Mississippi Valley Division
Regional Planning and Environmental Division South

Upper Barataria Basin, Louisiana Feasibility Report

Final Integrated Feasibility Report with Environmental Impact Statement

December 2021

Abstract: This Final Integrated Feasibility Study with Environmental Impact Statement documents the analysis of proposed actions related to the feasibility of flood risk reduction measures within the Upper Barataria Basin. Alternatives, including the proposed Recommended Plan and the No Action Alternative are discussed.

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Executive Summary

The U.S. Army Corps of Engineers (USACE), Mississippi Valley Division (MVD), New Orleans District (MVN), Regional Planning and Environment Division South (RPEDS), has prepared this Final Integrated Feasibility Report and Environmental Impact Statement (FIFR-EIS) for the Upper Barataria Basin, Louisiana Feasibility Study. This report supersedes the previously issued 2020 Second Draft Integrated Feasibility Report and Environmental Impact Statement (DIFR-EIS) and represents the most current and complete findings of this study effort. 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 is a Coastal Storm Risk Management (CSRM) 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).

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.

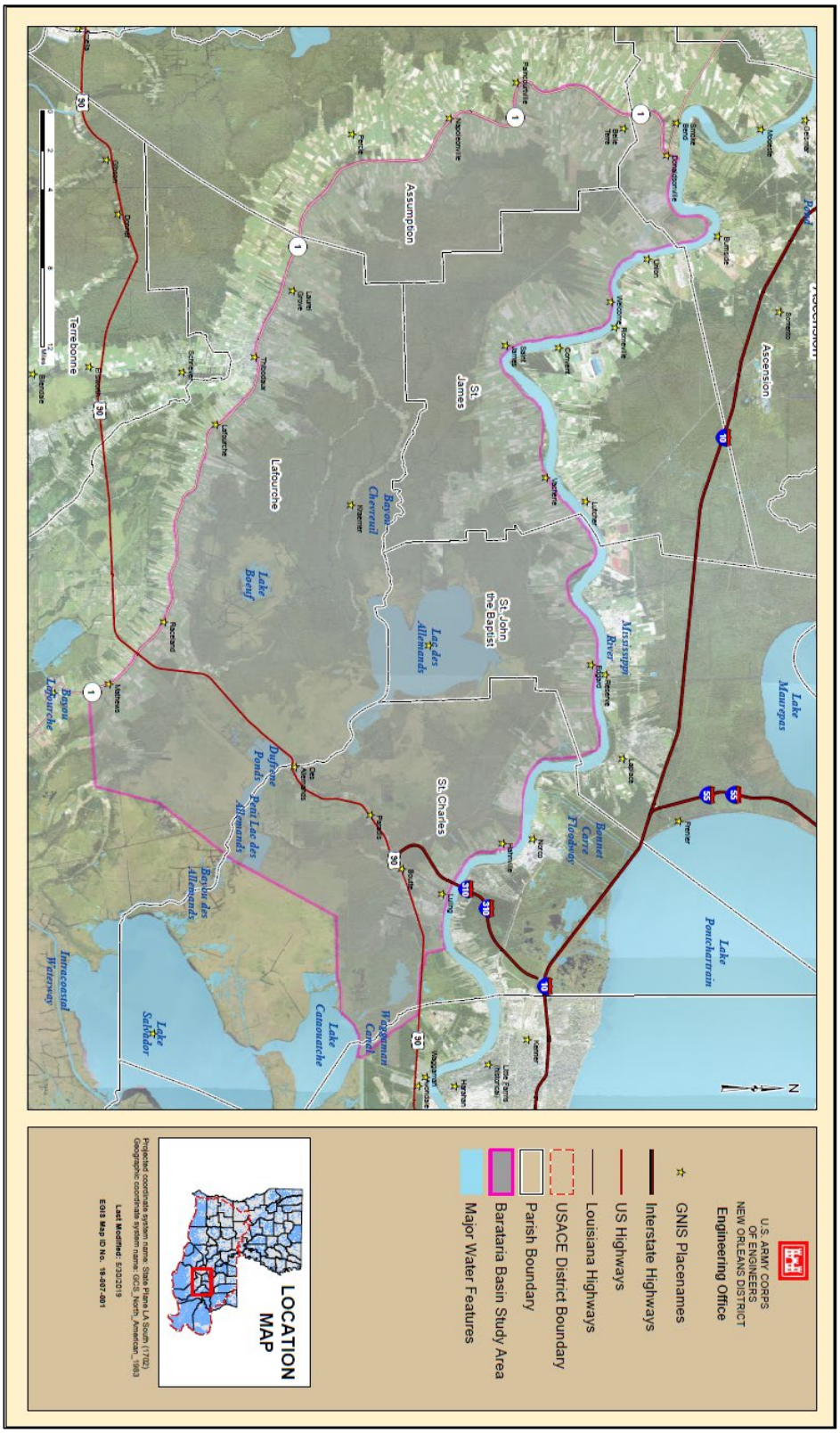

Figure ES-1. Upper Barataria Basin Feasibility Study Area

Problem – The study area is prone to coastal storm damages from storm surges, rainfall, and sea level rise. The flooding results in damages to industrial, commercial, and agricultural facilities as well as residential structures and critical evacuation routes such as US Highway 90 in the basin.

Planning Objectives – The goal for this study is to reduce coastal storm damages to UBB. 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 (as defined in ER1105-2-100), 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 followings, over the 50-year period of analysis:

- Induced flooding impacts must be mitigated
- 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

Recommended Plan (RP)/National Economic Development (NED) Plan – Per USACE Guidance, the Project Delivery Team (PDT) selected the alternative that reasonably maximizes net economic benefits consistent with protecting the nation's environment as the Recommended Plan (RP), also called the National Economic Development (NED) Plan, for this study. In order to determine 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 RP. The RP identified from the final array is Alternative 1, Hwy 90 – Segment 1 Extension.

The UBB RP is a structural alignment constructed to a 1 percent Annual Exceedance Probability (AEP) and totaling a little over 161,300 feet (30.6 miles) in length. The system would start in Luling, Louisiana, where it would connect to the Mississippi River Levee through the Davis Pond Diversion Structure West Guide Levee. Continuing south, the RP 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. Hydraulic reach elevations include sea level rise predictions. Material settlement over this period has also been incorporated into the material quantities for each of the alignment's hydraulic reaches. The 1% AEP over the initial 50 years of the authorized project is based on the Relative Sea Level Rise (RSLR) however there is some uncertainty on how much sea-level rise and climate change could impact the region. Additional details related to RSLR, climate change impacts, and residual risks can be found in section 6.8. This section also includes actions that the Federal government or the Non-Federal Sponsor (NFS) may have to take to address these uncertainties in the future.

The RP is estimated to produce $104 million in average annual benefits at an average annual cost of nearly $53 million (total project cost of $1,546,156), for a benefit-to-cost ratio (BCR) of 2.0 at the current Federal Discount Rate (FDR) of 2.25 percent. Of the approximately 1,074 acres of land needed for the RP, approximately 292 acres of bottomland hardwood forest (BLH), 168 acres of cypress-tupelo swamp, 267 acres of fresh marsh, and 95 acres of water bottom would be impacted as a result of construction.

Net Benefits Summary for the Recommended Plan (FY 2021 Price Level for Damages and Benefits; FY 2022 Price Level for Cost; FY 2022 Discount Rate at 2.25%); Appendix B, Economics.

Alternative Cost and Benefit	**Recommended Plan**
Project First Cost	$1,546,156,000
Interest During Construction	$52,893,500
Total Investment Cost	$1,599,049,500
AA Investment Costs	$50,313,600
AA O&M Costs	$2,200,300
Total AA Costs	$52,513,900
Construction Duration (Years)	5
Without Project EAD	$108,385,000
EAD Reduced Benefits	$104,037,000
Net Benefits	$51,523,000
B/C Ratio	**2.0**

Environmental Laws, Regulations and Commitments – This concludes USACE's feasibility study, however there are a number of tasks associated with state and Federal statute and regulatory requirements that will be completed during PED or prior to

construction. Please see section 8 for more information on completed and ongoing coordination and consultation.

The current velocities at the location where the gate would be constructed are approximately 5.7 feet per second under normal conditions. With construction of the gate, it is anticipated that the existing velocities would remain essentially the same under normal conditions. As such, no direct impact to fisheries species would be anticipated. 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 Pre-Construction Engineering and Design 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.

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Section 1
Introduction

The U.S. Army Corps of Engineers (USACE), Mississippi Valley Division (MVD), New Orleans District (MVN), Regional Planning and Environment Division South (RPEDS), has prepared this Final Integrated Feasibility Report and Environmental Impact Statement (FIFR-EIS) for the Upper Barataria Basin, Louisiana Feasibility Study (UBB study). This report supersedes the previously issued 2020 Second Draft Integrated Feasibility Report and Environmental Impact Statement (DIFR-EIS) and represents the most current and complete findings of this study effort. This report includes input from the non-Federal sponsor, natural resource agencies, federally recognized Indian Tribes, and the public. The UBB study is a Coastal Storm Risk Management (CSRM) study that evaluates impacts to people, cultural resources, and the environment.

1.1 STUDY SCOPE

The UBB 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, 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 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, the Bipartisan Budget Act (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 that does not deviate from the model is delegated to the Major Subordinate Command (MSC) Commander and may not be further delegated. Furthermore, Division Counsel's concurrence that the FCSA 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 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 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 with no structures; therefore, the area is not included in 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.

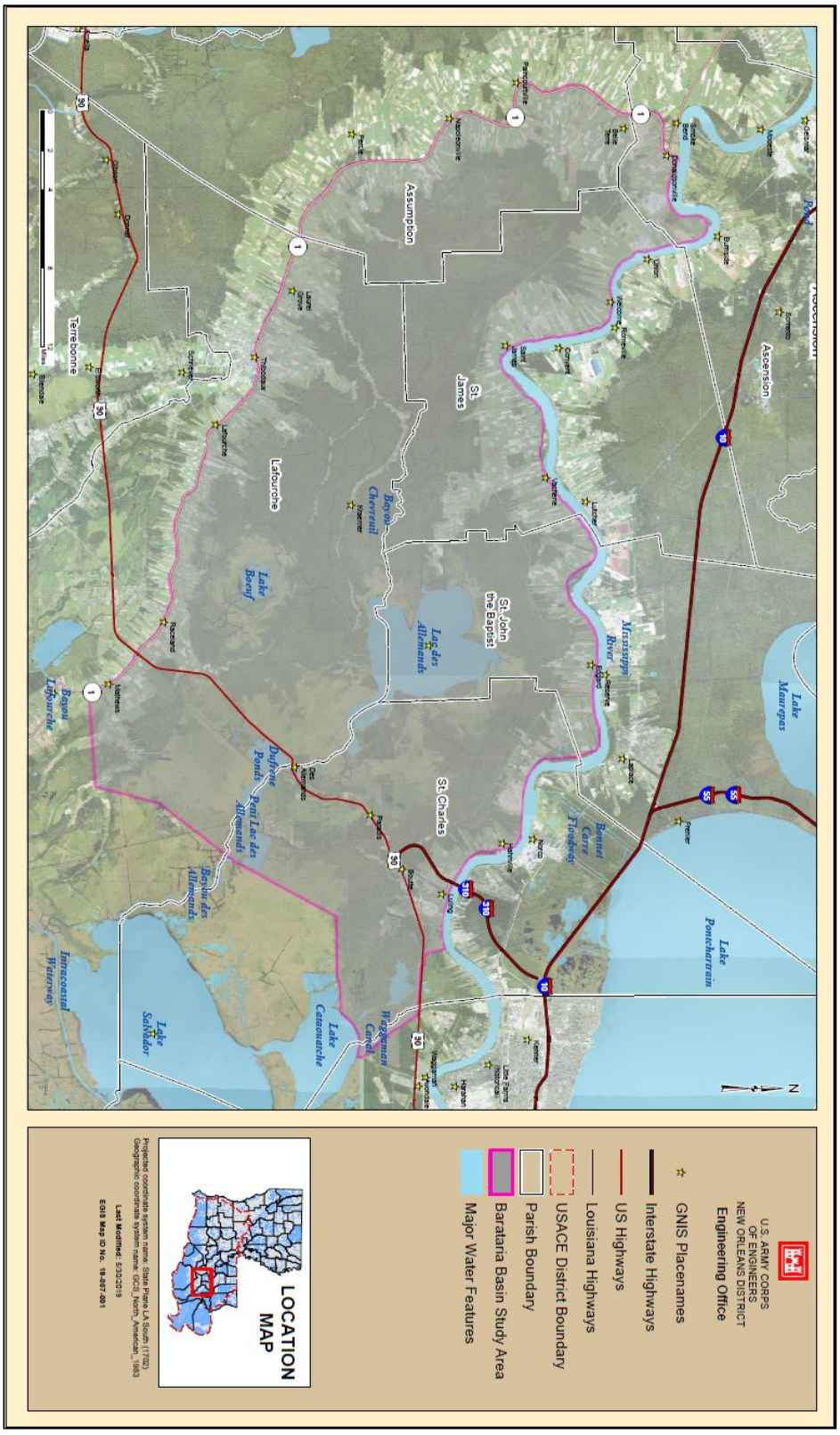

Figure 1-1. Upper Barataria Basin Feasibility Study Area

1.5 PRIOR REPORTS AND EXISTING WATER PROJECTS

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:

Prior Reports and Existing Water Projects:	***Date of Report***	***Use in Study***
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.	• 1980 March	• Historical and Future Without Conditions
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.	• 1981	• Historical and Future Without Conditions
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.	• 1983 April	• Historical and Future Without Conditions
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.	• 1984 September	• Historical and Future Without Conditions
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.	• 1984 September	• Historical and Future Without Conditions • David Pond Diversion
"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.	• March 1993	• Measure and Alternative Development

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.	• March 1998	• Problems and Opportunities Historical and Future Without Conditions
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 feet x 14 feet reinforced concrete culvert with corresponding inflow and outflow channels, approximately 19 miles of guide levees, 1.8 miles of Rock weir, a 570 cubic feet per second (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.	• July 2002	• Existing Conditions • Model Inputs
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 Parish Government. It incorporates a levee along U.S. Highway 90 between the West Bank and Larose, of which, St. Charles has constructed one segment. St James Parish South Vacherie Flood Protection (Coteau Canal Backwater Pump Station & Berm), the St. Charles Parish West Bank Levee Initiative, and the North Lafourche Levee District's Comprehensive Drainage and Flood Protection Project (CDFP).	• June 2012	• Problems and Opportunities • Historical and Future Without Conditions • Measure and Alternative Development
"Project Development and Implementation Program: Upper Barataria Risk Reduction" by ARCADIS, RAND, and The Water Institute of the Gulf, dated March 17, 2014.	• March 2014	• Feasibility Design Input • Model Inputs
"Upper Barataria Risk Reduction Modeling: Phase 2 - Rainfall & Storm Surge Combined Effects Modeling" by ARCADIS, RAND, and The Water Institute of the Gulf, dated July 8, 2015. These two studies combined found that the project as envisioned in CPRA's Master Plan has a BCR of 2.3.	• July 2015	• Feasibility Design Input • Model Inputs
In 2018, Burk-Kleinpeter, Inc., APTIM, and GIS Engineering prepared a report on behalf of LBLD and NLLD, Upper Barataria Risk Reduction Conceptual Design Report.	• 2018	• Feasibility Design Input
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.	• 1980 March	• Historical and Future Without Conditions

- "Upper Barataria Risk Reduction Modeling: Phase 2 - Rainfall & Storm Surge Combined Effects Modeling" by ARCADIS, RAND, and The Water Institute of the Gulf, dated July 8, 2015. These two studies combined found that the project as envisioned in CPRA's Master Plan has a BCR of 2.3.

St. Charles Parish sponsored an economic study to more accurately quantify potential project benefits including business disruption to Hwy 90.

Donaldsonville to the Gulf of Mexico Feasibility Study, the Upper Barataria Risk Reduction Conceptual Design Report, and information extracted from the Louisiana Coastal Area Hurricane Protection Reconnaissance Report were the most vital reports for formulation.

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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, storm surges, and rainfall. Storm surge is generated by ramping up of the water ahead of and during a storm due to the winds driving the surface of the water and drives it inland.

Flood Risk - The flooding in the area results in flood damages to industrial, commercial, and agricultural facilities as well as residential structures and critical evacuation routes, such as US Highway 90. 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 freshwater 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 CSRM 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, and cultural 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 goal for this study is to reduce coastal storm damages to UBB. 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 followings, for the period of analysis (as defined in ER1105-2-100):

- Induced flooding impacts must be mitigated
- 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 Service [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, and social media. A public website page with the study information and a request for feedback was established in December of 2018 (https://www.mvn.usace.army.mil/About/Projects/BBA-2018/studies/Upper-Barataria-Louisiana/). Per the Water Resources Reform and Development Act (WRRDA) of 2014, general scoping meetings in Jan 2019 were hosted by USACE within 90 days of the start of the study. These general scoping meetings requested feedback from the public and were through in-person comment cards and through Facebook Live Streaming. Feedback received during the public scoping meetings did not result in formulation of additional measures, but gave suggestions to where flooding was being experienced in the study area.

The collaborative stakeholders associated with this USACE study are the North Lafourche Levee District, Lafourche Basin Levee District, the St. Charles Parish Government, and the CPRAB. Resource agencies engaged with this study include the USFWS and the 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)

Per the Council on Environmental Quality's regulations on implementing the procedural provisions of 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.

