Order 12898. See Tables 3-20 through 3-22 for a listing of race and ethnic characteristics for the CDP in the study area.

Percentage of Minority Population

As defined by the U. S. Census Bureau, the minority population includes all non-Whites. According to Council of Environmental Quality (CEQ) guidelines, "Minority populations should be identified where either: (a) the minority population of the affected area exceeds 50 percent or (b) the minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis." For this study, the comparison geographic unit is St. Charles and Lafourche Parishes.

Low-Income Population

The percentage of persons living below the poverty level, as identified in the 2013-2017 ACS, was one of the indicators used to determine the low-income population in a CDP. Low-income population is defined as a CDP with 20 percent or more of its residents below the poverty threshold.

Only one CDP, Boutte, is considered an EJ community, using the Minority criteria, having approximately 67 percent of residents identifying as minority. The vast majority of these residents are Black or African American while those identifying as "Two or more Races" comprise 4.4 percent of the CDP population. Persons of Hispanic or Latino population (of any race) is no higher than 3.5 percent in any CDP. St. Charles Parish is majority White, or 70 percent of the parish population while Minority races are approximately 30 percent of total

population. Boutte CDP minority population percentage is nearly twice that of the St. Charles Parish reference area. Des Allemands CDP crosses into Lafourche Parish; however, the majority of the population resides in St. Charles Parish.

Two other CDPs that are in the study area, Mathews and Raceland, area located in Lafourche Parish, and are majority White, as is the parish as a whole. The largest minority in Mathews is Asian race and those identifying as being of “Two or More Races.”

Of the seven CDPs in the study area, only Boutte and Raceland CDPs are considered EJ communities, when using the poverty threshold criteria. Approximately 31 percent and 20.7 percent, respectively, of people residing in these communities have incomes below the poverty level, which are above the 20 percent threshold. The percentage of the Boutte population whose income is below the poverty level is nearly two and a half times larger than the reference area, St. Charles Parish, while the percentage living in Raceland who are below the poverty level (20.7 percent) is just above the Lafourche Parish percentage of 16.0 percent.

The Boutte CDP is both a minority and low-income EJ community, with percentages well above the reference community of St. Charles Parish.

Table 3-19. Population by Race and Percentage Minority Population, CDP, St. Charles Parish

ACS 2013-17	Luling		Boutte		Paradis		Des Allemands		Bayou Gauche		St. Charles Parish	
RACE												
Total population	13,088	100%	2,695	100%	1,616	100%	1,462	100%	2,557	100%	52,728	100%
One race	12,938	98.9%	2,577	95.6%	1,536	95.0%	1,354	92.6%	2,557	100.0%	52,195	99.0%
White	10,576	80.8%	884	32.8%	1,514	93.7%	1,232	84.3%	2,557	100.0%	36,851	69.9%
Black or African American	1,889	14.4%	1,675	62.2%	0	0.0%	113	7.7%	0	0.0%	14,008	26.6%
American Indian and Alaska Native	89	0.7%	0	0.0%	0	0.0%	9	0.6%	0	0.0%	136	0.3%
Asian	208	1.6%	0	0.0%	22	1.4%	0	0.0%	0	0.0%	567	1.1%
Native Hawaiian and Other Pacific Islander	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Some other race	176	1.3%	18	0.7%	0	0.0%	0	0.0%	0	0.0%	633	1.2%
Two or more races	150	1.1%	118	4.4%	80	5.0%	108	7.4%	0	0.0%	533	1.0%
Minority	2,512	19.2%	1,811	67.2%	102	6.3%	230	15.7%	0	0.0%	15,877	30.1%
HISPANIC OR LATINO												
Total population	13,088		2,695		1,616		1,462		2,557		52,728	
Hispanic or Latino (of any race)	403	3.1%	96	3.60%	18	1.10%	9	0.60%	82	3.20%	3,062	5.80%

Source: U.S. Census Bureau, 2013-2017 American Community Survey 5-Year Estimates

Table 3-20. Low Income Population by CDP, St. Charles and Lafourche Parishes, Study Area

Percentage of People with Income below Poverty Level in the past 12 Months			
CDP/Parish	Population Estimate*	Population Below Poverty Level	Percent of Population Below Poverty
Luling	12,933	1,410	10.90%
Boutte	2,695	841	31.20%
Paradis	1,616	115	7.10%
Des Allemands	1,462	88	6.00%
Bayou Gauche	2,557	46	1.80%
St. Charles Parish	51,926	6,337	12.20%
Matthews	2,556	120	4.70%
Raceland	10,153	2,102	20.70%
Lafourche Parish	95,542	15,299	16.00%

*Population for whom poverty status is determined
 Source: U.S. Census Bureau ACS, 2013-2017

Table 3-21. Population by Race and Percentage Minority Population, CDP, Lafourche Parish

ACS 2013-17	Mathews		Raceland		Lafourche Parish	
RACE						
Total population	2,556	100%	10,322	100%	98,112	100%
One race	2,509	98.2%	10,032	97.2%	95,651	97.5%
White	2,468	96.6%	6,732	65.2%	77,388	78.9%
Black or African American	0	0.0%	3,188	30.9%	12,819	13.1%
American Indian and Alaska Native	0	0.0%	87	0.8%	2,442	2.5%
Asian	41	1.6%	0	0.0%	789	0.8%
Native Hawaiian and Other Pacific Islander	0	0.0%	0	0.0%	21	0.0%
Some other race	0	0.0%	25	0.2%	2,192	2.2%
Two or more races	47	1.8%	290	2.8%	2,461	2.5%
Minority	88	3.4%	3,590	34.8%	20,724	21.1%
HISPANIC OR LATINO						
Total population	2,556		10,322		98,112	
Hispanic or Latino (of any race)	28	1.10%	354	3.40%	4,281	4.40%

Source: U.S. Census Bureau ACS, 2013-2017

3.1.6 Cultural Resources

The Barataria Basin results from the formation of the delta complexes of the Mississippi River. Initial delta formation began approximately 4700 B.P., with the Mississippi River following its present course and a distributary leading down Bayou Lafourche. As these two arms grew outward into the Gulf of Mexico, they formed the margins of the delta plain that developed between them, largely comprised of freshwater swamp and lakes. Other crevasses and lobes of the river opened or were active until more recently, and contain both the remains of prehistoric settlement and the historic settlement still present today.

In terms of resource potential and human settlement potential, the study area has been relatively stable for approximately 2000 years. As may seem obvious, the high portions of land that are natural levees along waterways past or present, have been and are the most desired locations for settlement or temporary resource use. However, the density and combination of animals and plants typically available in marsh and coastal areas means that harvesting of those resources may have left signs of activity within portions of the study area that are not the high natural levees.

Since European settlement within the study area, more numerous and more visible remains of human activity have been left behind. The most obvious of these exist along the Mississippi River, Bayou Lafourche, and Bayou des Familles. Other natural waterways with

high levee ground alongside, have also been settled for some time. Of most importance in terms of cultural resources that may be found within the study area are plantations, lumbering, the fur industry, hunting, and fishing, which leave remnants of activity on both high land and further into the backswamp areas. The oil and gas industry has also left cultural landmarks in all land and water types of the study area.

3.1.7 Recreation Resources

The recreational resources study area includes portions of Ascension, Assumption, Lafourche, Jefferson, St. Charles, St. James, and St. John the Baptist Parishes. Major bodies of water in the study area, listed in descending order by size, include Lac Des Allemands, Lake Boeuf, Patit Lac Des Allemands, Dufrene Ponds, and Bayou Des Allemands. There are many other minor natural and manmade waterways including numerous oil field canals. Most of the study area is forested uplands and swamp with freshwater marsh. The more significant ridges along navigable bayous have historically supported development of small communities and provide key points of access to the vast coastal wetland resources of the study area. Recreational facilities include camps, marinas, boat launch ramps, and small neighborhood parks. The communities within the study area are very much connected to the water, evidenced by the way many waterfront residents extend personal property into the waterways in the forms of docks, piers, camps, and homes.

Like much of coastal southeast Louisiana, the study area has experienced substantial coastal erosion, loss of wetlands, and increasing salinity levels. These conditions are due to numerous factors, such as extensive oil and gas exploration via a maze of canals and pipelines, subsidence, and coastal storm surges. Bayou Lafourche and the Mississippi River no longer provide freshwater replenishment and nutrients as they once did with precipitation being the main source of freshwater input for the area. The study area has traditionally provided excellent freshwater fishing and, in recent years, because of the increased salinity levels, anglers have been able to catch saltwater species much farther inland than in the past.

The study area includes the Lake Boeuf Wildlife Management Area (WMA), which has 800 acres and is located east of LA Hwy 308, north of Raceland. The WMA is only accessible by boat via Theriot Canal, Foret Canal, or Lake Boeuf. Recreation activities within the WMA include archery, hunting, and annual youth lottery deer gun hunts (Louisiana Department of Wildlife & Fisheries). The most prominent recreational activities within the study area are freshwater based consumptive uses include freshwater fishing, crawfishing, hunting for waterfowl, and hunting for deer or small game along natural ridges and in wooded swamp lands. Non-consumptive recreational activities attract far fewer participants and include hiking, wildlife observation, boating, camping, and photography.

Factors contributing to the high proportion of boating activity for fishing include the high quality of the recreational fishery, especially an abundance of freshwater fish habitat for three species of catfish (flathead, channel, and blue), bass, crappie, and panfish. Pleasure boating occurs to a lesser degree than boat fishing. According to data compiled by the Louisiana Oil Spill Coordinator's Office (LOSCO), there were approximately 30 boat

launches catalogued within the study area as of 2004. One indicator of the amount of recreational fishing that occurs in the study area is the number of recreational boats registered in the parishes of Ascension, Assumption, Jefferson, Lafourche, St. Charles, St. James, and St John. In 2018, approximately 16 percent of the boats registered with the State of Louisiana were registered within the seven parishes. In 2019, approximately 17 percent of the resident basic fishing licenses and 9 percent of the resident basic hunting licenses issued by the State of Louisiana were issued within the same parishes.

Table 3-23 shows the number of fishing licenses, hunting licenses, and boat registrations, respectively, within the study area. The fishing and hunting license and boat registration data are provided by the Louisiana Department of Wildlife and Fisheries (LDWF)

<https://www.wlf.louisiana.gov/resources/category/licenses-and-permits/recreational-fishing-and-hunting>

Table 3-22. Licenses and Registrations

Parish	2019 Resident-Basic Fishing	2019 Resident-Basic Hunting	2018 Boat Registrations
Ascension	10,749	3,056	9,268
Assumption	2,207	781	3,749
Jefferson	22,422	3,163	16,970
Lafourche	12,071	2,821	12,225
St. Charles	4,649	928	4,105
St. James	1,913	518	2,255
St. John	2,652	470	2,137
Statewide Totals	325,132	131,307	319,492

Funding from the Land and Water Conservation Fund (LWCF) has supported five recreation projects implemented in the study area since 1964, according to the United States Department of the Interior National Park Service Land & Water Conservation Fund. Details about these parks is provided in Table 3-24.

Table 3-23. Area Parks

Park	Parish	Grant Sponsor	Amount	Date Approved	Expiration Date
Modeste ParkDevelopment	Ascension	Ascension Parish Police Jury	\$39,159.45	8/4/1981	6/30/1986
Donaldsonville Riverfront Park	Ascension	City of Donaldsonville	\$6,735.75	9/22/1972	12/31/1975
Thibodaux Water Reservoir	Lafourche	City of Thibodaux	\$103,073.00	1/16/2002	12/31/2006
Killona Park	St. Charles	St. Charles Police Jury	\$366,662.00	1/13/2005	12/31/2011
Rathborne ParkDevelopment	St. Charles	St. Charles Parish Government	\$150,000.00	1/22/2010	12/31/2014

3.1.8 Aesthetics

The study area offers resources and viewsheds that are unique to the Mississippi Alluvial Plain Ecoregion. Within the study area landscape transitions north to south based on flora and fauna, habitat, land use, topography, and landforms. To the north and east along the Mississippi River and to the west along Bayou Lafourche, bottomland forests have been cleared for agriculture and the levee system is the dominant landform. Between the Mississippi River and Bayou Lafourche, freshwater swamp forests consisting of bottomland hardwood bald cypress and water tupelo compose one of the largest swamps in North America. South of U.S. Highway 90, brackish marshes consisting of grasses, sedges, and rushes act as a buffer to help moderate flooding and tidal inundation during storm events. ("Louisiana Speaks" and "USGS Eco-Region Map", Daigle, J.J., Griffith, G.E. Omernik, J.M., Faulker, P.L., McCulloh, R.P., Handley, L.R., Smith, L.M., and Chapman, S.S., 2006, Ecoregions of Louisiana color poster with map, descriptive text, summary tables, and photographs: Reston, Virginia, U.S. Geological Survey).

Swamp forests with numerous bayous and canals veining into Lac Des Allemands dominate the interior landscape. Primary vistas into this interior are limited and generally provided to residents and visitors traveling through the area from roadways such as U.S. Highway 90, State Highways 20, 304, 307, and 3127, which transect the study area. However, most of these views are only available from boat access as either great distances from paved roads or visual impediments make viewing this interior landscape difficult.

The communities within the study area are very much connected to the water, evidenced by the way many waterfront residents extend personal property into the waterways in the form of docks, piers, camps, and homes. Bayou Des Allemands, connecting Lac Des Allemands to Lake Salvador and accessible by U.S. Highway 90, is designated as part of the Louisiana Natural and Scenic Rivers System. Numerous boat launches in the study area provide support for boaters seeking access to Lac Des Allemands and surrounding areas that are not easily accessible, allowing views of tranquil and entrancing shorelines lined with native flora and fauna flourishing throughout this bottomland hardwood forest swamp.

In Lafourche Parish, State Highways 20, 304, and 307 comprise portions of the Wetlands Cultural Byway, which is an integral part of the Louisiana Scenic Byways Program and recognized by the National Scenic Byways Program. “The landscape of the roadway is mainly prairie and wetland. With natural bayous and tree-lined swamps, fresh, brackish, and saltwater marshes surrounding much of the environment, water dictates the byway’s twists and turns...,” according to the Louisiana Scenic Byways Program.

https://byways.louisianatravel.com/sites/default/files/resources/16-Wetlands-Cultural_Tearsheet.pdf

Additionally, there is a Louisiana Scenic Byway bounding the north and east of the study area referred to as the Louisiana Great River Road. This is but one segment to an overall scenic byway that stretches on multiple thoroughfares from Canada to the Gulf of Mexico. It is state and Federally designated and has an “All American Road” status, making it significant in culture, history, recreation, archeology, aesthetics, and tourism.

Land use within the study area is primarily woody wetlands constituting the interior landscape and encompassing Lac Des Allemands. Emergent herbaceous wetlands are generally located in the southeast of the study area as U.S. Highway 90 essentially runs along this wetland transition zone. On the perimeter of the study area and along the Mississippi River and Bayou Lafourche, land use consists of cultivated crops and hay/pasture. Agricultural communities have prospered along State Highway 18, also referred to the Louisiana Great River Road, and State Highway 308 following Bayou Lafourche. The drive along these thoroughfares is scenic and visually interesting. Patches of oaks and other hardwoods dot the area blending and growing denser as you look away from the water channels and into the backdrop of dense wetland forest. The landscape here is pastoral and serene, which tremendously adds to the visual quality of the area.

3.1.9 Air Quality

The Clean Air Act Amendment of 1990 directed the U.S. Environmental Protection Agency (EPA) to establish National Ambient Air Quality Standards (NAAQS) for all regulated air pollutants. Federal air quality standards have been established for six criteria air pollutants:

- Carbon monoxide (CO)
- Nitrogen dioxide (NO₂)
- Ozone (O₃)
- Sulfur oxides (commonly measured as sulfur dioxide [SO₂])
- Lead (Pb)
- Particulate matter no greater than 2.5 micrometers (µm) in diameter (PM_{2.5}); and
- Particulate matter no greater than 10 µm in diameter (PM₁₀)

The EPA classifies air quality by Air Quality Control Region (AQCR) according to whether the region meets primary and secondary air quality standards. An AQCR or portion of an AQCR may be classified as attainment, nonattainment, or unclassified. A classification of attainment indicates that air quality for one or more criteria air pollutants within the region is within NAAQS values. A nonattainment classification indicates that regional air quality for one or more criteria air pollutants is not within NAAQS values. A classification of unclassified

indicates that air quality within the region cannot be classified (generally because of lack of data). A region designated as unclassified is treated as an attainment region. The study area is located in the Southern Louisiana AQCR.

The EPA Green Book Nonattainment Areas for Criteria Pollutants (Green Book) maintains a list of all areas within the United States that are currently designated nonattainment areas with respect to one or more criteria air pollutants. Nonattainment areas are discussed by county or metropolitan statistical area (MSA). MSAs are geographic locations, characterized by a large population nucleus, which are comprised of adjacent communities with a high degree of social and economic integration. MSAs are generally composed of multiple counties or parishes. The entire study area is within the Baton Rouge MSA, which includes Ascension Parish. Based on review of the Green Book, Ascension Parish is the only parish in the study area currently designated as a nonattainment area and is listed for 8-Hr. Ozone. All other parishes within the study area are in attainment.

3.1.10 Hazardous, Toxic, and Radioactive Waste

MVN is obligated under Engineer Regulation (ER) 1165-2-132 to assume responsibility for the reasonable identification and evaluation of all Hazardous, Toxic, and Radioactive Waste (HTRW) contamination within the vicinity of proposed actions. ER 1165-2-132 identifies that HTRW policy is to avoid the use of project funds for HTRW removal and remediation activities. The NFS, would be responsible for planning and accomplishing any HTRW response measures, and would not receive credit for the costs incurred. The purpose of a Phase I Environmental Site Assessment (ESA) is to identify, to the extent feasible in the absence of sampling and analysis, the potential presence of petroleum products and “hazardous substances” (i.e., Recognized Environmental Conditions [RECs]) listed under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) within the proposed project footprint. The 2002 Brownfields Amendments to the CERCLA require EPA to promulgate regulations establishing standards and practices for conducting “all appropriate inquiries.” “All appropriate inquiries” is a process of evaluating a property’s environmental conditions and assessing potential liability for any contamination. “All appropriate inquiries” must be conducted to obtain certain protections from liability under the Federal Superfund Law (i.e., CERCLA). As directed by the EPA, the results of an “all appropriate inquiries” investigation must be documented in a report. The EPA requires no specific format, length, or structure of the written report. However, the EPA recommends utilizing the American Society for Testing and Materials (ASTM) E 1527-13 standard as it is consistent with the requirements and provisions in the “all appropriate inquiries” rule.

Section 4

Formulate Alternative Plans

Plan formulation supports the USACE water resources development mission. A systematic and iterative planning approach is used to ensure that sound decisions are made. The P&G manual describes the process for federal water resource studies. The process requires formulating alternative plans that contribute to federal objectives. Alternative plans are a set of one or more management measures functioning together to address one or more planning objectives. A management measure is a feature or activity that can be implemented at a specific geographic site to address one or more planning objective.

The initial plan formulation strategy was to focus on regional solutions (e.g., levees, floodwalls, and gates with and without pump stations) followed by further plan formulation based on economic damage centers (e.g., where the greatest consequences are) minimizing life loss, and/or more local protection. A semi-quantitative assessment of life safety was conducted using accepted USACE methods and tools. The plan formulation process utilized the best available information to identify a Tentatively Selected Plan (TSP).

Note: Sections 4.1 through 4.7 describe the plan formulation process used to identify the tentatively selected plan (TSP) identified in the 1st Draft Report which was released to the public in August 2013. Section 4.8 describes additional planning efforts that followed, which took into account comments received on the Draft Report as well as additional engineering and environmental investigations performed to optimize the TSP. These additional planning efforts allowed the team to modify and further refine features identified in the TSP; however, the PDT determined that there was a need to go back out to public review because a significant increase in environmental impacts was noted. Table 4-7 in Section 4.8 shows the general changes between the TSP under the 1st draft report and 2nd draft report. The changes in environmental consequences are discussed in Section 5 of this report.

4.1 MANAGEMENT AND SCREENING OF MEASURES

The study area largely overlaps with a previous USACE study, Donaldsonville to the Gulf of Mexico Feasibility Study (Donaldsonville to the Gulf). Donaldsonville to the Gulf was a reconnaissance and feasibility study for CSRMs that considered various measures such as levees, floodwalls, pump stations, nonstructural applications, flood gates, ring levees, and others to address flood damages in its study area. That study effort only looked at the 1 percent Annual Exceedance Probability (AEP) (100-Year Coastal Storm Event) and concluded in 2012, with a negative report as no evaluated alternatives had positive net benefits. However, because the two study areas have large areas of overlap and the damage centers are largely the same, there were opportunities for the UBB study to use much of the measures, screening criteria, and alternatives development data from the Donaldsonville to the Gulf of Mexico Feasibility Study. Therefore, the UBB study's

formulation process was able to capitalize on the Donaldsonville to the Gulf formulation and incorporate its assessments to provide an advanced starting point for alternatives evaluation. The current study has taken multiple measures from the Donaldsonville to the Gulf study and repackaged them into new alternatives for further evaluation. It has also carried forward the Highway 90 alignment alternative for further evaluation due to its preference by the NFS. For these reasons, and to capitalize on efficiency, a new individual measure development and screening process was not completed. Furthermore, it was determined by the PDT that no natural or nature based solutions would be developed, other than using the natural ridges to tie the alignments into, because the area is already populated by natural based features that help prevent storm damages. The following bullets provide a brief description of the structural and nonstructural measures:

Structural Measures:

- Levees: An earthen embankment or similar structure whose purpose is to reduce flood damages could be constructed to reduce risk to communities and other significant structures and/or lands
- Flood Walls: These measures are similar to levees in that they reduce risk from flood damages, but they can be constructed in a smaller footprint than earthen levees
- Flood Gates: Flood gates tie into the levee or floodwall system when there is a need to cross a waterway and maintain the existing hydrologic regime
- Pumping Stations: Pumping stations transport water produced from rainfall events or surge across levees
- Ring Levees: Ring levees/dikes could be constructed to reduce risk to communities and other significant structures and/or lands on a smaller scale

Nonstructural (NS) Measures:

- Physical: Consists of property acquisition (buyouts), relocation, elevation, and/or flood proofing of structures
- Non-physical: Consists of flood warning system/evacuation plans

4.2 DEVELOPMENT OF ALTERNATIVE PLANS

As previously stated, the formulation process capitalized on the formulation strategy from the Donaldsonville to the Gulf study and incorporated its assessments to provide an advanced starting point for alternative development. A planning and design charrette with the Federal agencies (USFWS and NOAA), the Coastal Protection and Restoration Authority Board (CPRAB), and the PDT was held December 12, 2018, to further develop alternatives. General public meeting comments from January 10, 2019, and public scoping meetings May 1 and May 2 of 2019, also had an impact on the formulation of alternatives. Based on the information discussed at the charrette and review of the existing information on each measure's combinability, alternatives were developed. A total of 10 regional alternatives (i.e. addressing flood risk over a large swath of the study area) were carried forward for further analysis including hydraulic modeling, development of conceptual designs, rough order of magnitude quantities, and parametric cost estimates for comparison. A total of 11

alternatives, including the no-action alternative, were developed. These alternatives, including the no-action alternative are described in Section 4.3 (initial array of alternatives), with exception of alternatives 9 and 10, which were developed for the revised final array.

For more detail associated with structures and the vertical reference frame of North American Vertical Datum or 1988 (NAVD 88) within the alignments below, please reference Appendix A.

4.3 INITIAL ARRAY OF ALTERNATIVES

4.3.1 Alt 1: Hwy 90 – Segment 1 Extension

This structural alternative would incorporate building a 7.5-foot levee extending out from the existing St. Charles Parish Levee, continuing south to improve the Sunset Levee, and include a vehicle crossing at Bayou Gauche. Then, the levee system would cross Bayou Des Allemands, just south of US Highway 90, with a 270-foot barge gate structure 9.5 feet high. The levee system would then parallel US Highway 90 until high ground near Raceland (Natural Ridge). In order to maintain existing water exchanges, hydraulic control structures would be placed in the section paralleling US Highway 90. CPRAB has a structural protection plan in the 2017 Master Plan (project number 022.HP.06) that follows a similar alignment.

This alignment would be approximately 18.3 miles in length and incorporate a little over 15.9 miles of earthen levee, 2.3 miles of flood wall, and a 270-foot barge gate structure (Figure 4-1). The levee is designed to a 2 percent AEP (50-year level of risk reduction) from storm surge and the damages prevented would be in St. Charles and Lafourche Parishes.

The 270 feet barge gate, also incorporated in other alternatives in the study, across Bayou Des Allemands would only be closed during a storm event. This gate (270-foot barge) could pivot in and out of position and be sunk in place to prevent the surge from entering the basin via Bayou Des Allemands.

4.3.2 Alt 2: Hwy 90 – Full Alignment

This structural alternative was carried forward from the Donaldsonville to the Gulf Feasibility Study. This Highway 90 levee alignment alternative would incorporate a levee that extends out from and raises the existing St. Charles Parish Levee, continues south, improves the Sunset Levee, and includes a vehicle crossing at Bayou Gauche. Then the levee system would cross Bayou Des Allemands, just south of US Highway 90, with a 270-foot barge gate structure 10.5 feet high. The levee system would then parallel US Highway 90 until high ground near Raceland (Natural Ridge). Hydraulic control structures would be placed to in the section paralleling US Highway 90 to maintain existing water exchanges. The levee elevation would be built to an 8.5 feet elevation, therefore elevating the existing St. Charles Parish levee. This levee would be approximately 30.4 miles in length (Figure 4-2). The levee is designed to a 1.5 percent AEP (75-year level of risk reduction) from storm surge and the damages prevented would be in St Charles and Lafourche Parishes.

4.3.3 Alternative 3: Des Allemands-Paradis Levee

This is a structural alternative in the form of a 7.5-foot levee that extends out from the existing St. Charles Parish Levee, continues south, improves the Sunset Levee, and includes a vehicle crossing at Bayou Gauche. The alignment would then continue around the Des Allemands community and tie around the back side of Paradis into a local parish levee. This levee would be approximately 20.6 miles in length (Figure 4-3). The levee is designed to a 2 percent AEP (50-year level of risk reduction) from storm surge and the damages prevented would be in St. Charles Parish.

4.3.4 Alternative 4: Raceland Levee

This is a structural alternative (ring levee) in the form of a levee that would extend around Raceland at various design elevations to reduce the risk of potential storm surge damages. This alignment would capitalize on the natural ridges around Raceland. It would stretch approximately 11.3 miles in length and would include a 45-foot rail road crossing gate and a 45-foot roller gate structure where the alignment crosses US Highway 90 (Figure 4-4). The damages prevented would be in Lafourche Parish.

4.3.5 Alternative 5: Basin Edge Levee

This is a structural alternative in the form of a 7.5-foot levee extending out from the existing St. Charles Parish Levee continuing south, improving upon and lifting the Sunset Levee and include a vehicle crossing at Bayou Gauche. Then, the levee system would cross Bayou Des Allemands just south of US Highway 90 with a 270-foot barge gate structure 9.5 feet high. The levee system would then parallel US Highway 90 until just past Dufrene Ponds where it would tie into US Highway 90. This levee would be approximately 12.5 miles long (Figure 4-5). The levee is designed to a 2 percent AEP (50-year level of risk reduction) from storm surge and the damages prevented would be in St Charles and Lafourche Parishes.

4.3.6 Alternative 6: Highway 90 Alignment – Master Plan

The Master Plan alignment would be constructed across the basin along the same footprint as the 2017 Coastal Master Plan project number 022.HP.06, defined in the 2017 State Master Plan. This alternative would be built to the 1 percent AEP from a storm surge event and include (1) 270-foot barge gate, a total of 40.2 miles of earthen levee, 8,200 feet of T-wall, (4) 10-foot sluice gates, and (2) 40-foot swing gates (Figure 4-6).

4.3.7 Alternative 7: Nonstructural

Physical nonstructural alternatives would consist of property acquisition (buyouts), elevation, and/or flood proofing of residential and non-residential structures within the study area. Nonstructural measures can be stand-alone or used in combination with structural alternatives. The nonstructural alternative (Figure 4-7) was economically evaluated by flood plain mapping of all frequencies, Non-Structural Method 1 (NS1).

4.3.8 Alternative 8: Hwy 90 Lift Alignment

This alternative was developed with the USFWS as a possible environmentally preferred plan to restore the natural hydrology across the basin. This Highway 90 levee alignment alternative would incorporate building a 1 percent AEP (100-Year Coastal Storm Event) connecting the northeast to the southeast side of the basin near the natural ridge at Bayou Lafourche and the natural ridge just south of Raceland respectively. This levee would be approximately 32.5 miles in length and incorporate a 270-foot barge gate 14 feet high across Bayou Des Allemands. The section of levee west of Bayou Des Allemands would have U.S. Highway 90 upon it for approximately 10 miles (Figure 4-8). This section of levee would have a 115 feet crown to allow for all four lanes of traffic. Close coordination with the US Department of Transportation would be required. The majority of damages prevented would be in St Charles and Lafourche Parishes.

4.3.9 Alternative 11: No Action

NEPA regulations (40 CFR 1502.14(d)) require that no action always be considered a viable alternative in any final array of plans. It represents the future that would likely occur if USACE takes no action. The no action is the default choice. The UBB study area would continue to experience damages from storm events. These impacts would be exacerbated due to increased storm intensities (global warming) coupled with increases in relative sea level change. The “No Action” was renamed to Alternative 11 after final array of alternatives was assessed with added Alternatives 9 and 10.