A scoping report is included in Appendix G – Public Comments, which has copies of all written feedback received.

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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 (2445 square miles) 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 eight subbasins: Des Allemands, Salvador, Central Marsh, Grande Cheniere, L'Ours, North Bay, Bay, and Empire.

The UBB study area only covers approximately 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 the pump stations mainly serve as a method of removing rainfall 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). Additional information regarding climate in the UBB is included in Appendix C.

3.1.3 Sea Level Change

Engineer 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.

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.

Relative sea level rise is expected to impact the performance of any recommended plan by causing flood risk to increase over time, requiring increased operational frequency of any gates proposed, and impeding drainage of landside floodwaters. If sea level rises faster than a selected design, then residual flood risk to the project area would be higher than envisioned in this report. Conversely, if sea level rises more slowly than anticipated, then risk would be correspondingly lower. A more complete discussion of potential project vulnerabilities due to sea level and climate change is provided in Annex 8 of Appendix A.

Climate change analysis required by ECB 2018-14 for the inland hydrology is contained within the Climate Hydrology Report in Annex 8 of Appendix A. Also, following ER 1100-2-8162, the alternatives 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 coastal 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 dammed in 1903. Seasonal freshwater and suspended sediment inputs from the Mississippi River were eliminated by construction of flood protection levees along the Mississippi River. 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 Significant Resources

Table 3-2 provides a summary of the institutional, technical, and public importance of significant 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 Significant 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.
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.

Resource	Institutionally Important	Technically Important	Publicly Important
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. Addition of gas and oil pipeline canals and channels affect the hydrology of the basin and only future studies/models would be able to capture these changes.

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, used to receive annual sediment inputs during flood events on the Mississippi and/or Atchafalaya Rivers. However, construction of flood protection levees 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 (Kozlowski 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	*Anas clypeata*
Wood duck	*Aix sponsa*
Hooded-merganser	*Lophodytes cucullatus*
Blue-winged teal	*Spatula discors*
Green-winged teal	*Anas crecca*
Mallard	*Anas platyrhynchos*
Canvasback	*Aythya valisineria*
Northern pintail	*Anas acuta*
Gadwall	*Mareca strepera*
American wigeon	*Mareca americana*
Mottled duck	*Anas fulvigula*
Lesser Scaup	*Aythya affinis*
Redhead duck	*Aythya americana*
Ring-necked duck	*Aythya collaris*
Red-breasted merganser	*Mergus serrator*

Source: USFWS

Table 3-4. Bird Species

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

Source: USFWS

Table 3-5. Reptile and Amphibian Species

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

Source: USFWS

Table 3-6. Mammal Species

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

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 post larval 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 anticipated salinity zones of the expected managed species. 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 *(Farfantepenaeus aztecus)*	Juvenile	<18m; SAV, sand/shell/soft bottom, emergent marsh, oyster reef
White Shrimp *(Litopenaeus setiferus)*	Larvae/post larvae	<82m; pelagic, soft bottom, emergent marsh
	Juvenile	<30m; soft bottom, emergent marsh
Red Drum *(Sciaenops ocellatus)*	Larvae/post larvae	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	GOM 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. However, water quality in the interior wetlands 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).

The United States Geological Survey (USGA) has delineated all the discrete watersheds in the United States and describes each discrete watershed unit with a hydrologic unit code (HUC). The study area is located in the East Central Louisiana Coastal HUC 08090301.

Surface Water Quality

Section 303(d) of the Clean Water Act (CWA) requires that states develop a list of waters that do not meet water quality standards and do not support their designated uses. In response to this mandate, the Louisiana Department of Environmental Quality (LDEQ) has prescribed water quality standards for surface waters within the State of Louisiana to promote a healthy and productive aquatic system. Surface water standards are set to protect the quality of all waters of the state, including rivers, streams, bayous, lakes, reservoirs, wetlands, estuaries, and many other types of surface water. Standards apply to pH, temperature, bacterial density, dissolved oxygen, chloride concentration, sulfate concentration, and total dissolved solids.

LDEQ's surface water quality monitoring program, which fulfills the requirements of the CWA sections 305(b) and 303(d), routinely monitors 25 parameters on a monthly or bimonthly basis using a fixed station, long-term network (Monitored Assessments) (LDEQ 1996). Based upon those data and the use of less-continuous information (Evaluated Assessments), such as fish tissue contaminants data, complaint investigations, and spill reports, the LDEQ has assessed water quality fitness for the following uses: primary contact recreation (swimming), secondary contact recreation (boating, fishing), fish and wildlife propagation, drinking water supply, and shellfish propagation (LDEQ 1996). Based on existing data and more subjective information, water quality is determined to either fully, partially, or not support those uses. A designation of "threatened" is used for waters that fully support their designated uses, but that may not fully support certain uses in the future because of anticipated sources or adverse trends in pollution.

The study area is located within three LDEQ designated subsegments. According to the LDEQ Final 2018 Louisiana Water Quality Inventory: Integrated Report (305(b)/303(d)), the

"Bayou Des Allemands – From US-90 to Lake Salvador (Scenic)" subsegment LA020301 is "not supporting designated use" for primary contact recreation (i.e., swimming); "fully supporting designated use" for secondary contact recreation (i.e., boating); and is "not supporting designated use" for fish and wildlife propagation (i.e., fishing) (LDEQ 2018). The "Bayou Gauche" subsegment LA020302 is "fully supporting designated use" for primary contact recreation (i.e., swimming); "fully supporting designated use" for secondary contact recreation (i.e., boating); and is "not supporting designated use" for fish and wildlife propagation (i.e., fishing) (LDEQ 2018). The "Lake Cataouatche and Tributaries" subsegment LA020303 is "fully supporting designated use" for primary contact recreation (i.e., swimming); "fully supporting designated use" for secondary contact recreation (i.e., boating); and is "not supporting designated use" for fish and wildlife propagation (i.e., fishing) (LDEQ 2018).

A Total Maximum Daily Load (TMDL) is a pollution budget for a specific waterbody. It is the maximum amount of a pollutant a waterbody can receive without causing it to become impaired and/or violate state water quality standards. In 2004, a biochemical oxygen-demanding TMDL was established for "Bayou Des Allemands – From US-90 to Lake Salvador (Scenic)" subsegment LA020301 to address organic enrichment/low dissolved oxygen and nutrients (LDEQ 2004). The suspected sources were industrial point sources, sediment resuspension, and upstream sources (LDEQ 2004). The TMDL for biochemical oxygen demand constituents (i.e., ultimate carbonaceous biochemical oxygen demand, ultimate nitrogenous biochemical oxygen demand, and sediment oxygen demand) was calculated for summer and winter critical seasons; the summer (May-October) load is 40,208 kilograms/day (kg/day) and the winter (November-April) load is 48,400 kg/day (LDEQ 2004). In 2005, a biochemical oxygen-demanding TMDL was established for the "Lake Cataouatche and Tributaries" subsegment LA020303 to address organic enrichment/low dissolved oxygen and nutrients (LDEQ 2005). The suspected sources were industrial, municipal, storm sewers, petroleum activities, and spills (LDEQ 2005). The TMDL for biochemical oxygen demand constituents (i.e., ultimate carbonaceous biochemical oxygen demand, ultimate nitrogenous biochemical oxygen demand, and sediment oxygen demand) is 21,579 kg/day; Organic N is 1,361 kg/day; Ammonia N is 409 kg/day; NO2+NO3N is 124 kg/day, and Phosphorus is 62 kg/day (LDEQ 2005). LDEQ does not list TMDLs for the "Bayou Gauche" subsegment LA020302 or "Lake Cataouatche and Tributaries" subsegment LA020303.

Groundwater Quality

The proposed alignment is within the Coastal Lowlands Aquifer System (Renken 1998). This aquifer system is a complex sequence of unconsolidated beds of sand, silt, and clay deposited under fluvial, deltaic, and marine conditions. The Coastal Lowlands Aquifer System extends eastward from Texas across southern and central Louisiana into southern Mississippi (Renken 1998). Groundwater in this system becomes more saline as it flows toward the coast; groundwater that moves toward the coastline becomes even more mineralized as a result of mixing with sea water (Renken 1998).

The LDEQ Aquifer Sampling and Assessment Program (ASSET) generates water quality data from freshwater aquifers within the state. The ASSET Program is an ambient

groundwater monitoring program designed to monitor the quality of groundwater produced from Louisiana's major freshwater aquifers. The ASSET Program samples approximately 200 water wells located in 14 aquifers and aquifer systems in Louisiana. The sampling process is designed so that all 14 aquifers and aquifer systems are monitored on a rotating basis, within a 3-year period so that each well is monitored every 3 years (LDEQ 2018). The Coastal Lowlands Aquifer System contains the Mississippi River Valley Alluvial Aquifer and the Chicot Equivalent Aquifer System. These aquifers are in the vicinity of the proposed alignment and they are discussed in LDEQ's 2015 ASSET Triennial Summary Report (LDEQ 2015). The following paragraphs summarize water quality data for these two aquifers.

The Mississippi River Valley Alluvial Aquifer is of poor quality regarding taste, odor, or appearance guidelines (LDEQ 2015). Thirty-eight secondary standards were exceeded, and the report also shows that four wells exceeded the Maximum Contaminant Levels (MCL) for arsenic, making certain locations of this aquifer to be of poor quality when considering short-term or long-term health risk guidelines (LDEQ 2015). There are certain areas of the Mississippi River Alluvial Aquifer that exhibit good water quality characteristics, but it still exhibits the poorest overall water quality characteristics of any of Louisiana's fourteen aquifers (LDEQ 2015).

The Chicot Equivalent Aquifer System is of fair quality when considering short-term or long-term health risk guidelines with one industrial use well exceeded the primary MCL for arsenic, while no other primary MCL was exceeded in any other well (LDEQ 2015). The water produced from this aquifer is moderately hard and is of fair quality when considering taste, odor, or appearance guidelines, with 28 secondary standards exceeded in 19 wells (LDEQ 2015).

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.

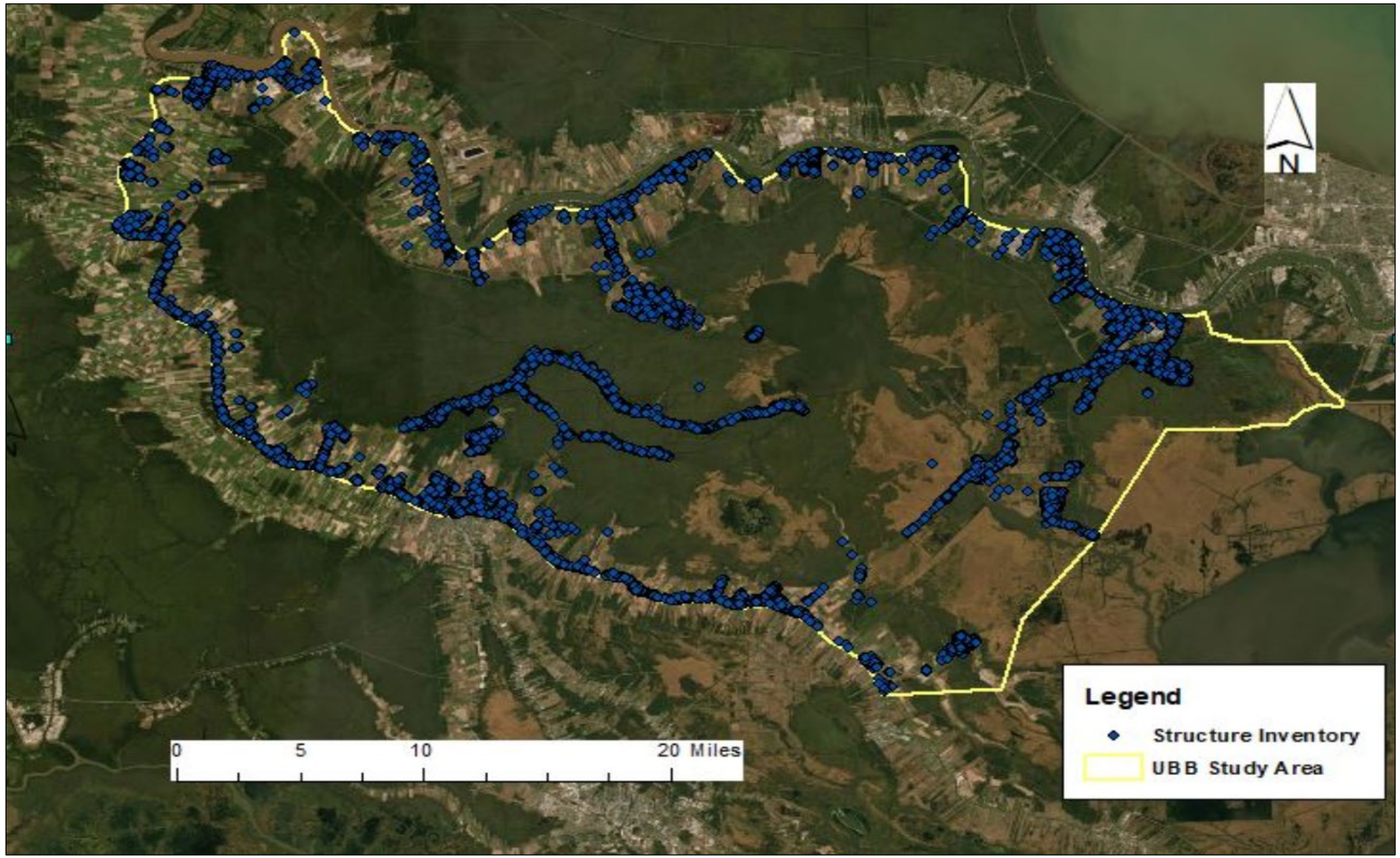

Figure 3-1. Upper Barataria Basin Louisiana National Structure Inventory

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 (not including open water acreages). As shown in the table, the majority of the study area is undeveloped land; with only 7 percent of the total acres in the study area currently developed land.

Table 3-9. Land Use in the Study Area

Land Class Name	Acres	Percentage of Total
Agricultural Land	91,200	21%
Developed Land	30,700	7%
Undeveloped Land	311,000	72%
Total	432,900	100%
Source: USGS National Land Cover Database, 2018 Note: Total acres does not include open water in the study area		

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 73 tropical events that have made landfall near the study area. 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. 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 the table. 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) 2019
Note 1: Incidents are for entire parish, which may include areas outside of the study area.

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)
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 Socioeconomics

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. There is one railroad line and one municipal airport in the UBB study area.

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. Only a portion of the study is in some of these parishes. The numbers are not meant to reflect a life safety risk to populations, but rather to show that there is a general increase in the population in the area.

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 Historical Condition and Projected 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	49829	60,180
Assumption	19,613	32,771	46788	54,195
Lafourche	23,485	40,391	47096	56,959
St. Charles	24,634	39,557	49353	63,678
St. James	18,722	38,421	48484	60,576
St. John the Baptist	20,002	33,894	40573	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

Existing Condition

The communities in the study area include Lulling, 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) for 2019. 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 3-19 and 3-20 for a listing of race and ethnic characteristics for the CDPs 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.

Only one CDP, Boutte, is considered an EJ community using the 50 percent analysis minority method, having approximately 66 percent of residents identifying as minority. The majority of Boutte residents are Black or African American while those identifying as "Two or more Races" comprise 1.6 percent of the CDP population. Persons of Hispanic or Latino population (of any race) is no higher than 5.6 percent in any CDP. St. Charles Parish is majority White, or about 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, a majority reside 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. The largest minority in Mathews is Asian race and those identifying as being of "Two or More Races."

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

ACS 2015-19	Luling		Boutte		Paradis		Des Allemands		Bayou Gauche		St. Charles Parish	
RACE												
Total population	14,049	100%	3,030	100%	1,586	100%	1,690	100%	1,819	100%	52,773	100%
One race	13,791	98.2%	2,982	98.4%	1,493	95.0%	1,633	92.6%	1,819	100.0%	52,219	99.0%
White	10,988	78.2%	1,021	33.7%	1,493	93.7%	1,424	84.3%	1,819	100.0%	36,542	69.9%
Black or African American	2,128	15.1%	1,944	64.2%	0	0.0%	148	7.7%	0	0.0%	14,059	26.6%
American Indian and Alaska Native	50	0.4%	0	0.0%	0	0.0%	61	0.6%	0	0.0%	191	0.3%
Asian	315	2.2%	0	0.0%	0	1.4%	0	0.0%	0	0.0%	528	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	310	2.2%	17	0.6%	0	0.0%	0	0.0%	0	0.0%	899	1.2%
Two or more races	258	1.8%	48	1.6%	93	5.0%	57	7.4%	0	0.0%	554	1.0%
Minority	3,061	21.8%	2,009	66.3%	93	5.9%	266	15.7%	0	0.0%	16,231	30.8%
HISPANIC OR LATINO												
Total population	14,049		3,030		1,586		1,690		1,819		52,773	
Hispanic or Latino (of any race)	784	5.58%	184	6.07%	58	3.66%	46	2.72%	71	3.90%	3,233	6.13%

Source: U.S. Census Bureau, 2015-2019 American Community Survey 5-Year Estimates

Table 3-20. Population by Race and Percentage Minority Population, CDP, Lafourche Parish

ACS 2015-19	Mathews		Raceland		Lafourche Parish	
RACE						
Total population	2,551	100%	10,698	100%	98,108	100%
One race	2,494	97.8%	10,571	98.8%	95,460	97.3%
White	2,399	94.0%	7,007	65.5%	77,504	79.0%
Black or African American	35	1.4%	3,490	32.6%	13,371	13.6%
American Indian and Alaska Native	0	0.0%	74	0.7%	2,158	2.2%
Asian	60	2.4%	0	0.0%	575	0.6%
Native Hawaiian and Other Pacific Islander	0	0.0%	0	0.0%	15	0.0%
Some other race	0	0.0%	0	0.0%	1,837	1.9%
Two or more races	57	2.2%	127	1.2%	2,648	2.7%
Minority	152	6.0%	3,691	34.5%	20,604	21.0%
HISPANIC OR LATINO						
Total population	2,551		10,698		98,108	
Hispanic or Latino (of any race)	0	0.00%	291	2.72%	4,280	4.4%

Source: U.S. Census Bureau, 2015-2019 American Community Survey 5-Year Estimates

Low Income Population

The percentage of persons living below the poverty level, as identified in the 2015-2019 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. See Table 3-21 for a listing of poverty characteristics for the CDPs in the study area.