Figure 4-1. Hwy 90 – Segment 1 Extension



Figure 4-2. Hwy 90 - Full Alignment

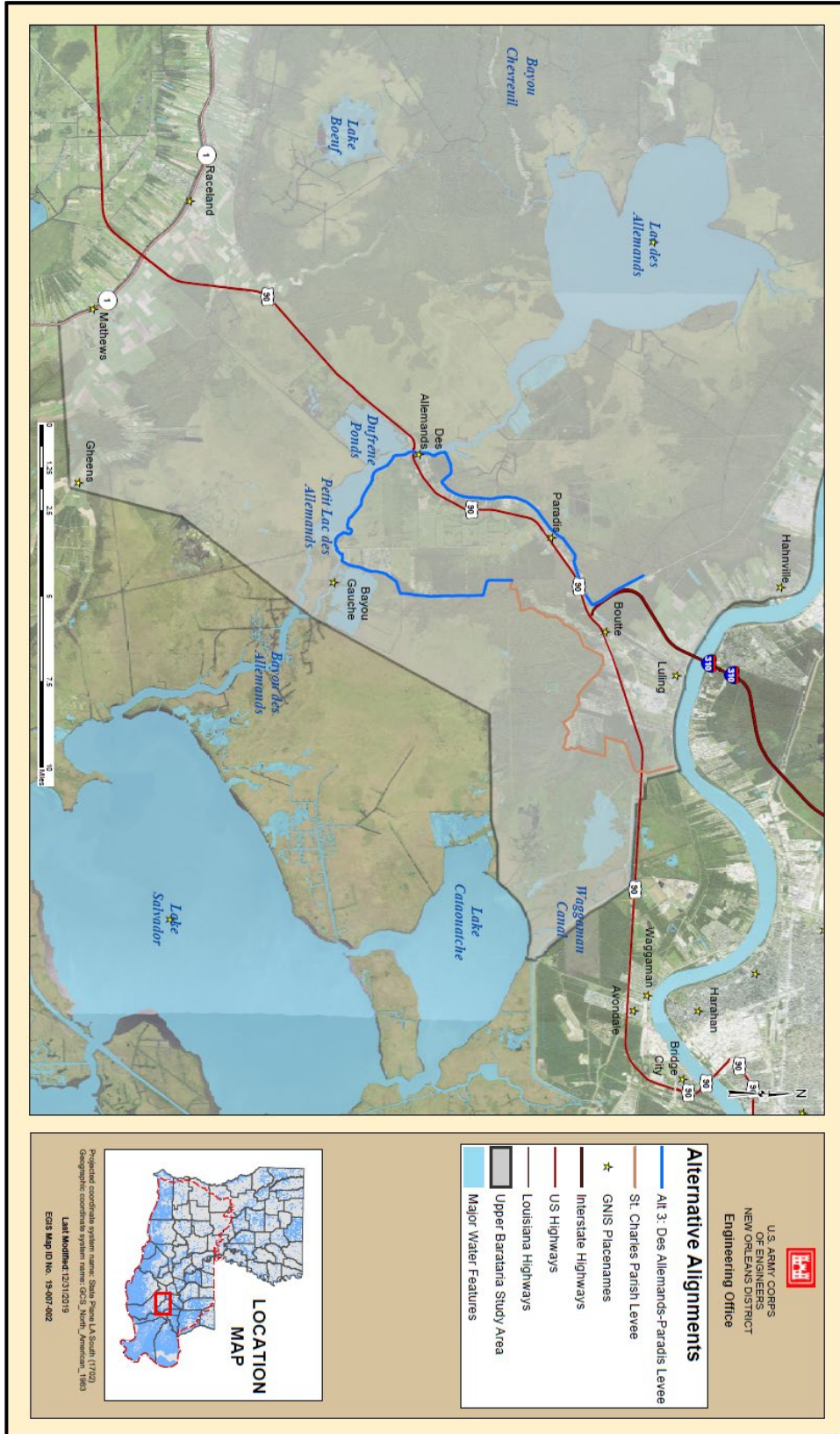


Figure 4-3. Des Allemands-Paradis Levee



Figure 4-4. Raceland Levee

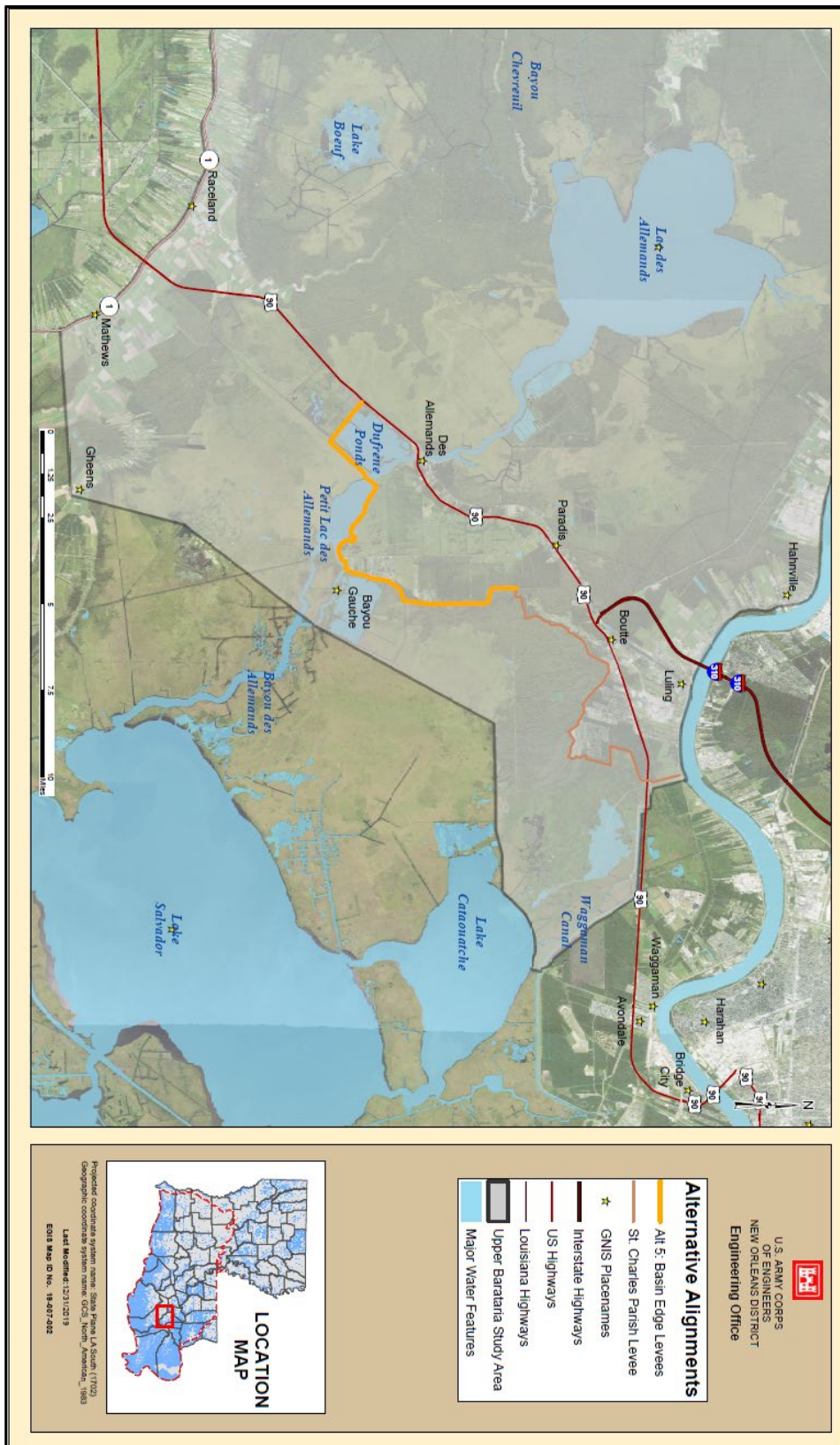


Figure 4-5. Basin Edge Levee



Figure 4-6. Hwy 90 Alignment - Master Plan

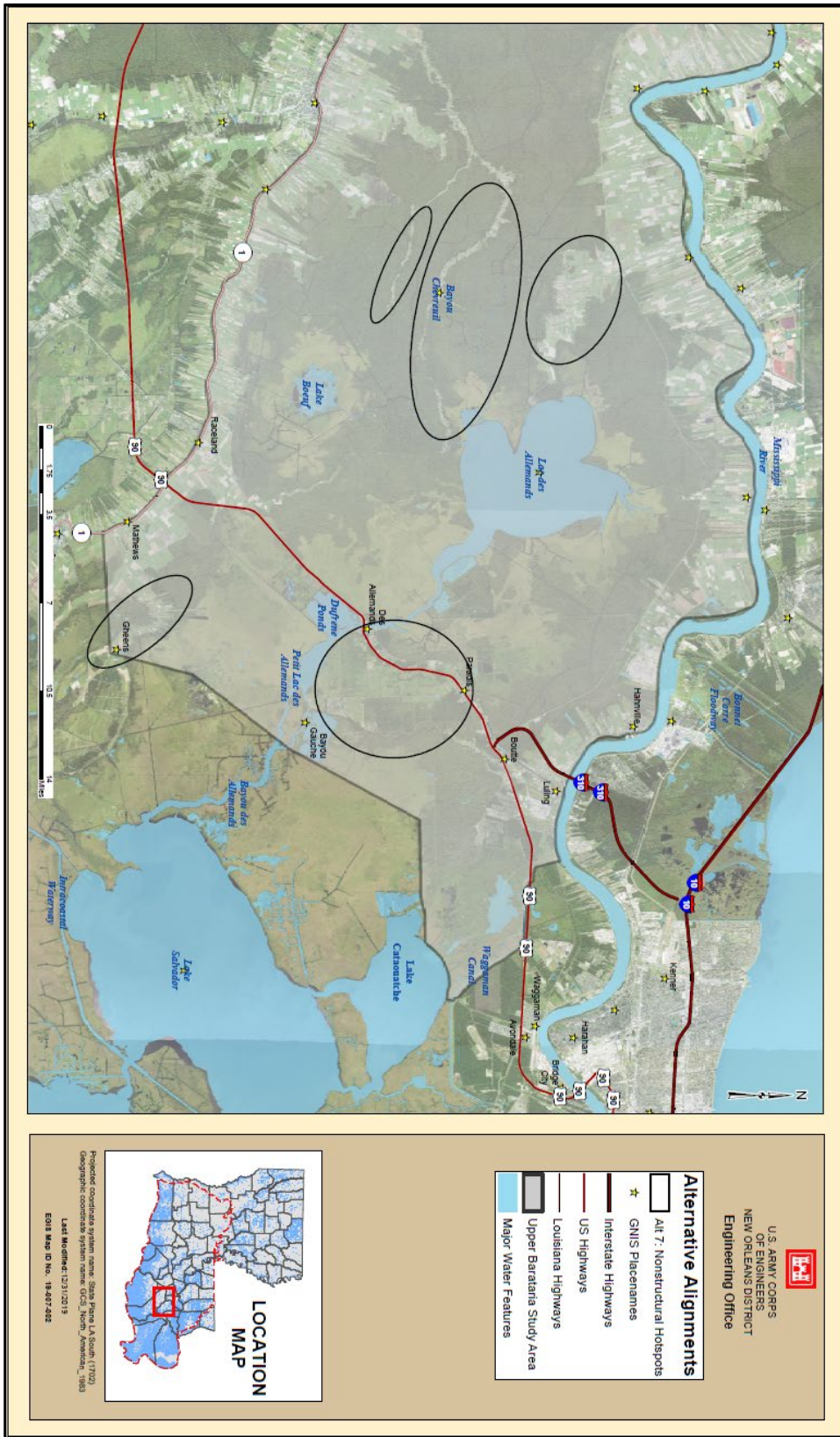


Figure 4-7 Nonstructural Alternative



Figure 4-8. Hwy 90 Lift Alignment

4.3.10 Screening of Initial Array of Alternatives

Screening of the initial array of alternatives (eight alternatives) began after Hydraulics and Hydrology (H&H) ran the existing conditions and the Future without Project (FWOP) Advanced Circulation (ADCIRC) models. The FWOP condition does not consider the St. Charles Parish Levee, which has not been constructed to USACE specifications, in place because it is an in-complete system by itself. Coastal storm surge damages were calculated for no action, 2 percent, 1 percent, 0.5 percent, and 0.2 percent AEP using the available 2010 ADCIRC model. Rainfall damages were calculated for no action, 50 percent, 20 percent, 10 percent, 5 percent, 2 percent, 1 percent, 0.5 percent, and 0.2 percent AEP. The results of the H&H models and the economic functions were inserted into the Hydrologic Engineering Center-Flood Damage Reduction Analysis (HEC-FDA) model and those results were brought into Excel for tabulation. Costs were estimated based on the value of levee construction and key structures (barge gate, roller gates, floodwalls, etc.). The benefit to cost ratio (BCR)s shown in Table 4-1, were estimated by comparing the total annual benefits to the total annual cost and were based on a 2020 Federal Discount Rate (FDR) of 2.75 percent, at the time of the evaluation. The nonstructural alternative was evaluated within the revised final array of alternatives. Alternatives within the initial array of alternatives would not impede navigable waterways.

Upon evaluating the future without project results, Alternative 4 (Raceland Levee) did not receive damages out to a 0.2 percent AEP. Therefore, Alternative 4 did not have enough damages to support a project.

With Alternative 8, P&G prohibits a large highway from being placed upon a Federal Levee. In the past, LADOTD has not supported placing roadways upon levees. The alternative also would not meet multiple USACE levee and earthen dam engineering and design regulations (Engineering Memorandum (EM) 1110-2-2300), risk analysis regulations (Engineering Regulation (ER) 1105-2-101 and EM 1110-2-1619), encroachment regulations, cost analysis regulations (ER 1110-2-1302), NFIP levee certification regulations (Engineering Circular (EC) 1110-6067), flood fighting and emergency operations regulations (ER 1130-2-530), and Operations, Maintenance, Repair, Replacement and Rehabilitation (OMRRR) regulations (ER1130-2-530 and ER1110-2-401). This alternative is the least damaging practicable alternative to wetlands of the cross basin alternatives, but it is not a feasible solution based on the guidance and regulations mentioned previously.

Table 4-1. Initial Array of Alternatives

Plan	Damage Reduced (EAD)	Construction Cost	Average Annual Cost	Net Benefits	B/C Ratio
Alternative 1, Hwy 90-Segment 1 Extension	\$13,541,000	\$314,000,000	\$11,916,000	\$1,626,000	1.14
Alternative 2, Hwy 90-Full Alignment	\$16,061,000	\$422,000,000	\$16,015,000	\$47,000	1.00
Alt 3 - Des Allemands Loop	\$8,712,000	\$288,000,000	\$10,930,000	\$(2,218,000)	0.80
Alt 5 - Open Basin	\$10,634,000	\$284,000,000	\$10,778,000	\$(144,000)	0.99
Alt 6 - Hwy 90 Alignment-Master Plan	\$19,655,000	\$1,053,000,000	\$39,960,000	\$(20,306,000)	0.49

4.4 INITIAL FINAL ARRAY OF ALTERNATIVE PLANS

After only considering structural quantities and material quantities in the parametric costs in Table 4-1, total costs were developed on alternatives 1 and 2 and are considered the initial final array. The additional costs include estimates from Real Estate, Cultural Resources, Relocations, Environmental Mitigation, and Operations and Maintenance (O&M) and included all contingencies based on an abbreviated risk analysis. The BCRs for the focused array are contained in Table 4-2 and are based on a FDR of 2.75 percent.

Table 4-2. Initial Final Array

Plan	EAD Benefits	Construction Cost	Average Annual Cost	Net Benefits	B/C Ratio
Alternative 1, Hwy 90-Segment 1 Extension, 7.5ft	\$13,846,000	\$513,423,000	\$20,358,000	\$(6,512,000)	0.7
Alternative 2, Hwy 90-Full Alignment, 8.5ft	\$16,060,000	\$665,108,000	\$26,238,000	\$(10,178,000)	0.6

4.5 REVISED FINAL ARRAY OF ALTERNATIVE PLANS

Before evaluating the nonstructural alternative in detail, the PDT looked back into the H&H model. Another H&H ADCIRC model was adopted with a more recent model (2017 CPRAB ADCIRC model). Two additional alternative plans (Alternatives 9 and 10) were then developed for the revised final array.

4.5.1 Alternative 9: Basin Rainfall Alternative

This structural alternative was developed to prevent rainfall damages back inside the basin north-west of US Highway 90. It incorporates a pump station and a 270-foot barge gate structure across Bayou Des Allemands, where US Highway 90 crosses Bayou Des Allemands (Figure 4-9). This alternative was developed to reduce tail water elevations to in turn drop the headwater water elevations during heavy rainfall events.

4.5.2 Alternative 10: 1 Percent AEP (100-Year Coastal Storm Event) Open Basin

Alternative 10 was developed to reduce the highest concentration of damages around Des Allemands and Paradis. This is a structural alternative in the form of a 12-foot levee extending out from the existing St. Charles Parish Levee continuing south improving the Sunset Levee and include a vehicle crossing at Bayou Gauche. Then, the levee system would cross Bayou Des Allemands, just south of US Highway 90, with a 270-foot barge gate structure 14 feet high. The levee system would then parallel US Highway 90 until just past Dufrene Ponds where it would tie into US Highway 90. This would also incorporate raising the existing St. Charles Parish Levee to an elevation of 12 feet. This alternative would be approximately 24 miles long (Figure 4-10). The majority of damages prevented would be in St. Charles and Lafourche Parishes.

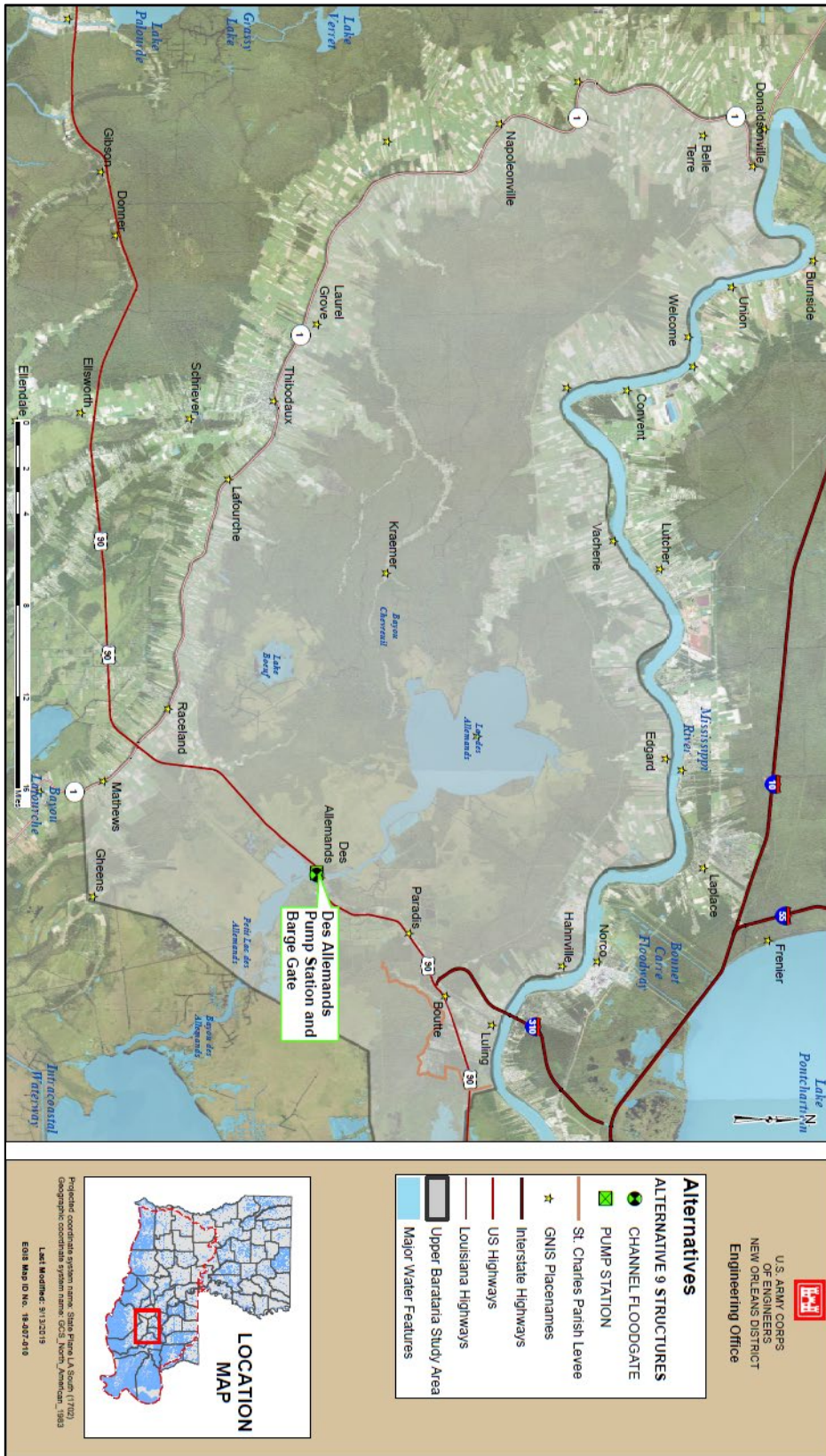


Figure 4-9. Basin Rainfall Alternative

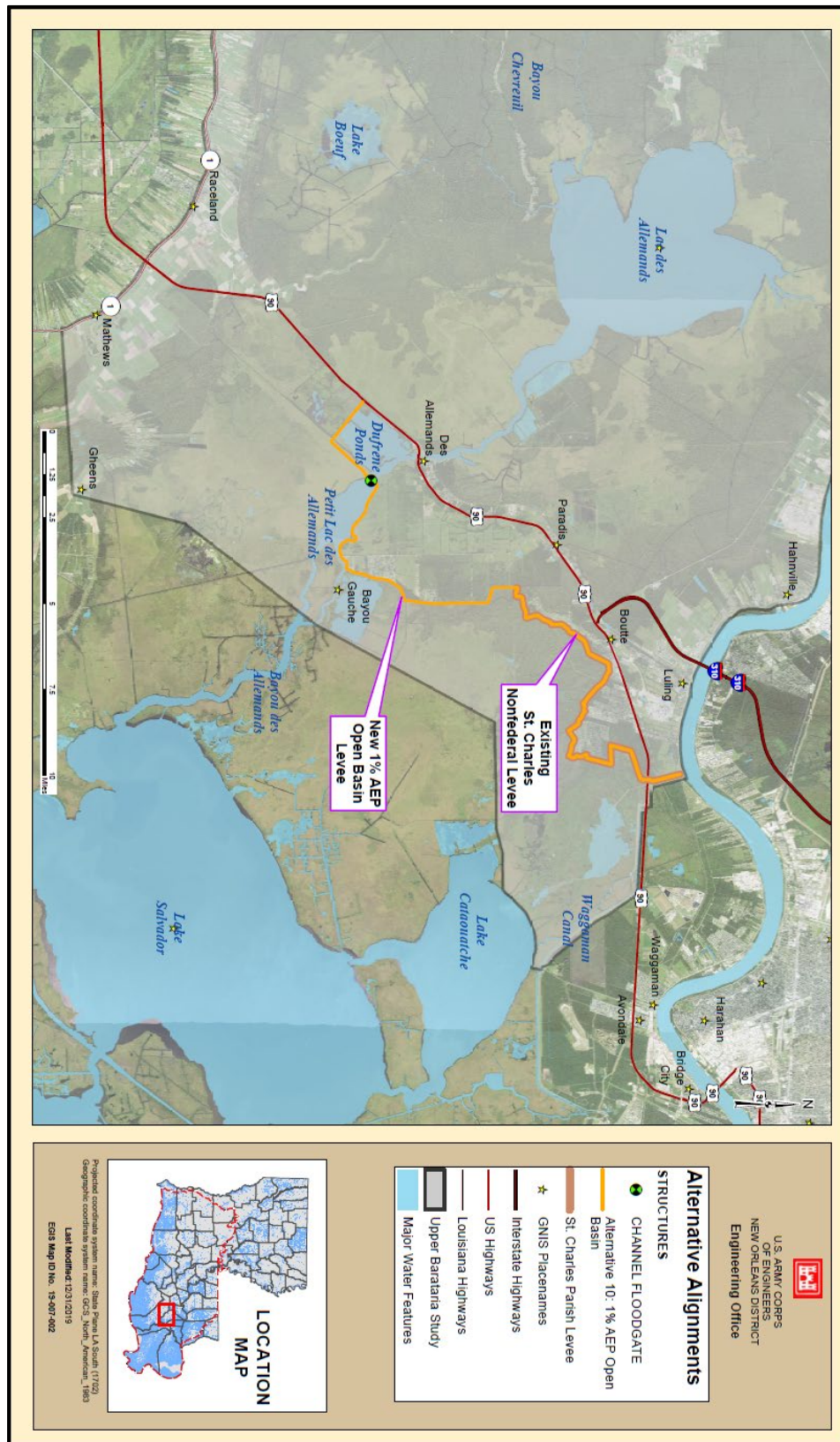


Figure 4-10. 100-Year Open Basin Alternative

4.6 SCREENING OF THE FINAL ARRAY OF ALTERNATIVES

Alternative 9 was screened out based on the storage capability of 17 billion cubic feet within the Upper Barataria Basin north of US Highway 90, which would equate to 1 foot in water surface elevation. Economic results indicated minimal damages down in the basin where Alternative 9 would be most effective. Therefore, there were nearly no damages to be prevented with a basin wide rainfall alternative.

In the initial final array analysis, it was assumed that the levee alternatives would have no resiliency once overtopped. However, in the revised final array, the design was altered to include substantial armoring of the project levee and the existing St. Charles Parish Levee, thereby making the levee completely resilient once overtopped. Alternatives screened at the initial array were not reassessed with armoring due to the fact that there were limited areas behind the proposed levee for storage. Armoring would not have added additional benefits to these earlier alternatives to make it into the initial final array. As a result, the levee significantly reduces stages interior to the levee resulting in damage reductions well past the target elevation of the levee. The Future with Project (FWP) Hydraulic model run verifies these early overtopping assumptions and were used to optimize the levee designs. These levees were designed and optimized to Hurricane and Storm Damage Risk Reduction System (HSDDRS) specifications. These assumptions have been made based on the storage in the basin.

Alternatives 1 and 2 were carried forward from the initial final array of alternatives along with alternative 10 and alternative 7 (nonstructural) to be further evaluated with the 2017 ADCIRC H&H model within the revised final array.

The NS1 nonstructural alternative was evaluated by including all frequencies up to the 0.2 percent AEP and all structures located within the flood plain affected by surge. The economic results for the nonstructural alternative and the structural alternatives, without costs for armoring, were calculated as shown in Table 4-3 and are based on a 2020 FDR of 2.75 percent.

Table 4-3. Revised Final Array of Alternatives

Plan	EAD Benefits	Construction Cost	Average Annual Cost	Net Benefits	B/C Ratio
Alternative 1, Hwy 90-Segment 1 Extension, 7.5ft	\$30,261,000	\$513,423,000	\$20,358,000	\$9,904,000	1.5
Alternative 2, Hwy 90-Full Alignment, 8.5ft	\$30,465,000	\$665,108,000	\$26,238,000	\$4,228,000	1.2
Alternative 10, 1% AEP Open Basin 12.0ft	\$30,875,000	\$908,484,000	\$32,574,000	(\$1,700,000)	0.95
Nonstructural (NS1)	\$17,559,000	\$1,568,912,000	\$58,312,000	(\$40,753,000)	0.3

Based on the economic analysis of the focused array (Table 4-3) the NED plan is the Alternative 1, Hwy 90 – Segment 1 Extension at 7.5 feet. Nonstructural measures could be used to reduce the residual risk associated with the TSP. The B/C ratio for the elevations of 7.5-feet thru 12-feet shows that flexibility exist with the final design, to consider structural superiority resiliency and life safety concerns. In turn, alternatives 3, 4, 5, 6, 7 (nonstructural), 8, and 9 were eliminated from the detailed analysis.

4.6.1 Life Safety

A semi-quantitative assessment of life safety was conducted using accepted USACE methods and tools. A measure/plan evaluation matrix was generated to help assess the risk between the No Action Alternative, nonstructural plans only, and the optimized TSP (HSDRRS) until a semi-quantitative life safety risk analysis is completed in PED phase. Refer to Table 4-4 and Appendix A for the life safety report.

Table 4-4. Revised Final Array of Alternatives

Measure	Metric							
	Estimated Economic Damage	Expected Annual LL ¹	Flood Velocity LLR	Warning Time LLR ²	Evacuation LLR	Vulnerable Population > 2ft ³	Incremental Risk ^{3,4,5}	Project Costs
No Action	High	Low	Medium	Low	Low	-	Low	Low
Non-Structural	Medium	Low	Medium	Low	Low	-	Low	High
HSDRRS	Low	Low	Low	Low	Low	-	High	High

4.6.2 System of Accounts

To facilitate alternative evaluation and comparison of the alternatives, the P&G lays out four federal accounts that are used to assess the effects of the final array of alternatives. The accounts are NED, Environmental Quality (EQ), Regional Economic Development (RED), and Other Social Effects (OSE). Table 4-5 compares the four Federal accounts against the economically justified alternatives in the revised final array. The four accounts are evaluated in the following:

- The intent of comparing alternative flood risk reduction plans in terms of NED account was to identify the beneficial and adverse effects that the plans may have on the national economy. Beneficial effects were considered to be increases in the economic value of the national output of goods and services attributable to a plan. Increases in NED were expressed as the plans' economic benefits, and the adverse NED effects were the investment opportunities lost by committing funds to the implementation of a plan. Alternative 1 ranked higher in this account based on the higher net benefits captured.
- The EQ account was another means of evaluating the plans to assist in making recommendations. The EQ account was intended to display the long-term effects that the alternative plans may have on significant environmental resources. The Water Resources Council defined significant environmental resources as those components of the ecological, cultural and aesthetic environments that, if affected by the alternative plans, could have a material bearing on the decision-making process. Alternative 1 ranked higher due to the lower amount of environmental impacts.
- The RED account was intended to illustrate the effects that the proposed plans would have on regional economic activity, specifically, regional income and

regional employment. Alternative 2 ranked higher due to the increased amount of impacts prevented in Luling, Paradise, and Des Allemands.

- The OSE account typically includes long-term community impacts in the areas of public facilities and services, recreational opportunities, transportation and traffic and man-made and natural resources. Table 4-5 compares the completeness and effectiveness by measurement of the four accounts (national economic development, environmental quality, regional economic development, and other social effects). Both alternatives had equivalent projected impacts when it came to OSE.

Table 4-5. Evaluation of 4 Accounts

Four Accounts	Alternative 1, HWY 90 – Segment 1	Alternative 2, HWY 90 – Full Alignment
National Economic Development (NED)	Avg. Annual Benefits-\$30.3M Avg. Annual Costs-\$20.4M \$10M in net benefits. 1.5 BCR Ranked 1st	Avg. Annual Benefits-\$30.5M Avg. Annual Costs-\$26.3M \$4.3M in net benefits. 1.2 BCR Ranked 2nd
Environmental Quality (EQ)	Construction footprint is in the middle of the other structural plans (310 acres). Ranked 1st	Construction footprint one of the largest structural plans (408 acres). Ranked 2nd
Regional Economic Development (RED)	The project cost supports a large amount of regional employment from construction of the project. Ranked 2nd	The project cost supports a large amount of regional employment from construction of the project. Ranked 1st
Other Social Effects (OSE)	A human impact to EJ resources is not expected. No buy outs or relocations are projected as of now . Ranked Equivalent	A human impact to EJ resources is not expected. No buy outs or relocations are projected as of now . Ranked Equivalent

4.7 IDENTIFYING THE TENTATIVELY SELECTED PLAN

Per USACE Guidance, the PDT tentatively selects the alternative that maximizes net benefits in the study area; this is also called the NED Plan. In order to determine which alternative is the NED Plan, the costs and benefits for the Final Array of Alternatives were compared. The alternative with the greatest net benefits is the apparent NED Plan, and thus the TSP. The TSP identified from the final array is Alternative 1, Hwy 90 – Segment 1 Extension. The TSP levee elevations would be optimized during the feasibility study design. This TSP is also the NED Plan.

As shown in Table 4-4, the net annual benefits for Alternative 1, Hwy 90 – Segment 1 Extension are \$10 million and the benefit cost ratio is 1.5. As the levee design is refined, it is

anticipated that the cost will increase due to armoring. This additional cost will be addressed in the TSP section.

This plan is estimated to produce nearly \$30.3 million in average annual benefits at an average annual cost of nearly \$20.4 million (total project cost of little less than \$514 million not including armoring costs for resiliency), for a BCR of 1.5 at the current Federal Discount Rate (FDR) of 2.75 percent.

The levee design elevation is at a 2 percent AEP-existing, but the system provides levels of risk reduction up to the 0.2 percent AEP-future based off of capitalizing on the storage within the basin during an event. This plan specifically addresses coastal storm events. Structures behind the levee alignment would benefit from the lowering of water stages and prevention of damages during a coastal storm event.

To allow for resiliency during elevated overtopping rates, concrete would be used where access roads are on top of the levee and High Performance Turf Reinforced Mat (HPTRM) would be placed upon the levee. An additional cost of \$47,000,000 for HPTRM and \$140,000,000 for concrete was added to the first cost of the TSP to armor the entire alignment and the existing St. Charles Parish Levee, which has not been built to the USACE specifications. HPTRM armoring protects the levee from wave overtopping. Wave overtopping testing has shown that wave topping erosion occurs on the land side levee slope, extending between 5 to 8 feet from the land side toe. Testing also determined that HPTRM combined with Bermuda grass provides resiliency and erosion resistance to these vulnerable areas of the levee with significant overtopping would occur. Table 4-6 breaks out the Alternative 1 BCR with HPTRM and with concrete across the entire length of levee (including armoring of the St. Charles Parish Levee) in the most extreme armoring case. Alternative 1 BCR reduces to 1.4 and 1.2 for HPTRM and Concrete armoring respectively.

Table 4-6. TSP with Armoring

	Alt 1 With Armoring - Matting	Alt 1 With Armoring - Concrete
First Cost	\$560,423,000	\$653,423,000
Annual Costs	\$22,122,000	\$25,614,000
Annual Benefits	\$30,261,000	\$30,261,000
Net Annual Benefits	\$8,139,000	\$4,647,000
Benefit to Cost Ratio	1.4	1.2

4.8 FEASIBILITY DESIGN AND OPTIMIZATION OF THE TSP

4.8.1 Inclusion of the Existing St. Charles Parish Levee and Deficiencies in the TSP

The 7.5-foot elevation levee extension, proposed at the TSP milestone, and presented in the first draft report, extended out from the existing St. Charles Parish Levee and assumed that the existing St. Charles Parish Levee was constructed to USACE specifications. From the

public comment period, input was provided to USACE on the existing levee system deficiencies (deficient levee elevations, highway and railroad crossings, and pipeline crossings). After the ADM, these findings prompted the incorporation and raising of the existing St. Charles Parish Levee into the design to provide a 1 percent AEP design from the optimization of the plan and not just armoring of the entire existing St. Charles Parish Levee. Table 4-7 shows the general changes between the TSP under the 1st draft report and 2nd draft report. There were no changes associated with the Alternative 2, HWY 90 – Full Alignment, presented in the 1st draft report.

Table 4-7. Changes to TSP from 1st Draft Report to 2nd Draft Report

Attribute	1st Draft Feasibility Report with Integrated Environmental Impact Statement		2nd Draft Feasibility Report with Integrated Environmental Impact Statement	
	Alt 2: Hwy 90 – Full Alignment	Alt 1: Hwy 90 – Segment 1 Extension (TSP)	Alt 2: Hwy 90 – Full Alignment	Alt 1: Hwy 90 – Segment 1 Extension (TSP)
Total Length of System	30.6 Miles	30.6 Miles	No Changes	30.6 Miles
Assumptions on Existing Levee Systems	Improvements needed St. Charles and Sunset Levee system	No Improvements needed to existing levee systems		Improvements needed St. Charles and Sunset Levee system
Miles of Existing Levee/Floodwall with no improvements	0	12.3 Miles		0
Miles of Levee/Floodwall Improvements	12.3	0		12.3
Miles of New Levee/Floodwall	18.3	18.3		18.3
Height of Levee Improvements	8.5 ft	7.5 ft		16 -18.5 ft
Level of Risk Reduction	1.5% AEP (75-year level of risk reduction)	2% (AEP) (50-year level of risk reduction)		1% (AEP) (100-year level of risk reduction)
Direct Footprint Impacts	790 acres	345 acres		1,074 acres

4.8.2 TSP Initial Optimization

The TSP levee was designed to overtop during the costal storm event in places where adequate storage would allow water to be stored during the event. The areas the levee would have been allowed to overtop were between Bayou Des Allemands and Raceland because of the vast storage available in the basin between the alignment and US Highway 90 and the much larger area north of US Highway 90. There were some limitations in the development of the TSP that prevented it providing the 1 percent AEP, initially. The

overtopping rates for the 7.5 feet elevation levee were beyond the maximum overtopping limits of HPTRM and concrete armoring (4.0ft³/s per foot of levee). For levee resiliency with armoring in place, the levee elevations would have to be raised in order to reduce the overtopping rates during the 1 percent AEP coastal storm event.

4.8.3 Increased Costs to Provide the 1 Percent AEP

Along with the levee elevations increasing to provide the 1 percent AEP, the levee design elevations increased from what was predicted at the TSP milestone after ADCIRC modeling of the with-project conditions. These results showed an increase in the amount of stacking outside the levee due to the levee now preventing a larger volume of water from entering the basin. A nonstructural component was then added to the TSP to address induced flooding on the flood side of the levee in areas of Bayou Gauche, Mathews, and Gheens. Refer to Appendix B for structure locations. With the increased project costs, the project BCR was calculated at less than 1.0.

4.8.4 Changes in the WOP ADCIRC Model and Local Levee Overtopping Assumptions

The PDT reviewed modeling. The adopted 2017 CRPAB model had levee elevations higher than the existing levee elevations and had assumptions that the levee would be resilient to storm surge overtopping. This assumption could not be supported and the resilient levee feature was removed from the model and an existing 5-foot levee elevation was placed back in the model. This resulted in a surge in the WOP damages and subsequently a surge in damages prevented in HECFDA modeling. From these findings, it was noted that the 1 percent future AEP levee could be developed across the entire basin, at an increased elevation, without armoring.

4.8.5 December 2020, Need for a Second Draft Public Review

After careful review of the engineering design, the PDT determined that there was a need to go back out to public review because a significant increase in environmental impacts was noted. These impacts included the design updates from the optimization of the TSP, and the improvements needed to address the deficiencies associated with the existing St. Charles Parish Levee. The changes in environmental consequences are discussed in Section 5 of this report, while the updates to the design associated with the optimized TSP is included in Section 4.9.