Of the seven CDPs in the study area, only Boutte and Des Allemands CDPs are considered EJ communities, when using the poverty threshold criteria. Approximately 26 percent of people residing in these communities have incomes below the poverty level, which are above the 20 percent threshold. The percentage of the Boutte and Des Allemands population whose income is below the poverty level is nearly one and a half times larger than the reference area, St. Charles Parish. Boutte CDP is both a minority and low-income EJ community, with percentages well above the reference community of St. Charles Parish.

Table 3-21. 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	13,960	1,323	9.48%
Boutte	3,030	781	25.78%
Paradis	1,586	70	4.41%
Des Allemands	1,674	433	25.87%
Bayou Gauche	1,819	34	1.87%
St. Charles Parish	52,041	5,854	11.25%
Mathews	2,551	284	11.13%
Raceland	10,555	1,919	18.18%
Lafourche Parish	94,464	17,849	18.90%

*Population for whom poverty status is determine
Source: U.S. Census Bureau ACS, 2015-2019

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 back swamp 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, Petit 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 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 3-22 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 3-23.

Table 3-23. Area Parks

Park	Parish	Grant Sponsor	Amount	Date Approved	Expiration Date
Modeste Park Development	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 Park Development	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 (PM2.5); 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

An American Society for Testing and Materials (ASTM) E1527-13 Environmental Site Assessment (ESA) was completed on January 27, 2021, for the Recommended Plan (i.e., northern and southern alignments). The Phase I ESA (i.e., hazardous, toxic, or radioactive waste [HTRW] report number 20-11) did not reveal any Recognized Environmental Conditions (REC) within the Recommended Plan footprint. A copy of the Phase I ESA (i.e., HTRW report number 20-11) is maintained on file at CEMVN.

Additionally, two previous Phase I ESAs were conducted. On February 7, 2019, the southern alignment of the Recommended Plan was subject to a Phase I ESA (i.e., HTRW report number 19-08). The Phase I ESA did not reveal any RECs within the proposed southern alignment footprint. A copy of the Phase I ESA (i.e., HTRW report number 19-08) is maintained on file at CEMVN. On April 30, 2010, MVN published a HTRW Investigation entitled: HWY 90 Alignment. The proposed project area in the 2010 HWY 90 Alignment HTRW Investigation (i.e., HTRW report number 10-08) overlays the same general area as the Recommend Plan (i.e., northern and southern alignments), and also covers additional areas farther to the south. Review of the 2010 HWY 90 Alignment HTRW Investigation indicated that there were no areas of concern or RECs that fell within the proposed project area at that time. A copy of the Phase I ESA (i.e., HTRW report number 10-08) is maintained on file at MVN.

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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 Planning Guidance Notebook 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 objectives.

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 TSP identified in the 1st Draft Report, which was released to the public in November 2019. 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 IDENTIFYING MANAGEMENT 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 CSRM 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. Annual Exceedance Probability (AEP) refers to the probability of a flood event occurring in any year. The probability is expressed as a percentage. For example, a large

flood which may be calculated to have a 1% chance to occur in any one year, or one time every 100 years, is described as 1% AEP.

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. 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 alternative evaluation. The current study has taken multiple measures from Donaldsonville to the Gulf and repackaged them into new alternatives for further evaluation. It has also carried forward the Highway 90 alignment alternative, Highway 90 Alignment - Master Plan, 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. WRDA 2016 Section 1184 states that "study teams must consider natural and nature-based features alone and in combination with other nonstructural and structural measures, as appropriate". Some Natural and Nature Based Features (NNBF) measures identified for the project area were swamp restoration, wetlands restoration, and ridge restoration.

Screening of the NNBF was conducted with the PDT. The area is made up of mostly marsh which eliminates the need for marsh restoration in the study area and combining this with structural and nonstructural measures would not improve the effectiveness of the storm risk reduction measure. Since swamp restoration has a lengthy growing time for trees to reach maturity and the area is predicted to continue to subside and the likelihood of RSLR impacts to the habitat over the period of analysis, swamp restoration in the study area would not be implementable, sustainable, or effective to help prevent storm surge. Ridge restoration was screened out due to no natural ridges existing that extend across the basin to help prevent storm surge damages moving back into the basin, and the natural ridges are sites where houses and businesses exist within the basin. Therefore, ridge restoration, marsh restoration, and swamp restoration were screened out from the measures and not combined with other measures. The magnitude of impact being addressed in this environment severely limits the effectiveness and reliability of these measures. 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 Donaldsonville to the Gulf 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, which included hydraulic modeling, development of conceptual designs, rough order of magnitude quantities, and parametric cost estimates for comparison, which included compensable mitigation cost. 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 Donaldsonville to the Gulf. 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 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). The damages prevented would be in St. Charles and Lafourche Parishes.

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 lift alignment alternative would incorporate building a 1 percent AEP (100-Year Coastal Storm Event) levee 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(c)) 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