4.9 DETAILS OF THE OPTIMIZED TSP - ALTERNATIVE 1, HIGHWAY 90 – SEGMENT 1 EXTENSION

The Upper Barataria Basin TSP is a structural alignment constructed to a 1 percent AEP (100-year future design) and totaling a little over 161,300 feet (30.6 miles) in length. The system starts in Luling where it connects the Mississippi River Levee through the Davis Pond Diversion Structure West Guide Levee. Continuing south, the TSP improves upon and updates deficiencies in the St. Charles Parish Levee, crosses Bayou Des Allemands with a 270-foot barge gate structure, and continues parallel to US Highway 90 before it ties into high ground across the Barataria Basin near Raceland. The proposed levee is designed to

HSDRRS specifications with a 1V:4H and a 10 foot crown, with multiple levee lifts authorized over the initial 50 years. The first lift is projected to occur in 2026 and would raise the levee to an elevation of 14 feet except in hydraulic reaches F and H where it would be constructed to 16 feet elevation after settlement. Subsequent lifts would sustain-maintain the 1 percent AEP over the initial 50 years of the authorized project. Material settlement over this period has also been incorporated into the material quantities for each of the alignment's hydraulic reaches. Hydraulic reaches A-H are shown in Figure 4-11. The smaller structures along the alignment were captured in the detailed map in Figure 4-12 and Figure 4-13.

Borrow material for construction is proposed to come from sites estimated to be within 15 miles of where US Highway 90 crosses Bayou Des Allemands. Existing Government borrow sites were not available within the designated distance. Potential borrow sites on farm lands (avoiding swamp and marsh lands) were identified in Raceland and can be seen in Figure 4-14. Not all of the lands from the potential pits in Figure 4-14 are intended to be used. A total of 5,200,400 cubic yards of soil is needed for the first lift in 2026 and a grand total of 8,812,700 cubic yards is needed over the entire authorized 50 year period to sustain the 1 percent AEP design elevations out to year 2076. It was assumed that 10-15 feet of usable material could be found in these sites. The borrow pit needed for the quantity of soil would be approximately 500 acres.

List of structures associated with Figure 4-12 and 4-13:

1. River Road crossing ramp
2. Union Pacific Railroad crossing
3. BNSF Railroad crossing
4. US Highway 90 Crossing Ramp
5. Davis Pond Pump Station frontage protection
6. Willowdale Pump Station, two new tidal exchange structures
7. Willowridge Pump Station frontage protection
8. Cousins Pump Station frontage Protection
9. T-wall section for East Gas Pipeline
10. Kellogg Pump Station frontage protection
11. T-wall section for West Gas Pipeline
12. Ellington Pump Station Frontage Protection
13. T-wall section for Magnolia Pipeline
14. Magnolia Ridge Pump Station Frontage Protection
15. Existing Paradise Control Structure
16. Floodwall section in Hydraulic Reach D TOW El. 15.0
17. Floodwall section in Hydraulic Reach E TOW El. 18.5
 - a. Floodwall type T-1 TOW El. 18.5
 - b. Floodwall type T-2 TOW El. 18.5
 - c. Floodwall type T-3 TOW El. 18.5
18. 45 foot Highway 306 (Bayou Gauche) Roller Gate TOW El. 18.5
19. Crawford Canal P.S. Fronting Protection TOW El 18.5 (50 LF of wall)
20. 270 foot Barge Gate crossing Bayou Des Allemands TOW El. 18.5

21. Environmental structures on either side of the Bayou Des Allemands Barge Gate, 12-15 X 20 foot box culverts with sluice gates
22. Godchaux Canal Bridge TOW El. 9.5
23. Drainage Structure – 4-6 X 6 foot RC box culverts with sluice gates in 3 locations
24. Drainage Structure – 4-6 X 6 foot RC box culverts with sluice gates
25. Drainage Structure – 4-6 X 6 foot RC box culverts with sluice gates
26. Drainage Structure – 2-84 inch RCP culverts with sluice gates
27. Drainage Structure – 1-60 inch RCP culvert with sluice gates
28. T-wall section, Enterprise and Shell Pipeline Crossing (Davis Pond Crossing #1)
29. T-wall section, Bridgeline Enlink Pipeline Crossing (Davis Pond Crossing #2)

Note: Screens are not being implemented in culverts with sluice gates.

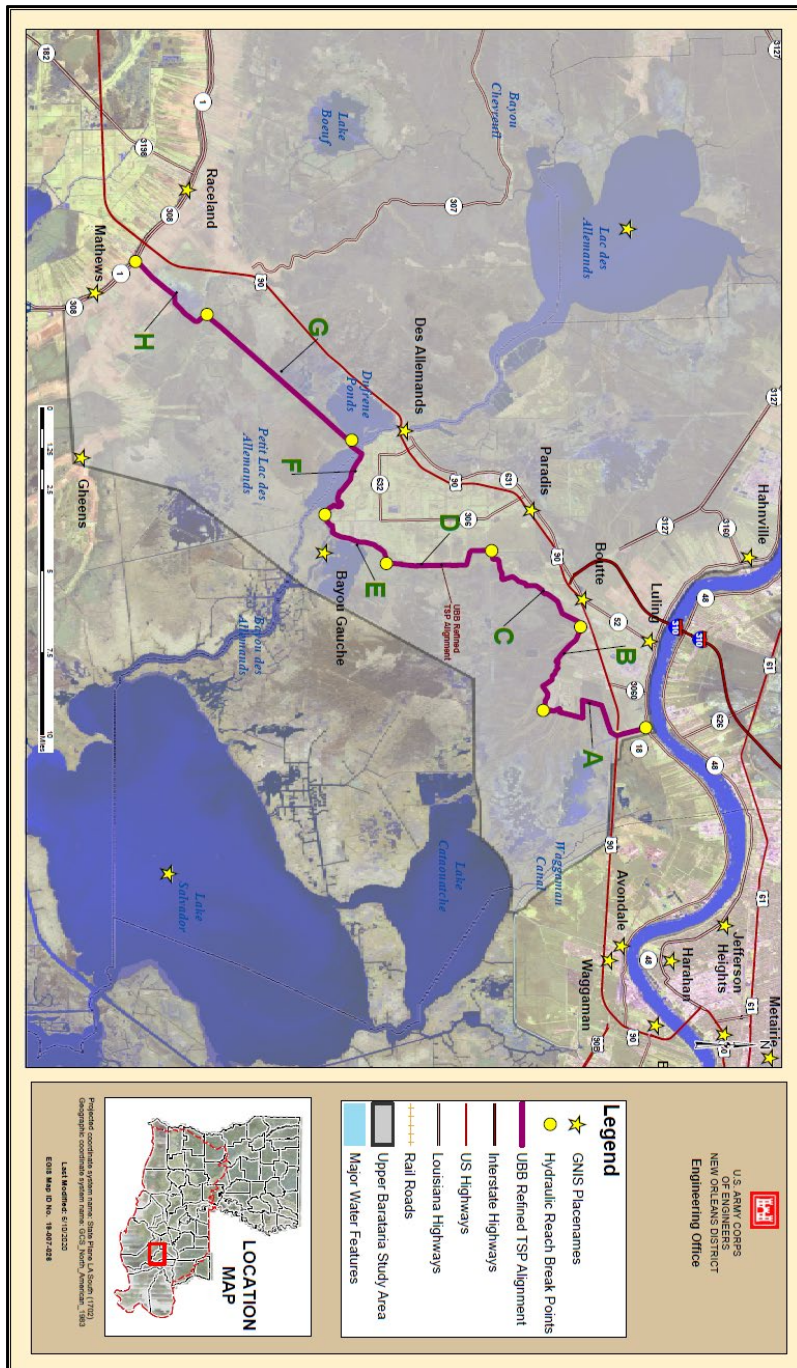


Figure 4-11. Hydraulic Reaches A-H

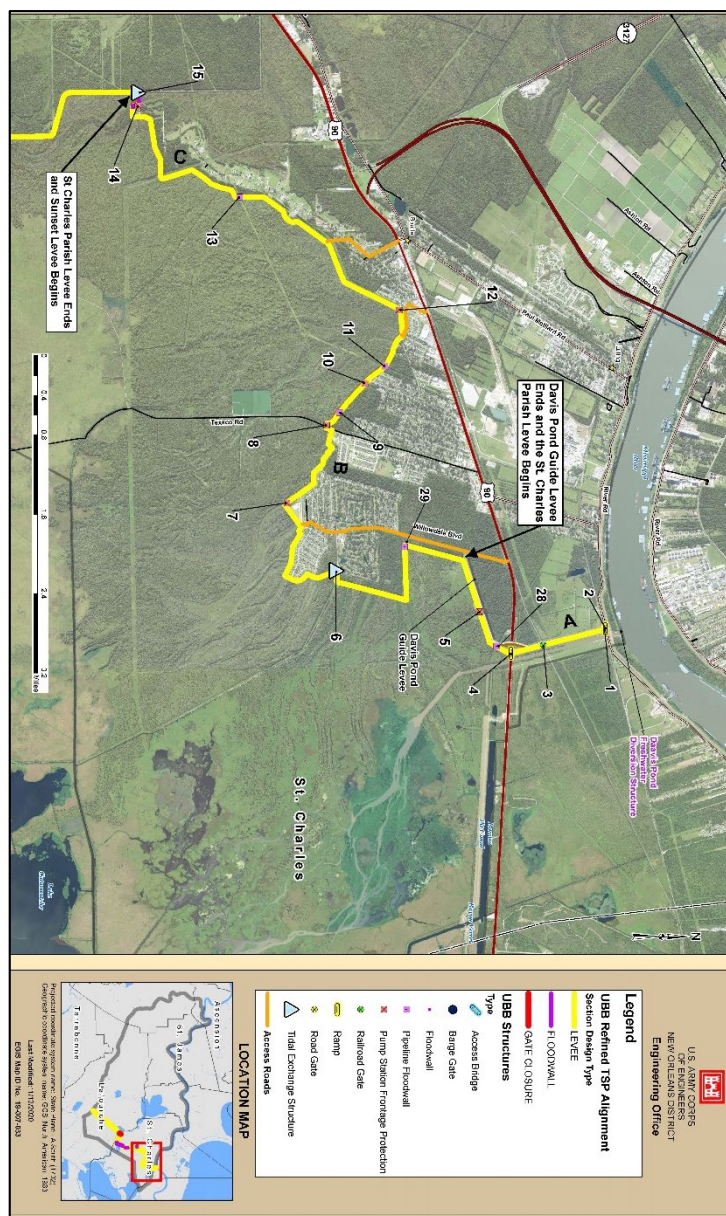


Figure 4-12. Structure Location, TSP Alignment (Northern)

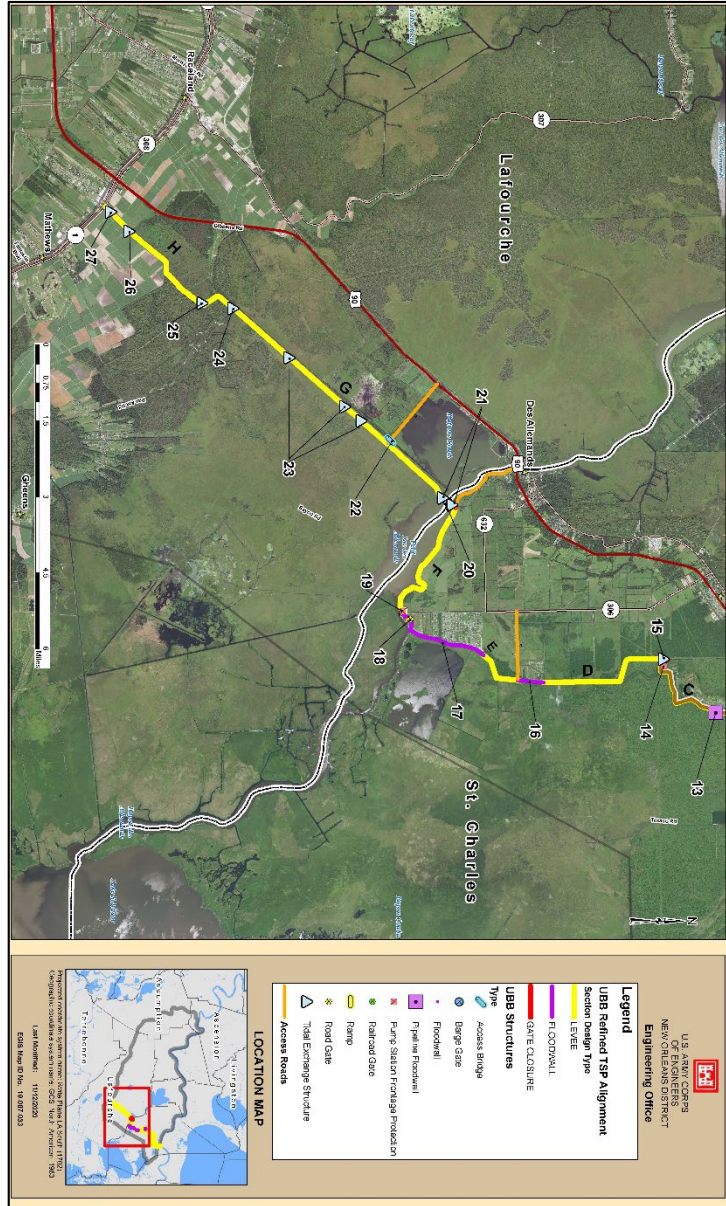


Figure 4-13. Structure Location, TSP Alignment (Southern)

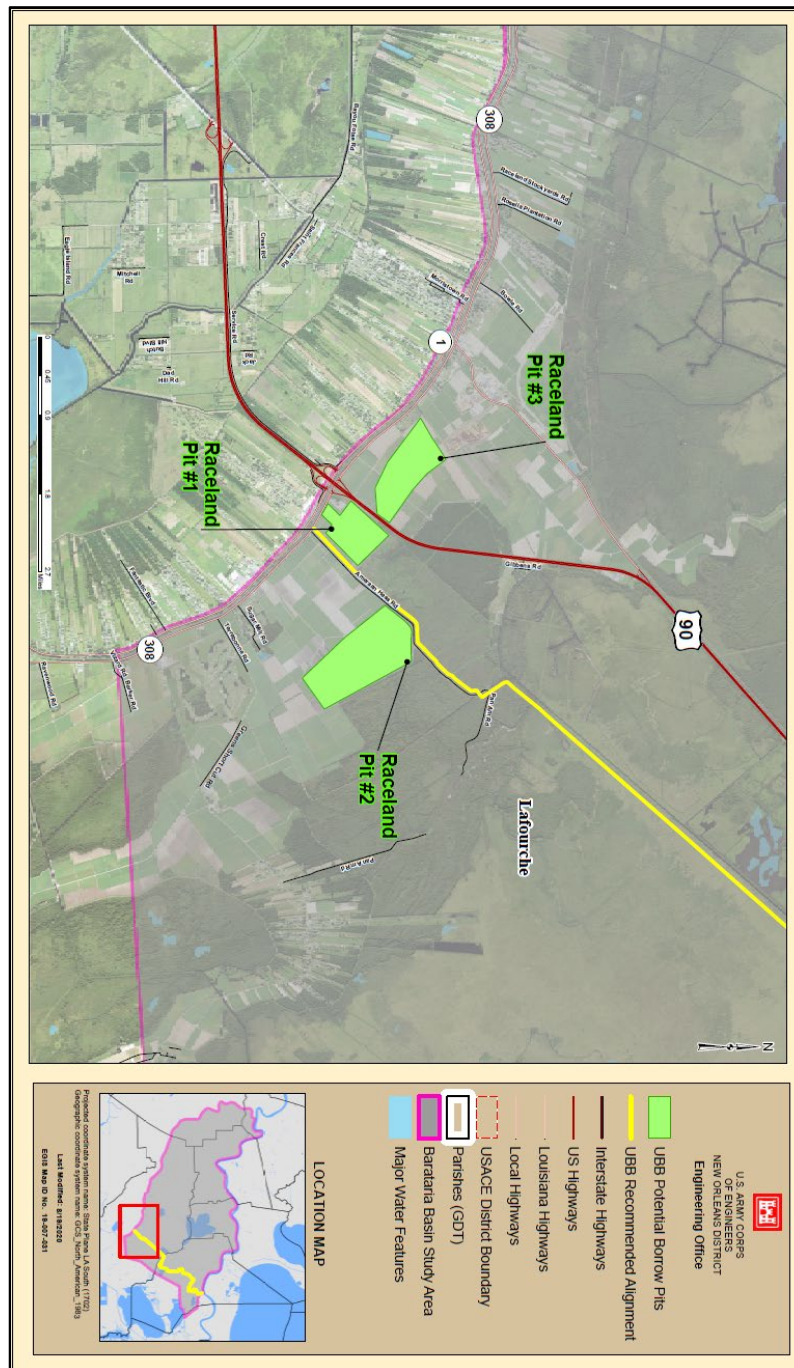


Figure 4-14. Potential Earthen Borrow Sources near Raceland

4.9.1 Hydraulic Connectivity

Hydrologic connectivity would be maintained to the extent practicable through water control structures except when those structures are closed during hurricanes or tropical storms, as the risk reduction system is only authorized to address storm surge caused by hurricane and tropical storm events. It is not authorized to mitigate for or reduce impacts caused by higher

day-to-day water levels brought about by increases in sea level rise. Rainfall events and high tides could still cause significant flooding of the swamps within the levee-enclosed area. All drainage features through the levee system were sized to match the existing gravity drainage system, and would mimic the existing drainage patterns when the system is not closed. Any operational changes implemented to address changing SLR conditions or for any other non-project-related purpose would be considered a separate project purpose requiring separate authorization, new NEPA documentation, and/or permit approvals.

4.9.2 Proposed Design for Construction by Reach

All listed access routes to access reaches A-H would have a 40 feet path width. There is a designated staging and access route for each reach listed below. The staging area totals approximately 20 acres and the access routes total approximately 40 acres. For all reaches, refer to Figures 4-15 through 4-22 for access routes and staging areas and to Figure 4-12 and Figure 4-13 for structures along the alignment. Table 4-7 provides all details of footprint width and ROW required to construct the proposed alignment. Also, note that the term frontage protection at existing pump stations entail T-walls with the pump outlet pipes going through the wall, pipe supports, and riprap.

4.9.2.1 Reach A

Reach A begins at the Mississippi River levee and extends approximately 24,700 feet south. The proposed earthen levee, with a centerline shifted away from the canals, would build off the existing Davis Pond West Guide Levee and the existing St. Charles Levee (Refer to Engineering Appendix A for cross-sectional drawings). All of the existing levee footprints, including ROW, would be incorporated into the proposed levee design.

From the Mississippi River Levee, the alignment continues south where it crosses River Road, the Union Pacific Rail Road track, the BNSF Rail Road track, and US Highway 90. Ramps would be constructed for the River Road and US Highway crossings and 2 railway gates would be constructed where the Union Pacific Rail Road track and the BNSF Rail Road track cross the alignment. Continuing south, the existing Davis Pond pump station would receive new frontage protection. At the Willowdale Pump Station, two existing tidal exchange structures, located on either side of the structure, would need to be replaced. New T-wall sections, one measuring 152 feet and one measuring 298 feet, would be constructed to allow the Enterprise/Shell Pipeline and the Bridgeline Enlink Pipeline to pass through the levee alignment without impacting the integrity of the alignment. Approximately 11,000 feet from the Mississippi River Levee, along the Davis Pond Diversion West Guide Levee, the alignment then turns into the St. Charles Parish Levee which would be elevated with the centerline being shifted away from the canal. Reach A would initially be constructed to a height of 14 feet in 2026, with an expected settlement of 1.5 feet by 2054. A second lift is proposed in 2054, to elevation 16 feet, in order to maintain the 1 percent AEP design elevation over the authorized 50 year period.

Reach A would be accessed from US Highway 90 to Willowdale Boulevard and then to Lafayette Drive. Three staging areas are proposed for use during the construction of the alignment and structures within Reach A. The first staging area is located off Willowdale

Boulevard and measures approximately 0.7 acres in size. A second staging area, approximately one (1) acre in size is located along Willowdale Boulevard, and the third staging area, approximately one (1) acre in size is located next to River Road. Staging area 3 would be utilized for construction of the ramp over the levee for River Road and the 2 Railroad roller gate structures (Union Pacific to the north and the BNSF to the south). Refer to Figure 4-15 for the locations of the staging areas.

4.9.2.2 Reach B

Reach B begins at Willowdale Pump Station and measures approximately 17,100 feet in length. The proposed new construction centerline of Reach B would be shifted away from the existing canal, similar to Reach A (Refer to Engineering Appendix A for cross-sectional drawings). All of the existing levee footprint, including ROW, has been incorporated into the proposed levee design.

Continuing southwest from the Willowdale Pump Station, along the St. Charles Parish Levee, frontage protection would be needed at the Willowridge, Kellogg, and Cousins pump stations. Due to the design elevation requirements, T-wall sections would be constructed in order to accommodate both the East Gas Pipeline and the West Gas Pipeline (Reference the Engineering Appendix A for all pipeline crossings). The T-wall would allow the gas pipelines to pass through the alignment while maintaining the integrity of the alignment.

Reach B would initially be constructed to an elevation of 14 feet in 2026, with an expected settlement of 1.5 feet by 2054. A second and final lift to 16 feet is proposed in 2054 in order to maintain the 1% AEP design elevation over the authorized 50 year period.

Reach B would be accessed from the same access route outlined in Reach A. A second access route for Reach B would be from US Highway 90 to River Ridge Drive and then to Primrose Street. One (1) acre staging area, located off Lafayette Drive, next to the alignment is proposed for Reach B. Please reference Figure 4-16 for access and staging areas.

4.9.2.3 Reach C

Reach C begins at the Ellington Pump Station, and measures approximately 22,600 feet in length and continues to elevate the St. Charles Levee to just past the Paradise Canal (which is now in place as an existing condition). The proposed new centerline of Reach C would be shifted away from the existing canal similar to previously defined Reaches A and B. (Refer to Engineering Appendix A for cross-sectional drawings). All of the existing levee footprint, including ROW, has been incorporated into the proposed levee design.

Continuing from the Ellington Pump Station, along the St. Charles Parish Levee footprint, the levee alignment turns back south along the St. Charles Parish Levee. Fronting protection would be placed at the Ellington Pump Station and a new T-wall section, measuring approximately, 135 feet would be constructed to allow the Magnolia pipeline to pass through the levee alignment without impacting the integrity of the alignment. Reach C would initially be constructed to an elevation of 14 feet in 2026, with an expected settlement of 1.5 feet by 2054. A second (final) lift to an elevation of 16 feet would be proposed in 2054 in order to maintain the 1% AEP design elevation over the authorized 50 year period.

Reach C would be accessed from US Highway 90 and then to Magnolia Ridge Road. The proposed staging area for Reach C would be located off Magnolia Ridge Road and would be approximately 1.6 acres in size. Please reference Figure 4-17 for access and staging areas.

4.9.2.4 Reach D

Reach D begins just south of the Paradise Control Structure at the end of Reach C, and measures approximately 19,000 feet in length. This reach would be constructed atop the existing Sunset Levee. The proposed new centerline of Reach D continues south and would be shifted away from the existing canal similar to previously discussed reaches (refer to Engineering Appendix A for cross-sectional drawings). All of the existing levee footprint, including ROW, has been incorporated into the proposed levee design.

Within Reach D there is one section of T-wall, measuring approximately 2,700 feet which would be constructed in order to avoid existing houses and utilities along the levee alignment. The T-wall would have a 10 feet base slab, with an 80 feet construction easement, and an elevation of 15 feet. The T-wall would be constructed via the right of way from the land side. The Reach D levee portion would initially be constructed to an elevation of 14 feet in 2026 with an expected settlement of 1.5 feet by 2056. A second (final) lift to elevation 16 feet is proposed in 2056 in order to maintain the 1 percent AEP design elevation over the authorized 50 year period.

Reach D would be accessed from Bayou Gauche Road (Highway 306) and then to Grand Bayou Road using a 1,527 feet long temporary access route. The 40 feet across access road would be constructed using crushed stone for the road surface that cuts across a local field to the alignment. The proposed staging area for Reach D would be located off of Grand Bayou Road and is approximately 2.2 acres in size. Please reference Figure 4-18 for the staging area and access route.

4.9.2.5 Reach E

Reach E begins just south of Grand Bayou Road and is a combination of earthen levee and floodwalls which total approximately 14,600 feet. The earthen levee portion measures approximately 3,340 feet in length while the floodwall section measures approximately 11,230 feet in length. The earthen levee portion of the reach would be constructed atop the existing Sunset Levee, with a newly proposed centerline shifted away from the existing canal, similar to previously defined reaches, (refer to Engineering Appendix A for cross-sectional drawings). All of the existing levee footprint, including ROW, have been incorporated into the proposed levee design.

Due to the minimal room for construction between the canal and the existing structures along the canal, the proposed floodwall portion (T-wall design) would be constructed to an elevation of 18.5 feet with a 10-20 feet wide concrete slab at the base. Within the T-wall section, where the alignment crosses Highway 306, a roller gate would be constructed in the alignment. This roller gate would remain open during normal day to day operations and would only be closed proceeding a hurricane or tropical storm event. A 400 foot section of T-wall will also be needed for a pipeline crossing just west of the Crawford Canal where Reach

E ties into Reach F. The small portion of earthen levee in this reach would initially be constructed to an elevation of 14 feet in 2026, with an expected settlement of 1.5 feet by 2038. A second lift to 16 feet is proposed for 2038, with an expected settlement of 1 foot by 2059. A third (final) lift to an elevation of 18.5 feet is proposed in 2059 to maintain the 1 percent AEP design elevation over the authorized 50 year period. T-wall would be designed to maintain the 1 percent AEP upon initial construction in 2026.

Reach E would be accessed directly from Bayou Gauche Road with a proposed, approximately 2 acre staging area also located off of Bayou Gauche Road. Reference Figure 4-19 for the access route and staging area location. A new access route would be constructed for the community outside the system at the end of Badeaux Lane because the floodwall cuts off access to the community. The permanent route would go from Highway 306, just outside the T-wall, and allow access to the community with a 30 feet wide road.

4.9.2.6 Reach F

Reach F begins just past the Crawford Canal Pump Station and measures approximately 15,400 feet in length. This reach would be constructed atop the existing Sunset Levee. The newly proposed centerline of Reach F continues south and would be shifted away from the bayou similar to previously defined reaches (refer to Engineering Appendix A for cross-sectional drawings). All of the existing levee footprint of the Sunset Levee, including ROW, would be incorporated into the proposed levee design.

Reach F consists of mostly earthen levee and includes a 270 feet barge gate structure and culverts with sluice gates. The barge gate would be constructed across the Bayou Des Allemands crossing and would incorporate (6)15 feet X 20 feet box culverts on each side of the gate for a total of twelve culverts with sluice gates (no screens on the culverts). The channel where the structure would be placed would require dredging in order to achieve a sill depth around negative 14-19 feet. Dredge material would be either used locally for levee construction if suitable, transported to a local landfill, placed on a local upland disposal sites or used beneficially in potential mitigation sites, once a detailed mitigation plan is developed. The Reach F earthen levee would initially be constructed to an elevation of 16 feet in 2026 with an expected settlement of 1.7 feet by 2044. A second (final) lift to 18.5 feet is proposed for 2044 to maintain the 1 percent AEP design elevation over the authorized 50 year period.

Access for Reach F would be via an approximately 4,575 linear foot temporary crushed stone access route, 40 feet wide, constructed from the end of Down The Bayou Road to the barge gate crossing on top of the existing Sunset Levee. Access to this route will be via US Highway 90 to the eastern side of Bayou Des Allemands via Down The Bayou Road near the proposed barge gate placement site. The temporary access road would be removed and the area returned to pre-construction conditions once construction has been completed.

Reach F has two proposed staging areas. The first one is located west of the Crawford Canal Pump Station with a second proposed staging area located on the east bank of Bayou Des Allemands where the alignment crosses the bayou. Both proposed staging areas are approximately 2.2 acres in size. Please reference Figure 4-20 for the locations of the staging and access routes.

4.9.2.7 Reach G

Reach G begins on the southern bank of Petit Lac Des Allemands and continues parallel to US Highway 90 through the marsh. Reach G measures approximately 31,000 feet in length and there are currently no existing levees located in this reach. Refer to Appendix A for this sections cross-sectional drawings for this new construction. Geotextile reinforcement has been incorporated into the levee design to reduce the footprint in this reach.

The proposed action for Reach G includes construction of a new levee which would parallel US Highway 90 through the marsh. The newly constructed levee would incorporate five sets of culverts, 4-6 X 6 foot box culverts with sluice gates (no screens), which are needed to maintain the hydraulic flows in and out of the marsh (through small tributaries and oil and gas line canals) on the southern side of the alignment. The proposed levee for Reach G would initially be constructed to an elevation of 14 feet in 2026, with a second (final) lift to an elevation of 16 feet proposed in 2054 in order to maintain the 1 percent AEP design elevation over the authorized 50 year period.

Access to Reach G would be from U.S. Highway 90 via a newly constructed permanent access route just southwest of Dufrene Ponds. The new access road would measure approximately 7,925 feet in length and would be surfaced with crushed stone. The access road includes construction of a permanent bridge across the Godchaux Canal in order to gain access to the alignment for construction and future operation and maintenance. The proposed staging area for Reach G, approximately 2.3 acres in size, would be located on the north-east corner of where the Godchaux Canal and the access route intersect. Reference Figure 4-21 for the access route and staging area locations. These structures would be constructed using the temporary access route located along the alignment within the right of way. Refer to Figure 4-13 for the locations of these hydraulic structures.

4.9.2.8 Reach H

Reach H begins where Gibbons Road meets the alignment and continues to parallel US Highway 90 through the marsh and follow next to Amarada Hess Rd. Reach H measures approximately 16,900 feet in length and there is currently no existing levee in place. Refer to Appendix A for this sections cross-sectional drawings for this new construction. Geotextile reinforcement has been incorporated into the levee design to reduce the footprint in this reach.

The proposed construction for Reach H includes construction of a new levee which would parallel US Highway 90 through the marsh. The newly constructed levee would incorporate two sets of culverts for hydraulic exchange from the north to the south of the alignment. These are 2-84 inch in diameter culverts with sluice gates and 1-60 inch in diameter culvert with sluice gate (no screens). The proposed levee for Reach H would be constructed with one lift to an elevation of 16 feet in 2026 in order to maintain the 1 percent AEP design elevation over the authorized 50 year period.

Reach H and a portion of G would be accessed using Amarada Hess Rd. For access along the project site, it is assumed access would be for the length of the reach, a 40 feet wide

access road positioned at least 15 feet from the levee toe is proposed. A two acre staging area is proposed along the intersection of Highway 308 and Amarada Hess Rd. Reference Figure 4-22 for the locations of the staging area. These structures would be constructed using the temporary access route located along the alignment within the right of way. Refer to Figure 4-13 for the locations of these hydraulic structures.