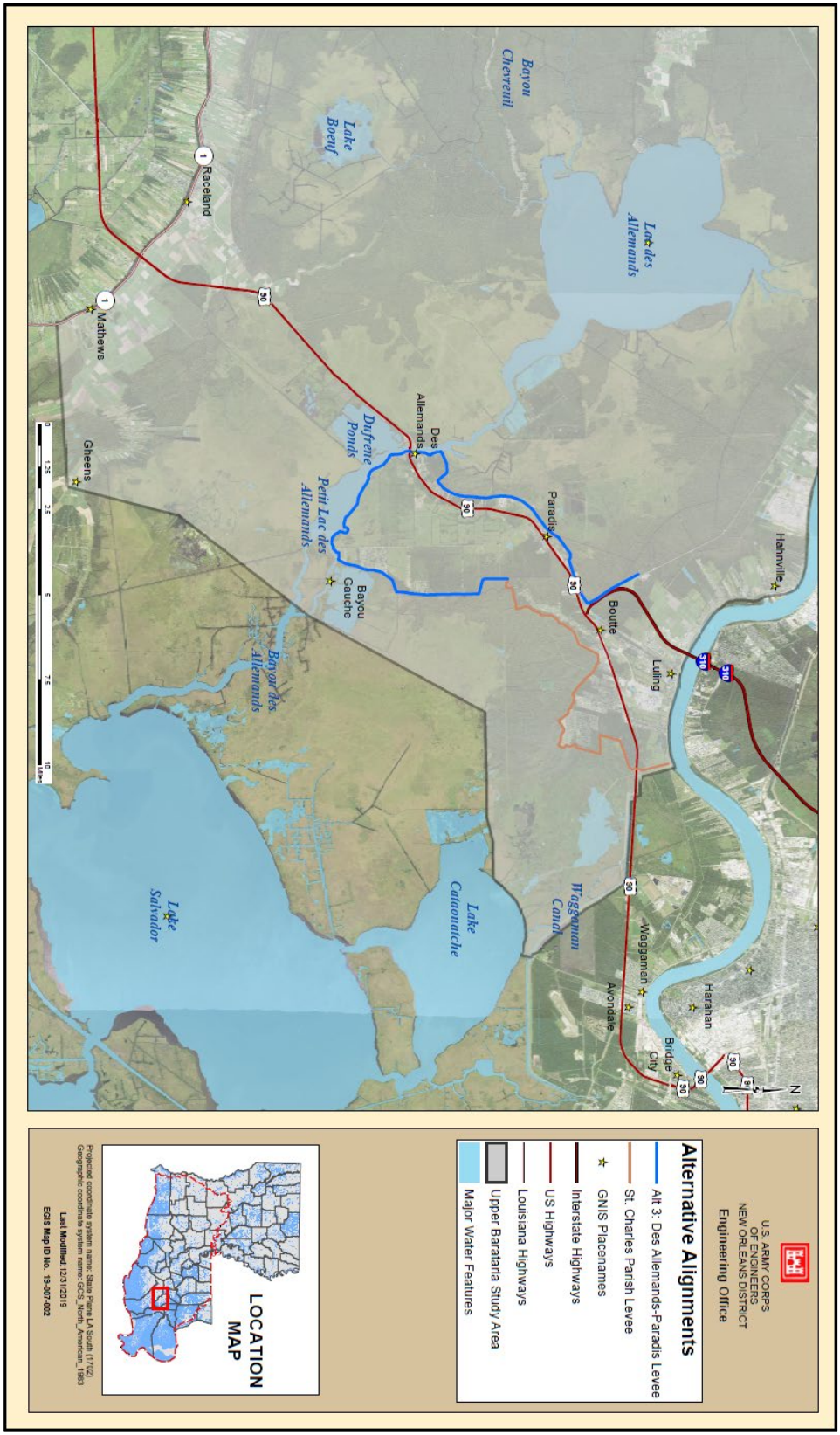

Figure 4-3. Des Allemands-Paradis Levee

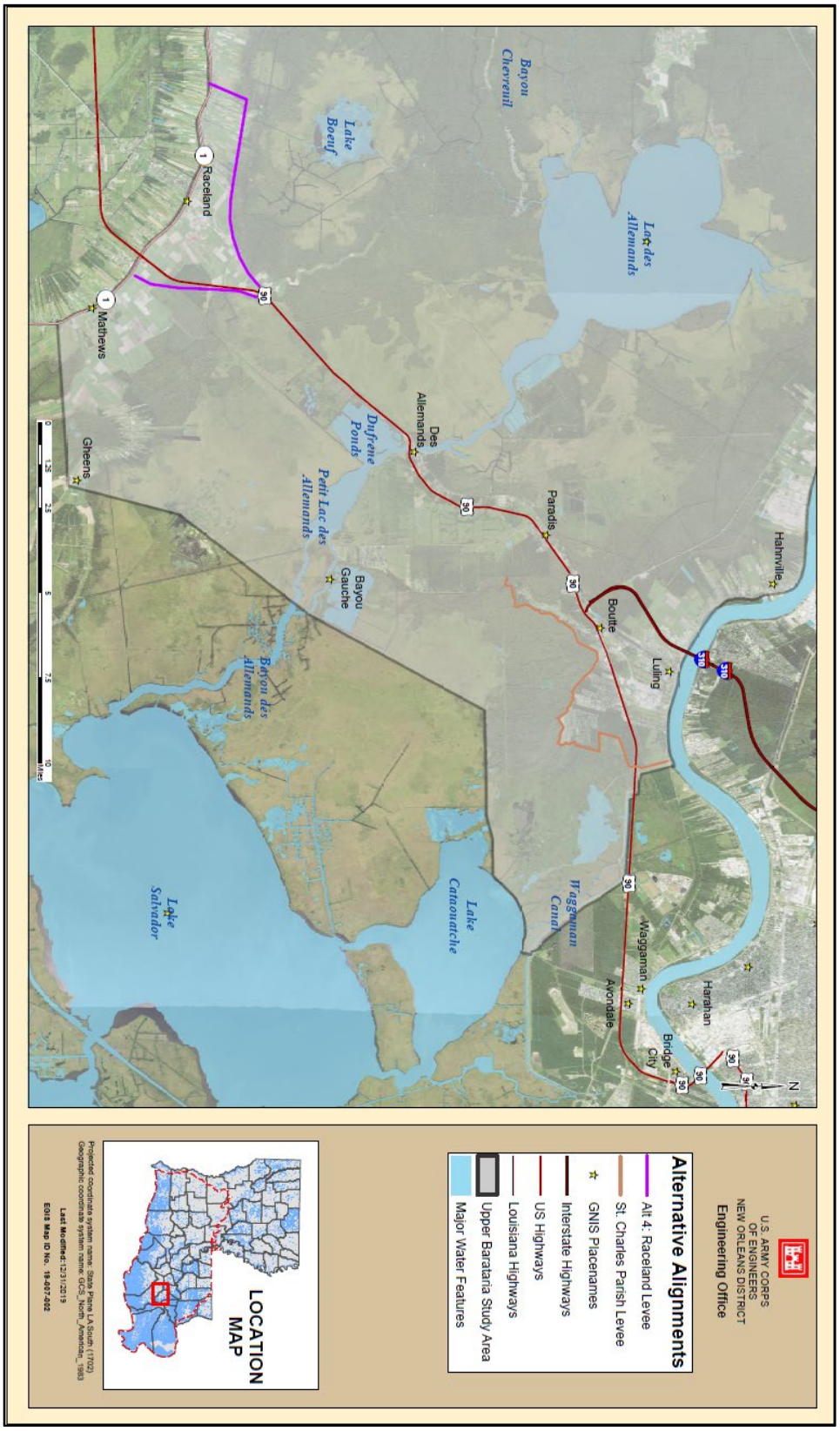

Figure 4-4. Raceland Levee

Figure 4-5. Basin Edge Levee

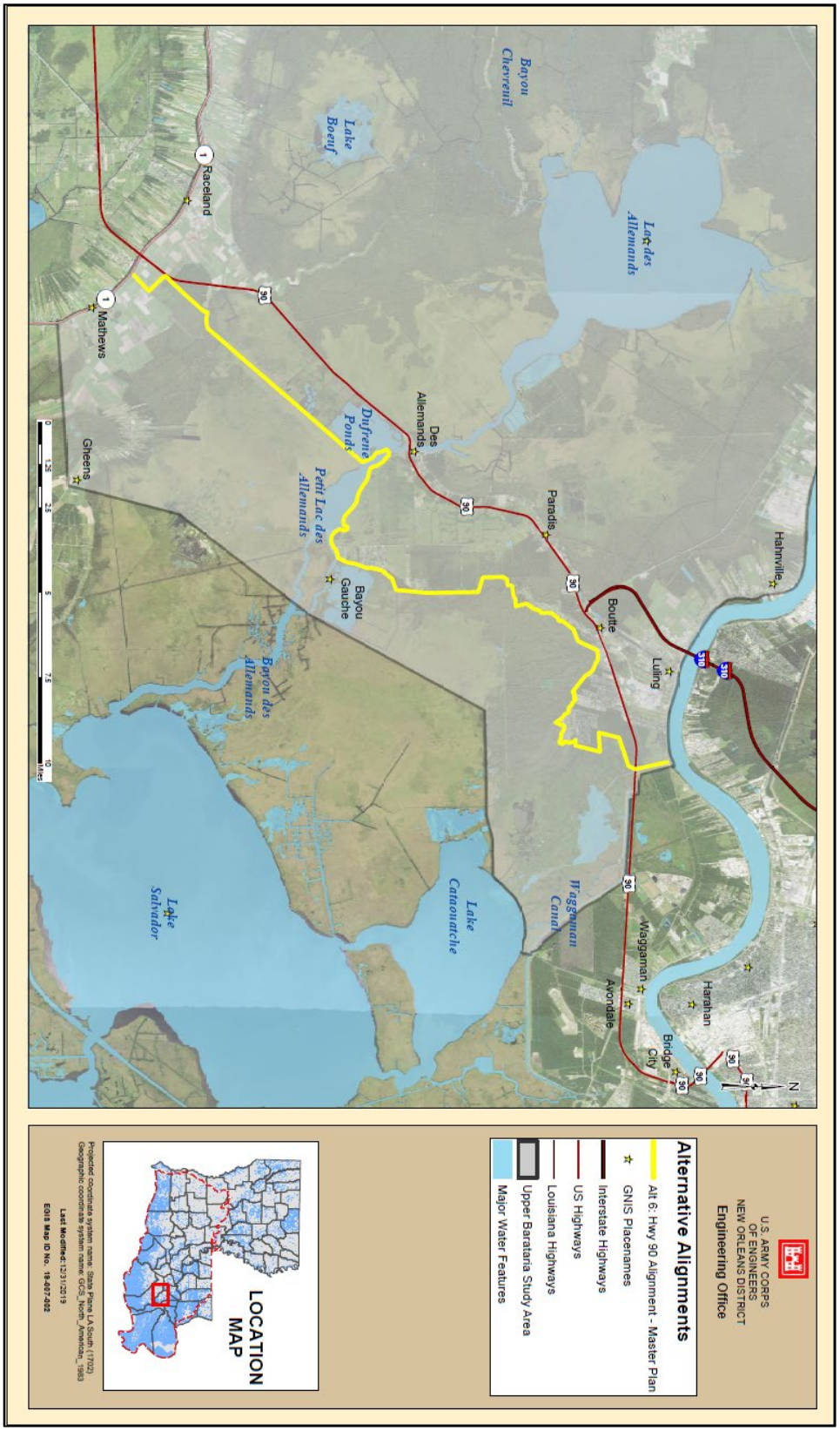

Figure 4-6. Hwy 90 Alignment - Master Plan

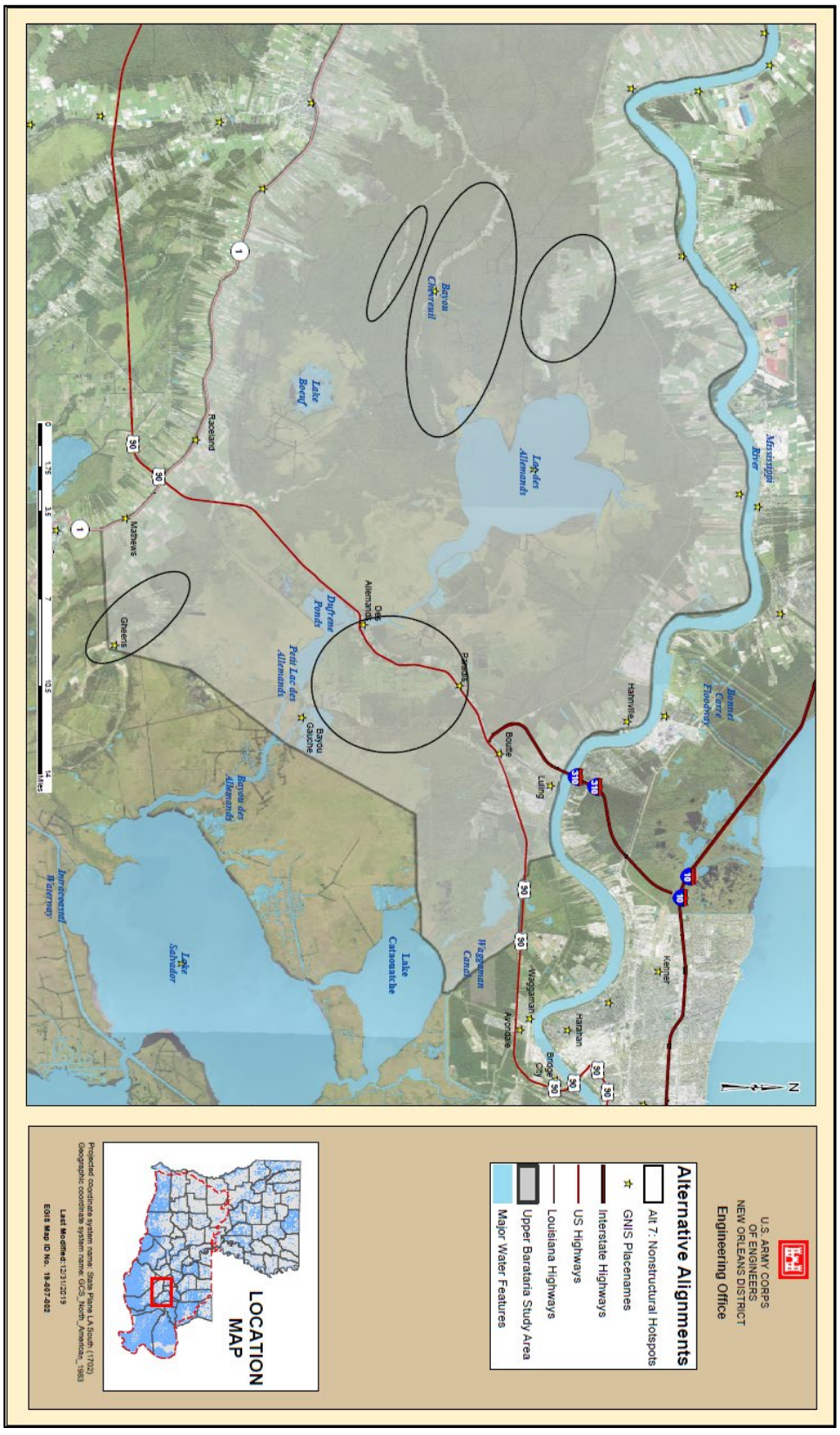

Figure 4-7 Nonstructural Alternative

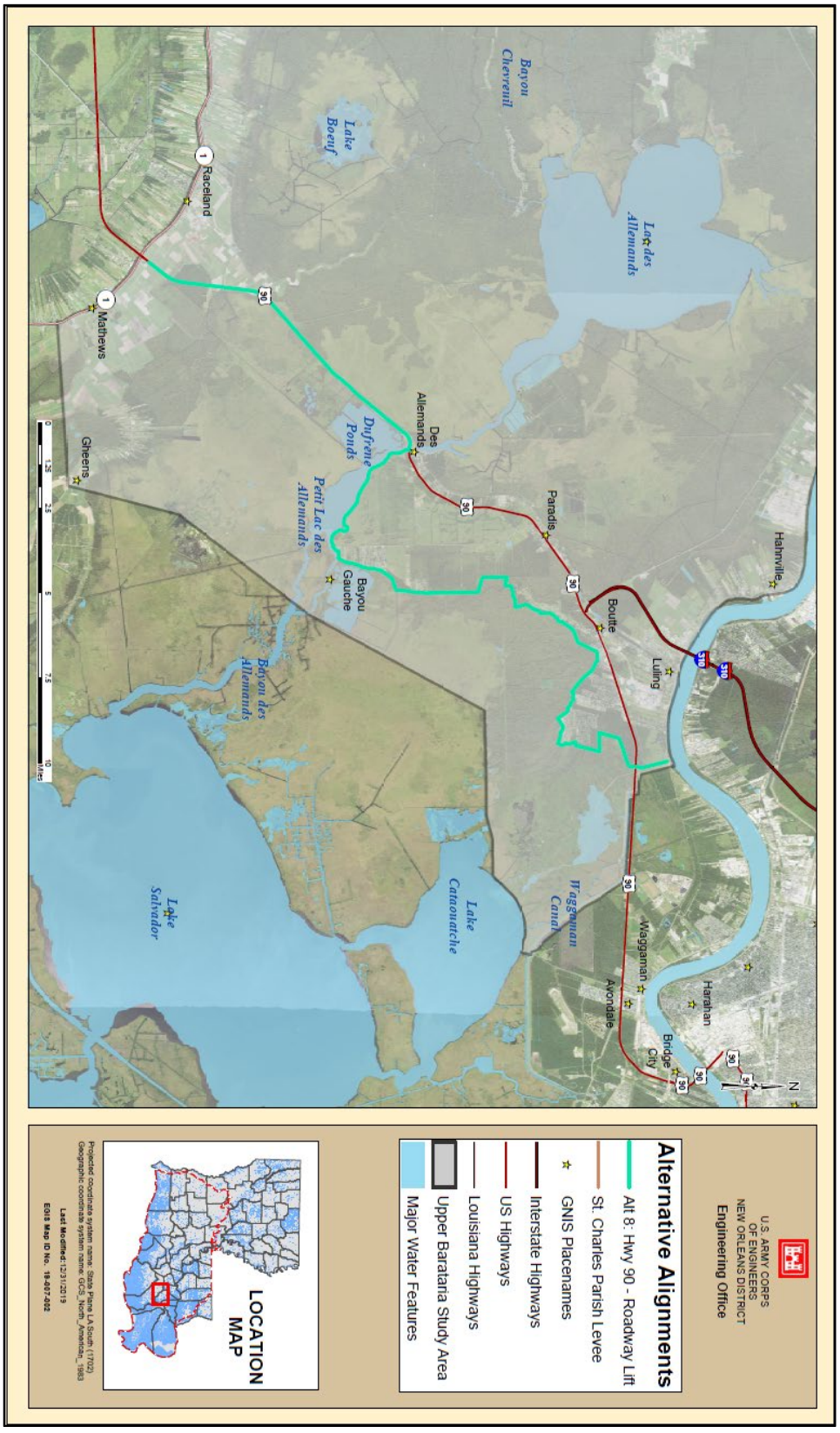

Figure 4-8. Hwy 90 Lift Alignment

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. Because all growth is expected to occur outside of the 100-year floodplain, the with-project and without-project impacts would be identical. 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.

Significant concerns were given to Alternative 5, and 8 related to either tying into the highway or elevating the highway.

Significant consideration was given to the full HWY option as a levee; Alternative 8, however, the highway is used as a major evacuation route for the city of New Orleans and Houma. Due to the fact that levee on the highway would have met 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, the existing highway would likely have to be removed. In discussion with NFS and stakeholders, it was determined that a 4 lane highway would have to be relocated and reconstructed as a bypass road with design speeds similar to the existing highway during the construction period in order to not have any significant risks to evacuation routes. This alternative initially appeared to the be least damaging practicable alternative to wetlands of the cross basin alternatives, but when you factor in the guidance and regulations mentioned previously the alternative is not a feasible solution. A temporary re-routing of traffic would have to be adjacent to the existing highway and would have had similar wetland impacts similar to other alternatives.

In addition, USACE 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) would require that the system be updated as RSLR impacts occur. Every time a levee lift is needed the highway would have to be

relocated and a bypass would be needed for construction. This is the reason why historically, the LADOTD has not supported placing roadways upon levees in coastal Louisiana. Based on these discussions Alternative 8 was screened out.

Alternative 5 was also reviewed due to their US Highway 90 tie-in location. The alternative had significant induced stages onto the existing highway. The stages would have to be mitigated and under Alternative 5 there were limited benefits to support costs for mitigating. Therefore alternative 5 was screened out. As discussed in section 4.5.2 below, a revised alternative (Alternative 10) was developed similar to Alternative 5, however, the level of risk reduction was much higher.

Only Alternatives 1, 2, 3, and were considered for detailed evaluations under table 4-1. As stated above, Alternative 4 and Alternative 5 was screened due to limited FWOP damages, to support the required cost. Alternative 7 (NS1) was later evaluated in the final array of alternatives, to ensure that nonstructural measures we are being evaluated alongside structural alternatives. Alternative 8 was also not considered for detailed evaluations under table 4-1 due to the significant engineering, environmental and logistical challenges with rebuilding a highway on top of a levee.

Table 4-1. Initial Array of Alternatives (FY20 Federal Discount Rate 2.75%)

Plan	Damage Reduced (AED)	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
Alternative 3 - Des Allemands Loop	$8,712,000	$288,000,000	$10,930,000	($2,218,000)	0.80
Alternative 6 - Hwy 90 Alignment Master Plan	$19,655,000	$1,053,000,000	$39,960,000	($20,306,000)	0.49

4.4 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 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. Alternatives 3 and 6 were eliminated due to a BCR under 1.0. The BCRs for the focused array are contained in Table 4-2 and are based on an FDR of 2.75 percent.

Table 4-2. Final Array (FY20 Federal Discount Rate 2.75%)

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 ACDIRC model). Two additional alternative plans (Alternatives 9 and 10) were then developed for the revised final array. Alternatives 1 and 2 were also brought back into the array, together with the Nonstructural alternative.

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 (water downstream from its source) elevations to in turn drop the upper Barataria basin (water at its source) 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.

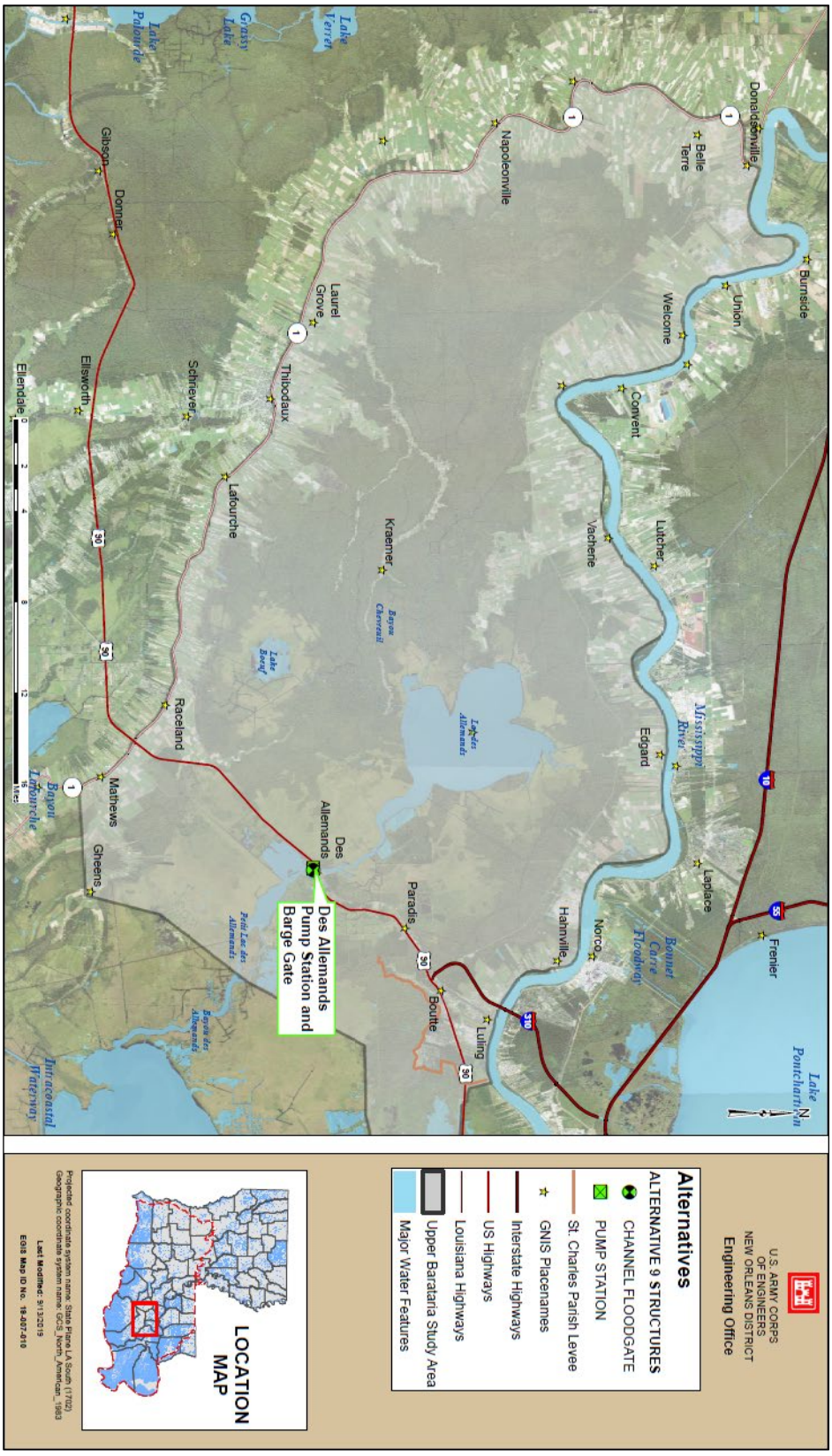

Figure 4-9. Basin Rainfall Alternative

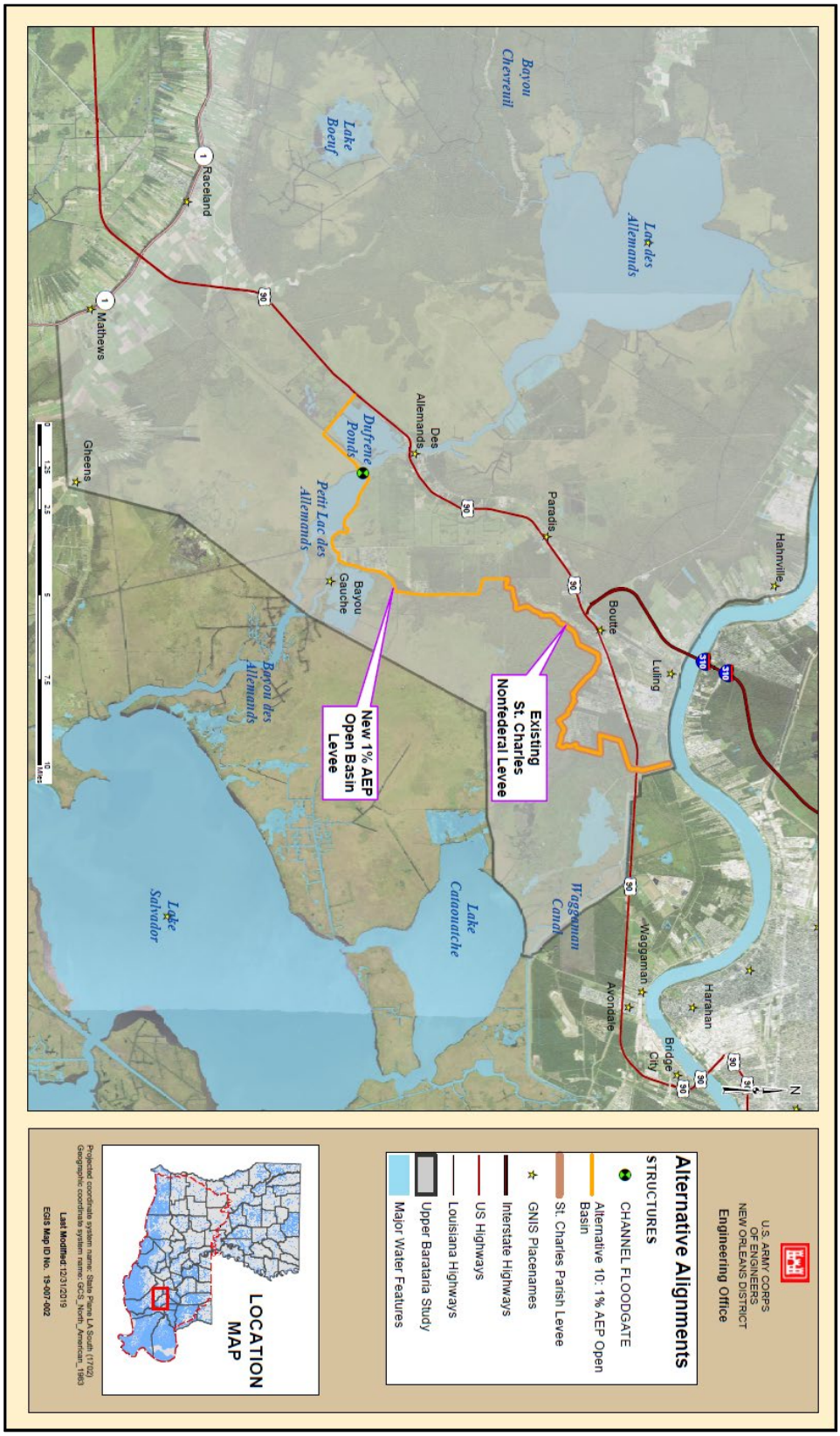

Figure 4-10. 100-Year Open Basin Alternative

4.6 SCREENING OF THE REVISED FINAL ARRAY OF ALTERNATIVES

Alternative 9 was screened out based on the storage capability of 17 billion cubic feet within the UBB 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 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 sufficiently 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 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 (HSDRRS) specifications. These assumptions have been made based on the storage in the basin.