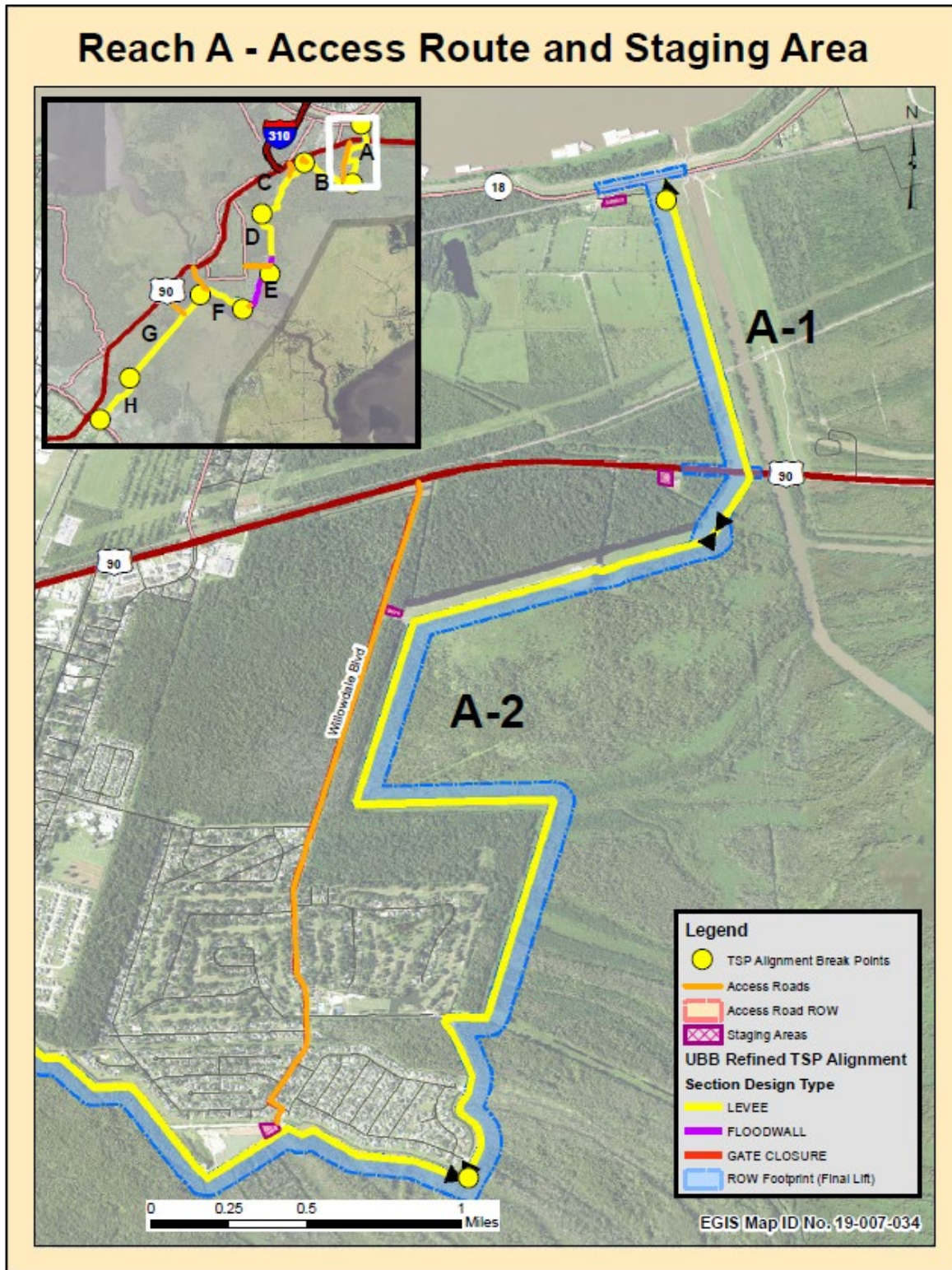


Figure 4-15. Reach A Access Road and Staging Area

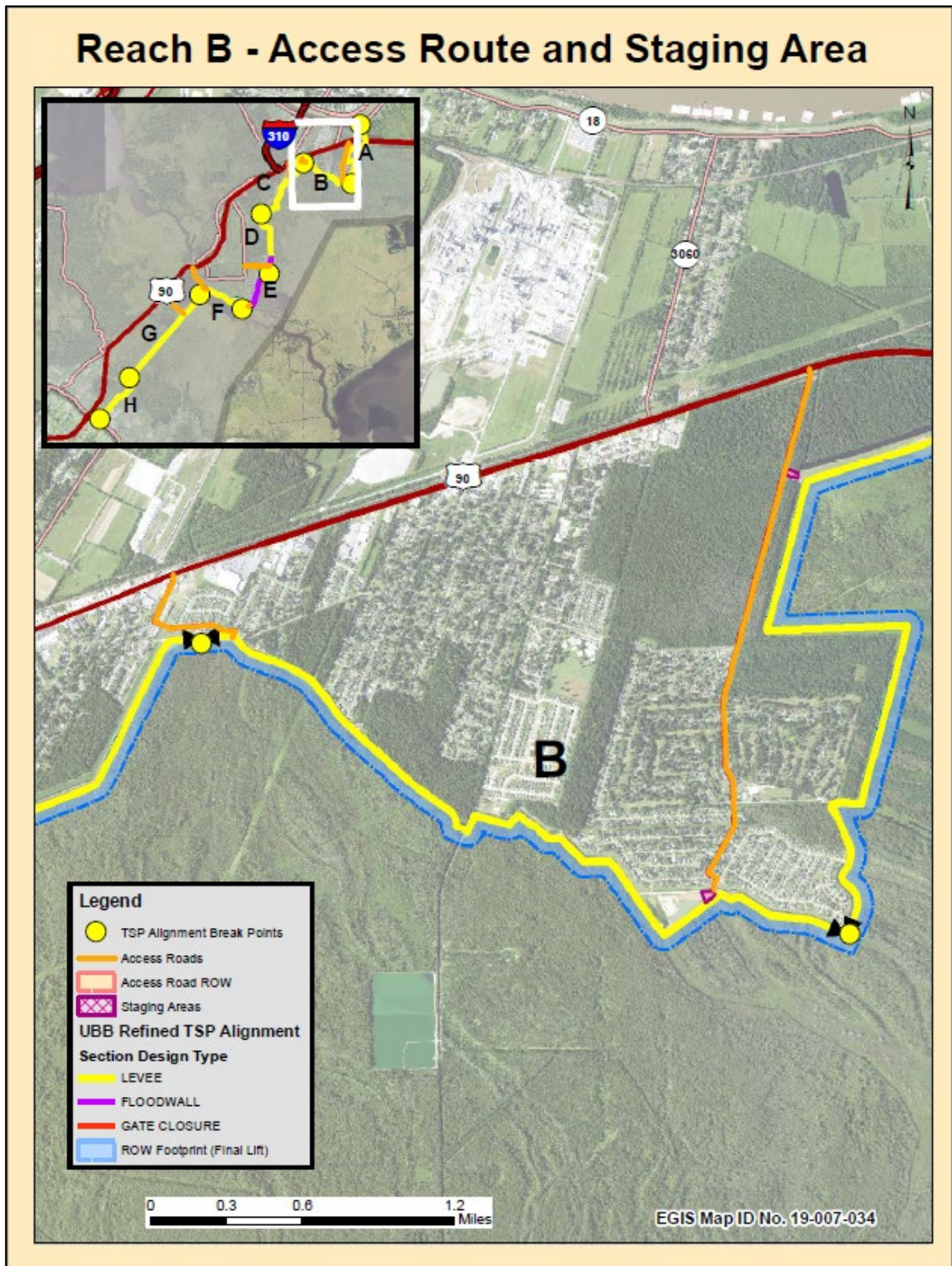


Figure 4-16. Reach B Access Road and Staging Area

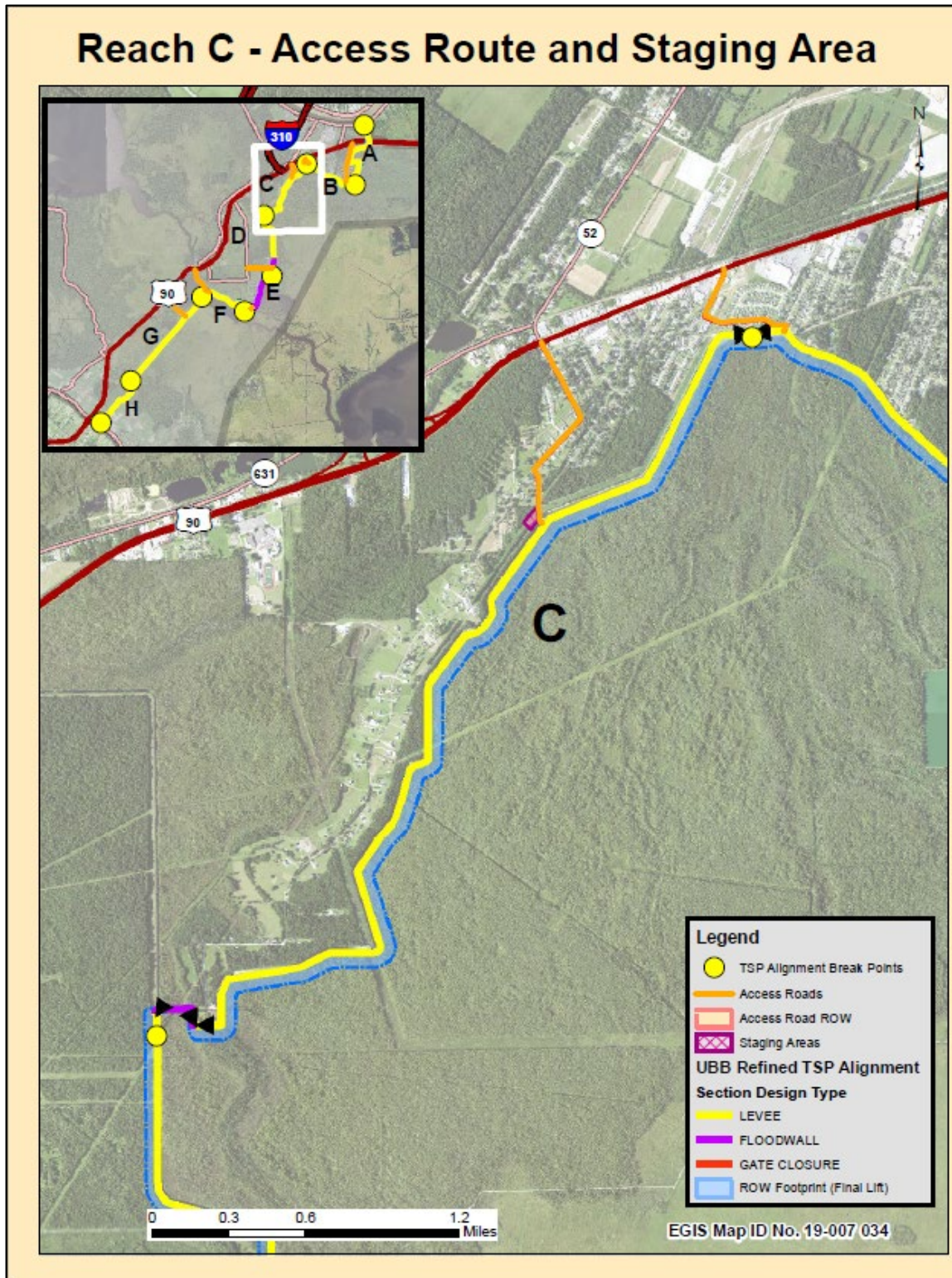


Figure 4-17. Reach C Access Road and Staging Area

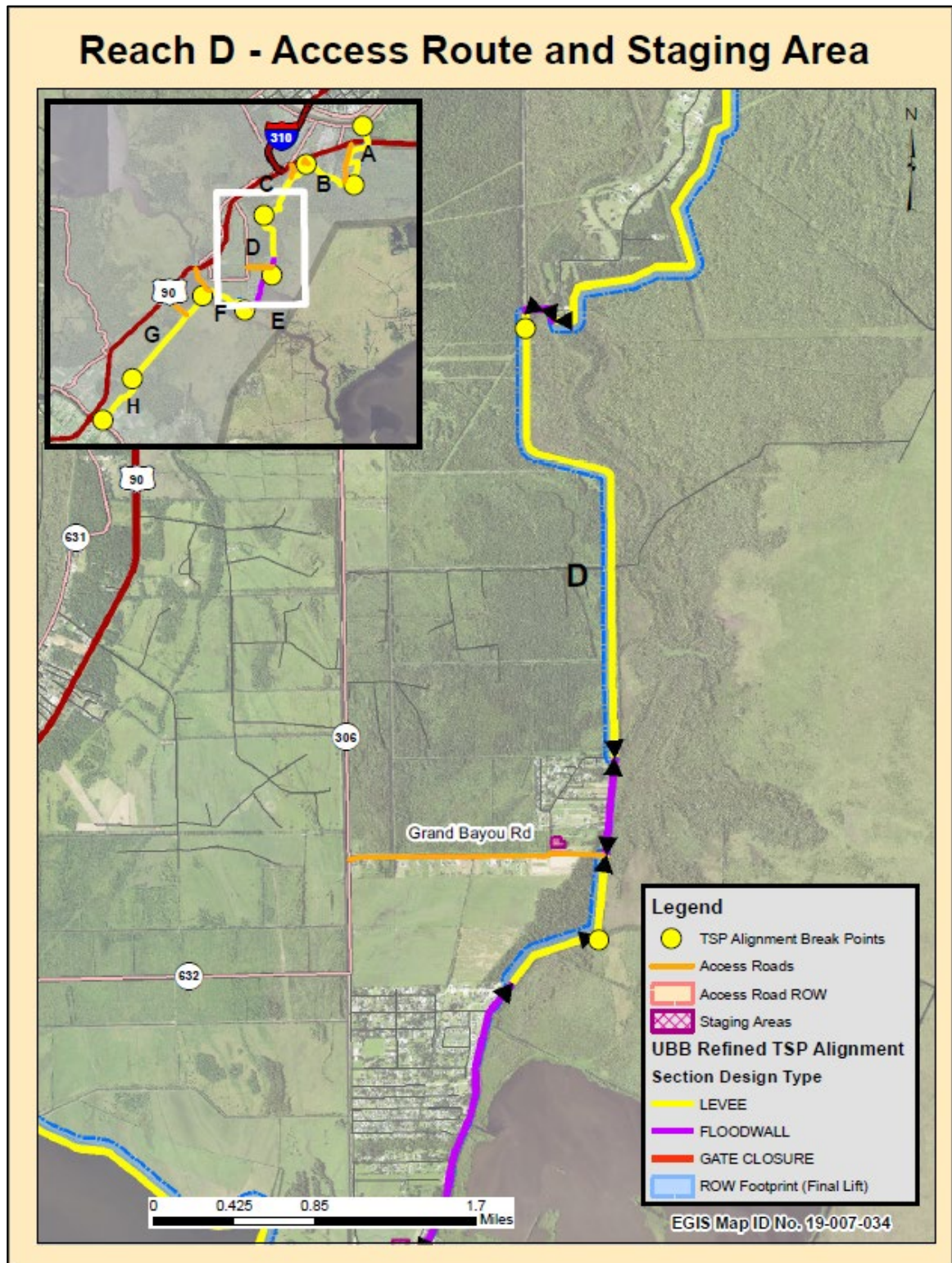


Figure 4-18. Reach D Access Road and Staging Area

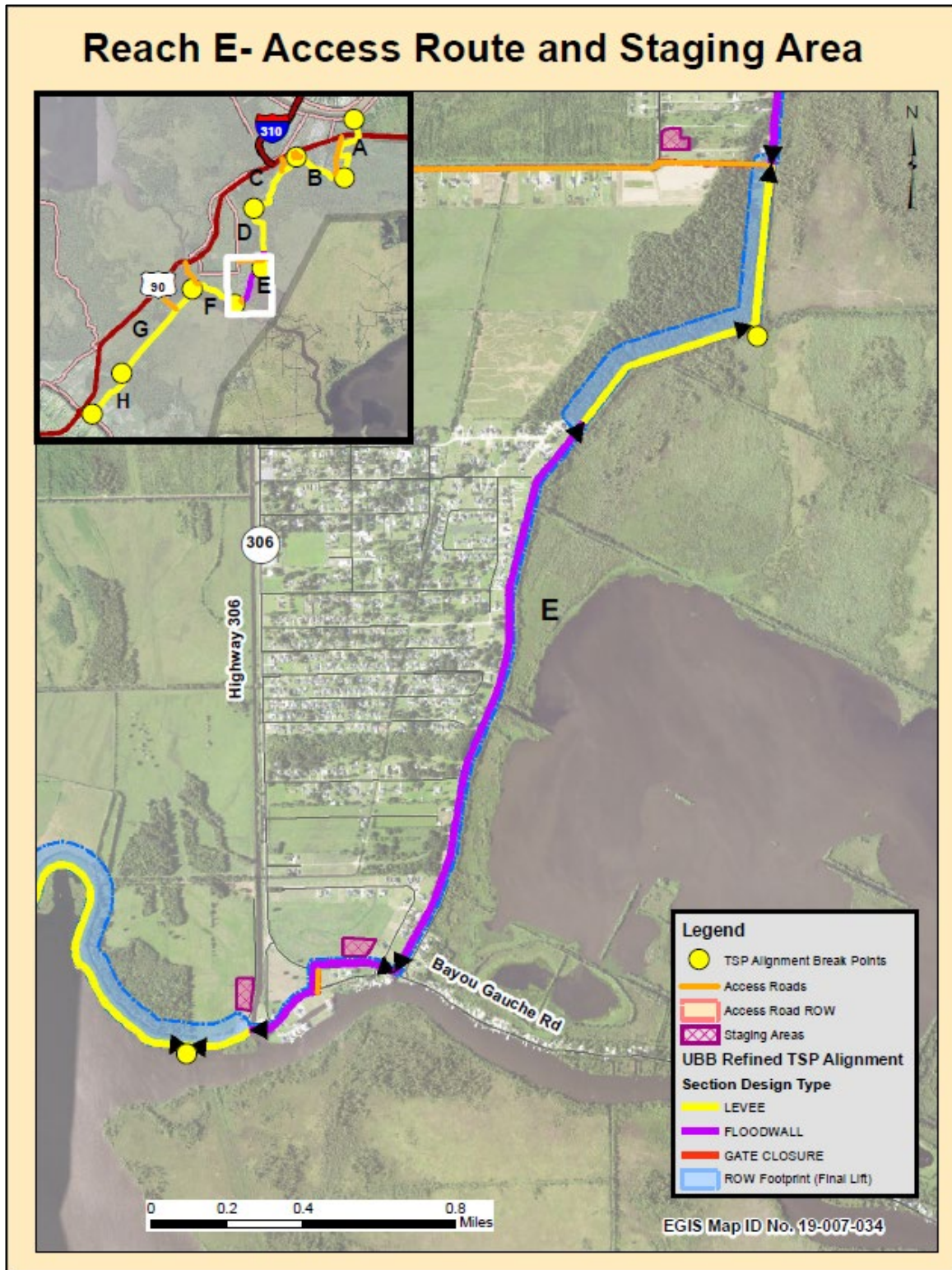


Figure 4-19. Reach E Access Road and Staging Area

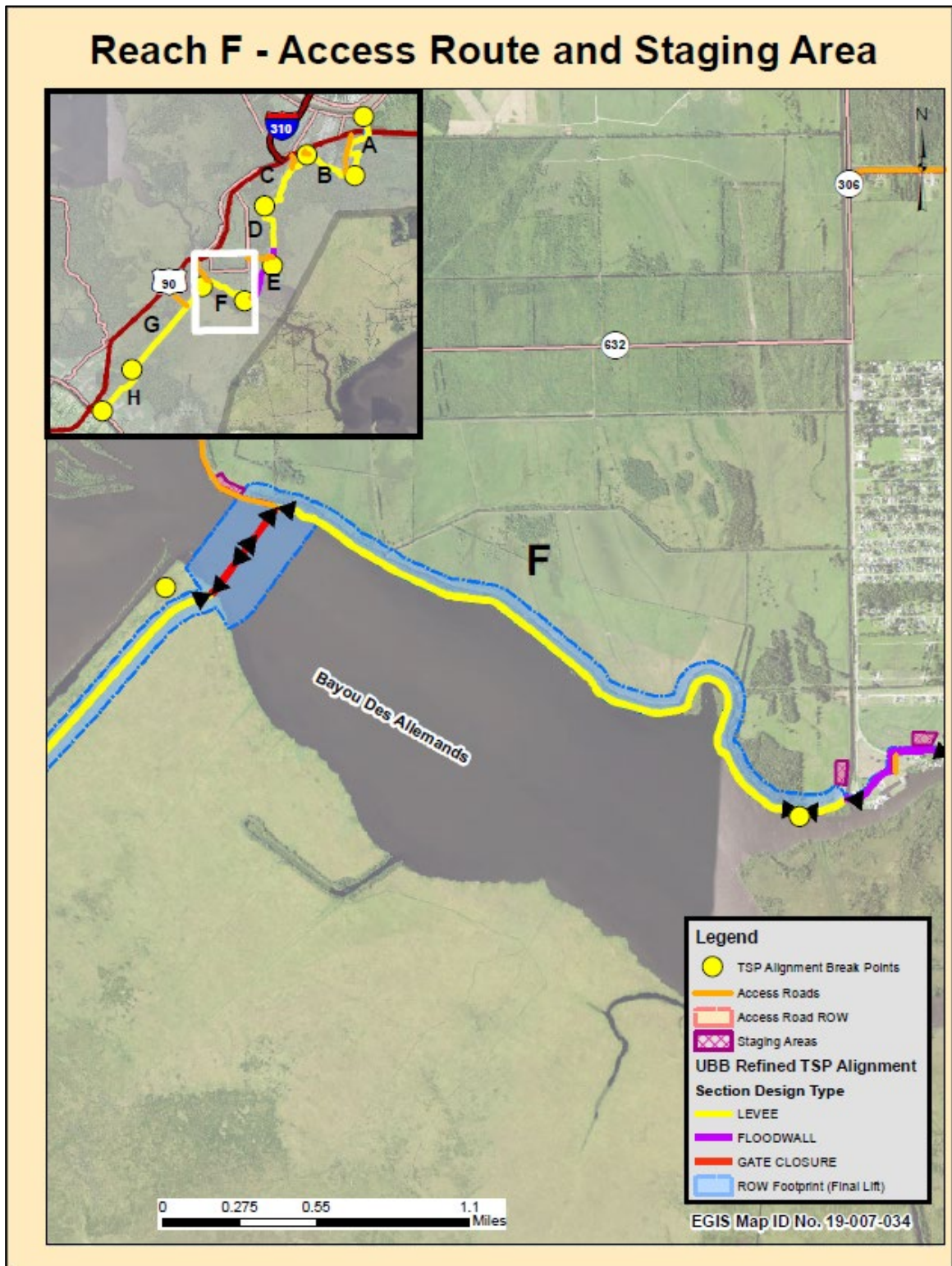


Figure 4-20. Reach F Access Road and Staging Area

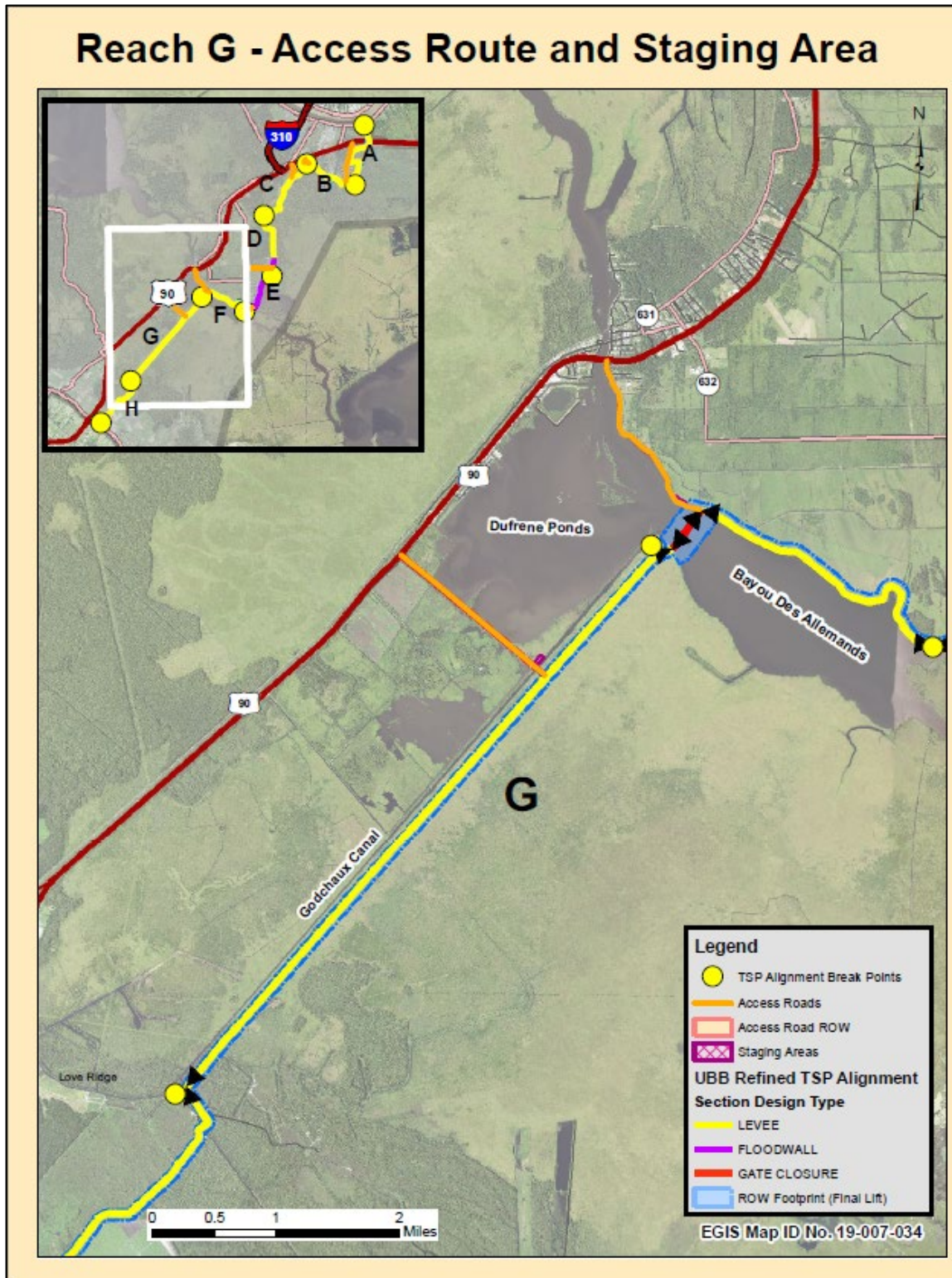


Figure 4-21. Reach G Access Road and Staging Area

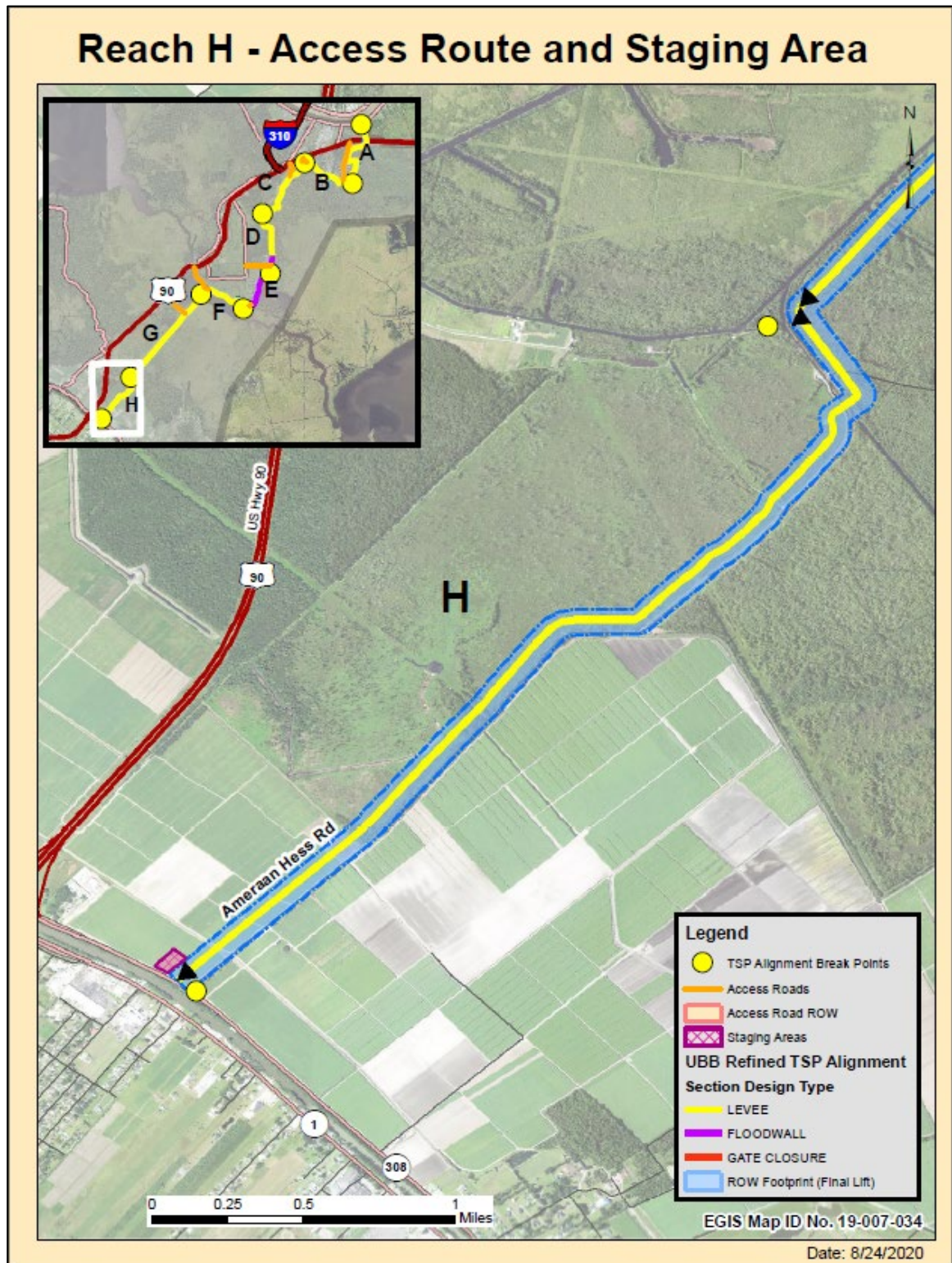


Figure 4-22. Reach H Access Road and Staging Area

4.9.3 Type of Equipment for Construction

Typical complex construction equipment would be used including but not limited to cranes, backhoes, dozers, pile drivers, and rollers.

4.9.4 Existing Footprints and New Levee Construction

There is an existing levee between the Mississippi River and Bayou Des Allemands that is incorporated into the levee construction. Nearly all of the existing levee footprint including existing right of way would be used in the new construction. The levee would be offset from the side opposite the water (Davis Pond Canal, existing St Charles Levee Canal, the Paradise Canal, and Bayou Des Allemands). The levee extending between Bayou Des Allemands and Raceland does not have an existing levee. Refer to Table 4-8 for these earthen levee measurements. The following table does not incorporate T-wall widths in which 80 feet of ROW is designated for the construction.

Table 4-8. Earthen Levee Footprint Widths

Reach	Existing Levee	2026 Construction		Final Lift Construction	
	Levee including ROW (ft)	Toe-To-Toe (ft)	Levee including ROW (ft)	Toe-To-Toe (ft)	Levee including ROW (ft)
A, Davis Pond	285	125	190	173	238
A	100	125	190	236	301
B	100	125	190	236	301
C	100	125	190	236	301
D	100	125	190	173	238
E	75	122	187	244	309
F	130	169	234	244	309
G	0	170	250	170	250
H	0	170	250	170	250

The ROW included in the levee design is for temporary construction of the levees.

4.9.5 Nonstructural Plan to Address Induced Flooding from the TSP

A couple of different nonstructural measures were evaluated for the nonstructural plan to mitigate induced flooding. These were structure raisings and dry proofing of nonresidential structures along with acquisitions (buyouts). It was a PDT decision not to incorporate relocations and flood warning systems into the formulation. To reduce the residual risk to the TSP, PED phase structure acquisition (buyouts) was selected until more information can be collected in the impacted areas. The 1 percent AEP design levee is estimated to induce flooding in the communities of Bayou Gauche, Gheens, and Mathews, which are located outside of the system on the east side of the levee. The induced flooding is greatest within the community of Bayou Gauche, which is directly adjacent to the levee. This area is

estimated to receive 1 to 1.5 feet of induced flooding under existing conditions and 2 to 4 feet under future conditions. In order to mitigate for the induced flooding, 64 residential structures in Bayou Gauche will be acquired. Due to the presence of existing or proposed flood risk reduction measures in Gheens and Mathews, the extent of induced flooding in those communities is more uncertain and will be investigated further in the PED phase of the study. Currently, it is estimated that 173 residential structures will be acquired in Gheens. In Mathews, it is estimated that 33 residential structures and 5 commercial structures will be acquired.

4.10 CONFIRMATION OF OPTIMIZED ALTERNATIVE 1, HIGHWAY 90 – SEGMENT 1 EXTENSION AS THE TSP

Due to the increases in construction costs and OMRR&R, there were concerns of whether or not Alternative 1, Highway 90 – Segment 1 Extension, required a reevaluation against other alternatives to confirm it was still the NED component of the plan. The selected plan does obtain positive net benefits, but during final technical reviews there were questions of whether or not other measures or other alignments discussed in Section 4.3 would have achieved higher net benefits if carried forward through feasibility design. A review of the initial array of alternatives and final array determined that we would have seen similar cost and benefit changes with the other alternatives. Also many of the earlier Alternatives had net benefits that were below unity. Although the plans could have positive benefits with updated H&H evaluations, the expected rate of change (benefits/cost) would be expected to change similarly across all alternatives, limiting to chance that another alternative would have been identified as the NED plan.

Section 5

Environmental Consequences

In accordance with NEPA section 1502.16, this chapter includes the scientific and analytic basis for comparison of the considered alternatives identified in Section 4. Accordingly, this chapter presents each alternatives' potential impact on the resources identified in Section 3 to include any adverse environmental effects that cannot be avoided, and the cumulative effects of proposed actions.

Note: As discussed in the previous section, Section 4.8 described the additional planning efforts that followed the 1st draft report. These additional planning efforts allowed the team to modify and further refine features identified in the TSP, however the PDT determined that there was a need to go back out to public review because a significant increase in environmental impacts was noted. Table 4-7 in Section 4.8 shows the general changes between the TSP under the 1st draft report and 2nd draft report. The updated changes in environmental consequences are discussed in sections below.

5.1 SUMMARY OF ENVIRONMENTAL CONSEQUENCES BY EACH ALTERNATIVE

This section describes the environmental consequences associated with implementing the final array of alternatives and contains a brief summary of the effects of the proposed alternatives. A more detailed comparison is contained in Appendix C. The analyzed alternatives include:

- No Action Alternative
- Alternative 1: Hwy 90 - Segment 1 Levee Extension
- Alternative 2: Hwy 90 – Full Alignment

5.2 ENVIRONMENTAL IMPACTS

5.2.1 Future without Project Conditions (No Action Alternative)

Under the No Action Alternative, wetlands and other surface waters, wildlife, threatened and endangered species, fisheries, aquatic resources, water quality, EFH, cultural resources, recreational resources, aesthetic resources, air quality, noise, HTRW, socioeconomics/land use, environmental justice, transportation, navigation, and commercial fisheries, would not be directly impacted from construction.

Without implementation of the proposed action, fresh marshes in the study area would likely remain relatively healthy, provided salinities do not increase and SLR remains relatively low. Increases in salinity or rapid SLR would likely result in gradually increasing marsh loss. Continued operation of the Davis Pond Freshwater Diversion could help preclude detrimental salinity increases. However, under the higher SLR scenarios, continued loss of

middle and lower basin marshes would allow tidal exchange to increase project area salinities, despite Davis Pond Diversion freshwater inputs.

Fish and wildlife resources that use area marshes may initially benefit from increased marsh loss because degradation would convert project area marshes having no internal open water to a complex with more interspersed internal water areas. With continued marsh loss however, fish and wildlife habitat quantity and quality would decrease, thereby reducing fish and wildlife abundance. As lower basin marshes continue to degrade, estuarine-dependent fisheries would increasingly seek to utilize upper basin marshes and degrading forested wetlands. This would partially offset the loss of nursery habitat in the middle and lower basin and extend the period of high Barataria Basin estuarine fisheries production. But eventually, should upper basin wetlands degrade sufficiently, fisheries production would decrease substantially.

Because of semi-permanent or permanent inundation, a majority of the upper basin cypress-tupelo forests are unsustainable and would gradually thin out and convert to marsh or open water. If rapid salinity increases occur, the mortality of cypress would be accelerated and impacted swamps would be more likely convert to open water rather than marsh. The bottomland hardwoods, already suffering from excessive inundation, would convert to degraded swamp, scrub-shrub, or marsh. Migratory songbirds that use these coastal forests as important stop-over habitat when migrating northward across the Gulf of Mexico, would have to fly further north to encounter suitable stop-over habitat. Resident forest-dependent wildlife would be gradually displaced to adjoining developed areas and there suffer from loss of food resources and increased mortality.