Alternatives 1 and 2 were carried forward from the final array of alternatives along with alternative 10 and alternative 7 (nonstructural) that was 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.

The no action alternative (Alternative 11) was included along with the alternatives shown in table 4-3. No NED benefits would be associated with the No Action Alternative. There would continue to be adverse impacts to the EQ as salinity levels increase in the area, affecting wetlands and eventually causing impacts to residents (OSE) in the immediate vicinity of the study by reducing the natural swamp buffer. Reducing the natural buffer could also cause uncertainty to RED by impacting businesses in the region and the overall economy.

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.

4.6.1 Life Safety

A Life Risk Assessment Report was developed for the non-structural, no action, and structural alternatives. The team determined, based on the similarities in alignment that differences in impacts to life safety and critical infrastructure within the structural set of alternatives would be minimal. As a result, one structural alternative was carried through in the life safety analysis as a representative of the other structural alternatives. This information can be found in the Life Safety Annex 14, Appendix A Engineering. A semi-quantitative risk assessment on the recommended plan will be conducted, in accordance with PB 2019-04, in PED.

The critical infrastructure in the area are electric power plants (3), elementary and secondary schools (16), fire stations (21), post offices (5), prisons (2), propane locations (5), and wood product manufacturing facilities (51). A direct comparison was not conducted but would be expected to be similar across the structural alternatives.

Refer to Table 4-4 and Appendix A for the life safety report.

Table 4-4. Revised Final Array of Alternatives, Life Safety Evaluation Matrix

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 TSP	Low	Low	Low	Low	Low	-	High	High

Notes:

LL: Life Loss, LLR: Life Loss Risk

1. Expected annual life loss is assumed to be low for all scenarios based on population density
2. Warning time based on the tropical storm forecasting days in advance of event
3. Inundation maps generated through HEC-LifeSIM were unavailable at time of assessment
4. Potential depth of inundation may be significant based on size of polder and height of flood event
5. Historic settlement and anticipated no tidal activities inside the polder mean the higher population areas are on higher ground

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 Federal accounts against the

economically justified alternatives in the revised final array. The 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, Paradis, and Des Allemands.
- A full OSE was not completed at this time, minimal effects are expected and it did not affect the formulation nor the selection of the recommended plan. Although OSE was not specifically addressed, the socioeconomic impacts of the project were addressed in the EIS for this project.

Table 4-5. Evaluation of Accounts

Account	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

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 Revised 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 Revised 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 4-3, 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 where 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-feet 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

	1st Draft Feasibility Report with Integrated Environmental Impact Statement		2nd Draft Feasibility Report with Integrated Environmental Impact Statement	
Attribute	**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
Elevation 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	408 acres	310 acres		1,074 acres

4.8.2 TSP Initial Optimization

The TSP levee was designed to overtop during the coastal 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 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 (4.0ft^3/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. Mitigation measures were 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 the modeling. The adopted 2017 CPRAB 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-feet 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 UBB study 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-feet 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 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 maps 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 of analysis 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 Paradis 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.

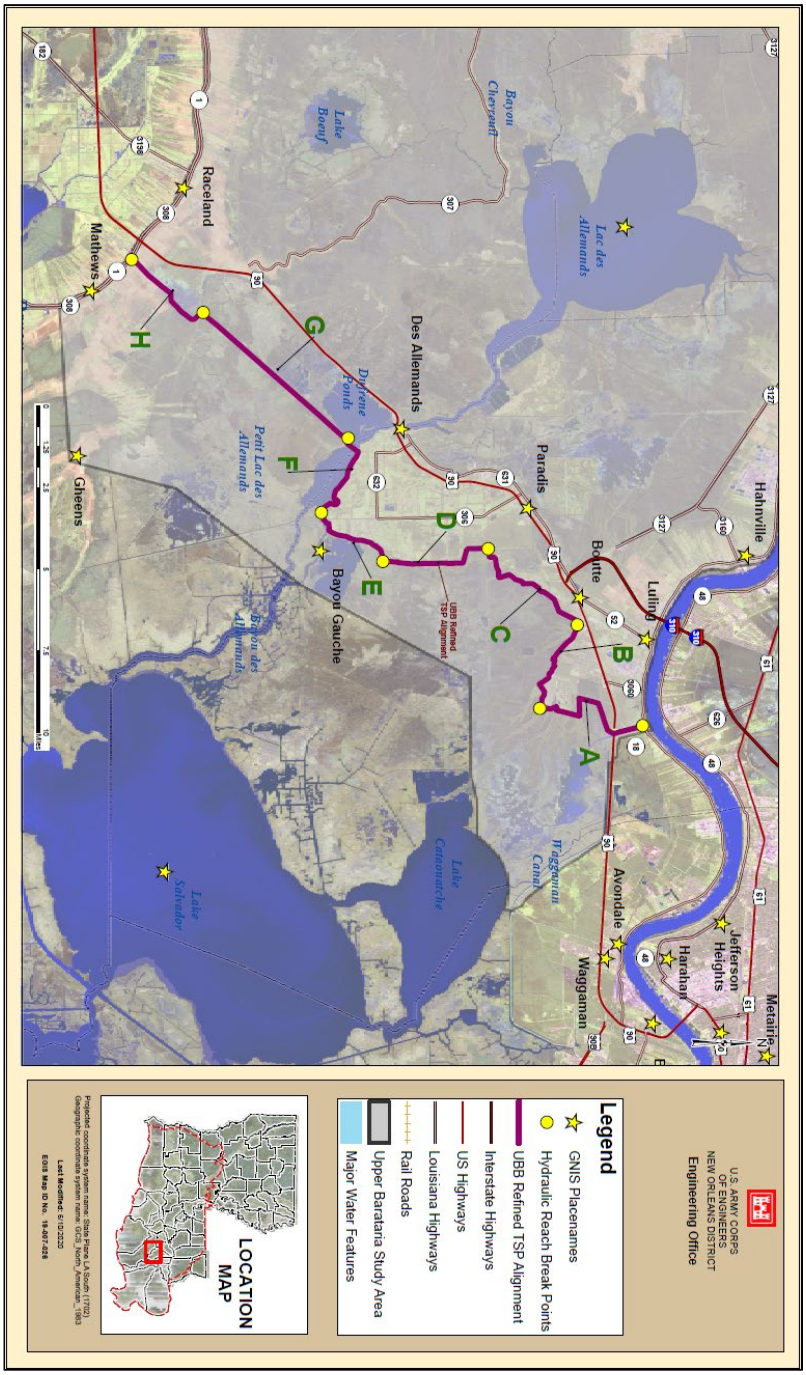

Figure 4-11. Hydraulic Reaches A-H

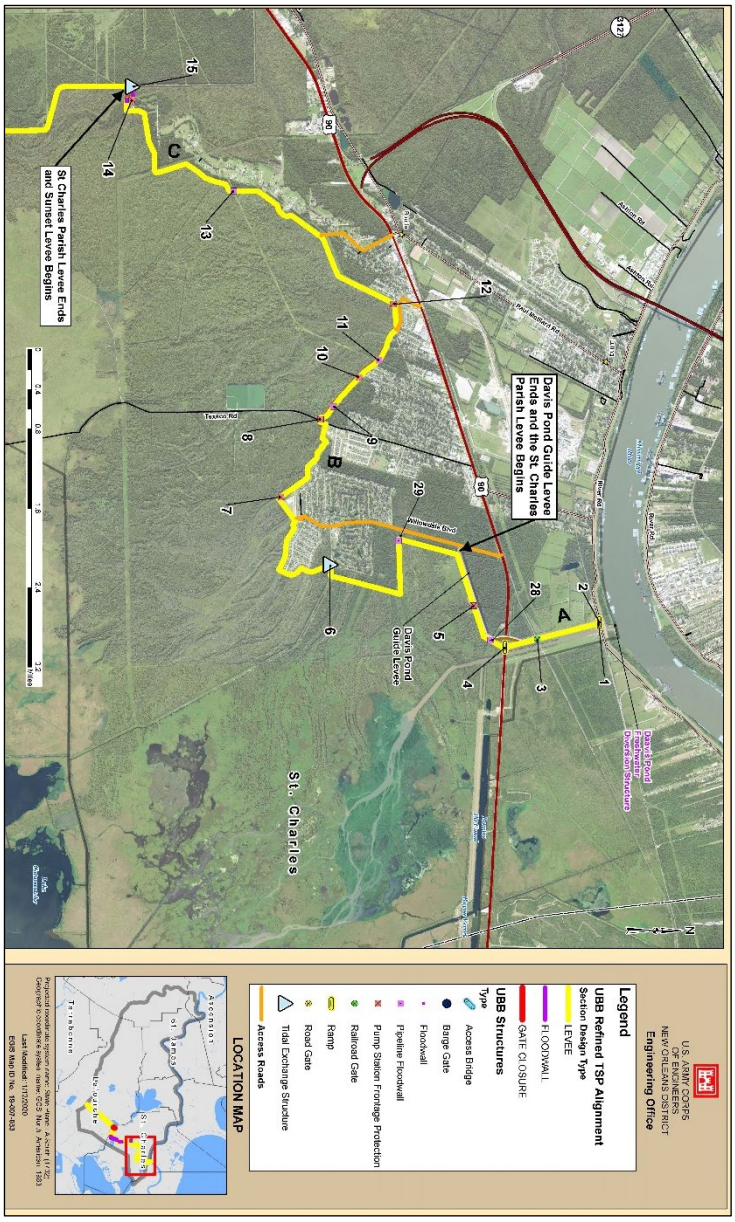

Figure 4-12. Structure Location, TSP Alignment (Northern)

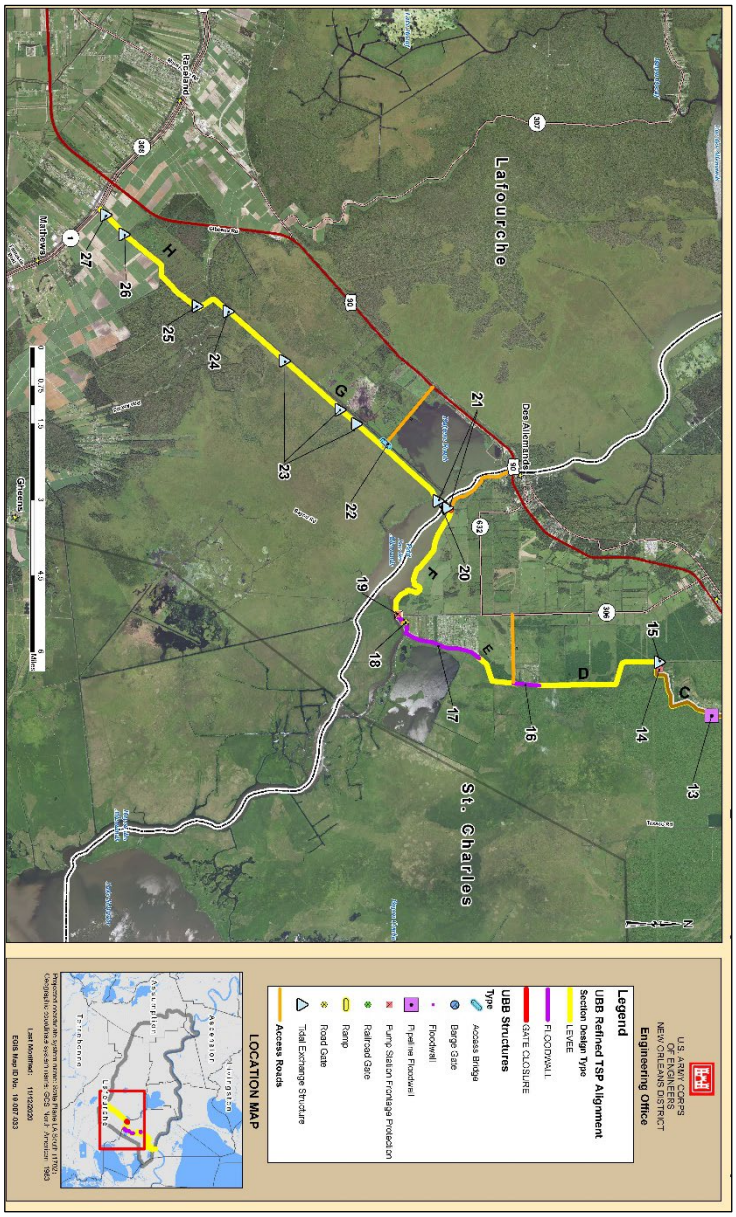

Figure 4-13. Structure Location, TSP Alignment (Southern)

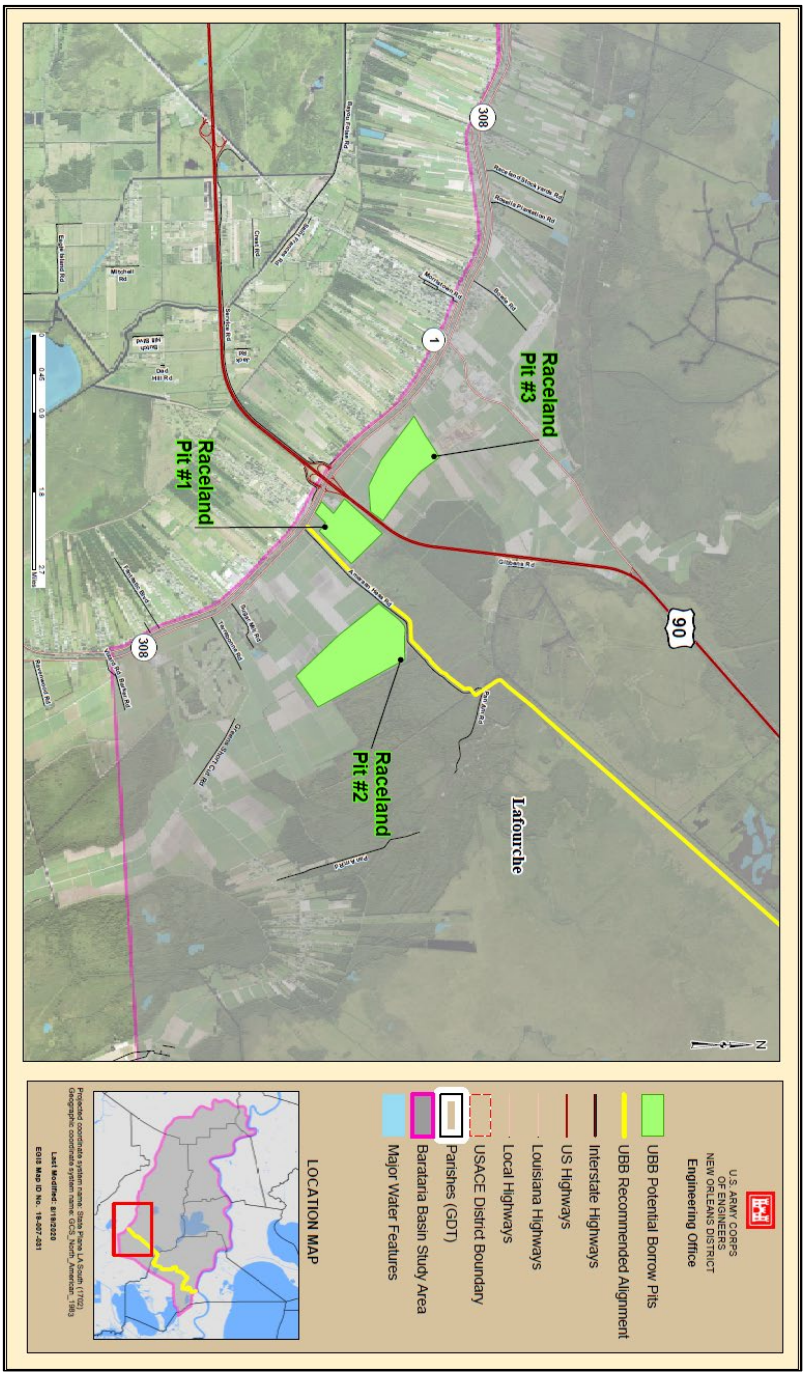

Figure 4-14. Potential Earthen Borrow Sources near Raceland

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.