Under future without project conditions, no impacts to threatened or endangered species would be expected to occur; however, the opportunity for the Barataria Basin to provide habitat for threatened or endangered species in the future would most likely diminish. Existing conditions would persist and listed species would likely continue to be subject to institutional recognition and further regulations.

Without intervention, communities within the study area would continue to be at risk from high water events induced by coastal storm surges and rainfall events. Visual resources would continue to evolve from existing conditions as a result of both land use trends and natural processes over the course of time. Waterways would continue to swell and overflow seasonally. Communities near these waterways would continue to experience high water events. Land loss would likely continue and there could be an overall loss of habitat within the system that once provided cover, resting, nesting, and foraging habitat. Where tranquil and entrancing shorelines once lined with native flora and fauna flourished there could be additional expanses of open water.

Recreational resources would continue to evolve from existing conditions as a result of both land use trends and natural processes over the course of time. Land loss would likely continue and there could be an overall loss of habitat within the system that once provided cover, resting, nesting, and foraging habitat. The loss of these habitats, and the effect such losses would have on wildlife and aquatic species, could cause recreational resources in the basin to transition. The study area has traditionally provided excellent freshwater fishing and,

in recent years, because of the increased salinity levels, anglers have been able to catch saltwater species much farther inland than in the past.

5.2.2 Future with Project Conditions (Construction Alternatives)

Table 5-1 identifies those resources located in the project area that would be temporarily or permanently impacted, directly or indirectly, by construction. A more detailed description of the impacts to these resources may be found in Appendix C.

Table 5-1. Impacts to Relevant Resources from Construction Alternatives

Relevant Resource	Impacted	Not Impacted
Wetlands	X	
Aquatic Resources/Fisheries/Water Bottoms	X	
Essential Fish Habitat		X
Wildlife	X	
Threatened and Endangered Species		X
Cultural Resources		X
Recreational Resources		X
Aesthetics	X	
Air Quality	X*	
Water Quality	X*	
HTRW		X
Socioeconomics		X
Environmental Justice		X
Noise	X	

*Impacts are temporary in nature

Of those resources in the project area, air quality, water quality, HTRW, and environmental justice would suffer no impacts or only temporary minimal impacts and are therefore not discussed further.

5.2.2.1 Natural Environment Impacts

5.2.2.1.1 Wetlands

Alternative 1 – Hwy 90 - Segment 1 Levee Extension

Alternative 1 – Hwy 90 - Segment 1 Levee Extension Alternative 1 is a structural alignment constructed to a 1 percent AEP (100-year future design) that takes place in reaches A through H. Alternative 1 is 30.4 miles long and involves construction of new levees and floodwalls, levee lifts along the existing St. Charles Parish and Sunset Drainage District

levees, and construction of a 270-foot-wide barge gate to preclude storm surge flooding within the protected area. Levees in this alternative would be constructed to an elevation of 14.5 to 16 feet, and would be up to 190 feet wide in the marshes southwest of Bayou Des Allemands and 260 feet wide along the existing St. Charles levee. A 40-foot-wide right of way would be established on both sides of the levee footprint in marshes.

Wing walls on the floodgate structure would include 12 auxiliary drainage gates to provide a total cross-sectional area greater than that at the existing railroad crossing located adjacent to the U.S. Highway 90 crossing. (Figure 5-1)

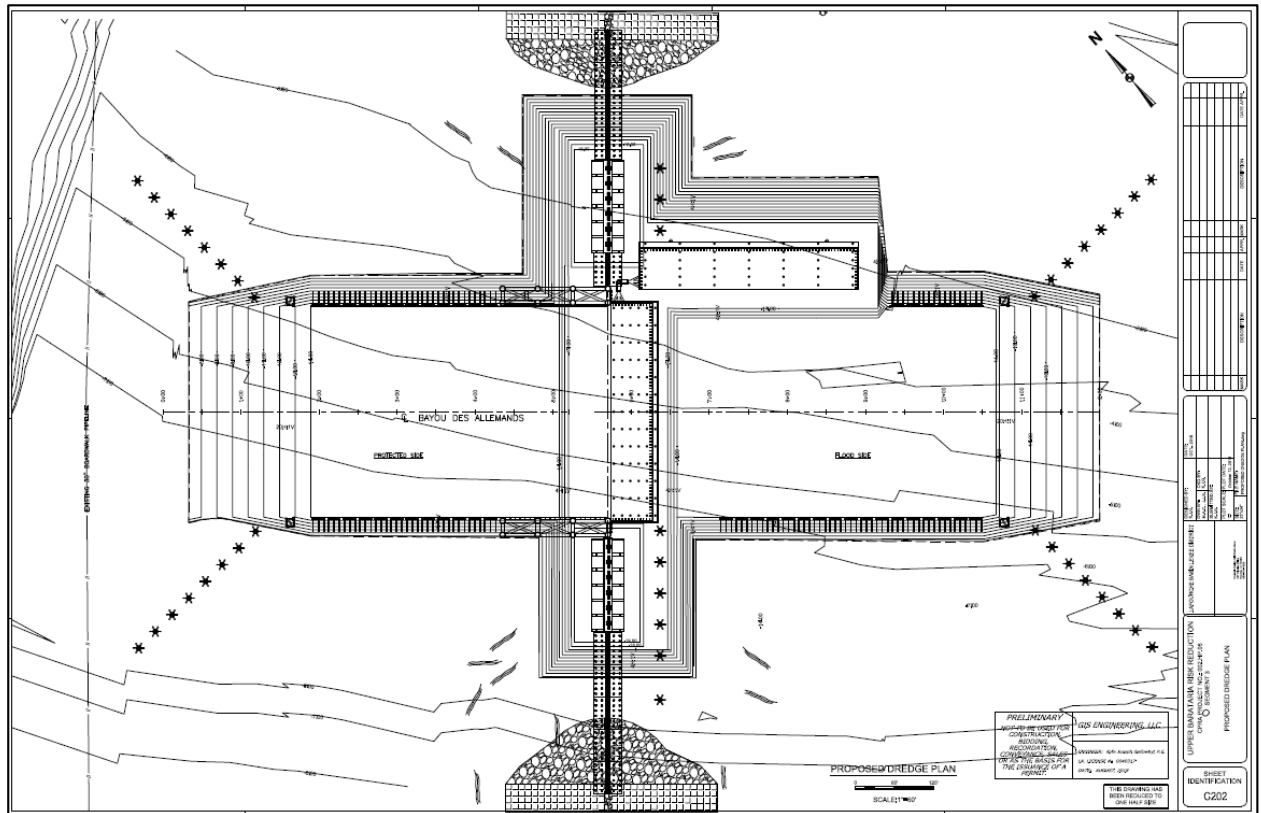


Figure 5-1 Floodgate Structure at Bayou Des Allemands

This would allow for the same conveyance capacity as the railroad (RR) restriction north of the proposed gate location. This would prevent a "bottleneck" situation (which would cause water to stack behind the gate), resulting in elevated water levels on the landside. During normal hydro-meteorological conditions, all gates will remain open to mimic the natural drainage patterns north of Hwy 90. Additional investigation would take place during PED to investigate gate operations outside of normal hydro-meteorological conditions.

Indirect impact to wetlands in the area between U.S. Highway 90 and Hydraulic Reaches G and H of the proposed levee alignment were also investigated (Figure 5-2).

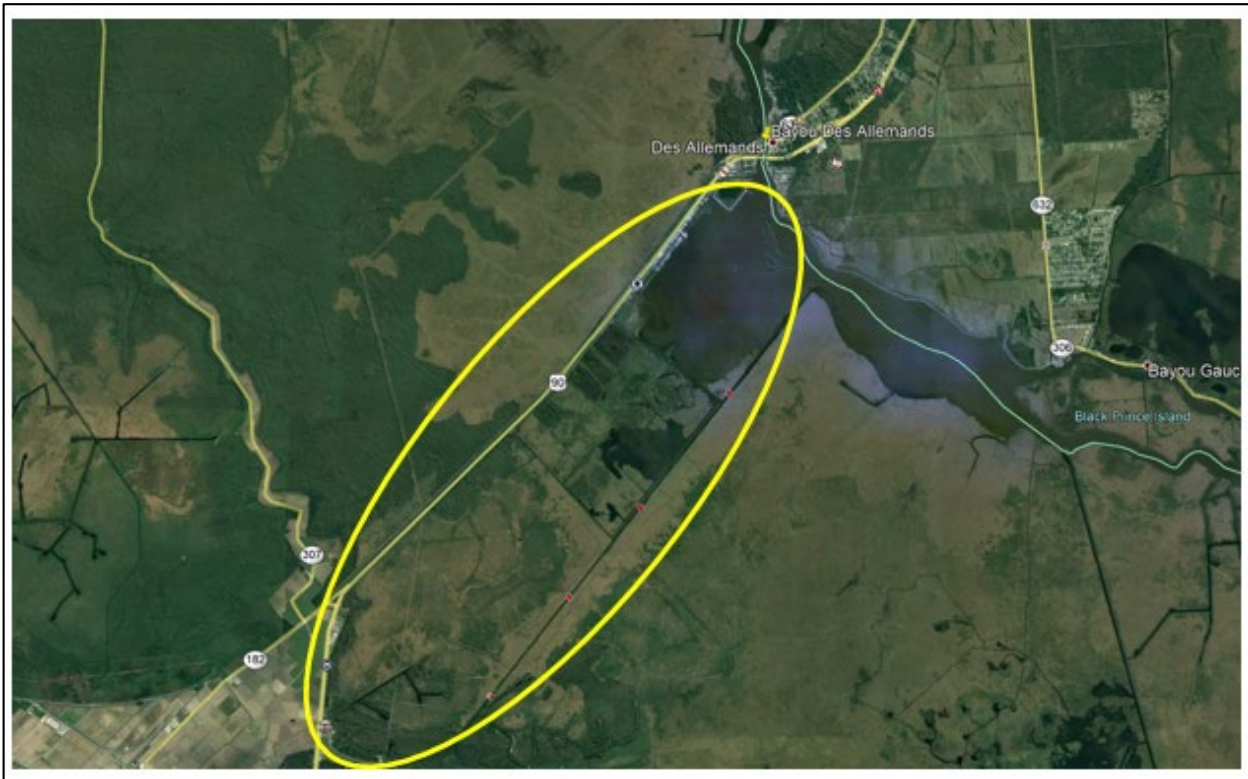


Figure 5-2: Upper Barataria Basin Area of Interest

A HEC-RAS, two-dimensional (2D) hydraulic model was developed of the natural and constructed channels in the area shown on Figure X. A H&H evaluation determined that an inclusion hydraulic control structures along reaches G and H would minimize impact to marshes in this area. Additional information related to the H&H evaluation conducted are included in the engineering appendix. Based on this evaluation, Alternative 1 includes five sets of culverts, 4-6 X 6 foot box culverts with sluice gates (no screens), and 2-84 inch in diameter culverts with sluice gates and a 1-60 inch in diameter culvert with sluice gate (no screens through the levee in Reach G and Reach H (southwest of Bayou Des Allemands) to maintain water exchange across the marsh and mitigate any impacts to the existing habitat. As stated above additional investigation would take place during PED to verify these assumptions, and ensure that the timing and flows match the existing conditions in both areas, above and below Hwy 90.

Implementation of Alternative 1 would result in a need for approximately 725 acres of land in Reaches A through H during initial construction (the first levee lift) of the levees and floodwalls, which would occur in the year 2026. A second levee lift for reaches A, B, C, D, F, AR, and G, which is required to reach the 100 year level of protection, would result in a need for approximately 344 additional acres of land. A third and final lift for Reach E would require another 5 acres. Although there is currently no estimated schedule for the second and third lifts, constructed in its entirety, Alternative 1 would require a total of approximately 1,074 acres of land for construction.

Of the approximately 1,074 acres of land needed for Alternative 1, approximately 292 acres of bottomland hardwood forest (BLH) impacts, 168 acres of cypress-tupelo swamp impacts, 267 acres of fresh marsh impacts, and 95 acres of water bottom would be impacted as a result of construction. BLH impacts would occur within the forced drainage area of the Sunset Drainage District. A small acreage of the Paradis Mitigation Bank, located within that forced drainage district, would be impacted. Swamp and BLH on the flood side of the St. Charles levee would also be impacted.

Marsh impacts would occur primarily southwest of Bayou Des Allemands where a new levee would be constructed across the marsh. Small amounts of fresh marsh impacts would occur along the St. Charles levee, where inundation has converted former BLH to marsh. A complete breakdown of acres of direct construction impacts by region, habitat type, and alternative is provided in Appendix C – Environmental Information. Wetland mitigation is discussed in Appendix E – Mitigation Plan.

Alternative 2 – Hwy 90 Full Alignment

Alternative 2 takes place in Reaches A through H, measures 30.4 miles long, and incorporates all of the Alternative 1 structures: however, this alternative would be constructed to an elevation of 8.5 feet with a maximum levee base footprint of 200 feet. Wetland impacts from levee construction in Alternative 2 would be similar to Alternative 1; however, construction of Alternative 2 would result in an overall reduction in these impacts by 337 acres as a result of the smaller footprint. Implementation of alternative 2 would cause direct permanent impacts to approximately 737 acres impacted as a result of construction of the levee, floodwalls, barge gate and fronting protection.

Of the approximately 737 acres of impact associated with Alternative 2, there would be approximately 87 acres of BLH, impacts, 37 acres of cypress-tupelo swamp impacts, 149 acres of fresh marsh impacts, and 95 acres of water bottom impacts as a result of construction. As with Alternative 1, BLH impacts would occur within the forced drainage area of the Sunset Drainage District. A small acreage of the Paradis Mitigation Bank, located within that forced drainage district, would be impacted. Swamp and BLH on the flood side of the St. Charles levee would also be impacted. Wetland mitigation is discussed in Appendix E – Mitigation Plan.

5.2.2.1.2 Aquatic Resources and Water Bottoms

Alternative 1 – Hwy 90 - Segment 1 Levee Extension

Implementation of Alternative 1 would have direct permanent impacts on approximately 94.3 acres of open water habitat from construction of the barge gate and pump station fronting protection. Of the 94.3 acres, approximately 74.3 acres of shallow open water bottom habitat in Bayou des Allemands would be impacted by placement of the barge gate and approximately 20 additional acres of water bottoms would be impacted from construction of fronting protection along the pump stations. Direct impacts to aquatic resources and water bottoms would be in the form of permanent physical alterations to open water bottom habitat and temporary increases in turbidity in the water column during construction activities.

It is anticipated that mobile fish species would avoid the project area during construction of the gate and fronting protection, thereby minimizing direct impacts to those species. Because Bayou des Allemands is a naturally turbid environment that resident fish species have generally adapted to, the effects of turbidity and suspended solids on fisheries in the area during construction would likely be negligible and could be avoided by mobile fish species, if necessary. Less mobile fish and benthic species in the area would experience demise as a result of dredging activities associated with the gate construction; however, it is believed these species would gradually recolonize the area adjacent to the gate post construction.

The current velocities at the location where the gate would be constructed are approximately 5.7 ft/s under normal conditions. With construction of the gate, which would create an opening approximately the same width as Bayou des Allemands at Hwy 90, it is anticipated that the existing velocities would be approximately 5.4 ft/s under normal conditions. This small increase in velocities is not anticipated to impact fisheries species. However, reduced flow, reduced tidal amplitude, and periodic high velocities around the flood gates could have long term effects on estuarine habitats and fauna in the study. Modeling conducted in PED will determine if the structures, as currently sized and located, are sufficient to maintain current hydrologic connectivity/tidal interchange. Additionally, larval transport modeling would be conducted to determine the project's effects on the movement of species' early life stages through the structure. Inclusion of additional openings would be considered to avoid significant impacts to fish species. Design options would also be evaluated if culverts and the overhead structures associated with the floodgate are found to deter resident species from swimming through those structures. All movement of fish species through the gates would be lost when the gates are in operation; however, these impacts would be short term and only persist until the gates are reopened.

Alternative 2 – Hwy 90 Full Alignment

Alternative 2 takes place in Reaches A through H and incorporates all of the Alternative 1 structures; however, this alternative would be constructed to an elevation of 8.5 feet with a maximum levee base footprint of 200 feet. Levee footprint impacts from Alternative 2 would be similar to Alternative 1, but reduced as a result of the smaller footprint. Impacts associated with the construction of the barge gate and additional control structures would be the same as Alternative 1 as the footprint of that structure would likely not change with a reduced height.

5.2.2.1.3 Essential Fish Habitat (EFH)

Alternative 1 – Hwy 90 - Segment 1 Levee Extension

Estuarine emergent wetlands are the primary type of EFH that would be impacted with construction of Alternative 1. Construction of the levee feature would impact estuarine emergent wetlands, thus affecting post-larval and sub-adult brown and white shrimp and post-larval and sub-adult red drum. Brown shrimp, white shrimp, and crabs may be directly impacted through the filling of shallow open water areas with dredged materials; however, these species could potentially benefit indirectly from the abundance of introduced detritus

and subsequent food resources from these materials. Where tidally-influenced waters designated as EFH would be converted to a non-tidal elevation, loss of EFH would result. However, these impacts would be considered minimal when compared with the size of the basin and similar EFH located in the project vicinity. EFH losses would be quantified and presented in the final EIS report.

Alternative 2 – Hwy 90 Full Alignment

Impacts from Alternative 2 would be similar to Alternative 1; however, impacts to EFH from construction of the levees would be reduced as a result of the smaller levee footprint.

5.2.2.1.4 Wildlife

Alternative 1 – Hwy 90 - Segment 1 Levee Extension

As construction activities commence, there is the potential for noise and construction activities to displace terrestrial wildlife occupying nearby marsh and BLH forested areas; however, this would be a temporary disturbance, with wildlife likely to return following the completion of levee construction. Migratory waterfowl and other avian species in the area would likely be temporarily displaced from the project area. These species would not likely be adversely affected as these species would be expected to move to existing adjacent habitat areas during construction activities. The construction of levees and floodwalls would reduce the marsh, BLH and swamp habitat in the area by converting the area within the construction footprint to grassland and floodwall. While this would reduce the available foraging and nesting habitat for some avian species, portions of the basin adjacent to the project area may contain similar habitats that could be utilized by these species.

Alternative 2 – Hwy 90 Full Alignment

Impacts from Alternative 2 would be similar to Alternative 1; however, impacts to wildlife from construction of the levees would be reduced as a result of the smaller levee footprint.

5.2.2.1.5 Threatened and Endangered Species and Other Protected Species

Alternative 1 – Hwy 90 - Segment 1 Levee Extension

Given that there is no critical habitat located within the project area, implementation of Alternative 1 would not be expected to have adverse impacts to T&E critical habitat. There is the potential that construction of the barge gate could have minimal impacts on the West Indian manatee, which may occasionally occur in and around the project area. It is assumed that any potential impacts associated with displacement of West Indian manatee during project construction would be minimal because of the immense amount of similar and more preferable habitat located outside of the project vicinity. Any West Indian manatee(s) that potentially occur within the project area would likely move to other areas with more suitable habitat and foraging opportunities.

To ensure there are no adverse effects to any T&E species potentially occurring in the area, construction guidelines including manatee protection measures would be placed within the

plans and specifications. A Section 7 Endangered Species Act consultation memo and coordination with USFWS on the potential impacts construction may have on the West Indian manatee is currently ongoing.

Alternative 2 – Hwy 90 Full Alignment

Impacts from Alternative 2 would be similar to Alternative 1; however, impacts from Alternative 2 would be reduced as a result of the smaller footprint. The same protection measures outlined for Alternative 1 would be followed for Alternative 2.

5.2.2.1.6 Cultural Resources

Alternative 1 – Hwy 90 - Segment 1 Levee Extension

The construction footprint has potential to cause direct impacts to any cultural resources that exist within it, via required processes of excavation and construction. Indirect impacts of construction can affect cultural resources because of changes to the water and drainage patterns that have existed previously. Cultural resources survey has occurred on or near much of the proposed alignment from Davis Pond to Paradis, and cultural resources are not common. The Alternative 1 Alignment narrowly misses site 16SC46, a Coles Creek earth midden. Site 16SC43 is a Coles Creek shell midden and intersects the Alignment, which is anticipated to adjust in avoidance of the site during PED phase. Adjacent to Lac des Allemands and in some surrounding areas, cultural resources surveys are necessary to identify existing cultural resources. The nature and extent of cultural resources surveys will be defined by Stipulations of a Programmatic Agreement, currently being negotiated by the Corps of Engineers, the Louisiana State Historic Preservation Officer (SHPO), the Advisory Council on Historic Preservation (ACHP), and Federally-recognized Tribes. The Stipulations of the Programmatic Agreement will designate how cultural resources surveys will occur, and what further investigations must occur if cultural resources cannot be avoided during PED phase of this project.

Alternative 2 – Hwy 90 Full Alignment

Impacts would be similar to those described for Alternative 1.

5.2.2.1.7 Recreation Resources

Alternative 1 – Hwy 90 - Segment 1 Levee Extension

Consumptive and non-consumptive recreation resources would be directly impacted by wetland habitat transitions. Implementation of Alternative 1 would have direct, permanent impacts on approximately 1,074 acres of habitat as a result of construction of the levees, floodwalls, and control structures. During construction, there could be short-term indirect impacts to recreational resources along the immediate levee area, temporary access roads, and staging areas. Mobile wildlife species associated with hunting and fishing may attempt to move from the area of influence. Non-consumptive recreation resources relating to sports and leisure could be impacted by noise and/or dust associated with construction activity.

The St. Charles Parish Levee Lift is in close proximity to the Rathborne Park Development in St. Charles Parish. This park was a recipient of funding in 2014 from the Land Water Conservation Fund. All indirect impacts would be avoided, minimized, and reduced to the maximum extent practicable and mitigated as necessary.

Alternative 2 – Hwy 90 Full Alignment

Impacts from Alternative 2 would be similar to Alternative 1. Alternative 2 would decrease the footprint by 317 acres overall and include a reduction in the height of the levee design elevation. Impacts associated with the St. Charles Parish Levee Lift would remain the same.

5.2.2.1.8 Aesthetics

Alternative 1 – Hwy 90 - Segment 1 Levee Extension

As stated previously, Alternative 1 consists of levee and floodwall (T-Wall) construction east of Des Allemands along the Paradise canal, one roller gate structure at Bayou Gauche, and one barge gate structure across Bayou Des Allemands. Direct impacts to visual resources would be minimal as most of the site is remote and public access is limited. The barge gate structure across Bayou Des Allemands would be visible from the channel by boaters and from the Highway 90 Bridge. Bayou Des Allemands from Lac Des Allemands to Lake Salvador is designated a Natural and Scenic River with regards to the Louisiana Scenic Rivers Act (LA R.S. 56:1840). The man-made structure may be considered obtrusive against a tranquil and entrancing shoreline. However, man-made structures currently occupy stretches of shoreline and multiple bridges cross Bayou Des Allemands just north of the proposed barge gate structure.

Alternative 2 – Hwy 90 Full Alignment

Impacts from Alternative 2 would be similar to Alternative 1. Alternative 2 decreases the footprint by 317 acres overall and includes a reduction in the height of the levee design elevation. Impacts associated with the St. Charles Parish Levee Lift would remain the same.

5.2.2.2 Human Environment

5.2.2.2.1 Socio-economics

Alternative 1 – Hwy 90 - Segment 1 Levee Extension

There would be negligible direct impacts to socio-economic resources. Two hundred and seventy-five structures would potentially be acquired in order to mitigate for induced flooding caused by the alternative. There would be small scale, localized disruptions to community cohesion in the communities of Mathews, Gheens, and Bayou Gauche, as those residents whose houses were acquired would need to relocate. Also, there would be some small scale, localized disruptions to business due to the acquisition of a warehouse, two clubhouses, and two retail establishments. Additional discussion related to the risk and uncertainty around the induced flooding can be found in Section 6.8.1 “Risk of Induced Flooding Outside the Project”

Alternative 2 – Hwy 90 Full Alignment

Impacts from Alternative 2 would be similar to Alternative 1.

5.2.2.2 Transportation

Alternative 1 – Hwy 90 - Segment 1 Levee Extension

There would be minor, temporary, direct impacts to transportation during construction in the form of increased traffic on streets and highways in the study area from workers and construction vehicles. This increased traffic could result in increased congestion on the roadways during construction.

Alternative 2 – Hwy 90 Full Alignment

Impacts from Alternative 2 would be similar to Alternative 1.

5.3 CUMULATIVE EFFECTS ANALYSIS

The Council on Environmental Quality (CEQ) Regulations define cumulative impacts 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. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.” (40 CFR §1508.7).

The CEQ issued a manual entitled Cumulative Effects under the National Environmental Policy Act (CEQ, 1997). This manual presents an 11-step procedure for addressing cumulative impact analysis. The cumulative effects analysis concentrates on whether the actions proposed for this study, combined with the impacts of other projects, would result in a significant cumulative impact, and if so, whether this study’s contribution to this impact would be cumulatively considerable.

The following describes how the study is consistent with the CEQ’s 11-step cumulative effects analysis:

- Step 1: This document has identified in previous sections the significant effects and issues associated with implementing the proposed action by documenting the direct and indirect effects of the proposed action on significant environmental resources.
- Step 2: This document has identified the geographic scope of the analysis as the area consisting of Ascension, Assumption, Jefferson, Lafourche, St. Charles, St. James, and St. John the Baptist Parishes including the migratory species frequenting the geographic area.
- Step 3: The time frame of the analysis consisted of the historic, existing, future without project and future with project conditions for the identified significant natural and human environmental resources.

- Step 4: Other actions affecting the significant natural and human resources (the significant resources have been previously described).
- Steps 5 and 6: The responses of each identified significant resource to change has been documented for each identified significant human and natural resource, as have the factors or stressors potentially affecting significant human and natural resources, and if appropriate, their relationship to regulatory thresholds (e.g., air quality standards; threatened and endangered species and their designated critical habitat).
- Step 7: The baseline condition has been documented for each significant human and natural resources including the historic, existing, and future without project conditions
- Step 8: The incremental project-induced impacts would be in addition to impacts from other actions such as navigation, commercial and recreational fisheries, continued oil and gas exploration/extraction/production/refining, habitation and employment, other coastal protection and restoration activities, and other human activities in the project area.
- Step 9: The magnitude and significance of cumulative effects on identified significant resources are identified for study area influences on significant resources.
- Step 10: The plan has been evaluated to ensure steps were taken to avoid and minimize impacts to significant resources. During plan formulation steps were taken to remove, modify or add alternatives to avoid, minimize, reduce, or mitigate potential significant effects.
- Step 11: Monitoring effects of the proposed action and adaptation of management are identified and described in the Adaptive Management and Monitoring (AM&M) Plan. This analysis considers known past, present, and reasonably foreseeable future nonstructural hurricane storm damage risk reduction projects and ecosystem restoration projects over a 50-year period of analysis from 2025 to 2075.

Cumulative effects are not caused by a single project, but include the effects of a particular project in conjunction with other projects (past, present, and future) on the particular resource. Cumulative effects are studied to enable the public, decision-makers, and project proponents to consider the “big picture” effects of a given project on the community and the environment. In a broad sense, all impacts on affected resources are probably cumulative; however, the role of the analyst is to narrow the focus of the cumulative effects analysis to important issues of national, regional, and local significance (CEQ, 1997).

The causes of coastal wetland degradation and loss have been researched extensively and are well documented. Nationwide coastal wetland degradation and loss is expected to continue due to many different, and often interacting factors, including: agriculture, nutrient enrichment, drainage, climate change, human development, pollution, invasive species, world-wide eustatic sea level rise, subsidence, navigation channels, oil and gas activities, saltwater intrusion, and hurricane and storms to name a few.

The processes of coastal wetland loss in the Study Area can result from the gradual decline of marsh vegetation due to storm surge events, as well as from inundation and saltwater intrusion; both of which can eventually lead to complete loss of marsh vegetation. As marsh vegetation is lost, underlying soils are more susceptible to erosion and are typically lost as well, leading to an increase in open water areas and precluding marsh regeneration. Significant accretion of sediments is then required in order for marsh habitat to reestablish. Perhaps the most serious and complex problem in the study area is the rate of land and habitat loss. The effects of hurricanes have increased effect on marsh loss. Coastal Louisiana has been and will continue to be subjected to stresses which will continue the decline of environmental resources. RSLR would expose additional shoreline areas to erosive forces into the foreseeable future.

The levee, floodwall and barge gate construction would provide protection in the form of decreased risk to human life during flooding events from storm surge; aid in the reduction of flood risk and damages to residential, commercial, historic, cultural, and critical assets and infrastructure; limit economic damages and improve economic resiliency of the local economy and communities; convert flood zones to help minimize insurance expenses; and help reduce recovery time from high water events that make evacuation routes and other critical roadways impassable.

The currently known significant long term adverse cumulative effects expected from implementing the proposed plan would be associated with the conversion of existing marsh, swamp and bottomland hardwood habitats to grass covered levee habitat and floodwalls. However, conversion of marsh, swamp and bottomland hardwood habitats to protection grass covered levee habitat would provide greater long-term positive benefits when considered within the context of the ongoing extensive land loss throughout coastal Louisiana and the project area which is converting extensive areas of BLH to swamp, marsh and shallow open water. Additional long term cumulative impacts would be related to a reduction in existing habitat used by various terrestrial and aquatic organisms for shelter, nesting, feeding, roosting, cover, nursery, EFH and other life requirements. Additional impacts would be related to construction of the 30.6 miles of levee and floodwalls and the dredging and construction associated with the proposed barge gate. Dredging and construction related impacts are generally temporary and localized and include: increased turbidity and total suspended sediments, organic enrichment, chemical leaching, reduced dissolved oxygen, and elevated carbon dioxide levels. Following construction, these temporary and localized effects would return to pre-construction levels.

Long-term positive cumulative impacts are expected to occur as the proposed measures help protect the area north of the alignment from the effects of coastal storm surge. Other long term, indirect impacts include structures for flood control, as well as alterations to canals and their associated spoil banks which could invariably alter the hydrology of these wetland systems, often interfering with normal tidal flooding and drainage and modifying overland water flow.

Section 6

Tentatively Selected Plan Summary

As described in section 4.9, the Upper Barataria Basin TSP is a structural alignment constructed to a 1 percent AEP (100-year future design) and totaling a little over 161,300 feet (30.6 miles) in length. The system starts in Luling where it connects the Mississippi River Levee through the Davis Pond Diversion Structure West Guide Levee. Continuing south, the TSP improves upon and updates deficiencies in the St. Charles Parish Levee, crosses Bayou Des Allemands with a 270-foot barge gate structure, and continues parallel to US Highway 90 before it ties into high ground across the Barataria Basin near Raceland.

The proposed levee is designed to HSDRRS specifications with a 1V:4H and a 10 foot crown, with multiple levee lifts authorized over the initial 50 years. The first lift is projected to occur in 2026 and would raise the levee to an elevation of 14 feet except in hydraulic reaches F and H where it would be constructed to 16 feet elevation after settlement. Subsequent lifts would sustain-maintain the 1 percent AEP over the initial 50 years of the authorized project. Material settlement over this period has also been incorporated into the material quantities for each of the alignment's hydraulic reaches.

Borrow material for construction is proposed to come from sites estimated to be within 15 miles of where US Highway 90 crosses Bayou Des Allemands. Existing Government borrow sites were not available within the designated distance. Potential borrow sites on farm lands (avoiding swamp and marsh lands) were identified in Raceland, however not all of the lands from the potential pits in the TSP are intended to be used. A total of 5,200,400 cubic yards of soil is needed for the first lift in 2026 and a grand total of 8,812,700 cubic yards is needed over the entire authorized 50 year period to sustain the 1 percent AEP design elevations out to year 2076. It was assumed that 10-15 feet of usable material could be found in these sites. The borrow pit needed for the quantity of soil would be approximately 500 acres. Additional sites would be reviewed in PED.

6.1 MITIGATION REQUIREMENTS WITH TSP

Compensatory mitigation is required for the unavoidable impacts to the environment that are caused by the TSP. Of the approximately 1,074 acres of land needed for TSP, approximately 292 acres of bottomland hardwood forest (BLH) impacts, 168 acres of cypress-tupelo swamp impacts, 267 acres of fresh marsh impacts, and 95 acres of water bottom would be impacted as a result of construction. Additional details related to the mitigation plan are included in Section 7; however, the TSP would include creation and restoration of up to a total of approximately 119.79 AAHUs of fresh marsh, 94.94 AAHUs of BLH and 111.40 AAHU of cypress-tupelo swamp as compensatory mitigation for the impacts resulting from construction of the TSP.

6.2 MONITORING AND ADAPTIVE MANAGEMENT

The TSP has been developed in accordance with USACE planning guidance at ER 1105-2-100 and other applicable USACE policies and regulations applicable to flood risk management studies. The Water Resources Development Act (WRDA) of 2007, Section 2036(a) and U.S Army Corps of Engineers (USACE) implementation guidance for Section 2036(a) (CECW-PC Memorandum dated August 31, 2009: "Implementation Guidance for Section 2036 (a) of the Water Resources Development Act of 2007 (WRDA 2007) – Mitigation for Fish and Wildlife and Wetland Losses") requires Adaptive Management (AM) and monitoring plans be included in all mitigation plans for fish and wildlife habitat and wetland losses. AM is an iterative and structured process which reduces ecological and other uncertainties that could prevent successful project implementation and performance. AM establishes a framework for decision making which utilizes monitoring results and other information, as it becomes available, as a feedback mechanism used to update project knowledge, and adjust management and mitigation actions to better achieve project goals and objectives.

6.3 REAL ESTATE AND RELOCATION REQUIREMENTS

A Real Estate Plan (REP) describing the real estate requirements and costs for the project can be found in Appendix D. The CPRAB will have the responsibility of acquiring all necessary real estate interests for the project and for ensuring that relocation of utilities and facilities are accomplished. The Non-Federal contribution of Land, Easements, Rights-Of-Way, Relocation, and Disposal Areas (LERRD) for this project is estimated to be \$95,989,000 which includes the costs associated with acquisition of real estate interests for structural features, non-structural features, and mitigation. The TSP will potentially require the acquisition of an estimated 270 residential and 5 commercial structures due to the impacts of induced flooding. This was selected as the worst case scenario. See section 6.8.1 Risk of Induced Flooding Outside the Project for additional details. The total estimated costs of \$84,213,000 for non-structural measures should be included in this section. More detailed LERRD required for the project are included in Appendix D, Real Estate Plan. In addition, as part of the NFS responsibility to provide LERRDs for the project, the NFS is responsible for 100 percent the cost of facility and utility relocations which is estimated at a total first cost of \$30,509,000. Because pipelines will be relocated in place, there will be no acquisition of real estate interests required for the proposed relocations for the project. NFS relocation costs are construction costs; these are discussed below in Section 5.5 of this chapter and are also discussed in Section 17 of the Real Estate Plan (Appendix D of this report). Administrative Federal costs of acquisition oversight and review of Non-Federal Sponsor work products is estimated to be \$225,000.