Generally speaking, hydraulic connectivity has been maintained by not blocking off any waterways. Those canals that were cut off by the levee have had their conveyance maintained by culverts and sluice gates. Half of the alignment already has a levee as well as Highway 90 crossing the basin, so there is no major alteration to flow patterns. The majority of the flows are carried into Bayou Des Allemands. This hydrologic connectivity would be maintained to the extent practicable through water control structures, except during gate closures for surges from hurricanes or tropical storms. The operational criteria of the gates closure will need to be fully assessed in the PED phase. The gate operations will be dependent on the intensity, track and orientation of the approaching storm, which will dictate the trigger condition for gate closings.

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 entails 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 an elevation 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 of analysis.

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 percent AEP design elevation over the authorized 50 year period of analysis.

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 Paradis 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 percent AEP design elevation over the authorized 50 year period of analysis.

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 Paradis 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 that 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 of analysis.

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 of analysis. 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 six 15 feet by 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 on local ecosystem restoration sites if available. 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 of analysis.

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, each consisting of four 6 feet X 6 feet 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 of analysis.

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 two 2-84 inch diameter culverts with sluice gates and one 60 inch 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 of analysis.

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-ft wide footprint (consisting of a 25 ft right-of-way for the access road itself and a 15-ft width for a vegetative free zone), positioned at the levee toe, is proposed. A 2 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.