The estimated cost of real estate acquisition for structural features is \$11,866,000. This estimate includes costs associated with acquisition of real estate rights for the levee/T-Walls/gates, access, staging, drainage canals, and pump stations. In total, there is approximately 84,158 linear feet of earthen levee, 12,253 linear feet of floodwall (T-wall) east of Des Allemands along the Paradis Canal, one 45 linear feet roller gate structure at Bayou Gauche, and one 270 linear feet barge gate structure across Bayou Des Allemands

for the TSP. Portions of this footprint are within existing ROW or are owned by local or state government agencies. LERRD not within existing ROW or owned by local government entities is estimated to be owned by 75 private landowners.

LERRD required from private landowners includes perpetual easement for earthen levees, floodwalls, roller gates at two railroad crossings, box culverts and sluice gates; temporary easement for borrow; temporary and perpetual road easement; and temporary staging area.

LERRD required from local government entities includes easement for levee, T-wall, frontage protection, tidal exchange structures, staging area, temporary access road, access within existing ROW, ramp, roller gate, barge gate, culverts, sluice gates, dredging and deposit of material within state waterbottoms. LERRD required from US government includes easement for levee and ramps.

Borrow material for construction is proposed to come from sites estimated to be within 15 miles of where US Highway 90 crosses Bayou Des Allemands. At this time, it is not known if existing Government borrow sites would be available at the time needed for construction that would be located within the designated distance. Potential borrow sites on farmlands (avoiding swamp and marsh lands) were identified near Raceland. It was assumed that 10-15 feet of usable material could be found in these sites. The quantity of area needed for borrow would be approximately 500 acres of agriculture lands.

A final mitigation plan is currently being developed. The acreage needed for mitigation and potential sites has not yet been determined; however, the overall construction cost, reflect the potential need for mitigation based on similar projects. The potential risk for additional LERRD's required from the NFS is depended on the final site selection (private or public lands) or use of existing private mitigation banks.

6.4 PROJECT BENEFITS & NATIONAL SIGNIFICANCE OF THE PROJECT

The TSP is the NED Plan and is estimated to produce nearly \$90 million in average annual benefits. The levee design is at a 1 percent AEP future design elevation. This plan specifically addresses coastal storm surge events. Structures behind the levee alignment would benefit from the lowering of water stages and preventing damages during a coastal storm event. The reduction in water levels would help to lessen the financial and social impacts that tropical storms and hurricanes can cause by reducing the risk of property damage that displaces residents, shuts down commercial and industrial services, and disrupts livelihoods. If structures avoid or experience fewer damages because of the TSP, families and businesses can rebound much more quickly after a tropical event. Examples of this include:

- Increasing the opportunity to return children to school where their residences and schools were not damaged from a hurricane storm surge event
- Reducing lost work days of workers who support the local or regional economy by decreasing the number of hurricane storm events that require repairs to hurricane storm surge damaged houses, businesses and other non-residential structures, by

minimizing the debris from hurricane storm damaged structures that can affect other properties

The TSP would generally improve the opportunity and time necessary for residents, businesses, and government to return to normal function after a hurricane storm event. Under the future without project conditions ~ 6,430 structures would be impacted during a 1 percent AEP event. With the project in place, only ~145 structures would be impacted under the same event. Table 6-1 shows equivalent annual damages and benefits by reach under the future without project and future with project conditions. Figure 6-1, shows the study area reaches impacted by surge and contained structures.

Table 6-1. Study Area Equivalent Annual Damages and Benefits by Reach (FY 20 Price Level; FY 21 Discount Rate; \$1,000s)

Reach	Without Project Damages	Residual Damages	Damages Reduced
1a	15,807	1,111	14,696
1b	147	3	144
1c	6,373	162	6,211
1d	8,594	266	8,328
1e	3,219	101	3,118
1f	10,786	747	10,038
1g	185	2	183
2a	2,722	40	2,681
2b	1,038	16	1,022
2c	5,855	149	5,706
2d	31,121	788	30,333
3a	563	52	511
3b	62	0	62
3c	404	0	404
4a	677	66	611
4b	2,115	103	2,012
5a	385	22	362
5b	4,242	143	4,099
5c	226	20	206
Total	94,519	3,792	90,727

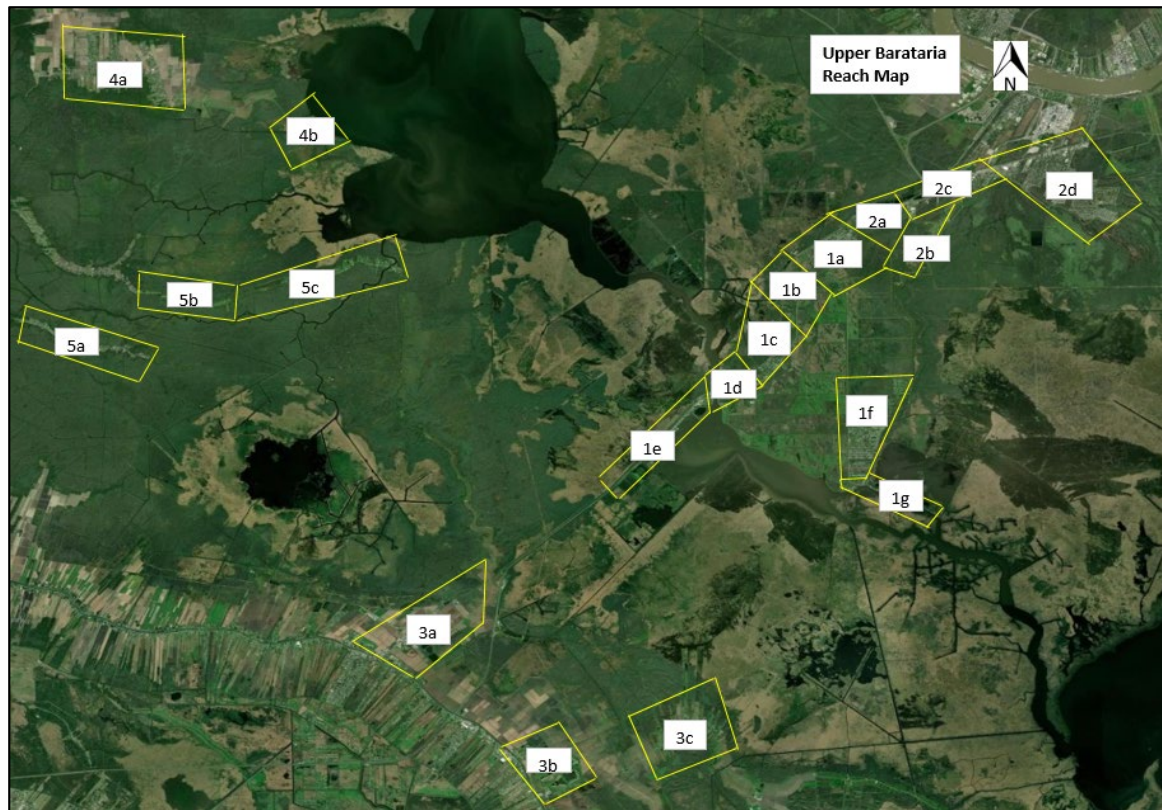


Figure 6-1. Reach Boundaries

The TSP would also provide a level of risk reduction to possible damage of US Highway 90, which is a critical evacuation route for the area from Houma to New Orleans. This would not only aid in evacuation, but in the ability for the region to get supplies back into the area for a more rapid recovery effort. The TSP would also further strengthen the efforts to reduce the level of risk associated with coastal storms in southern Louisiana by connecting into surrounding Federal levees. The alignment ties into the Mississippi River Levee System on the east and on the west ties into Bayou Lafourche where the Morganza to the Gulf alignment will eventually connect, therefore, occupying the gap in the coastal storm risk reduction systems spanning southern Louisiana.

The Hydrologic Engineering Center Flood Damage Analysis (HEC-FDA) Version 1.4.2 certified model was used to calculate the damages for the without project and with project conditions. Overall, nearly \$90 million in annual damages would be prevented with the project in place, under the Intermediate RSLC Scenario.

Net benefits are based on the following benefit categories:

- residential and commercial (structure/content/vehicles/debris removal)
- transportation and infrastructure (highways/streets)

Benefits for TSP are shown in Table 6-2. The table provides the TSP using the Federal FY2021 Fiscal year discount rate (2.5 percent). The study is using the Intermediate RLSC

Scenario to describe expected future storm risks and to present the benefits of the TSP. The RSLC evaluations have been used to establish project size and to evaluate future adaptability. This is consistent with other studies and projects across Louisiana.

Table 6-2. Upper Barataria Basin Benefit Summary (\$1,000s, 2.5% Interest Rate, FY20 Price Level)

(RSLC Scenario)	Equiv Annual w/o Project Damages (2026 – 2076)	Equiv Annual with Project Damages (2026 – 2076)	Equiv Annual Benefits (2026 – 2076)
Low	\$59,233	\$2,105	\$57,129
Intermediate	\$94,519	\$3,792	\$90,727
High	\$203,061	\$7,255	\$195,806

6.5 PROJECT COSTS

For the detailed cost estimate, the cost was compiled using the MicroComputer Aided Cost Estimating System, Second Generation (MCACES 2nd Generation or MII). The detailed cost estimate for the TSP is based on combination of MII's Cost Book, estimator-created site-specific cost items, local subcontractor quotations, and local material suppliers' quotations. The individual components in the cost estimate are outlined in Annex 15 of Appendix A, the Engineering Appendix. Additional information on Real Estate costs is also provided in Appendix D, the Real Estate Appendix. Cost contingencies were developed through a standard Cost and Schedule Risk Analysis (CSRA). Table 6-3 shows the project cost summary. Further discussion of cost estimates and cost apportionment is provided in the sections below. As discussed in Section 6.3, the final mitigation plan has yet to be completed, however the potential cost of the feature is included in the overall cost under the 06 FISH & WILDLIFE FACILITIES account code at this time. As the migration plan is developed for the final report, portions of the cost may have to be borne by the local sponsor as LERRD cost, which would be reflected in a shift of cost from the 06 account into the 01 LANDS AND DAMAGES account.

Table 6-3. Project Cost Summary

	TSP: Alternative 1 – Hwy 90 - Segment 1 Levee Extension 1 percent AEP (100-year future design) (30.6 miles) in length
PED	\$290,094
Construction	\$1,401,154
Lands Easements & ROW	\$98,931
Construction Management	\$155,660
Total Project First Costs	\$1,945,840
Total Average Annual Project Cost*	\$69,769
(\$1,000s, 2.5% Interest Rate, FY20 Price Level)	
* Includes OMRR&R in calculation of Total Average Annual Project Cost	

6.6 OPERATION, MAINTENANCE, REPAIR, REHABILITATION, AND REPLACEMENT (OMRR&R)

The purpose of OMRR&R is to sustain the constructed project and to maintain the stated level of benefits at the completion of construction and throughout the life of the project. The total estimated annual OMRR&R cost for the TSP is \$2,114,800 based on the current Federal FY2021 Fiscal year discount rate (2.5 percent). A majority of the annual OMRR&R costs are based upon sustaining the gate structures. OMRR&R requirements would also include, but not be limited to, annual exercising of all of the closure structures, grass mowing of levee and floodwall right of way, painting of numerous metal surfaces, and general maintenance of drainage structures. The non-Federal sponsor is not obligated to address loss of risk reduction due to RSLC through future levee lifts or structure modification, but they will still be required to repair, rehabilitate or provide replacement of components to maintain the original project benefits. The sections below provide a general overview of the OMRR&R tasks required to sustain the constructed project. As part of PED, a detailed OMRR&R manual will be developed to outline the expected OMRR&R requirements for the TSP. After the District Engineer provides notice of construction completion for the project, or functional portion of the project, the non-Federal sponsor will commence OMRR&R responsibilities associated with the project.

The OMRR&R for the TSP includes, but is not limited to:

- Maintenance and staffing of the gate control for emergency operations related to tropical events. The local sponsors would also be required to coordinate with stakeholders for OMRR&R concerns and evacuation/ emergency action planning.
- Expenses for staffing, training and stockpiling of typical flood fighting materials and equipment needed to respond to typical response events.
- Trial operations of all gates. The cost associated with collecting survey and instrumentation is also included in the OMRR&R estimate.

- Mowing of the grass cover and maintaining a vegetation free zone, a reliable corridor of access and permit proper inspection, manage pests, and inhibit weed encroachment to maintain the health and vigor of the grass stand.
- Drainage structures maintenance items including gate adjustments, gate rehab, clean-out of outfalls, and gate replacement (clean-out of outfalls; annually or pre-hurricane season, gate adjustment/ rehab every 5 year/replacement 10 year).
- Cost associated with floodwall maintenance includes crack repair, repair, replacement of cracked scour protection, waterstop repair, and horizontal sealant at the wall joints. General floodgate maintenance includes repairing damage or rusted areas, repair to galvanized surfaces, rubber gate seals replacement, etc.

The cost associated with the individual components have defined periodic maintenance intervals that will be further developed in the PED phase of this project. For instance, the gate would be exercised periodically, on a defined schedule and in accordance with the completed construction documents.

The previously mentioned OMRR&R is to ensure the features perform their intended purpose as expected during a tropical event. Estimates for routine maintenance and inspection occurring before, during and after hurricane season is included in the cost and will dictate the scope of the major repair work to be performed during unwatering.

The annual OMRR&R cost includes an estimated cost for maintaining mitigation sites once they are developed. The non-Federal sponsor would be responsible for OMRR&R of functional portions of sites as they are completed. On a cost-shared basis, the USACE would monitor completed mitigation to determine whether additional construction, invasive species control, and/or planting are necessary to achieve mitigation success. A monitoring and adaptive management plan will be refined over time to define specific success criteria and monitoring needs for mitigation features. The USACE would undertake additional actions necessary to achieve mitigation success in accordance with the plan and cost sharing applicable to the project and subject to the availability of funds. Once the USACE determines that the mitigation has achieved initial success criteria, monitoring would be performed by the non-Federal sponsor as part of its OMRR&R obligations. If, after meeting initial success criteria, the mitigation fails to meet its intermediate and/or long-term ecological success criteria, the USACE would consult with other agencies and the non-Federal sponsor to determine whether operational changes would be sufficient to achieve ecological success criteria. If instead, structural changes are deemed necessary to achieve ecological success, the USACE would evaluate and take appropriate actions, subject to cost sharing requirements, availability of funding, and current budgetary and other guidance; as well as coordination with the local non-Federal sponsor and resource agencies.

6.7 BENEFIT-COST ANALYSIS FOR THE TSP

The equivalent annual benefits were compared to the annual costs to develop a BCR for the TSP. The initial construction costs (first costs) and an expected schedule of expenditures were used to determine the interest during construction and gross investment cost at the end of the installation period (2025). Construction of the TSP is expected to begin in the year 2021 and to continue through the year 2026, which was established as the base year for

analysis. The OMRR&R activities will begin in the year 2026 and will continue throughout the 50-year period of analysis. Using the FY 2021 Federal interest rate of 2.5 percent, the construction and OMRR&R costs were discounted to the base year and then amortized over the 50-year period of analysis to develop an annual cost for the project. The net benefits for the TSP were calculated by subtracting the annual costs from the equivalent annual benefits. The net benefits were used to determine the economic justification of the TSP. Table 6-4 shows the equivalent annual net benefits for the TSP by benefit category, including the resultant BCR, for each of the three sea-level rise scenarios for the years 2026 through 2076. The study is using the Intermediate RSLC Scenario to describe expected future storm risks and to present the benefits of the TSP. The RSLC evaluations have been used to establish project size and to evaluate future adaptability. This is consistent with other studies and projects across Louisiana.

Table 6-4. Net Benefits Summary for the TSP under RSLC scenarios

Scenario	Low RSLR	Intermediate RSLR	High RSLR
Total AA Costs	69,769	69,769	69,769
Without Project EAD	59,233	94,519	203,061
EAD Reduced Benefits	57,129	90,727	195,806
Net Benefits	-12,640	20,957	126,037
B/C Ratio	0.8	1.3	2.8

6.8 RISK & UNCERTAINTY ANALYSIS

Risk and uncertainty are intrinsic in water resources planning and design. This section describes various categories of risk and uncertainty pertinent to the study. Induced damages and mitigation for economic damages will be further addressed during PED.

6.8.1 Risk of Induced Flooding Outside the Project

Based on the current surge modeling, the 1percent AEP design could increase water levels during storm events by approximately 1 to 1.5 feet over the without project conditions in areas immediately outside the risk reduction system. The induced flooding risk is greatest within the community of Bayou Gauche due to the close proximity to the proposed levee. 64 residential structures in Bayou Gauch were identified as a risk for induced stages. Due to the presence of existing local flood risk reduction measures in Gheens and Mathews, the extent of induced flooding risk in those communities is more uncertain. 173 residential structures in Gheens were identified as a risk for induced stages and in Mathews, an estimated 33 residential structures, and 5 commercial structures were identified as a risk for induced stages. Although areas outside the levee system would already receive damages under the without-project conditions, the alternatives could increase damages during some events. At the current time, additional detailed information regarding the differences in

frequency, depth, and duration of the flooding between the future without-project and future with-project conditions is not available. This detailed information typically would be assessed in light of the uses to which the particular land is zoned, and the appropriate mitigation methods, if any, would be implemented to address the effects of the Federal project.

In order to prevent increased risk to people and structures, which are already located in high risk areas, a preliminary nonstructural compensation plan has been developed as part of the TSP. Mitigation options such flowage easements, structure raising, dry flood proofing of structure, and acquisitions (buyouts) were all reviewed but due of the vast scope of this project and the limited amount of available information at this time, each affected parcel could not be assessed individually to determine what the level of impact would be, and whether that impact would be categorized as a taking of property rights. A worst case scenario (most expensive option) was assumed, which would be acquisitions (buyouts) of structures (270 residential and 5 nonresidential) in the impacted areas. The cost with this scenario has been incorporated into the TSP.

The potential induced damages and mitigation for economic damages would be further addressed during PED. Individual investigation and mitigation for each structure, if appropriate, will be done during PED. Additional factors (height of structures vs. induced stages, type of residential structure, social concerns, etc.) would have to be investigated under PED. Each structure would have to be evaluated under PED to determine if mitigation is appropriate. Further modeling will also be performed during PED to determine whether there is a potential taking. A Takings Analysis will be prepared during PED to address this issue; at that time, it will be determined what real estate interest, if any, would be acquired.

6.8.2 Environmental Factors

6.8.2.1 Relative Sea Level Rise

There is uncertainty about how much sea level change (SLC) would occur in the region. Higher than estimated RSLR could cause salt water intrusion into the study area causing significant changes to the habitat in the study area.

An assessment of RSLR was included in plan formulation and alternatives analysis. The evaluation of RSLR is documented in Appendix A. Calculations based on EC 1165-2-212 determined that the low, intermediate and high rates of RSLR at 2076 are 1.9 feet per year, 2.4 feet per year, and 4.3 feet per year, respectively. The PDT selected intermediate SLR due to the fact that the alternatives were in a similar alignment. It was also assumed that changes in sea level rise would have affected the alternatives equally. Additional sensitivity analysis will be conducted on the TSP in PED phase to measure the impacts of sea level rise on the TSP. Because the project was developed using the intermediate RSLR rate, the TSP would provide more benefits than anticipated should the low RSLR rate result and less benefits with the high RSLR rate.

6.8.2.2 Storms

Risks associated with the TSP are primarily related to the possibility of extreme weather events. The uncertainty of the size or frequency of storms and meteorological events, such

as El Nino and La Nina, cannot be predicted over a set period of time. The storm record is constantly being updated and a large storm such as Hurricane Katrina or a slow moving storm such as Isaac can alter the expected return period for other storms. To reduce the uncertainties of storm events, storms with varying degrees of size, intensity, and path are included in the modeling. By using a long-term record of different storm scenarios, the effects of such storms are incorporated into the modeling. The team is then able to reduce the uncertainty in the determination of project benefits (Appendix A).

6.8.3 Engineering Factors

6.8.3.1 Levee/Structure Failure

The risk associated with the levee/structure system is its stability due to limited (current and previous) soil borings in the area. Soil borings should be taken in PED phase to provide further needed information on the analysis of the earthen levee, associated T-walls, and various gate structures. The levee and other features have been designed to meet USACE specifications.

6.8.3.2 Hydrologic Flows

The risk of running the ADCIRC and SWAN models is the assumption that the models appear to provide a specific response on the TSP in any given scenario however it is only a representative point of reference in a complex system. While the analysis is enhanced by the models, application of the models can introduce error and uncertainty. Calibration and verification efforts are employed so that the models more closely replicate observed changes or at least provide insight into the limitations of the model.

Models are limited by basic, underlying assumptions and uncertainties. Some of the simplifying assumptions include the model parameters. Another uncertainty is that a limited number of storm scenarios are modeled. It is assumed that various storm scenarios over a number of years will represent a much higher indicator of the levees ability to withstand major storm events.

The models also use available historic data to extrapolate future storm conditions and frequency. The size and frequency of storms included in the model are based on statistical analysis but do not account for meteorological changes, such as El Nino and La Nina effects, that can increase or decrease storms over a period of several years. Neither do the models account for the potential of increased storms due to climate change. Reference the Climate Hydrology Report for more detailed information.

6.8.4 Economic Factors

The risk for economics is in under or overestimating the future benefits associated with the project alternatives. The with-project damages and overall benefits associated with the alternatives were estimated based on the existing and future without-project damages. This could potentially result in the TSP not being economically justified or overestimating its benefits. Additional uncertainty surrounding variables such as first floor elevations, structure

value, depth damage relationships and additional inputs are consistent with typically accepted project uncertainty.

The Hydrologic Engineering Center Flood Damage Analysis (HEC-FDA) Version 1.4.2 certified model was used to calculate the damages for the without project existing and future conditions. Economic and engineering inputs were necessary for the model to calculate damages for the project base year (2026) and the final year in the period of analysis (2076). The inputs included structure inventory, future development, contents-to-structure value ratios, vehicles, first floor elevations and depth-damage relationships, ground elevations and without-project stage probability relationships.

The uncertainty surrounding each of the economic and engineering variables was entered into the model. Either a normal probability distribution, with a mean value and a standard deviation, or a triangular probability distribution, with a most likely, a maximum and a minimum value, was entered into the model to quantify the uncertainty associated with the key economic variables. A normal probability distribution was entered into the model to quantify the uncertainty surrounding the ground elevations. The number of years that stages were recorded at a given gage was entered for each study area reach to quantify the hydrologic uncertainty or error surrounding the stage-probability relationships.

Section 7

Mitigation

Mitigation planning was an integral part of the planning process. Measures to avoid and minimize impacts to significant resources were employed to the extent practicable. Nonetheless, unavoidable project-induced impacts to freshwater emergent marsh, swamp, and BLH habitat would occur and would be offset through compensatory mitigation.

Law, regulations, and USACE policy ensure that adverse impacts to significant resources have been avoided or minimized to the extent practicable and that remaining, unavoidable impacts have been compensated to the extent justified. Section 1508.20 of the National Environmental Policy Act defines mitigation as the following actions:

- *Avoiding the impact altogether by not taking a certain action or parts of an action.*
- *Minimizing impacts by limiting the degree or magnitude of the action and its implementation.*
- *Rectifying the impact by repairing, rehabilitating, or restoring the affected environment.*
- *Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action.*
- *Compensating for the impact by replacing or providing substitute resources or environments*

The appropriate application of mitigation is to formulate an alternative that first avoids, then minimizes, and lastly, compensates for unavoidable adverse impacts. Conceptual measures for a compensatory mitigation plan for the UBB study are evaluated in this DEIS. This document describes these conceptual mitigation measures, as required by 33 CFR 332.4(c) and 40 CFR 230.92.4(c).

Section 2036(a)(3)(A) of WRDA 2007 gives guidance on how USACE Civil Works mitigation plans shall be planned and implemented. It states:

To mitigate losses to flood damage reduction capabilities and fish and wildlife resulting from a water resources project, the Secretary shall ensure that the mitigation plan for each water resources project complies with the mitigation standards and policies established pursuant to the regulatory programs administered by the Secretary.

During a preliminary investigation of the proposed UBB project area, CEMVN tentatively determined approximately 725 acres of direct impacts from the TSP. Approximately 291 acres of Bottomland Hardwood (BLH), 167 acres of Cypress-Tupelo Swamp, and 267 acres of Fresh Marsh.

The following mitigation measures may be considered in the following order:

1) Purchase of mitigation bank credits

The impacts to all habitat types could be mitigated through the purchase of mitigation bank credits. It is not known which banks would be available when the decision whether to purchase bank credits or not is made: some banks may not have enough credits remaining, some banks may be closed, and additional mitigation banks may be approved. As such, a general mitigation bank was assumed for the next step of the mitigation project analysis using information obtained from existing banks in the basin and no specific banks were identified. The Regulatory In lieu fee and Bank Information Tracking System (RIBITS) (<https://ribits.usace.army.mil/>) has information on all currently approved banks in the basin including their credit availability.

2) Potential Corps Constructed BLH, Swamp and Marsh Mitigation Sites

Mitigation for fresh marsh, BLH and swamp impacts associated with the TSP could be achieved by creating the applicable habitat near the project site (as proposed by USFWS in their draft CAR) or in state water bottoms within the basin. Mitigation for BLH and/or Swamp impacts associated with the TSP could also be achieved by BLH and/or swamp restoration and/or enhancement areas (mitigation areas) located in agriculture, scrub/shrub, pasture, and other non-forested areas of lower habitat value. Any submerged aquatic vegetation that is impacted at the potential mitigation sites would be offset by an increase in the size of the proposed marsh mitigation sites or the purchase of marsh mitigation credits from available mitigation banks.

Fill (borrow material) needed to attain the desired final target grade elevation for mitigation features created in open water, could be obtained from the dredging of the sites of the water control structures. In addition, the borrow could be dredged or trucked from location(s) to be determined at a later date. Containment dikes may be needed during the construction of these mitigation features. If containment dikes are constructed, they would be gapped or degraded once the area has reached target elevation. Transportation and method of placement of the borrow material would be dependent upon the location of the mitigation site.

Earthwork that may be associated with the BLH and/or swamp mitigation sites could also include grading to ensure appropriate drainage, establishment of dirt access roads around the perimeter of the mitigation areas, establishment of dirt access roads within some of the mitigation areas, and tillage of soil in the mitigation areas. Any existing drainage features (drainage ditches, etc.) within or adjacent to the mitigation areas and within the property boundary would likely be removed to help ensure appropriate site hydrology, unless doing so would adversely affect drainage on off-site lands.

It is assumed that the marsh mitigation areas would naturally vegetate. If the areas do not show potential for natural vegetative recruitment, then they would be planted with native fresh marsh species. Native canopy and midstory plants typical of BLH and swamp habitats would be installed in the BLH and swamp mitigation areas following completion of the initial earthwork (Planting Plan, included with Appendix E). Note that the planted acreage of a few

mitigation areas would be reduced by the impacts of the staging areas, roadways, and borrow sites within the mitigation area.

Table 7-1 shows each habitat type with its associated AAHUs (approximated (~)) of impact and the associated acres that would be needed at each type of mitigation site. These numbers are based on assumptions from previous mitigation projects. As project implementation evolves, final WVAs will be ran on specific mitigation sites to determine exact acres needed at each specific site.

Table 7-1. Conceptual Mitigation Measures

Mitigation Site	Marsh <i>~120 AAHUs impacted</i>	BLH <i>~95 AAHUs impacted</i>	Swamp <i>~111 AAHUs impacted</i>
Bank	TBD	TBD	TBD
Restoration from Open Water	~367 acres	NA	~388 acres
Restoration from Agricultural/ Pasture land	NA	~168 acres	~388 acres
Enhancement from Scrub/Shrub	NA	~559 acres	~925 acres

The National Environmental Policy Act (NEPA) and other environmental laws require Federal agencies to consider the environmental impacts in their decision-making, identify unavoidable environmental impacts and make this information available to the public. All evaluated alternatives should be investigated with respect to environmental consequences. However, since a recommended alternative needs to be selected prior to being released for public review and comment, the PDT must attempt to analyze the impacts of mitigation measures conceptually using preliminary information, for those resources which could be impacted to differing degrees by each of the measures, focusing only on noteworthy differences between the measures. Below describes the impacts of the type of mitigation measures that could be implemented. These are general impacts of the conceptual mitigation measures. A more robust mitigation plan will be developed for the Final EIS. Once mitigation alternatives are developed, incremental cost analysis will be applied in order to determine the recommended mitigation plan. The mitigation plan will be adapted as project implementation evolves.

Only the resources that could potentially be impacted by implementation of each mitigation measure will be discussed. If it is determined that a particular resource would not be impacted by a certain mitigation measure, then it will simply not be included in the impacts analysis.

7.1 MARSH

7.1.1 Mitigation Banks

For this project, the CEMVN would purchase sufficient marsh credits from a bank within the Barataria Basin to mitigate up to 120 AAHUs. The particular bank to be utilized is unknown at this time. Because permitted banks exist as reasonably foreseeable projects in the FWOP conditions, no new direct, indirect, or cumulative impacts to any of the relevant resources would be incurred from the purchase of these credits for the UBB mitigation.

7.1.2 Marsh Restoration in Open Water

7.1.2.1 Wetlands and other Surface Waters

Direct, Indirect, and Cumulative Impacts

There would be a beneficial impact to wetlands as approximately 367 acres of open water would be filled to create marsh habitat. Any impacts to submerged aquatic vegetation would be mitigated by expanding the acreage of marsh created at that particular site.

Implementation of this measure would prevent an overall loss in the basin of marsh habitat. This project, when added to other past, present, and reasonably foreseeable ecosystem restoration and mitigation projects in the basin, would prevent the net loss of wetland function within the basin and would be beneficial in combating the current trend of conversion of coastal marsh to open water which would be accelerated due to sea level rise.

7.1.2.2 Wildlife

Direct, Indirect, and Cumulative Impacts

Impacts to wildlife would result from the conversion of approximately 367 acres of open water habitat within the mitigation area to herbaceous intertidal wetland (marsh). This conversion would reduce use and function for brown pelicans, seabirds, dabbling and diving ducks, coots, and gallinules and other species that feed in the shallow open water in this location. However, it is anticipated they would utilize adjacent areas of open water habitat. The establishment of marsh in the area would provide approximately 367 acres of new habitat for terrestrial and semi-aquatic species such as muskrat, mink, river otter, and raccoon, all of which are commercially important furbearers. Reptiles, including the American alligator, western cottonmouth, water snakes, speckled king snake, rat snake, and eastern mud turtle are likely to utilize and populate the proposed marsh habitat. Amphibians expected to colonize the area include the bullfrog, southern leopard frog, and Gulf coast toad. The edges and small areas of open water that would form over time would also provide feeding habitat for common wading bird species including great blue heron, green heron, tricolored heron, great egret, snowy egret, yellow-crowned night heron, black-crowned night-heron, and white ibis. This project, when added to other past, present, and reasonably foreseeable ecosystem restoration and mitigation projects in the basin, would prevent the net loss of wetland function and overall decline of wildlife species within the basin and would be beneficial in both preserving the species bio-diversity and combating the current trend of conversion of coastal marsh to open water which would be accelerated due to sea level rise.

7.1.2.3 Threatened, Endangered and Other Protected Species

Direct, Indirect, and Cumulative Impacts

There is the potential that construction of the marsh mitigation measure could have minimal impacts on the West Indian manatee which may occasionally occur in and around the UBB project area. The presence of construction-related activity, machinery, and noise would be expected to cause any manatees present to avoid the project area during the construction period. Although a rise in turbidity during construction could immediately reduce water quality in the project area, those effects would be temporary and would be reduced by movement of the tides.

In order to minimize the potential for construction activities to cause adverse impacts to manatees the following standard manatee protection measures, developed by the USFWS, Lafayette, Louisiana Field Office.

During in-water work in areas that potentially support manatees all personnel associated with the project would be instructed about the potential presence of manatees, manatee speed zones, and the need to avoid collisions with, and injury to manatees. All personnel would be advised that there are civil and criminal penalties for harming, harassing or killing manatees which are protected under the Marine Mammal Protection Act and the Endangered Species Act. Additionally, personnel would be instructed not to attempt to feed or otherwise interact with the animal, although passively taking pictures or video would be acceptable.

All on-site personnel would be responsible for observing water-related activities for the presence of manatee(s). To minimize potential impacts to manatees in areas of their potential presence, these procedures would be followed:

- All work, equipment, and vessel operation shall cease if a manatee is spotted within a 50-foot radius (buffer zone) of the active work area. Once the manatee has left the buffer zone on its own accord (manatees must not be herded or harassed into leaving), or after 30 minutes have passed without additional sightings of manatee(s) in the buffer zone, in-water work can resume under careful observation for manatee(s).
- All vessels associated with the project shall operate at "no wake/idle" speeds within the construction area and at all times while in waters where the draft of the vessel provides less than a four-foot clearance from the bottom. Vessels should follow routes of deep water whenever possible.
- If used, siltation or turbidity barriers would be properly secured, made of material in which manatees cannot become entangled, and be monitored to avoid manatee entrapment or impeding their movement.
- Temporary signs concerning manatees would be posted prior to and during all in water project activities and removed upon completion. Each vessel involved in construction activities would display, at the vessel control station or in a prominent location, visible to all employees operating the vessel, a temporary sign at least 8½" X 11" reading language similar to the following: "CAUTION BOATERS:

MANATEE AREA/ IDLE SPEED IS REQUIRED IN CONSTRUCTION AREA AND WHERE THERE IS LESS THAN FOUR FOOT BOTTOM CLEARANCE WHEN MANATEE IS PRESENT". A second temporary sign measuring 8" X 11" would be posted at a location prominently visible to all personnel engaged in water-related activities and would have language similar to the following: "CAUTION: MANATEE AREA / EQUIPMENT MUST BE SHUTDOWN IMMEDIATELY IF A MANATEE COMES WITHIN 50 FEET OF OPERATION".

- To ensure manatees are not trapped due to construction of containment or water control structures, the project area would be surveyed prior to commencement of work activities. Should manatee be observed within those areas, the contractor would immediately contact the US Fish and Wildlife Service's Louisiana Ecological Services Office (337/291-3100) and the Louisiana Department of Wildlife and Fisheries, Natural Heritage Program (225/765-2821).
- Collisions with, injury to, or sightings of manatees would be immediately reported to the US Fish and Wildlife Service's Louisiana Ecological Services Office (337/291-3100) and the Louisiana Department of Wildlife and Fisheries, Natural Heritage Program (225/765-2821). Information to be provided includes the nature of the call (i.e., report of an incident, manatee sighting, etc.); time of incident/sighting; and the approximate location, including the latitude and longitude coordinates, if possible.

Once vegetation establishes, the creation of marsh habitat would provide habitat for certain migratory birds, such as herons and egrets, which are protected under the MBTA. There is potential that during construction some birds may try to nest on the marsh platform. Caution must be taken not to allow these birds to begin nesting. If it becomes apparent that birds might be trying to nest on the marsh platform during construction, a nesting bird abatement plan would be developed in coordination with USFWS and implemented prior to nesting. If birds succeed in nesting on the marsh platform during construction, the buffer zones below (no work zones), developed by USFWS and LDWF, would be implemented.

No-work distance restrictions are:

- Terns, Gulls, and Black Skimmers -650 feet;
- Colonial nesting wading birds -1,000 feet; and,
- Brown Pelicans -2,000 feet; and,

This project, when added to other past, present, and reasonably foreseeable ecosystem restoration and mitigation projects in the basin, would have minimal cumulative (beneficial and adverse) impacts to T&E and other protected species.

7.1.2.4 Aquatic Resources and Fisheries

Direct, Indirect, and Cumulative Impacts

Approximately 367 acres of open water would be replaced with marsh, increasing spawning, nursery, forage and cover habitat for fisheries resources over the long term. Initially, after project construction, the area would be above daily tidal inundation and only partially

vegetated, so maximum fisheries benefits would not be realized until after a few years. Turbidity during fill placement would temporarily impair visual predators and impact filter feeders, but this impact is expected to cease and benthic species rebound once construction is complete.

Fish access to this area would be extremely limited until the material consolidated and settled to an elevation conducive to that of a natural intermediate marsh. It is uncertain at this time what this “lag” time would be but is expected to be 3- 5 years. There would be a loss of approximately 367 acres of open water from construction of this measure. However, open water is found in abundance throughout the Barataria Basin.

The resulting marsh would provide a cumulative benefit in the form of additional spawning, nursery, forage and cover habitat for important fish species in the basin. Combined with other marsh restoration and mitigation efforts, the proposed action would provide a great overall environmental lift. Implementation of this project would prevent an overall loss in the basin of marsh habitat. This project, when added to other past, present, and reasonably foreseeable ecosystem restoration and mitigation projects in the basin would help retard the loss of wetlands and combat the current trend of conversion of marsh to open water. There would be an overall loss of open water habitat containing submerged aquatic vegetation in the basin, but no permanent adverse impacts are anticipated because this habitat is prevalent throughout the basin.

7.1.2.5 Essential Fish Habitat (EFH)

Direct, Indirect, and Cumulative Impacts

Essential fish habitat most likely to be present at the marsh restoration site would include estuarine water bottom, estuarine water column, and submerged aquatic vegetation. These habitats would be largely converted to another type of essential fish habitat – estuarine intertidal herbaceous wetlands (marsh). Fisheries access to the marsh mitigation area would be extremely limited during the initial 3-5 years while the fill material is dewatering and subsiding. The adverse impacts to essential fish habitat that would result from the mitigation measure may affect, but should not adversely affect, managed species considering the small acreage involved relative to the Barataria Basin. In addition, the project would provide long-term benefit to the managed species by providing intertidal wetlands, a valuable type of essential fish habitat. Indirect impacts to managed species include increased turbidity during fill placement. Species may be temporarily displaced.

Cumulative impacts to EFH resulting from the UBB were considered and found to be adequately offset by the resulting increase in habitat quality from the proposed action. Implementation of the proposed action would result in sufficient EFH habitat improvement to offset adverse impacts to EFH and open water designated as essential fish habitat from the UBB project.

7.1.2.6 Water Quality

Direct, Indirect, and Cumulative Impacts

Temporary water quality impacts from turbidity are not anticipated to be substantial enough to cause impairment of the water body's designated uses as defined under the standards of Louisiana Administrative Code, Title 33, Part IX, Chapter 11. Water quality impacts in the fill area would temporarily add to the water quality impairment of this sub-segment, but these impacts would be minimized through best management practices and would diminish to background levels after construction. Combined with other marsh restoration and mitigation efforts, the proposed action would provide a great overall environmental lift with an incidental improvement to water quality within the basin.

7.1.2.7 Air Quality

Direct, Indirect, and Cumulative Impacts

The only emissions would be from temporary construction equipment. All Parishes that fall within the UBB project area are in attainment for all monitored air quality parameters. If a marsh mitigation project is identified in a parish that is in nonattainment, a conformity determination would be necessary. No cumulative impacts are anticipated.

7.1.2.8 Cultural Resources

Direct, Indirect, and Cumulative Impacts

The presence of cultural resources cannot be determined at this time as the mitigation sites have not yet been identified. Once the specific sites are identified, a full cultural resources assessment will be conducted as necessary.

7.1.2.9 Recreational Resources

Direct, Indirect, and Cumulative Impacts

Water recreational activities could potentially be impacted by implementation of marsh creation in open water. The impacts would be minimal and temporary and would consist of presence of construction equipment and noise. Once the marsh habitat is fully vegetated, the mitigation area(s) could support duck hunting and some fishing opportunities. The UBB mitigation project would have a positive cumulative effect on recreation by improving habitat for species sought after by recreational hunters and fishermen.

7.1.2.10 Aesthetic Resources

Direct, Indirect, and Cumulative Impacts

Creation of marsh habitat in open water would add to the aesthetic resources of the area in which it is implemented. Marsh habitat would attract several species of waterfowl and migrating wading birds which could lend to bird watching opportunities. This project in

combination with other marsh restoration and mitigation projects would have a positive cumulative effect on aesthetic resources.

7.1.2.11 Noise

Direct, Indirect, and Cumulative Impacts

It is assumed that the areas to be chosen for marsh creation would be remote enough that noise from construction would not affect residences or businesses. Once the specific sites are identified, a full noise assessment will be conducted as necessary. No cumulative impacts are anticipated.

7.2 BOTTOMLAND HARDWOODS

7.2.1 Mitigation Banks

For this project, the CEMVN would purchase sufficient BLH credits from a bank within the Barataria Basin to mitigate up to approximately 95 AAHUs. The particular bank to be utilized is unknown at this time. Because permitted banks exist as reasonably foreseeable projects in the FWOP conditions, no new direct or indirect impacts to any of the relevant resources would be incurred from the purchase of these credits for the UBB mitigation.

7.2.2 BLH Restoration in Open Water

7.2.2.1 Wetlands and other Surface Waters

Direct, Indirect, and Cumulative Impacts

There would be a beneficial impact to wetlands as approximately 291 acres of open water would be filled to create BLH habitat. Any impacts to submerged aquatic vegetation would be mitigated by expanding the acreage of marsh created at marsh mitigation site. Implementation of this measure would prevent an overall loss in the basin of BLH habitat.

7.2.2.2 Wildlife

Direct, Indirect, and Cumulative Impacts

Impacts to wildlife would result from the conversion of approximately 291 acres of open water habitat within the mitigation area to forested wetland (BLH). This conversion would reduce use and function for brown pelicans, seabirds, dabbling and diving ducks, coots, and gallinules and other species that feed in the shallow open water in this location. However, it is anticipated they would utilize adjacent areas of open water habitat. The establishment of BLH in the area would provide approximately 291 acres of new habitat for terrestrial animals such as deer, rabbits, raccoons, various bird species, and several reptile species. This project would prevent an overall loss in the basin of BLH habitat necessary for many wildlife species. This project, when added to other past, present, and reasonably foreseeable ecosystem restoration and mitigation projects in the basin, would help retard the loss of wetlands and overall decline of wildlife species within the basin and would be beneficial to preserving the species bio-diversity.

7.2.2.3 Threatened, Endangered and Other Protected Species

Direct, Indirect, and Cumulative Impacts

Impacts would be the same as discussed for the marsh mitigation measure.

7.2.2.4 Aquatic Resources and Fisheries

Direct, Indirect, and Cumulative Impacts

Impacts to aquatic resources and fisheries would result from the conversion of approximately 291 acres of open water habitat within the mitigation area to forested wetland (BLH). This would permanently remove foraging and spawning habitat for some species. Though construction of this project would result in the loss of fisheries habitat, some fish, and benthic habitat; this habitat is abundant throughout the basin and therefore impacts to existing fisheries would be minimal. As such, construction of this project would result in minimal loss to fisheries and aquatic resources from the past, present and reasonably foreseeable projects in the basin.

7.2.2.5 Essential Fish Habitat (EFH)

Direct, Indirect, and Cumulative Impacts

Essential fish habitat most likely to be present at the marsh restoration site would include estuarine water bottom, estuarine water column, and submerged aquatic vegetation. This EFH would be permanently removed and replaced with BLH habitat. Once specific mitigation sites are identified, EFH coordination will be conducted with NOAA as necessary. Any impacts to EFH would be mitigated as necessary. There could be a short term indirect impact to EFH due to temporary increases in turbidity and increased sedimentation rates adjacent to the placement and dredge area. These areas would return to normal once the construction ends. There would be an overall loss of EFH in the basin, but no permanent cumulative impacts are anticipated because of the required mitigation.

7.2.2.6 Water Quality

Direct, Indirect, and Cumulative Impacts

Impacts would be the same as discussed for the marsh mitigation measure.

7.2.2.7 Air Quality

Direct, Indirect, and Cumulative Impacts

Impacts would be the same as discussed for the marsh mitigation measure.

7.2.2.8 Cultural Resources

Direct, Indirect, and Cumulative Impacts

Impacts would be the same as discussed for the marsh mitigation measure.

7.2.2.9 Recreational Resources

Direct, Indirect, and Cumulative Impacts

Water recreational activities could potentially be impacted by implementation of BLH creation in open water. The impacts would be minimal and temporary and would consist of presence of construction equipment and noise. Once the BLH habitat is fully established, the mitigation area(s) could support deer and hog hunting as well as bird watching. The UBB mitigation project would have a positive cumulative effect on recreation by improving habitat for species sought after by recreational hunters and potential bird watchers.

7.2.2.10 Aesthetic Resources

Direct, Indirect, and Cumulative Impacts

Creation of BLH habitat in open water would add to the aesthetic resources of the area in which it is implemented. BLH habitat would attract several species of raptors and song birds which could lend to bird watching opportunities. This project in combination with other BLH restoration and mitigation projects would have a positive cumulative effect on aesthetic resources.

7.2.2.11 Noise

Direct, Indirect, and Cumulative Impacts

Impacts would be the same as discussed for the marsh mitigation measure.

7.2.3 BLH Restoration in Agricultural or Pasture Lands

7.2.3.1 Wetlands and other Surface Waters

Direct, Indirect, and Cumulative Impacts

There would be a beneficial impact to wetlands as approximately 291 acres of agricultural land would be converted to BLH habitat. Implementation of this project would prevent an overall loss in the basin of BLH habitat. This project, when added to other past, present, and reasonably foreseeable ecosystem restoration and mitigation projects in the basin would help retard the loss of wetlands.

7.2.3.2 Wildlife

Direct, Indirect, and Cumulative Impacts

Approximately 291 acres of agricultural/pasture land would be converted to forested wetlands. Wildlife present at the time of construction would be temporarily displaced to adjacent habitats due to noise, movement and vibration. Some slower moving animals (e.g. moles and snakes) may experience demise during construction. It is anticipated that displaced animals would return once construction is complete and that the construction of high quality forested wetland habitat would provide additional area for the expansion of existing wildlife populations. Wildlife abundance and diversity would increase in the area as a monoculture of agricultural crops would be replaced by a diversity of BLH species that would provide a variety of ecological niches for colonization.

This project, when added to other past, present, and reasonably foreseeable ecosystem restoration and mitigation projects in the basin, would help retard the loss of wetlands and overall decline of wildlife species within the basin and would be beneficial to preserving species bio-diversity.

7.2.3.3 Threatened, Endangered, and Other Protected Species

Direct, Indirect, and Cumulative Impacts

Direct impacts to threatened and endangered species would be avoided in accordance with the ESA. Once specific mitigation sites are identified, ESA coordination will be conducted with USFWS as necessary. If bald eagle nests are discovered near the site, the National Bald Eagle Management Guidelines (Appendix E) would be followed during construction to avoid and minimize impacts to this species.

7.2.3.4 Air Quality

Direct, Indirect, and Cumulative Impacts

Impacts would be the same as discussed for the marsh mitigation measure.

7.2.3.5 Cultural Resources

Direct, Indirect, and Cumulative Impacts

Impacts would be the same as discussed for the marsh mitigation measure.

7.2.3.6 Recreational Resources

Direct, Indirect, and Cumulative Impacts

Flora and fauna that historically populated the area would again be established on the site once construction of this mitigation measure is complete. Recreational resources such as wildlife viewing and hunting would be created as few opportunities for recreation currently exist on this type of site. Recreational opportunities would continue to increase on the site as

the habitat matures over time and would be maintained with perpetual conservation of the site. The UBB mitigation project would have a positive cumulative effect on recreation by improving habitat for species sought after by recreational hunters and potential bird watchers.

Cumulative Impacts

7.2.3.7 Aesthetic Resources

Direct, Indirect, and Cumulative Impacts

Creation of BLH habitat in agricultural/pasture land would add to the aesthetic resources of the area in which it is implemented. BLH habitat would attract several species of raptors and song birds which could lend to bird watching opportunities. This project in combination with other BLH restoration and mitigation projects would have a positive cumulative effect on aesthetic resources.

7.2.3.8 Noise

Direct, Indirect, and Cumulative Impacts

Impacts would be the same as discussed for the marsh mitigation measure.

7.2.3.9 Prime and Unique Farmlands

Direct, Indirect, and Cumulative Impacts

There is potential for this mitigation measure to impact up to 291 acres of prime and unique farmlands. Once specific mitigation sites are identified, a farmland conversion impact rating will be coordinated with NRCS.

7.2.4 BLH Enhancement in Scrub/Shrub Habitat

7.2.4.1 Wetlands and other Surface Waters

Direct, Indirect, and Cumulative Impacts

There would be a beneficial impact to wetlands as approximately 291 acres of low quality habitat would be converted to high quality BLH habitat. Implementation of this project would prevent an overall loss in the basin of BLH habitat. This project, when added to other past, present, and reasonably foreseeable ecosystem restoration and mitigation projects in the study area would help retard the loss of wetlands.

7.2.4.2 Wildlife

Direct, Indirect, and Cumulative Impacts

Impacts would be similar to those discussed for the BLH from agricultural/pasture land measure.

7.2.4.3 Threatened, Endangered and Other Protected Species

Direct, Indirect, and Cumulative Impacts

Impacts would be similar to those discussed for the BLH from agricultural/pasture land measure.

7.2.4.4 Air Quality

Direct, Indirect, and Cumulative Impacts

Impacts would be similar to those discussed for the BLH from agricultural/pasture land measure.

7.2.4.5 Cultural Resources

Direct, Indirect, and Cumulative Impacts

Impacts would be similar to those discussed for the BLH from agricultural/pasture land measure.

7.2.4.6 Recreational Resources

Direct, Indirect, and Cumulative Impacts

Impacts would be similar to those discussed for the BLH from agricultural/pasture land measure.

7.2.4.7 Aesthetic Resources

Direct, Indirect, and Cumulative Impacts

Impacts would be similar to those discussed for the BLH from agricultural/pasture land measure.

7.2.4.8 Noise

Direct, Indirect, and Cumulative Impacts

Impacts would be similar to those discussed for the BLH from agricultural/pasture land measure.

7.3 SWAMP

7.3.1 Mitigation Banks

For this project, the CEMVN would purchase sufficient swamp credits from a bank within the Barataria Basin to mitigate up to approximately 111 AAHUs. The particular bank to be utilized is unknown at this time. Because permitted banks exist as reasonably foreseeable

projects in the FWOP conditions, no new direct or indirect impacts to any of the relevant resources would be incurred from the purchase of these credits for the UBB mitigation.

7.3.2 Swamp Restoration in Open Water

7.3.2.1 Wetlands and other Surface Waters

Direct, Indirect, and Cumulative Impacts

There would be a beneficial impact to wetlands as approximately 167 acres of open water would be filled to create swamp habitat. Any impacts to submerged aquatic vegetation would be mitigated by expanding the acreage of marsh created at marsh mitigation site.

Implementation of this measure would prevent an overall loss in the basin of swamp habitat. This project, when added to other past, present, and reasonably foreseeable ecosystem restoration and mitigation projects in the study area would help retard the loss of wetlands.

7.3.2.2 Wildlife

Direct, Indirect, and Cumulative Impacts

Impacts to wildlife would result from the conversion of approximately 167 acres of open water habitat within the mitigation area to forested wetland (swamp). This conversion would reduce use and function for brown pelicans, seabirds, dabbling and diving ducks, coots, and gallinules and other species that feed in the shallow open water in this location. Less mobile species would experience demise from dredged material disposal.

The establishment of swamp in the area would provide approximately 167 acres of new habitat for terrestrial and semi-aquatic species such as nutria, muskrat, mink, river otter, and raccoon, all of which are commercially important furbearers. Reptiles including the American alligator, western cottonmouth, water snakes, speckled king snake, rat snake, and eastern mud turtle are likely to utilize and populate the proposed swamp area. Amphibians expected to colonize the area include the bullfrog, southern leopard frog, and Gulf coast toad.

This project would prevent an overall loss in the basin of swamp habitat necessary for many wildlife species. This project, when added to other past, present, and reasonably foreseeable ecosystem restoration and mitigation projects in the basin, would prevent the net loss of forested wetland function and overall decline of wildlife species within the basin. It would be beneficial in both preserving the species bio-diversity and combating the current trend of conversion of coastal wetlands to open water, which could be accelerated due to sea level rise.

7.3.2.3 Threatened, Endangered and Other Protected Species

Direct, Indirect, and Cumulative Impacts

Impacts would be the same as discussed for the marsh mitigation measure.

7.3.2.4 Aquatic Resources and Fisheries

Direct, Indirect, and Cumulative Impacts

Impacts to aquatic resources and fisheries would result from the conversion of approximately 167 acres of open water habitat within the mitigation area to forested wetland (swamp). This would permanently remove foraging and spawning habitat for some species but would provide the same for other species. Aquatic species access to the mitigation area would be extremely limited until the fill material has consolidated and settled to an elevation conducive to that of a natural swamp. Once target elevations have been achieved and swamp habitat established (in approximately 3 years), this area would serve a functional role in the local ecosystem.

Implementation of this project would prevent an overall loss in the basin of swamp habitat in the basin. This project, when added to other past, present, and reasonably foreseeable ecosystem restoration and mitigation projects in the basin would help retard the loss of wetlands and combat the current trend of conversion of wetlands to open water.

7.3.2.5 Essential Fish Habitat (EFH)

Direct, Indirect, and Cumulative Impacts

Impacts would be similar to those discussed in the BLH from open water mitigation measure.

7.3.2.6 Water Quality

Direct, Indirect, and Cumulative Impacts

Impacts would be the same as discussed for the marsh mitigation measure.

7.3.2.7 Air Quality

Direct, Indirect, and Cumulative Impacts

Impacts would be the same as discussed for the marsh mitigation measure.

7.3.2.8 Cultural Resources

Direct, Indirect, and Cumulative Impacts

Impacts would be the same as discussed for the marsh mitigation measure.

7.3.2.9 Recreational Resources

Direct, Indirect, and Cumulative Impacts

Water recreational activities could potentially be impacted by implementation of swamp creation in open water. The impacts would be minimal and temporary and would consist of presence of construction equipment and noise. Once the swamp habitat is fully established, the mitigation area(s) could support hunting as well as bird watching. The UBB mitigation

project would have a positive cumulative effect on recreation by improving habitat for species sought after by recreational hunters and potential bird watchers.

7.3.2.10 Aesthetic Resources

Direct, Indirect, and Cumulative Impacts

Creation of swamp habitat in open water would add to the aesthetic resources of the area in which it is implemented. Swamp habitat would attract several species of raptors and song birds which could lend to bird watching opportunities. This project in combination with other ecosystem restoration and mitigation projects would have a positive cumulative effect on aesthetic resources.

7.3.2.11 Noise

Direct, Indirect, and Cumulative Impacts

Impacts would be the same as discussed for the marsh mitigation measure.

7.3.3 Swamp Restoration in Agricultural or Pasture Lands

7.3.3.1 Wetlands and other Surface Waters

Direct, Indirect, and Cumulative Impacts

There would be a beneficial impact to wetlands as approximately 167 acres of agricultural land would be converted to swamp habitat. This project, when added to other past, present, and reasonably foreseeable ecosystem restoration and mitigation projects in the basin would help retard the loss of wetlands.

7.3.3.2 Wildlife

Direct, Indirect, and Cumulative Impacts

Approximately 167 acres of agricultural/pasture land would be converted to forested wetlands. Impacts would be similar to those discussed for the BLH from agricultural/pasture land measure with the exception of the type of species that might colonize the area. Species expected to colonize the swamp habitat would be nutria, muskrat, mink, river otter, and raccoon, all of which are commercially important furbearers. Reptiles including the American alligator, western cottonmouth, water snakes, speckled king snake, rat snake, and eastern mud turtle. Amphibians expected to colonize the area include the bullfrog, southern leopard frog, and Gulf coast toad.

7.3.3.3 Threatened, Endangered and Other Protected Species

Direct, Indirect, and Cumulative Impacts

Impacts would be similar to those discussed for the BLH from agricultural/pasture land measure.

7.3.3.4 Air Quality

Direct, Indirect, and Cumulative Impacts

Impacts would be the same as discussed for the marsh mitigation measure.

7.3.3.5 Cultural Resources

Direct, Indirect, and Cumulative Impacts

Impacts would be the same as discussed for the marsh mitigation measure.

7.3.3.6 Recreational Resources

Direct, Indirect, and Cumulative Impacts

Impacts would be similar to those discussed for the BLH from agricultural/pasture land measure.

7.3.3.7 Aesthetic Resources

Direct, Indirect, and Cumulative Impacts

Impacts would be similar to those discussed for the BLH from agricultural/pasture land measure.

7.3.3.8 Noise

Direct, Indirect, and Cumulative Impacts

Impacts would be the same as discussed for the marsh mitigation measure.

7.3.3.9 Prime and Unique Farmlands

Direct, Indirect, and Cumulative Impacts

There is potential for this mitigation measure to impact up to 167 acres of prime and unique farmlands. Once specific mitigation sites are identified, a farmland conversion impact rating will be coordinated with NRCS.

7.3.4 Swamp Enhancement in Scrub/Shrub Habitat

7.3.4.1 Wetlands and other Surface Waters

Direct, Indirect, and Cumulative Impacts

There would be a beneficial impact to wetlands as approximately 167 acres of low quality habitat would be converted to high quality swamp habitat. Implementation of this project would prevent an overall loss in the basin of swamp habitat. This project, when added to

other past, present, and reasonably foreseeable ecosystem restoration and mitigation projects in the study area would help retard the loss of wetlands.

7.3.4.2 Wildlife

Direct, Indirect, and Cumulative Impacts

Impacts would be similar to those discussed for the swamp from agricultural or pasture land habitat measure.

7.3.4.3 Threatened, Endangered, and Other Protected Species

Direct, Indirect, and Cumulative Impacts

Impacts would be similar to those discussed for the BLH from scrub/shrub habitat measure.

7.3.4.4 Air Quality

Direct, Indirect, and Cumulative Impacts

Impacts would be similar to those discussed for the BLH from scrub/shrub habitat measure.

7.3.4.5 Cultural Resources

Direct, Indirect, and Cumulative Impacts

Impacts would be similar to those discussed for the BLH from scrub/shrub habitat measure.

7.3.4.6 Recreational Resources

Direct, Indirect, and Cumulative Impacts

Impacts would be similar to those discussed for the BLH from scrub/shrub habitat measure.

7.3.4.7 Aesthetic Resources

Direct, Indirect, and Cumulative Impacts

Impacts would be similar to those discussed for the BLH from scrub/shrub habitat measure.

7.3.4.8 Noise

Direct, Indirect, and Cumulative Impacts

Impacts would be similar to those discussed for the BLH from scrub/shrub habitat measure.

Section 8

Environmental Laws and Regulations

8.1 EXECUTIVE ORDER (E.O.) 11988 FLOODPLAIN MANAGEMENT

Executive Order 11988 directs Federal agencies to reduce flood loss risk; minimize flood impacts on human safety, health, and welfare; and restore and preserve the natural and beneficial values served by flood plains. Agencies must consider alternatives to avoid adverse and incompatible development in the flood plain. If the only practical alternative requires action in the flood plain, agencies must design or modify their action to minimize adverse impacts. The proposed action represents the least environmentally damaging alternative that is feasible to accomplish the needed risk reduction system modifications.

Also, because USACE's actions in the flood plain are subject to NEPA, the Statement of Findings that is required as part of the conclusions in feasibility report is required for actions pertaining to operations and maintenance and will include, in addition to existing requirements, the following:

1. Reasons why the proposed action must be located in the flood plain.
2. Facts considered in making the determination to locate in the flood plain, including alternative sites and actions considered.
3. Statement on whether the proposed action conforms to applicable state or local flood plain protection standards.
4. Statement on whether the action affects the natural and beneficial values of the flood plain.
5. Steps taken to design or modify the proposed action to minimize potential harm to or within the flood plain; and
6. A general listing of involved agencies, groups, and organizations.

8.2 COASTAL ZONE MANAGEMENT ACT OF 1972

The Coastal Zone Management Act (CZMA) requires that "each federal agency conducting or supporting activities directly affecting the coastal zone shall conduct or support those activities in a manner which is, to the maximum extent practicable, consistent with approved state management programs." In accordance with Section 307, a Consistency Determination was prepared for the proposed Project and is currently undergoing review with the Louisiana Department of Natural Resources (LDNR). In an email November 16, 2020, LDNR assigned the record number C20200150 to the ongoing review. Coastal Zone Consistency Determination coordination will be completed prior to the Record of Decision being signed.

8.3 FISH AND WILDLIFE COORDINATION ACT OF 1934

The Fish and Wildlife Coordination Act (FWCA) provides authority for USFWS involvement in evaluating impacts to fish and wildlife from proposed water resource development projects. It requires that fish and wildlife resources receive equal consideration to other project features. It requires Federal agencies that construct, license, or permit water resource development projects to first consult with USFWS, NMFS, and state resource agencies regarding the impacts on fish and wildlife resources and measures to mitigate these impacts. Section 2(b) requires USFWS to produce a Coordination Act Report (CAR) that details existing fish and wildlife resources in a project area, potential impacts due to a proposed project, and recommendations for a project.

USFWS provided a draft CAR on November 6, 2019 and a revised version on October 16, 2020, which addresses the modifications to the alternatives. Both draft CARs are included in Appendix C. Responses to the USFWS recommendations are:

“Because information regarding possible system-level hydroperiod impacts and fisheries access impacts associated with proposed water control structures are not yet available, we cannot complete our evaluation of project effects on fish and wildlife resources, nor can we entirely fulfill our reporting responsibilities under Section 2(b) of the Fish and Wildlife Coordination Act. When available, that information will be incorporated into our Final Coordination Act Report. Additional Service involvement during the preconstruction engineering and design phase of this project, along with more-definitive project information, will be required so that we can fulfill our responsibilities under the Coordination Act. Regarding indirect project effects, the Service recommends:

USFWS 1. Auxiliary drainage structures should be installed in the Bayou Des Allemands floodgate to preclude any with-project hydroperiod increase following heavy rainfall events.

USACE 1. Acknowledged. Efforts to avoid and minimize impacts associated with an increase in hydroperiod due to the project will be made.

USFWS 2. The existing Bayou Des Allemands channel cross-section (in square feet) should be provided to enable assessment of potential structure related fisheries access impacts

USACE 2. Acknowledged. Additional information regarding the channel cross sections will be provided to the Service.

USFWS 3. The project drainage structures should be designed to handle inputs associated with the two Mississippi River diversions identified in the 1993 CWPPRA Louisiana Coastal Wetlands Restoration Plan without corresponding widescale hydroperiod increases.

USACE 3. Acknowledged. Projects in the future without project conditions would include all authorized and permitted projects in the study area.

Available information indicates that substantial direct wetland losses will result from construction of project features. Consequently, avoidance and minimization of direct wetland impacts should be pursued to the greatest extent practicable. The Service provides the

following recommendations to avoid and/or minimize project impacts on fish and wildlife resources, and for mitigating unavoidable impacts to those resources.

USFWS 4. The Corps should coordinate closely with the Service and other fish and wildlife conservation agencies throughout the engineering and design of project features including levees, floodgates, and environmental water control structures to ensure that those features are designed, constructed and operated consistent with wetland restoration and associated fish and wildlife resource needs.

USACE 4. Concur. The USACE will continue to coordinate with the resource agencies throughout the project phases.

USFWS 5. Estimates of all direct and indirect project-related wetland impacts should be refined for inclusion in the project's Final Report and Environmental Impact Statement.

USACE 5. Concur. WVAs and hydrological Future with Project modeling will be completed in coordination with the resource agencies to better determine wetland impacts and mitigation needs.

USFWS 6. Locations of borrow for levee construction material should be identified and provided to the Service and other interested natural resource agencies.

USACE 6. Concur. The USACE will continue to coordinate with the resource agencies throughout the project phases.

USFWS 7. To the greatest degree practical, the proposed levees and borrow pits should be located to avoid and minimize direct and indirect impacts to wetlands. Efforts should be made to further reduce those direct impacts by hauling in fill material, using sheetpile for the levee crest, deep soil mixing, or other alternatives.

USACE 7. Concur. All efforts will be made to avoid and minimize direct and indirect impacts to wetlands.

USFWS 8. If organic soils must be removed from the construction site, that material should be used to create or restore emergent wetlands to the greatest extent practicable. If that is not practicable, then use of that material to improve borrow pit habitat quality (e.g., construct bank slopes, reduce depths, etc.) should be examined.

USACE 8. Acknowledged. Beneficial use of organic soils will be explored during advanced design should their removal from the project site be necessary.

USFWS 9. Forest clearing associated with project features should be conducted during the fall or winter to minimize impacts to nesting migratory birds, when practicable.

USACE 9. Concur. USACE will conduct on site surveys, in coordination with USFWS, to determine the presence of any nesting birds or the potential of future nesting. If needed, USACE, in coordination with USFWS, will develop a bird abatement/nesting prevention plan to be implemented prior to and during construction.

USFWS 10. Avoid adverse impacts to bald eagle nesting locations and wading bird colonies through careful design of project features and timing of construction. Surveys prior to construction such be undertaken to ensure no nesting birds are within 1,000 feet of any proposed work. If nesting birds are found within 1,000 feet of any proposed work sites, the Service and the Louisiana Department of Wildlife and Fisheries should be contacted for procedures to avoid impacts.

USACE 10. Concur. USACE will conduct on site surveys, in coordination with USFWS, to determine the presence of any nesting bald eagles.

USFWS 11. The Service recommends that the Corps contact the Service for additional consultation if: 1) the scope or location of the proposed project is changed significantly, 2) new information reveals that the action may affect listed species or designated critical habitat; 3) the action is modified in a manner that causes effects to listed species or designated critical habitat; or 4) a new species is listed or critical habitat designated. Additional consultation as a result of any of the above conditions or for changes not covered in this consultation should occur before changes are made and or finalized.

USACE 11. Concur. The USACE will continue to coordinate with the resource agencies throughout the project phases.

USFWS 12. Full, in-kind compensation (quantified as AAHUs) should be provided for unavoidable net adverse impacts on forested wetlands, marsh, and associated submerged aquatic vegetation, including any additional losses identified during post-authorization engineering and design studies. To help ensure that the proposed mitigation features meet their goals, the Service provides the following recommendations.

a. The Corps should fully compensate for any unavoidable losses of wetland habitat or non-wet bottomland hardwoods caused by project features.

USACE 12.a. Concur. The USACE has developed a General Mitigation Plan based on assumption pulled from the USFWS CAR. A Final Mitigation Plan will be developed, in coordination with USFWS, and included in the Final EIS.

b. Levee construction borrow sites should be designed to avoid and minimize impacts to fish and wildlife habitat; in the event new borrow sites are identified, guidelines for the selection of borrow sites are found in Appendix C.

USACE 12.b. Concur. The assumption is that borrow for levee construction would come from agricultural land within 15 miles from the levee alignment.

c. Mitigation measures should be constructed concurrently with the features that they are mitigating. If construction is not concurrent with mitigation implementation then revising the impact and mitigation period-of-analysis to reflect additional temporal losses will be required.

USACE 12.c. Concur.

d. The Service and other fish and wildlife conservation agencies should be consulted in the development of plans and specifications for all mitigation features and any monitoring and/or adaptive management plans.

USACE 12.d. Concur. The USACE will continue to coordinate with the resource agencies throughout the project phases.

e. To avoid shortfalls in marsh creation acreage, the contractor should be required to guarantee the creation of at least the target acreage of marsh platform, or excess acres should be created.

USACE 12.e Acknowledged. The number of AAHUs per habitat type impacted would be determined in coordination with the interagency environmental team and the mitigation designed such that it fully satisfies the mitigation requirement in-kind for the project.

f. The acreage of marsh created to mitigate project impacts should meet or exceed the marsh acreage projected by the Habitat Evaluation Team for target year 5.