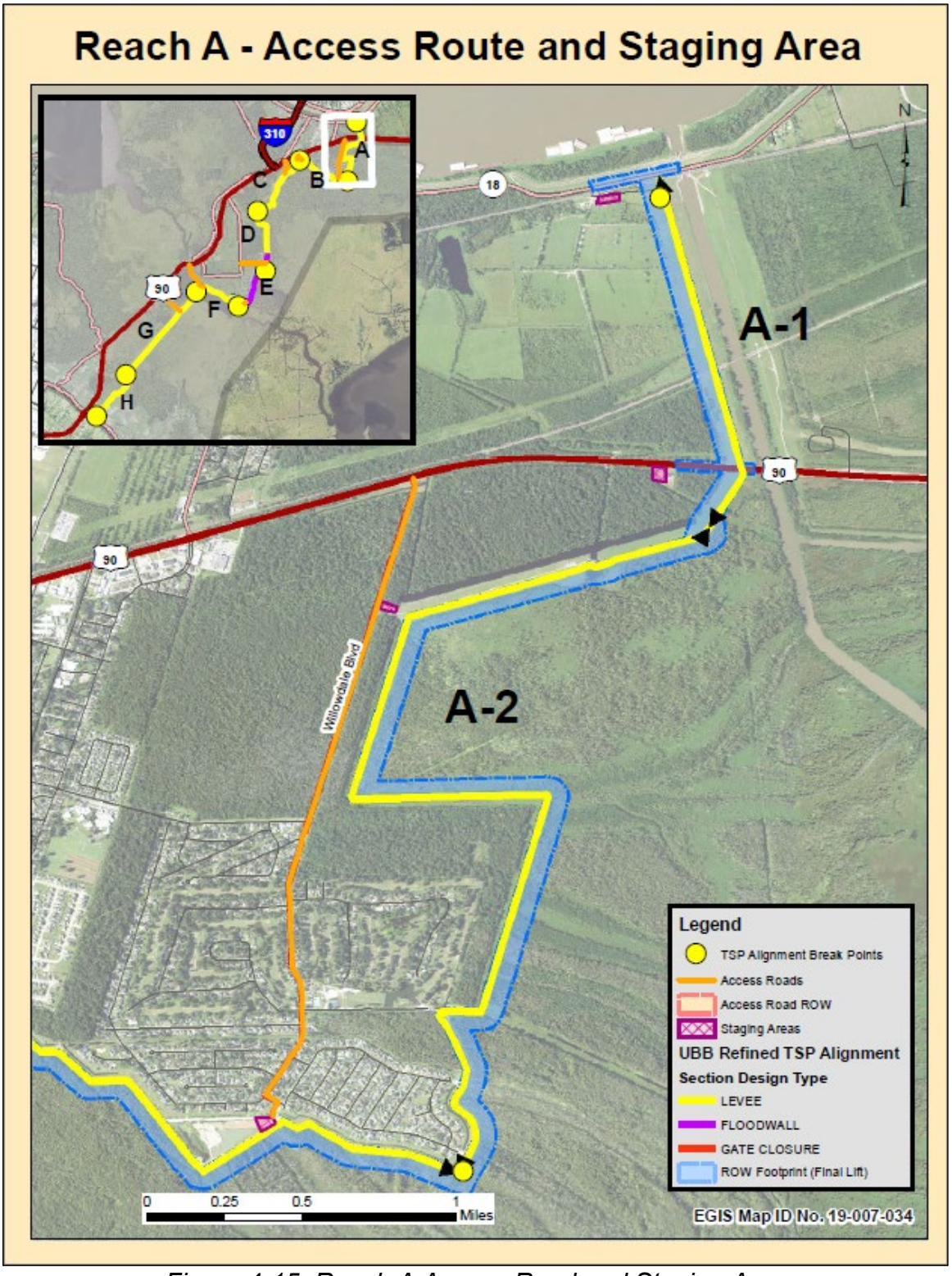

Figure 4-15. Reach A Access Road and Staging Area

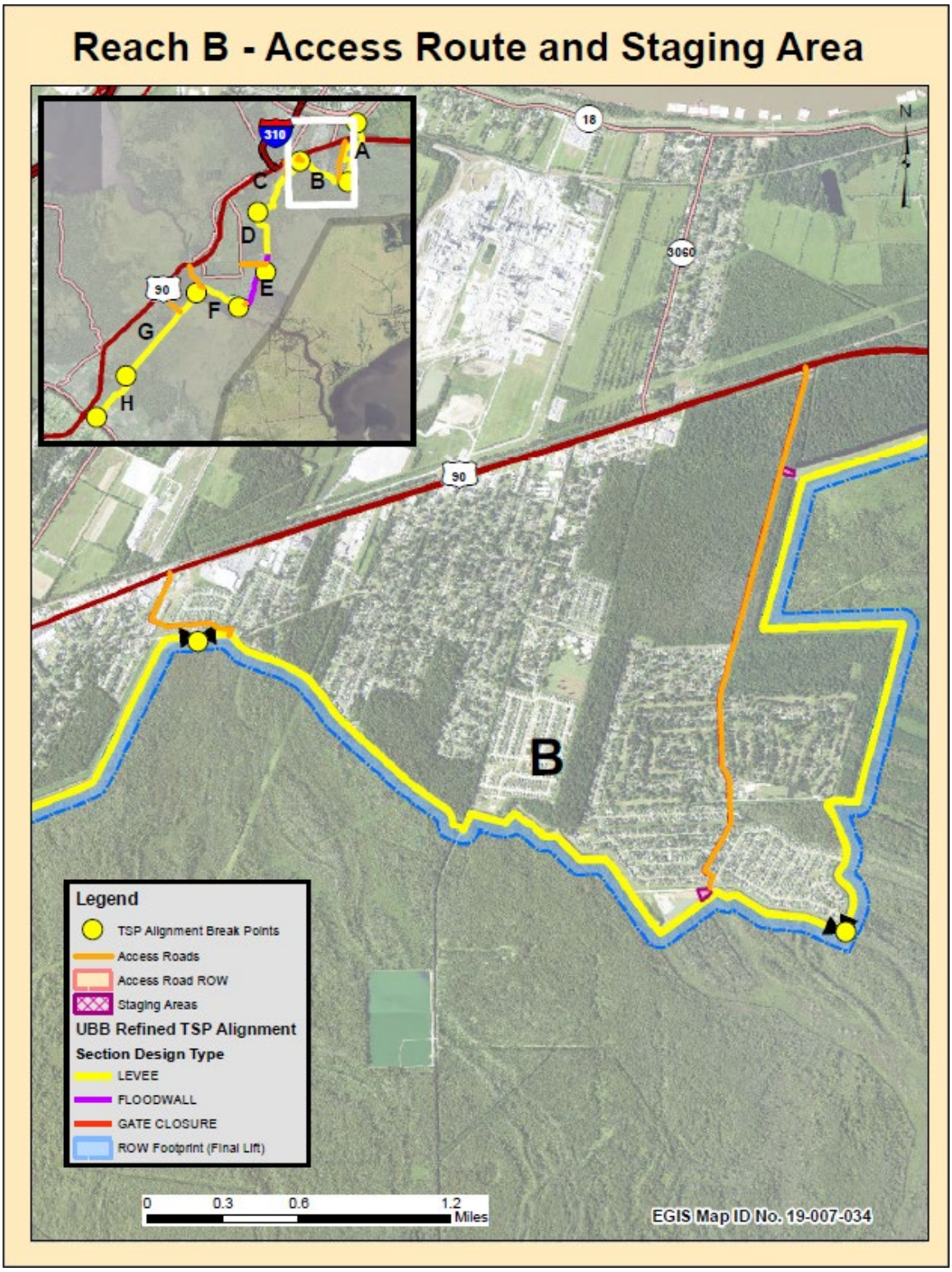

Figure 4-16. Reach B Access Road and Staging Area

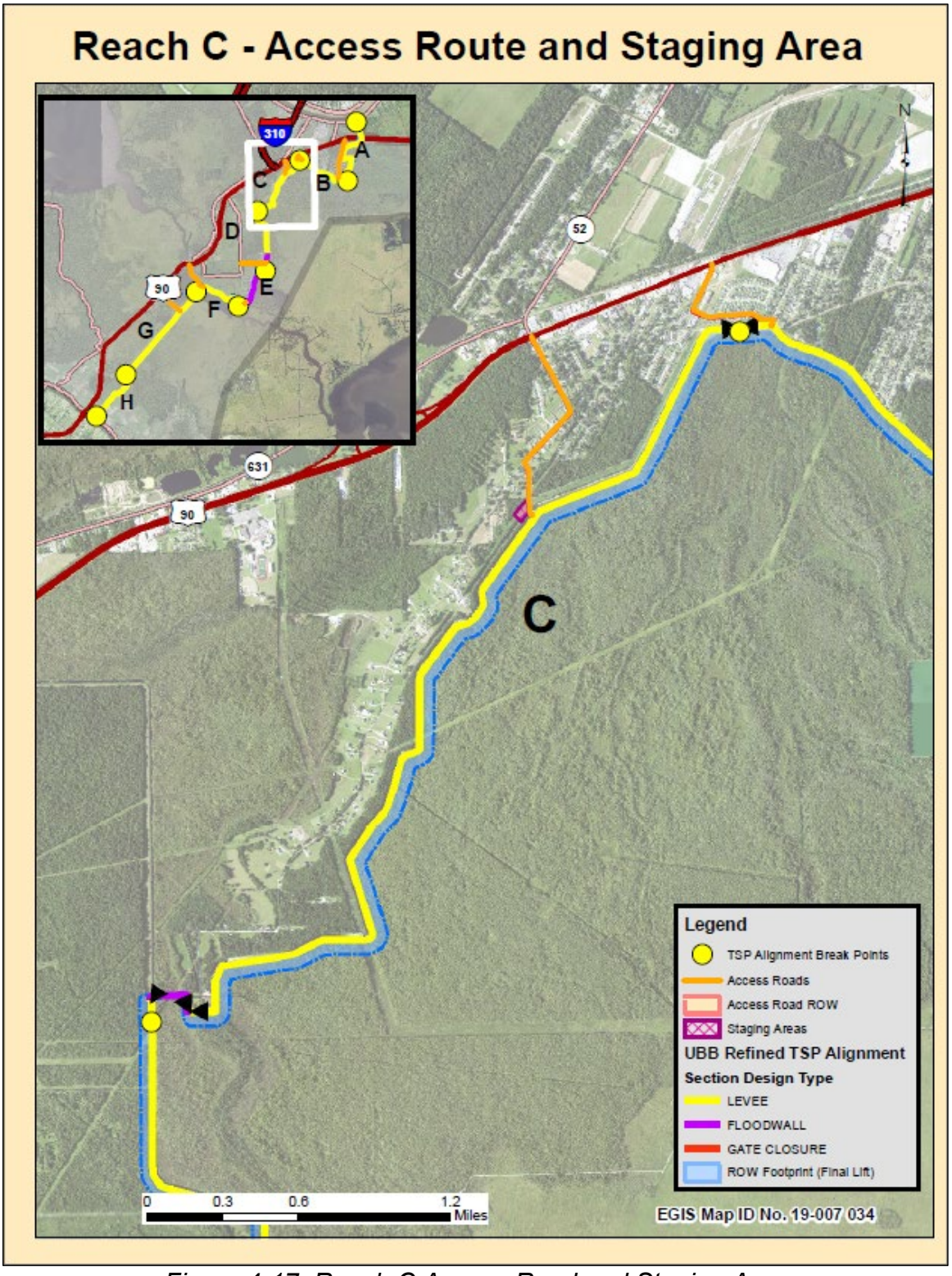

Figure 4-17. Reach C Access Road and Staging Area

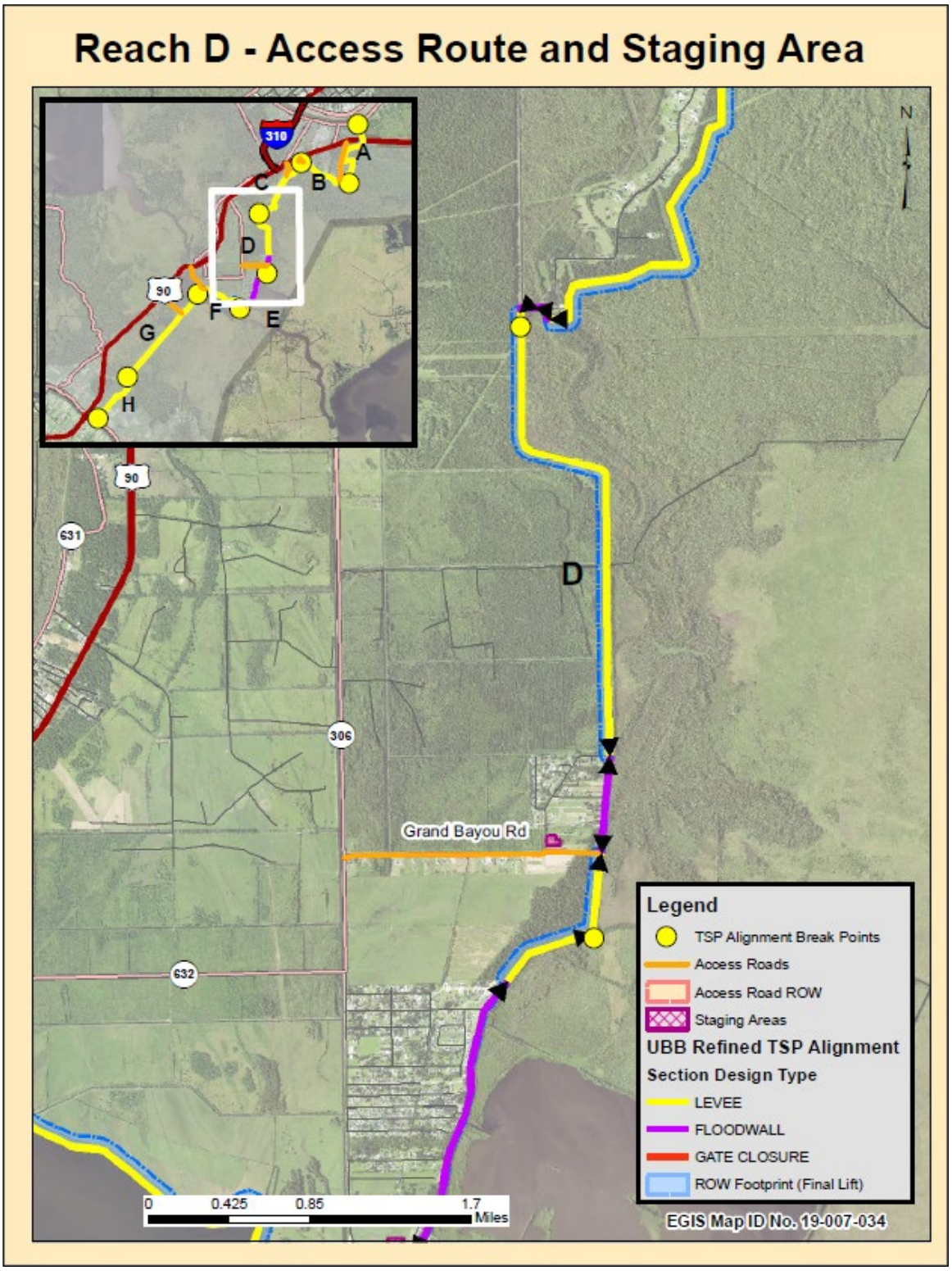

Figure 4-18. Reach D Access Road and Staging Area

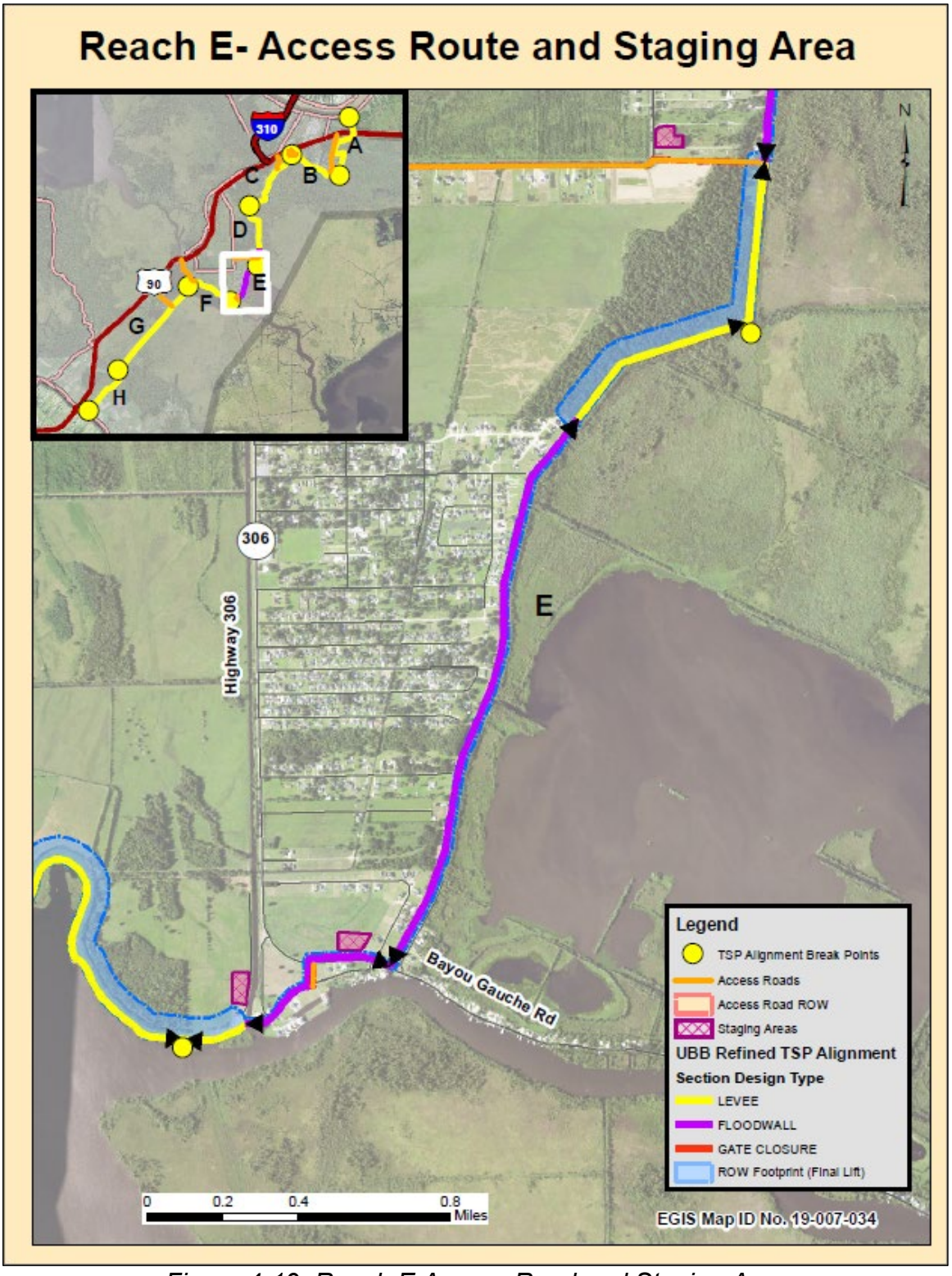

Figure 4-19. Reach E Access Road and Staging Area

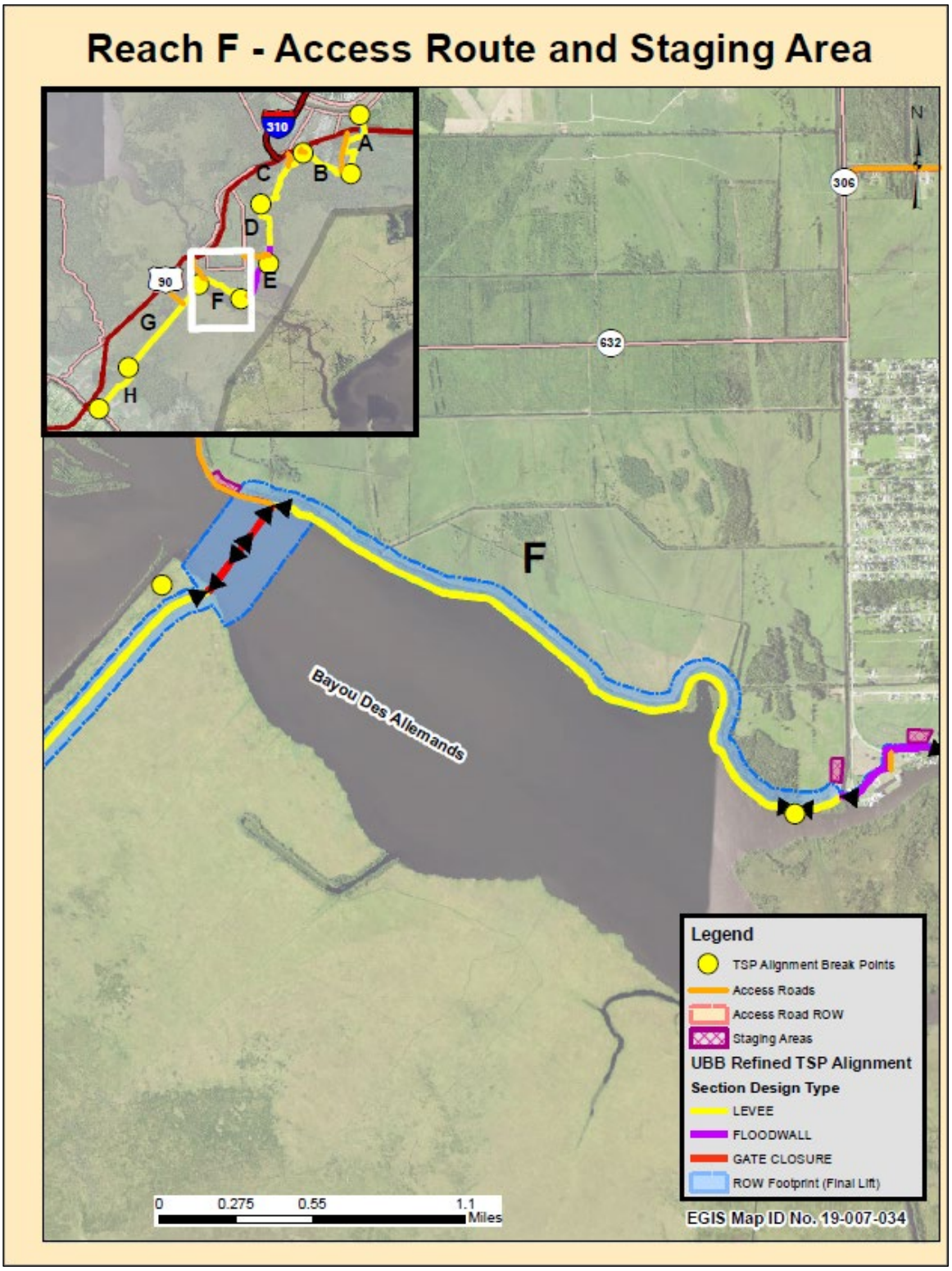

Figure 4-20. Reach F Access Road and Staging Area

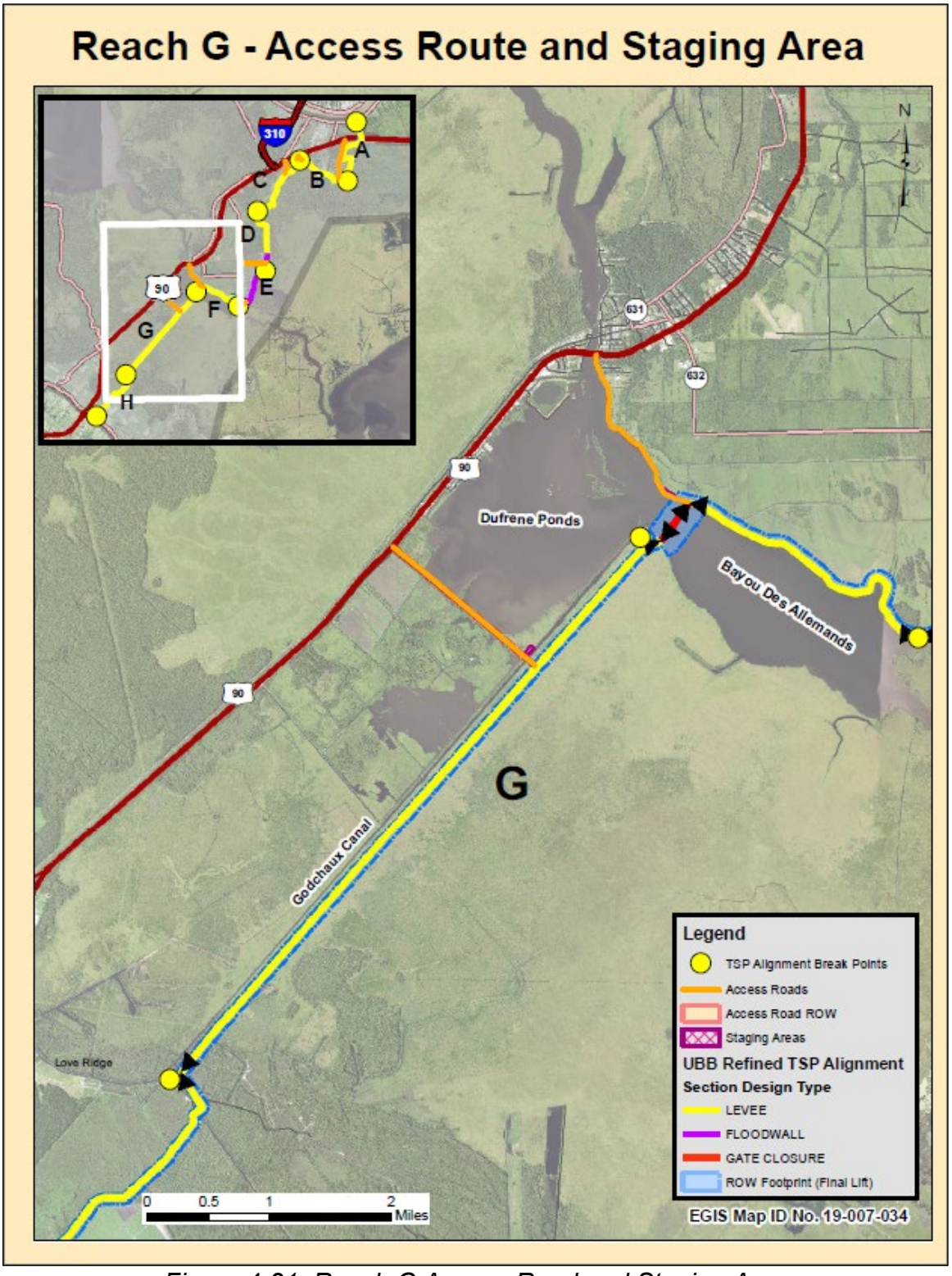

Figure 4-21. Reach G Access Road and Staging Area

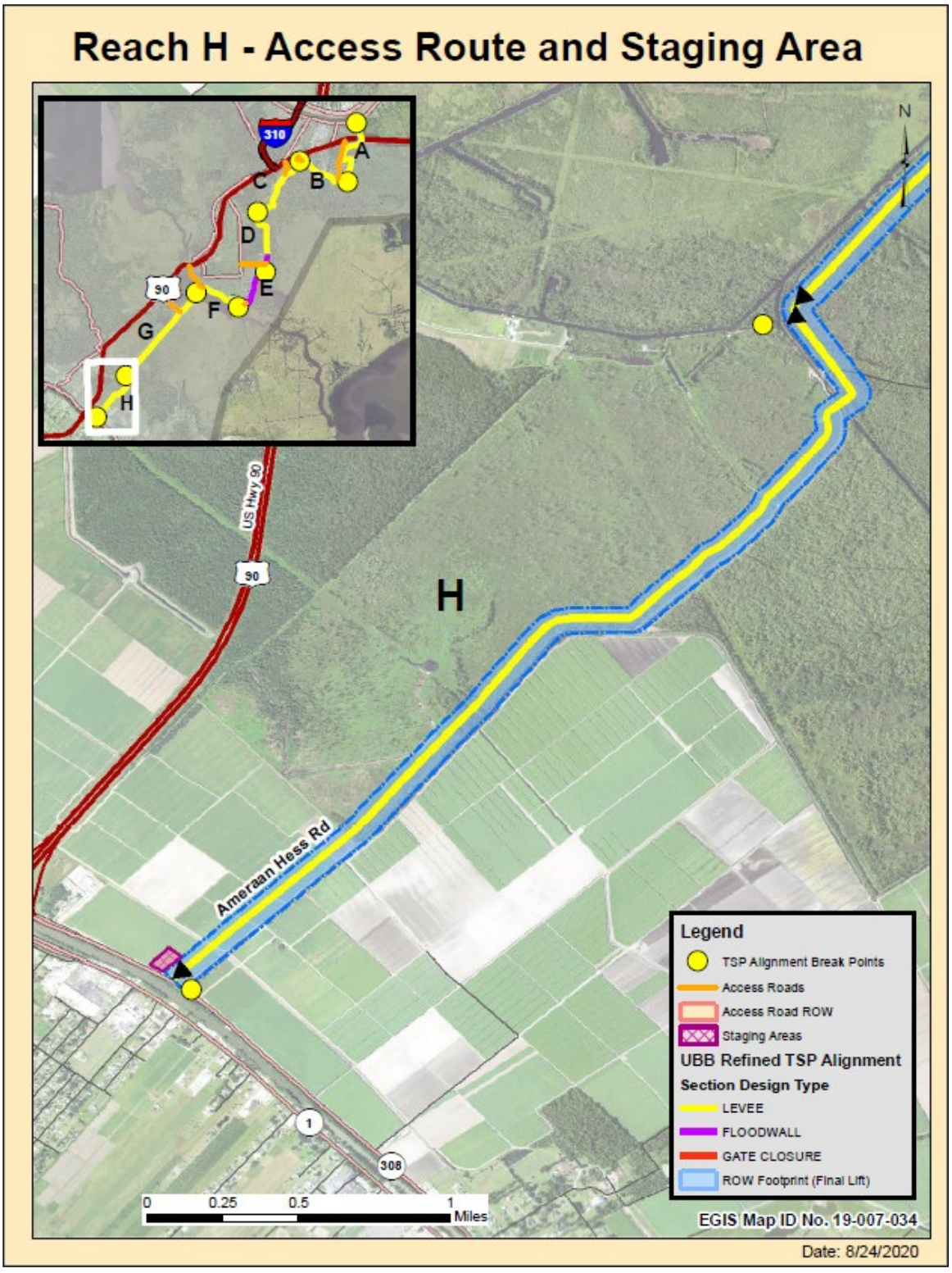

Figure 4-22. Reach H Access Road and Staging Area

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 Paradis 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 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

	Existing Levee	2026 Construction		Final Lift Construction	
Reach	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 Mitigation Measures to Address Induced Flooding from the TSP

A couple of different mitigation measures were evaluated 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. Flood warning system is not needed because local and state authorities monitor storm tracks and provide notification to residents on whether to evacuate or shelter

in place. Relocation is not practicable because voluntary relocations are not allowed. Eminent domain would likely be required, which would require relocation/buy outs to become mandatory for all residents. Residents are not in favor of mandatory buy outs. 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. Mitigation for potential induced damages will be further investigated during PED, including options to make improvements to the existing local levees (Gheens and Mathews) as a mitigation measure. At this time, we have included the highest cost, a worst case scenario mitigation for potential induced flooding, which includes acquisition of 64 residential structures in Bayou Gauche, 173 residential structures in Gheens, and 33 residential structures plus 5 commercial structures in Mathews. Though the highest cost (acquisitions) was accounted for in the overall project cost estimate, individual investigation and mitigation for each structure, if appropriate, will be done during PED. Please see section 6.8.1 for more information on methods to reduce risk of induced flooding outside the project.

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. There was a significant risk moving forward to reevaluate Alternative 2 based on the significant costs with armoring the entire levee for resiliency and the benefits were significantly lower due to the lower elevation. 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 the chance that another alternative would have been identified as the NED plan.

Section 5
Environmental Consequences

In accordance with the Council on Environmental Quality Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act (NEPA) Part 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 noted previously, Section 4.8 describes 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 the 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. However, should upper basin wetlands eventually 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 is presented in Appendix C.

Table 5-1. Impacts to Significant Resouces from Construction Alternatives

Significant 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, and HTRW and would suffer no impacts or only temporary, minimal impacts.

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.