USACE 12.f Acknowledged. The mitigation project would be designed to fully satisfy the mitigation requirement in-kind within the period of analysis for the parent project (50 years). If excessive delays in implementation of the mitigation project(s) are incurred, CEMVN understands that additional impacts may be assessed to the project to account for the temporal lag in mitigation implementation.

g. The acreage of marsh created for mitigation purposes, and adjacent affected wetlands, should be monitored over the project life to evaluate project impacts, effectiveness of compensatory mitigation measures, and the need for additional mitigation should those measures prove insufficient.

USACE 12.g. Acknowledged. The mitigation project(s) would be monitored over the project life to evaluate their effectiveness and the need for additional mitigation should they fail to meet their applicable success criteria. Best management practices during construction of the mitigation projects would be utilized to avoid additional impacts to adjacent wetlands.

In the CAR, recommendations h. and i. are repeats of recommendation g and therefore the same response for g. applies.

h. The USACE should maintain full responsibility for all mitigation projects until the projects are found to be fully compliant with success and performance requirements.

USACE 12.h. Concur.

i. Dredged material borrow pits, including those utilized to create marsh for mitigation purposes, should be carefully designed and located to minimize anoxia problems and excessive disturbance to area water bottoms, and to avoid increased saltwater intrusion.

USACE 12.i. Concur.

j. If applicable, a General Plan for mitigation should be developed by the Corps, the Service, and the managing natural resource agency in accordance with Section 3(b) of the FWCA for mitigation lands. See Appendix E for details.

USACE 12.j. Concur. The USACE has developed a General Mitigation Plan based on assumption pulled from the USFWS CAR. A Final Mitigation Plan will be developed, in coordination with USFWS, and included in the Final EIS.

k. The USACE should maintain full responsibility for all mitigation projects until the projects are found to be fully compliant with success and performance requirements. Success requirements are provided in Appendix D.

USACE 12.k. Concur.

Extensive additional information is needed by the Service to complete the required evaluation of project effects and fulfill our reporting responsibilities under Section 2(b) of the Fish and Wildlife Coordination Act. Much of that information may not be available until engineering and design of the project features has progressed. To help ensure that sufficient information is provided, the Service recommends that the Corps perform the following tasks during the engineering and design phase.

7. Provide additional information on anticipated construction techniques and their associated wetland impacts, such as additional dredging to install floodgates and water control structures, dredging temporary by-pass channels, construction of access roads, and the method for disposing organic surface soils that are unsuitable for levee construction.

USACE 1. Concur. The USACE will continue to coordinate with the resource agencies throughout the project phases.

8. Provide final levee footprint shape-files and designs for borrow sites used in levee construction.

USACE 2. Concur. The USACE will continue to coordinate with the resource agencies throughout the project phases.

9. Provide with-out project channel cross-sections at or near where water control structures would be installed.

USACE 3. Acknowledged. These would be provided prior to release of the final document and prior to signing of the ROD.

10. Provide hydrologic model outputs on FWOP and FWP stages within the protected area wetlands following a variety of heavy rainfall events.

USACE 4 Acknowledged. Hydrologic model outputs for FWOP and FWP stages within the protected area wetlands during rainfall events would be provided prior to release of the final document and prior to signing of the ROD.

Sufficient funding should be provided for full Service participation in the post-authorization engineering and design studies, and to facilitate fulfillment of its responsibilities under Section 2(b) of the Fish and Wildlife Coordination Act.

Given that information needed to assess fish impact impacts and project-induced hydroperiod impacts are not available, the Service cannot fulfill its Coordination Act responsibilities at this time. Hence, we will require additional funding during the post-authorization engineering and design phase of this project to fulfill our responsibilities under the Fish and Wildlife Coordination Act. Estimates of those funding needs should be coordinated in advance with the Service, and should be based on the nature and complexity of the issues.

Provided that Service funding needs are met and that all of the above recommendations are incorporated into the feasibility report and related authorizing documents, the Service does not oppose further planning and implementation of the TSP.

8.3.1 Clean Air Act of 1970

The Clean Air Act (CAA) sets goals and standards for the quality and purity of air. It requires the EPA to set National Ambient Air Quality Standards (NAAQS) for pollutants considered harmful to public health and the environment. All parishes in the state of Louisiana are currently in attainment of NAAQS. The Louisiana Department of Environmental Quality is not required by the CAA and Louisiana Administrative Code, Title 33 to grant a general conformity determination.

8.3.2 Clean Water Act of 1972 – Section 401 and 404

The Clean Water Act (CWA) sets and maintains goals and standards for water quality and purity. Section 401 requires a Water Quality Certification from the LDEQ that a proposed project does not violate established effluent limitations and water quality standards. Coordination with LDEQ for a State Water Quality Certification is currently pending with a determination that the requirements for a WQC have been met.

Section 305(b) of the Clean Water Act requires each state to monitor and report on surface and groundwater quality, which the Environmental Protection Agency (EPA) synthesizes into a report to Congress. The LDEQ produces a Section 305(b) Water Quality Report that provides monitoring data and water quality summaries for hydrologic units (sub-segments) throughout the state.

As required by Section 404(b)(1) of the CWA an evaluation to assess the short and long term impacts associated with the discharge of dredged and fill materials into waters of the United States resulting from this project has been completed. Section 404(b)(1) will be released for a 30 day public notice and review period from December 11, 2020 until January 10, 2021, concurrently with this second draft report release. A copy of the Section 404(b)(1) is included in Appendix C Annex 1.

8.3.3 Endangered Species Act of 1973

The Endangered Species Act of 1973 (ESA) is designed to protect and recover Threatened and Endangered (T&E) species of fish, wildlife, and plants. The NLAA letter may be issued at a later date for listed T&E species, including the migratory shorebirds, and species of management concern (i.e. rare and very rare species) that are known to occur or believed to occur within the study area and vicinity of the project area. No plants were identified as being threatened or endangered in the project area (Appendix C).

Although they are not expected to occur in the project area, the proposed action would include Standard Manatee Conditions for In-Water Activities, with the contractor instructing all personnel of the potential presence of manatees in the project area, and the need to avoid collisions with these animals. If a manatee(s) is sighted within 100 yards of the project area, moving equipment must be kept at least 50 feet away from the manatee or shut down. There would be restrictions on vessel operation, restrictions on the use of siltation barriers, and mandatory signage designed to avoid any harm to manatees in the project area. More specific information would be contained in any dredging contracts for activities associated with construction of the barge gate. This draft IFR-EIS has been made available to agencies and the USFWS has concurred in its determination that the project would have no adverse effect to threatened and endangered species (Appendix C).

8.3.4 Hazardous, Toxic, and Radioactive Waste

MVN is obligated under Engineer Regulation (ER) 1165-2-132 to assume responsibility for the reasonable identification and evaluation of all HTRW contamination within the vicinity of proposed actions. ER 1165-2-132 identifies that HTRW policy is to avoid the use of project funds for HTRW removal and remediation activities. The NFS, would be responsible for planning and accomplishing any HTRW response measures and would not receive credit for the costs incurred.

An ASTM E 1527-13 Phase I ESA, HTRW investigation will be completed, the results will be placed in the final EIS, and a copy will be maintained on file at MVN. Based on previous HTRW investigations in this area (see section 3.1.10), there is a low-medium risk for finding HTRW issues with the TSP. Given that the northern and southern alignments are generally next to subdivisions/undeveloped areas and not industrial areas, and existing levees have already received environmental clearance and undergo regular maintenance, a low risk classification has been assigned. Additionally, the medium-risk classification has been assigned to the northern alignment because this portion of the TSP has not been subject to an HTRW Investigation in over 10 years. If a REC is identified in relation to the project area, MVN would take the necessary measures to avoid the REC, so that the probability of encountering or disturbing HTRW would continue to be low. Because a Phase I ESA is valid for 1 year, another Phase I ESA would be conducted for the TSP prior to construction.

8.3.5 Migratory Bird Treaty Act

The study area is known to support colonial nesting wading/water birds (e.g., herons, egrets, ibis, night-herons and roseate spoonbills) and shorebirds (terns and gulls). Based on review

of existing data, site visits, and with the use of USFWS guidelines, MVN finds that implementation of the proposed actions would have no effect on colonial nesting water/wading birds or shorebirds. USFWS and USACE biologists would survey the proposed project area before construction to confirm no nesting activity as suitable habitat and the potential for nesting exist within the project area. If active nesting exists within 1,000 feet (water birds) or 1,300 feet (shorebirds) of construction activities then USACE, in coordination with USFWS, would develop specific measures to avoid adverse impacts to those species. A detailed nesting prevention plan may be necessary in order to deter birds from nesting within the aforementioned buffer zones of the project footprint, in order to avoid adverse impacts to these species. If a nesting prevention plan is necessary, it would be prepared in coordination with USFWS.

The bald eagle was removed from the List of Endangered and Threatened Species in August 2007, but continues to be protected under the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act of 1918, as amended (MBTA). During nesting season, construction must take place outside of USFWS/LDWF buffer zones. A USACE Biologist and USFWS Biologist would survey for nesting birds. This would be done prior to the start of construction.

8.3.6 Executive Order 12898 Environmental Justice

USACE is obligated under E.O. 12898 of 1994 and the Department of Defense's Strategy on Environmental Justice of 1995, which direct Federal agencies to identify and address any disproportionately high adverse human health or environmental effects of Federal actions to minority and/or low-income populations. Minority populations are those persons who identify themselves as Black, Hispanic, Asian American, American Indian/Alaskan Native, Pacific Islander, or some other race or a combination of two or more races.

A minority population exists where the percentage of minorities in an affected area either exceeds 50 percent or is meaningfully greater than in the general population. Low-income populations are those whose income is the Census Bureau's statistical poverty threshold for a family of four. The Census Bureau defines a "poverty area" as a census tract or block numbering area with 20 percent or more of its residents below the poverty threshold level and an "extreme poverty area" as one with 40 percent or more below the poverty threshold level. Because the population within the study area does not meet the threshold for being a minority population or a poverty area, this project does not require additional evaluation of environmental justice considerations.

8.3.7 National Historic Preservation Act of 1966

The consideration of impacts to historic and cultural resources is mandated under Section 101(b)4 of NEPA as implemented by 40 CFR, Parts 1501-1508. Section 106 of the NHPA requires federal agencies to take into account their effects on historic properties (i.e., historic and cultural resources) and allow the Advisory Council on Historic Preservation (ACHP) an opportunity to comment. Historic properties are identified by qualified agency representatives in consultation with interested parties. USACE has chosen to address

potential impacts to historic properties through the “Section 106 consultation process” of the NHPA as implemented through 36 CFR, Part 800.

In partial fulfillment of USACE’s Section 106 responsibilities, on April 13, 2020, USACE submitted an initial Section 106 consultation letter entitled: Notice of Intent to Prepare Programmatic Agreement Regarding “Upper Barataria Basin Louisiana, Coastal Storm Risk Management Feasibility Study (Appendix C) to the LA and MS SHPOs, Affected Tribes ACTT, CNO, CT, CTL, JBCI, MBCI, MCN, SNO, STF, TBTL, the NFS (LA DOTD), and the ACHP. The aforementioned letter provided information regarding the study area, initial array of alternatives being considered, alternative evaluation criteria, plan formulation milestones, and VMN’s proposal to develop a project-specific PA pursuant to 36 CFR § 800.14(b) to fulfill its responsibilities under Section 106 of the NHPA. Additionally, this letter invited stakeholders to provide input regarding the proposed undertaking and its potential to significantly affect historic properties and/or sites of religious and cultural significance and requested potential consulting parties’ assistance with identifying other relevant entities who may have an interest in participating in this consultation. On April 23, 2020, USACE received a written response from the ACHP stating that the agency “has not yet determined if Appendix A of the regulations, Criteria for Council Involvement in Reviewing Individual Section 106 Cases, applies to this undertaking” and requested additional information regarding the views of the SHPO, Tribes, other consulting parties, and the public in order to determine if their participation in this consultation is warranted. On April 13, 2020, the Choctaw Nation of Oklahoma responded with email the wish to participate. To date, no other responses to this letter were received from any of the other potential stakeholders consulted (SHPO/Tribal/NFS).

Additionally, on June 14, 2019, USACE posted a NHPA/NEPA Public Notice (Appendix C) to <https://www.mvn.usace.army.mil/About/Projects/BBA-2018/studies/Upper-Barataria-Basin/> for a 15-day comment period requesting the public’s input concerning the proposed undertaking and its potential to significantly affect historic properties, assistance in identifying any relevant parties who may have an interest in participating in this consultation, and USACE’s proposal to develop a project-specific PA pursuant to 36 CFR § 800.14(b). No comments were received. USACE will continue to follow its Section 106 procedures to develop a project-specific PA in furtherance of USACE’s Section 106 responsibilities for this undertaking. The PA would then govern USACE’s subsequent NHPA compliance efforts. Following the execution of the PA, USACE may proceed with issuing a ROD in compliance with Section 106 and NEPA.

8.3.8 Executive Order (EO) 13175 Consultation and Coordination with Indian Tribal Governments

It is the policy of the federal government to consult with federally recognized Tribal Governments on a Government-to-Government basis as required in EO 13175 (“Consultation and Coordination with Indian Tribal Governments;” U.S. President 2000). The requirement to conduct coordination and consultation with federally recognized Tribes on and off of Tribal land finds its basis in the constitution and Supreme Court cases and is clarified in later planning laws, such as NEPA.

When conducting a civil works planning activity, USACE is directed to follow six principles when engaging with Tribal Governments: these principles emphasize Tribal Sovereignty, the federal governments trust responsibility, Government-to-Government consultation, early and pre-decisional consultation, recognition of tribal self-reliance, focusing USACE on efforts at tribal capacity building, and requiring USACE to protect natural and cultural resources during project development and implementation.

[\(http://www.usace.army.mil/Missions/Civil-Works/Tribal-Nations/\)](http://www.usace.army.mil/Missions/Civil-Works/Tribal-Nations/)

Moreover, the USACE Planning and Guidance Notebook (ER 1105-2-100), including Smart Planning, gives guidance in Appendix B, Public Involvement, Collaboration and Coordination (B-8) and Appendix C, Environmental Evaluation and Compliance (C-4), reinforcing the same authorities and processes. The most explicit and accessible guidance regarding USACE and Tribal interaction can be found in USACE's Tribal Consultation Policy (1 Nov 2012).

In addition to consulting with Tribes under the NHPA as described above (NHPA 1966 Section), USACE, is consulting in accordance with EO 13175, NEPA, and its 2012 Tribal Policy. The 2012 Tribal Consultation Policy directs that consultation should begin at the earliest planning stages before decisions are made and actions are taken (paragraph 3b); provides guidance that USACE should contact "[t]ribes whose aboriginal territories extend to the lands where an activity would occur...sufficiently early to allow a timely review of the proposed action" (paragraph 5.d.(1); and goes on to state that the USACE official interacting with federally recognized tribes should maintain open lines of communication through consultation with Tribes during the decision making process for matters that have the potential to significantly affect protected tribal resources, tribal rights (including treat rights), and Indian lands (paragraph 6. d.). In summary, all of this guidance directs the agency to start early and to coordinate often.

In accordance with MN's responsibilities under NEPA, NHPA, and E.O. 13175, USACE started the Tribal Consultation process by inviting Tribes to participate as a cooperating agencies in the development of the DEIS, via letter on April 24, 2019. This correspondence was directed to the leadership of each of the Tribal governments whose aboriginal and historic territories or historic removal routes extended to the lands where the proposed activities would occur (i.e., the ACTT, CTL, CNO, CT, JBCI, MBCI, MCN, STF, SNO, and TBTL). No responses have been received. USACE also shared progress on this project via a monthly tribal conference call in (July, September, and October of 2020), providing updates to participating tribal representatives. USACE intends to keep the lines of communication open throughout the study, relying on the "Section 106 Process" to capture significant tribal concerns regarding historic properties, but remains open to the need to undertake Government-to-Government consultation, as necessary.

Section 9

Public Involvement and Coordination

Public involvement is an important part of planning and decision-making. Agencies, non-governmental organizations, and citizens provided valuable input for the final recommendation. NEPA provides people, organizations, and governments an opportunity to review and comment on proposed major federal actions. Engaging with and receiving input from the public, interested parties, stakeholders, government agencies, and nongovernmental organizations regarding the content of the draft IFR-EIS in all stages is critical to achieving the USACE objective of enhancing trust and understanding with customers, stakeholders, teammates, and the public through strategic engagement and communication.

A Public Notice for the first UBB Draft IFR-DEIS was published in the Baton Rouge and New Orleans Advocate for the 45-day comment period beginning November 29, 2019 and ending January 13, 2020. This second UBB Draft IFR-DEIS will be going out again for another 45 day public review period from December 15, 2020 to January 29, 2021.

Preparation of the first and second IFR and DEIS has been coordinated with appropriate Congressional, Federal, Tribal, state, and local interests, as well as environmental groups and other interested parties. The following agencies, as well as other interested parties, will receive copies of the second draft IFR-EIS:

- U.S. Department of the Interior, Fish and Wildlife Service
- U.S. Environmental Protection Agency, Region VI
- U.S. Department of Commerce, National Marine Fisheries Service
- U.S. Natural Resources Conservation Service, State Conservationist
- Coastal Protection and Restoration Authority Board of Louisiana
- Advisory Council on Historic Preservation
- Governor's Executive Assistant for Coastal Activities
- Louisiana Department of Wildlife and Fisheries
- Louisiana Department of Natural Resources, Coastal Management Division
- Louisiana Department of Natural Resources, Coastal Restoration Division
- Louisiana Department of Environmental Quality
- Louisiana State Historic Preservation Officer
- Louisiana Departments of Transportation and Development

9.1 VIEWS OF THE NON-FEDERAL SPONSOR

The NFS (CPRAB) has been actively involved in all of the planning milestone meetings with the vertical team and weekly PDT meetings held since the beginning of the study. The NFS supports the TSP/NED Plan.

Section 10

Implementing the TSP and Summary of Findings

10.1 IMPLEMENTING THE PLAN

The TSP is still subject to project authorization, appropriation and availability of funding, full environmental compliance, and execution of a binding agreement with the NFS. For planning purposes for this study, construction was scheduled to begin in 2024. The schedule assumes a complete risk reduction system in place by 2026. The project would require construction authorization and the appropriation of construction funds. A continuous funding stream is needed to complete this project within the anticipated timeline, which requires continuing appropriations from Congress and the State of Louisiana in order to fund the detailed design phase and fully fund construction contracts.

Once construction funds are appropriated for this project, the NFS, and the Department of the Army would enter into a Project Partnership Agreement (PPA). After the signing of a PPA, the NFS can acquire the necessary land, easements, and rights of way to construct the project.

Because project features cannot be advertised for construction until the appropriate real estate interests have been acquired, obtaining the necessary real estate in a timely fashion is critical to achieving the project schedule. At the completion of construction, or functional portions thereof, the NFS would be fully responsible for OMRR&R of the project or of the completed functional portion of the project.

10.2 COST SHARING REQUIREMENTS

Generally, feasibility studies funded by Public Law 115-123 will be conducted for not more than \$3 million and will be completed within 36 months, consistent with Section 1001 of WRRDA 2014. If a cost exemption is approved for a study, those additional costs may be funded from remaining Supplemental Investigations funds. However, if available remaining Supplemental Investigations funds are exhausted, then the additional costs will be cost shared and the federal portion of those remaining costs will compete for funding from annual Investigations funding. If additional cost sharing is required, the FCSA will need to be amended.

Pursuant to the model Project Partnership Agreement (PPA) for structural flood risk management projects, the NFS shall contribute a minimum of 35 percent, up to a maximum of 50 percent, of construction costs. The NFS shall pay 5 percent of construction costs, with credit given for funds already provided by the NFS pursuant to the Design Agreement, which would include credits for LERRD's. See Section 10.4 herein for a list of the items of local (non-Federal) cooperation to be required under the PPA. Table 10-1 describes the general cost share provisions for the TSP.

Table 10-1. Cost Share

	Cost Share %		Fed	Non-Fed	Total
	Fed	Non-Fed			
PED	65%	35%	\$188,561,000	\$101,533,000	\$290,094,000
Construction	65%	35%	\$910,750,000	\$490,404,000	\$1,401,154,000
Lands, Easements, Rights-of-Way, Relocations, and Disposal Area (LERRD)*		100%	\$225,000	\$98,706,000	\$98,931,000
Construction Management	65%	35%	\$101,179,000	\$54,481,000	\$155,660,000
Total Project First Cost					\$1,945,840,000

* Includes both Fed/Non-Fed Administration cost for Acquisitions

* As discussed in Section 6.5, LERRD cost and crediting is subject to final mitigation plan.

* Contributions in excess of 50 percent will be reimbursed by the Federal Government to the non-Federal sponsor.

10.3 FEDERAL RESPONSIBILITIES FOR THE SELECTED PLAN

The federal government will be responsible for Planning, Engineering, and Design (PED) and construction of the project in accordance with the applicable provisions of Public Law 99-662 (WRDA of 1986), as amended. The Government, subject to Congressional authorization, the availability of funds, and the execution of a binding agreement with the NFS in accordance with Section 221 of the Flood Control Act of 1970, as amended, and using those funds provided by the NFS, shall expeditiously construct the project, applying those procedures usually applied to federal projects, pursuant to federal laws, regulations, and policies.

10.4 NON-FEDERAL RESPONSIBILITIES FOR THE SELECTED PLAN

Federal implementation of the project would be subject to the NFS agreeing in a binding written agreement to comply with applicable Federal laws and policies, and to perform the following non-Federal obligations, including, but not limited, to:

1. The NFS shall contribute a minimum of 35 percent, up to a maximum of 50 percent, of construction costs. The NFS shall pay 5 percent of construction costs, with credit given for funds already provided by the NFS pursuant to the Design Agreement.
2. The NFS shall provide the real property interests, placement area improvements, and relocations required for construction, operation, and maintenance of the Project.
3. As functional portions of the work are completed, the NFS shall begin operation and maintenance of such work.
4. When the District Commander determines that construction of the Project, or a functional portion thereof, is complete, within 30 calendar days of such determination, the District Commander shall so notify the NFS in writing and the

- NFS, at no cost to the Government, shall operate, maintain, repair, rehabilitate, and replace the Project, or such functional portion thereof.
5. The NFS shall conduct its operation, maintenance, repair, rehabilitation, and replacement responsibilities in a manner compatible with the authorized purpose of the Project and in accordance with applicable federal laws and specific directions prescribed by the Government in the OMRR&R Manual.
 6. Not less than once each year, the NFS shall inform affected interests of the extent of risk reduction afforded by the Project.
 7. The NFS shall participate in and comply with applicable federal floodplain management and flood insurance programs.
 8. In accordance with Section 402 of the Water Resources Development Act of 1986, as amended (33 U.S.C. 701b-12), the NFS shall prepare a floodplain management plan for the Project within one year after the effective date of this Agreement and shall implement such plan not later than one year after completion of construction of the Project. The NFS shall provide an information copy of the plan to the Government.
 9. The NFS shall publicize floodplain information in the area concerned and shall provide this information to zoning and other regulatory agencies for their use in adopting regulations, or taking other actions, to prevent unwise future development and to ensure compatibility with the Project.
 10. The NFS shall prevent obstructions or encroachments on the Project (including prescribing and enforcing regulations to prevent such obstructions or encroachments) that might reduce the level of flood risk reduction the Project affords, hinder operation and maintenance of the Project, or interfere with the Project's proper function.
 11. The NFS shall not use federal program funds to meet any of its obligations under this Agreement unless the federal agency providing the funds verifies in writing that the funds are authorized to be used for the Project.
 12. The NFS shall comply with all the requirements of applicable federal laws and implementing regulations, including, but not limited to: Section 601 of the Civil Rights Act of 1964 (P.L. 88-352), as amended (42 U.S.C. 2000d), and Department of Defense Directive 5500.11 issued pursuant thereto; the Age Discrimination Act of 1975 (42 U.S.C. 6102); and the Rehabilitation Act of 1973, as amended (29 U.S.C. 794), and Army Regulation 600-7 issued pursuant thereto.
 13. If the NFS requests that the Government perform any betterments on behalf of the NFS and the Government agrees to such request, the NFS must provide funds sufficient to cover the costs of such work in advance of the Government performing the work.
 14. The NFS shall acquire the real property interests that the Government has determined are required for the construction, operation, and maintenance of the Project and shall provide the Government with authorization for entry thereto in accordance with the Government's schedule for construction of the Project. The NFS shall ensure that real property interests provided for the Project are retained in public ownership for uses compatible with the authorized purposes of the Project.

15. The NFS shall construct the placement area improvements necessary for construction, operation, and maintenance of the Project in accordance with the Government's construction schedule for the Project.
16. The NFS shall perform or ensure the performance of the relocations necessary for construction, operation, and maintenance of the Project in accordance with the Government's construction schedule for the Project.
17. The NFS shall accept delivery of deeds for all real property interests acquired by the Government in the name of the NFS.
18. The Government's providing real property interests, placement area improvements, or performing relocations on behalf of the NFS does not alter the NFS's responsibility in accordance with provisions of the Project Partnership Agreement for the costs of any cleanup and response related thereto.
19. To the maximum extent practicable, no later than 3 months after it provides the Government with authorization for entry onto a real property interest or pays compensation to the owner, whichever occurs later, the NFS shall provide the Government with documents sufficient to determine the amount of credit to be provided for the real property interest in accordance with provisions of the Project Partnership Agreement. To the maximum extent practicable, no less frequently than on a quarterly basis, the NFS shall provide the Government with documentation sufficient for the Government to determine the amount of credit to be provided for other creditable items in accordance with in accordance with provisions of the Project Partnership Agreement.
20. As required by Sections 210 and 305 of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, Public Law 91-646, as amended (42 U.S.C. 4630 and 4655), and Section 24.4 of the Uniform Regulations contained in 49 C.F.R. Part 24, the NFS assures that (1) fair and reasonable relocation payments and assistance shall be provided to or for displaced persons, as are required to be provided by a federal agency under Sections 4622, 4623 and 4624 of Title 42 of the U.S. Code; (2) relocation assistance programs offering the services described in Section 4625 of Title 42 of the U.S. Code shall be provided to such displaced persons; (3) within a reasonable period of time prior to displacement, comparable replacement dwellings will be available to displaced persons in accordance with Section 4625(c)(3) of Title 42 of the U.S. Code; (4) in acquiring real property, the NFS will be guided, to the greatest extent practicable under State law, by the land acquisition policies in Section 4651 and the provision of Section 4652 of Title 42 of the U.S. Code; and (5) property owners will be paid or reimbursed for necessary expenses as specified in Sections 4653 and 4654 of Title 42 of the U.S. Code.
21. The NFS shall be responsible for undertaking any investigations to identify the existence and extent of any hazardous substances regulated under the Comprehensive Environmental Response, Compensation, and Liability Act (hereinafter "CERCLA") (42 U.S.C. 9601-9675), that may exist in, on, or under real property interests required for construction, operation, and maintenance of the Project.

22. In the event it is discovered that hazardous substances regulated under CERCLA exist in, on, or under any of the required real property interests, within 15 calendar days of such discovery, the NFS and the Government, in addition to providing any other notice required by applicable law, shall provide written notice to each other, and the NFS shall not proceed with the acquisition of such real property interests until the parties agree that the NFS should proceed.
23. If hazardous substances regulated under CERCLA are found to exist in, on, or under any required real property interests, the parties shall consider any liability that might arise under CERCLA and determine whether to initiate construction, or if already initiated, whether to continue construction, suspend construction, or terminate construction. Should the parties initiate or continue construction, the NFS shall be responsible, as between the Government and the NFS, for the costs of cleanup and response, including the costs of any studies and investigations necessary to determine an appropriate response to the contamination. Such costs shall be paid solely by the NFS without reimbursement or credit by the Government.
24. As between the Government and the NFS, the NFS shall be considered the operator of the Project for purposes of CERCLA liability. To the maximum extent practicable, the NFS shall operate, maintain, repair, rehabilitate, and replace the Project in a manner that will not cause liability to arise under CERCLA.
25. To the maximum extent practicable, no later than 3 months after it provides the Government with authorization for entry onto a real property interest or pays compensation to the owner, whichever occurs later, the NFS shall provide the Government with documents sufficient to determine the amount of credit to be provided for the real property interest in accordance with the Project Partnership Agreement.
26. The NFS shall obtain, for each real property interest, an appraisal of the fair market value of such interest that is prepared by a qualified appraiser who is acceptable to the parties. Subject to valid jurisdictional exceptions, the appraisal shall conform to the Uniform Standards of Professional Appraisal Practice. The appraisal must be prepared in accordance with the applicable rules of just compensation, as specified by the Government.
27. The NFS shall obtain, for each real property interest, an appraisal of the fair market value of such interest that is prepared by a qualified appraiser who is acceptable to the parties. Subject to valid jurisdictional exceptions, the appraisal shall conform to the Uniform Standards of Professional Appraisal Practice. The appraisal must be prepared in accordance with the applicable rules of just compensation, as specified by the Government.
28. The NFS shall hold and save the Government free from all damages arising from design, construction, operation, maintenance, repair, rehabilitation, and replacement of the Project, except for damages due to the fault or negligence of the Government or its contractors.
29. The NFS shall assure that books, records, documents, or other evidence pertaining to costs and expenses are reasonably available for examination, audit,

or reproduction by the Government for a minimum of three years after the final accounting.

10.5 SUMMARY OF FINDINGS

Information in this document was developed for feasibility analysis, with input from Federal agencies (USFWS and NMFS), local levee districts, local governments, and comments from the public, to help refine potential solutions to coastal storm risk within the Upper Barataria Basin. Public involvement is an important part of the planning and decision-making process.

A Notice of Availability for the second draft report was published in the Federal Register and circulated for a 45-day public review period to Federal, state and local agencies, non-governmental and other organizations and individuals who have an interest in the project. All comments received during the public review period will be considered and incorporated into the final report, as appropriate.

A Notice of Availability of the final report for a 30-day state, agency, and public review period will be also be published in the Federal Register. All comments received during this period will be considered prior to USACE making a final decision on the TSP and in preparing the Record of Decision (ROD).

The TSP contained herein reflect the information available at this time and current departmental policies governing formulation of individual projects. They do not reflect program and budgeting priorities inherent in the formulation of a national Civil Works construction program nor the perspective of higher review levels within the Executive Branch. Consequently, the final recommendation may be modified before they are transmitted to Congress as proposals for authorization and implementation funding (ER 1105-2-100).

Section 11

List of Preparers

Information in this document has been prepared and submitted by these individuals:

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Section 12

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Section 13

List of Acronyms and Abbreviations

A	
ACHP	Advisory Council on Historic Preservation
ACS	American Community Survey
ADCIRC	Advanced Circulation
AEP	Annual Exceedance Probability
AQCR	Air Quality Control Region
B	
BCR	Benefit to Cost Ratio
BGEPA	Bald and Golden Eagle Protection Act
BMP	Best Management Practices
C	
CAR	Coordination Act Report
CDP	Census of Designated Places
CEM VN	USACE New Orleans District
CEQ	Council on Environmental Quality
CNO	Choctaw Nation of Oklahoma
CPRAB	Coastal Protection and Restoration Authority Board
CSR M	Coastal Storm Risk Management
CT	Coushatta Tribe of Louisiana
CTL	Chitimacha Tribe of Louisiana
CWA	Clean Water Act
E	
EC	Engineering Circular
EFH	Essential Fish Habitat

EIS	Environmental Impact Statement
EJ	Environmental Justice
EM	Engineering Memorandum
EO	Executive Order
EPA	Environmental Protection Agency
EQ	Environmental Quality
ER	Engineer Regulation
ESA	Endangered Species Act
F	
FCSA	Feasibility Cost Sharing Agreement
FDR	Federal Discount Rate
FEMA	Federal Emergency Management Agency
FMC	Fish Management Counsel
FWCA	Fish and Wildlife Coordination Act
FWCAR	Coordination Act Report
FWOP	Future With Out Project
H	
H&H	Hydraulics and Hydrology
HPTRM	High Performance Turf Reinforced Mat
HSDRSS	Hurricane and Storm Damage Risk Reduction System
HTRW	Hazardous, Toxic, and Radioactive Waste
I	
IFR	Integrated Feasibility Report
J	
JBCI	Jena Band of Choctaw Indians
L	

LDEQ	Louisiana Department of Environmental Quality
LDOA	Louisiana Division of Archaeology
LDOTD	Louisiana Department of Transportation and Development
LDWF	Louisiana Department of Wildlife and Fisheries
LERRD	Lands, Easements, Rights-of-Way, Relocations, and Disposal
LORR	Level of Risk Reduction
LWCF	Land and Water Conservation Fund
LWFMP	Louisiana Statewide Comprehensive Water Based Floodplain Management Program

M

MBCI	Mississippi Band of Choctaw Indians
MBTA	Migratory Bird Treaty Act
MCN	Muscogee (Creek) Nation
MSA	Metropolitan Statistical Area
MSC	Major Subordinate Command

N

NAAQS	National Ambient Air Quality Standards
NAVD	North American Vertical Datum
NED	National Economic Development
NEPA	National Environmental Policy Act
NFS	Non- Federal Sponsor
NGVD	National Geographic Vertical Datum
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NOX	Nitrogen Oxide
NRHP	National Register of Historic Places
NRCS	Natural Resource Conservation Service
NS1	Non-Structural
NSI	National Structure Inventory

O	
O&M	Operation and Maintenance
OMRR&R Replacement	Operations, Maintenance, Repair, Rehabilitation, and
OSE	Other Social Effects
P	
P&G	Policy and Guidance
PA	Programmatic Agreement
PDT	Project Delivery Team
PED	Planning, Engineering and Design
PPA	Project Partnership Agreement
R	
REC	Recognized Environmental Condition
RED	Regional Economic Development
ROD	Record of Decision
ROE	Right of Entry
RPEDS	Regional Planning and Environmental Division South
RSLR	Relative Sea Level Rise
S	
SHPO	State Historic Preservation Officer
SNO	Seminole Nation of Oklahoma
STF	Seminole Tribe of Florida
T	
TBTL	Tunica-Biloxi Tribe of Louisiana
T&E	Threatened and Endangered
TSP	Tentatively Selected Plan

U

URA	Uniform Relocation Assistance Act
USACE	United States Army Corps of Engineers
USC	United States Code
USDA	US Department of Agriculture
USFWS	US Fish and Wildlife Service
USGS	United States Geological Survey

V

VOC	Volatile Organic Compound
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W

WMA	Wildlife Management Area
WVA	Wetland Value Assessment