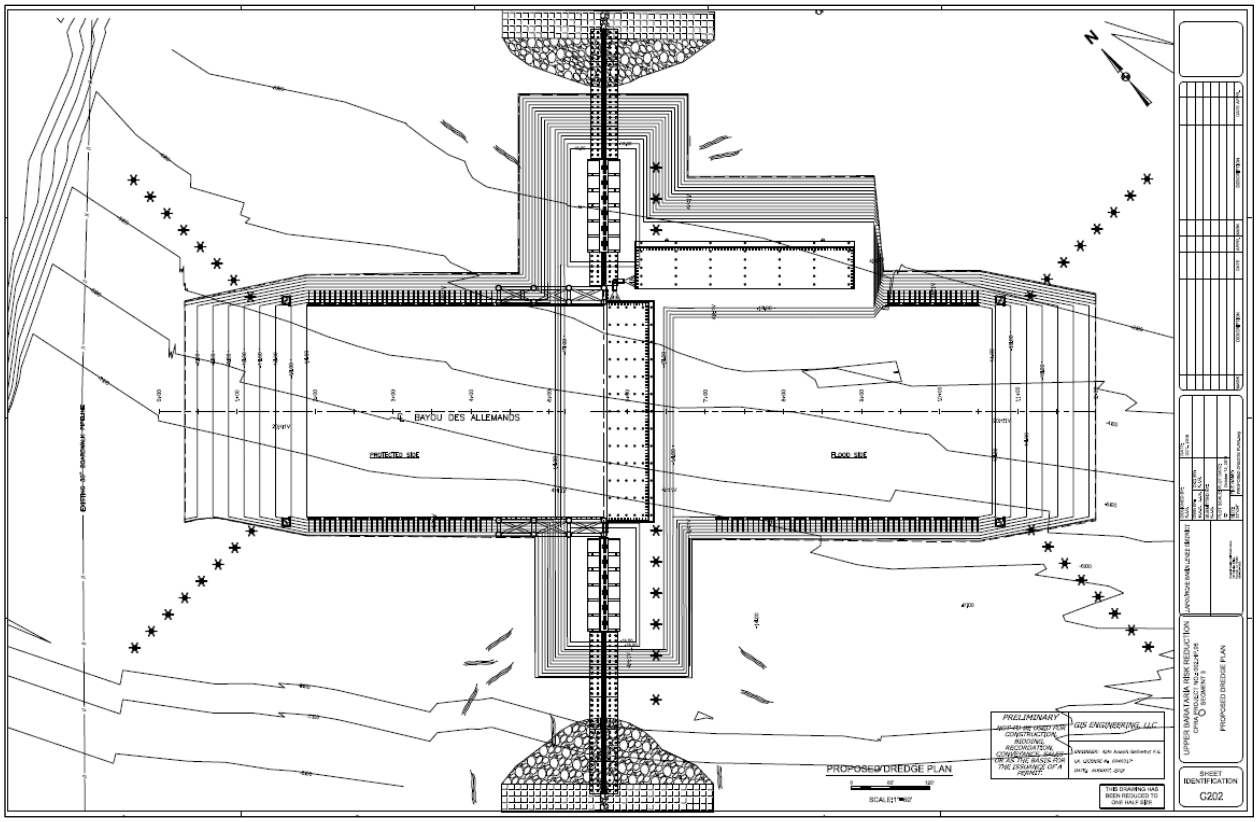

Figure 5-1 Floodgate Structure at Bayou Des Allemands

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 mic 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 impacts 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).

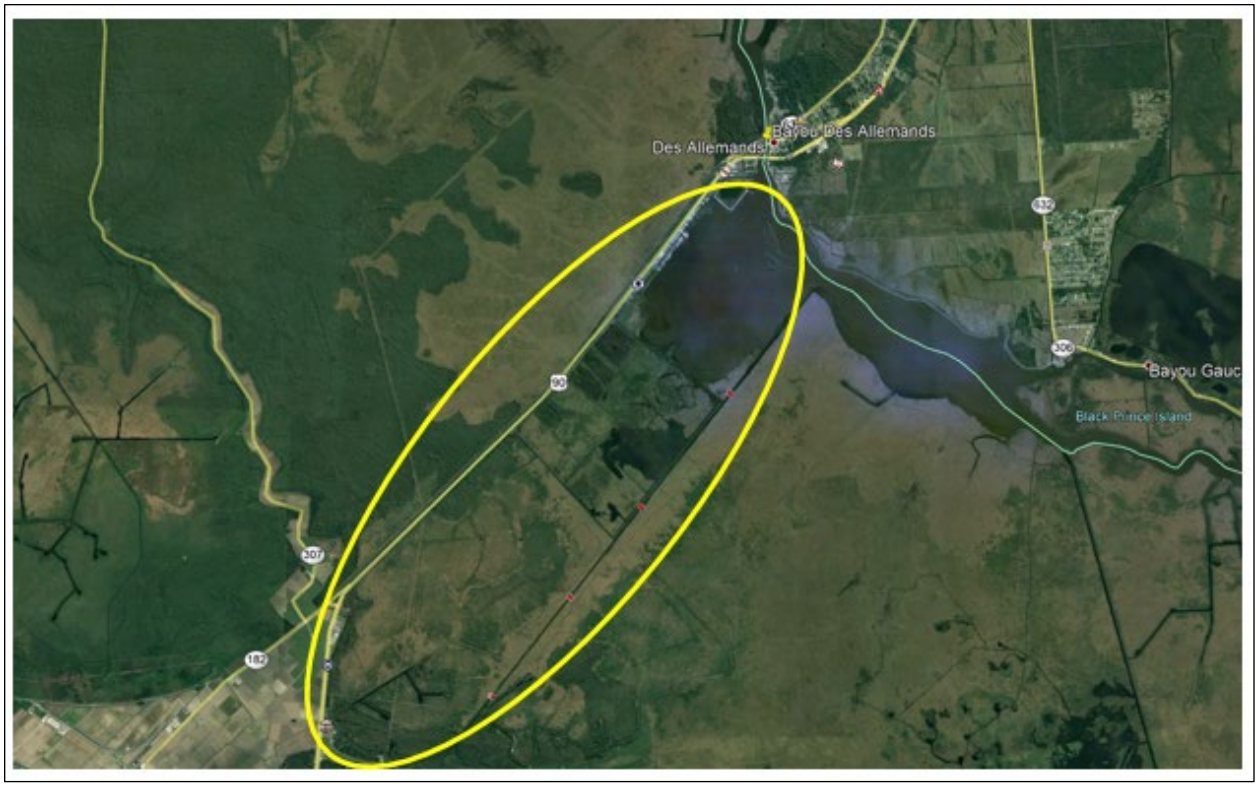

Figure 5-2. Upper Barataria Basin Area of Interest

A HEC-RAS, two-dimensional (2D) hydraulic model was developed of the natural and constructed channels in the area shown on Figure 5-2. A H&H evaluation determined that an inclusion of 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, Appendix A. Based on this evaluation, Alternative 1 includes five sets of culverts, four 6 by 6 foot box culverts with sluice gates (no screens), and two 84 inch in diameter culverts with sluice gates and one 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 previously, additional investigation would take place under 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, access road, 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), 168 acres of cypress-tupelo swamp, 267 acres of fresh marsh, 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.

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 Alterative 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 velocity at the location where the gate would be constructed is 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 this existing velocity would remain essentially the same under normal conditions. As such, no direct impact to fisheries species would be anticipated. 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 directly impacted with construction of Alternative 1. Approximately 267 acres of fresh marsh impacts, and 95 acres of water bottom would be impacted as a result of construction. 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. These impacts would be mitigated with the purchase of mitigation bank credits consistent with the mitigation plan found in Appendix E.

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.

Alternative 1 includes a 270 foot wide barge gate flanked by 6 20 foot wide by 15 foot high box culverts with sluice gates. In addition, along reaches G and H there will be 5 locations with four 6 foot by 6 foot RC box culverts (no screens), two 84 inch in diameter culverts with sluice gates, and one 60 inch in diameter culvert with sluice gate (no screens) to maintain water exchange across the marsh and mitigate any impacts to the existing habitat. As stated previously, additional investigation would take place under PED to verify these assumptions and ensure that the timing and flows match the existing conditions in both areas, above and below Hwy 90. Based on our ability to maintain the same crossection with the gate, we do not believe there would be any indirect impacts associated with this project.

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 was completed on November 18, 2020. The USFWS agreed with USACE's determination that the proposed action is "not likely to adversely affect" the West Indian Manatee.

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 could 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 USACE, 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

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.

5.2.2.1.9 Water Quality

Direct and Indirect Impacts

The Upper Barataria Basin Recommended Plan 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 Recommended Plan improves upon and updates deficiencies in the St. Charles Parish Levee, crosses Bayou Des Allemands with a 270-feet 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 USACE has applied for a Water Quality Certification (WQC) from LDEQ to determine whether the construction of these proposed features will impact established site specific water quality standards. The construction contractor would be required to comply with any applicable conditions and requirements included as part of the issued WQC. USACE has also submitted a Coastal Zone Consistency Determination for the proposed project to the Louisiana Department of Natural Resources (LDNR). This determination evaluates the project's consistency with enforceable policies of the state's coastal management program. The construction contractor would be required to comply with any special conditions pertaining to protection of water quality contained in LDNR's final determination for the proposed project. Additionally, to help avoid and minimize the proposed project's impacts to water quality, the construction contractor would be required to prepare a Stormwater Pollution Prevention Plan (SWPPP) for review and approval by the USACE. The construction contractor would then be required to apply for and obtain a Stormwater General Permit (i.e., Louisiana Pollutant Discharge Elimination System General Permit) from the LDEQ. The construction contractor would further be required to comply with all applicable conditions and requirements set forth in the issued permit. The required permits and actions above are designed to lessen construction impacts on receiving waterbodies.

Because LDEQ has currently classified some receiving waterbodies (i.e., LDEQ subsegments) adjacent to the proposed alignment as "not supporting designated use" for some of its use categories, which indicates that water quality is not meeting, and will not meet, applicable water quality standards, the temporary direct effects to water quality from the proposed construction activity would be expected to affect the existing conditions.

Activities for the Recommended Plan that would take place on the flood side of the existing and proposed levee and T-Wall alignments within Waters of the United States (e.g., navigable waterways, wetlands, etc.) would have the potential to increase turbidity, suspended sediments, Biological Oxygen Demand, and decrease Dissolved Oxygen. There would also be the potential for nutrient enrichment associated with suspended sediments during dredging and fill placement operations that could possibly lead to localized algae blooms. Localized short-term increases in turbidity could possibly lead to a temporary displacement of aquatic organisms. Where concrete pours occur adjacent to or within waterbodies for armoring to protect against erosion and scour, temporary minor impacts on

water quality would occur. However, any such direct impacts are expected to be minor and temporary.

Activities for the Recommended Plan that would take place on the protected side of the existing and proposed levee and T-Wall alignments would be expected to have little to no effect on water quality. Earth-moving activities during construction disturb soils and can create indirect water quality effects in the event of uncontrolled runoff or poor sediment control practices during construction. Adherence to permit requirements, best management practices (BMPs), and an approved sediment control plan by the construction contractor would minimize the risk of these indirect water quality effects.

Where wetland fill occurs, this will permanently eliminate the affected wetlands' ability to perform water quality functions, causing a major permanent impact on water quality. Fill material that would be used for levee construction would be tested in advance to eliminate placement of contaminants that could adversely affect water quality. Additionally, to help alleviate some water column impacts during construction, construction-related runoff into the wetlands and open water would be managed by construction contractors through implementation of BMPs and a SWPPP.

Normal water circulation and flow patterns would not be significantly impacted under the Recommended Plan. However, wetlands and open water areas that would be converted to uplands due to the placement of fill material would eliminate flow patterns and water circulation for those specific locations but would not have a significant effect on the overall waterbodies within the study area due to the scale and location of the impacts. Because the water level fluctuations in the surrounding wetlands and waterbodies were and would continue to be regulated by water control structures, no significant effects on normal water fluctuations/hydroperiod would be expected to occur outside of a storm event. Furthermore, no significant alteration of salinity gradients is expected to occur from the placement of fill material for levee construction.

There are no permanent, cumulative effects to water quality anticipated by implementing the Recommended Plan. As discussed previously, there would be construction-related water quality degradation that would have a temporary cumulative effect.

5.2.2.1.10 Air Quality

Alternative 1 – Hwy 90 - Segment 1 Levee Extension

Implementation of Alternative 1 would result in direct and indirect impacts to ambient air quality within the immediate vicinity of the Project Area. These impacts are expected to be temporary in nature, primarily due to the emissions of construction equipment. Any increases or impacts to ambient air quality are expected to be short-term and are not expected to cause or contribute to a violation of federal or state ambient air quality standards. Once all construction activities associated with the Alternative 1, air quality within the vicinity is expected to return to pre-construction conditions.

Alternative 2 – Hwy 90 Full Alignment

Impacts from Alternative 2 would be similar to Alternative 1.

5.2.2.2 Human Environment

5.2.2.2.1 Socioeconomics

Alternative 1 – Hwy 90 - Segment 1 Levee Extension

The impacts to socioeconomic resources were considered low because the alignment proposed does not impede the transportation in the area and there would not be a separation of communities. Road closures are not expected and furthermore, access to homes, businesses, and public services is not expected to be impeded. Neighborhoods are not expected to be divided, and gathering places should still be accessible, so community cohesion should not be significantly impacted.

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.

5.2.2.2.2 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.

5.2.2.2.3 Environmental Justice

Alternative 1 – Hwy 90 - Segment 1 Levee Extension

Positive impacts to EJ communities from this alternative would include a decrease in flood risk to minority or low-income populations in the study area. The alternative would reduce

the adverse impacts to EJ communities experienced under the no-action condition - flood damages, loss of life, reduced economic activity, and potential out-migration. These positive impacts would be long term and would be likely to sustain the socioeconomic vitality of the project area, thus positively impacting EJ communities.

There would be no high, adverse disproportionate impacts to EJ communities near the proposed levee alignment from the construction of the Federal action. Impacts to those communities further from the proposed levee alignment would be expected to be positive, resulting in reduced flood risk. Although EJ communities are spread throughout the study area, as shown in the EJ Affected Environmental Section, there are no EJ communities along the Alternative 1 alignment that could be directly impacted by the Federal action. Eight reaches, A-H, comprise the Alt 1 levee alignment. The levee lengths vary from Reach E at 14,600 linear feet (LF) to the largest segment Reach G at 31,000 LF. The following is a description of the potential impacts to communities along the proposed Alternative 1 levee alignment.

The northern part of the CSRM levee alignment, reaches A, B and C, involves increasing the height of the existing St. Charles Parish Levee, which crosses through marshland. A canal separates the existing levee and several communities. There would be no direct impacts to housing along these reaches of levee improvement.

Communities that may experience construction-related noise impacts are located across the canal and are vastly white and not low-income, with census block groups ranging from 80 percent of residents identifying as white and 3 percent having household incomes below the poverty level. Indirect impacts may be felt by residents in these communities, which may include construction related noise and potential increase in truck traffic using access routes (streets) to deliver material to the construction sites along the levee reaches. The types of indirect impacts that may be relevant to this Federal action are discussed in detail in Annex 1, Appendix C, Environmental Justice, as are mitigation measures that would be utilized to avoid, reduce, and contain temporary impacts to human health and safety.

The southern part of the levee alignment includes a new earthen levee and floodwalls in reaches D, E, F, G, and H. The reach D levee alignment passes through undeveloped marshland, before passing near a community along Grand Bayou Road. A floodwall is proposed to be constructed adjacent to this community, which is 100 percent white with 2.7 percent of households living below poverty. Reach E consists of a floodwall that would be constructed adjacent to the Bayou Gauche community, which is also located in the same census block group as the community in Reach D, vastly majority white and not low-income. The communities along the southern alignment may experience similar indirect impacts as described for the northern reaches. Table 1 in Annex 1, Appendix C, Environmental Justice shows the demographic composition of communities in Reaches D and E. Reaches F, G and H consist of a building a new earthen levee that passes through undeveloped land.

The proposed Alternative 1 levee alignment does not bifurcate any neighborhoods as shown in the proposed Alternative 1 alignment map, Figure 4-1, nor requires the taking of housing. For more information on EJ communities along Reaches A-H and a discussion of impacts, refer to Annex 1, Appendix C, Environmental Justice.

EJ impacts related to borrow and staging sites would be expected to be minimal and are discussed in Annex 1, Appendix C, Environmental Justice.

Alternative 2 – Full Alignment

EJ impacts from construction of Alternative 2 would include those impacts identified for Alternative 1. There would be no additional direct impacts to EJ communities from construction of Alternative 2. Housing near the northern part of the alignment, but across from Paradis Canal would only feel temporary, indirect, impacts during construction activities. Indirect impacts would include those discussed for Alternative 1, but to a lesser extent because the alignment includes a lower levee height and therefore less construction activities that may temporarily, indirectly impact housing in the vicinity.

The potential for Induced Flooding

The 1 percent AEP design levee has the potential 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. Eminent domain may be required which would require relocation/buy outs to become mandatory for all residents in areas with induced flooding. Residents are not in favor of mandatory buy outs. To reduce the residual risk to the Recommended Plan, PED phase structure acquisition (buyouts) was selected until more information can be collected in the impacted areas. The induced flooding would be 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 may 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 could be acquired in Gheens. In Mathews, it is estimated that 33 residential structures and 5 commercial structures could be acquired.

Two of the three of the areas where induced flooding is possible, including Gheens and Bayou Gauche (and half of Mathews) have very minimal minority population and low-income households, as shown in Table 2 in Annex 1, Appendix C, Environmental Justice. However, mitigation measures would be included in the final plan once a better determination regarding induced flooding can be made at PED.

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 UBB 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 BLH 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 form flood control, as well as alterations to canals and their associated spoil banks which could invariably alters the hydrology of these wetland systems, often interfering with normal tidal flooding and drainage and modifying overland water flow.

The cumulative effects of the recommended plan will consider the impacts from 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. The most relevant studies, reports, and projects which would contribute to the cumulative effects may be found in Section 1.5, Prior Reports and Existing Water Projects.

Section 6
Recommended Plan Summary

The Optimized TSP Alternative 1 is the Recommended Plan (RP). As described in section 4.9, the UBB study RP 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 RP improves upon and updates deficiencies in the St. Charles Parish Levee, crosses Bayou Des Allemands with a 270-feet 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 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 RP 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 RP

Compensatory mitigation would be required for the unavoidable impacts to the environment that would be caused by the RP. The RP minimized and reduced impacts by building upon the existing levee systems in the basin. When compared to other alternatives in the final array, the RP was the least environmentally damaging practicable alternative. In areas where significant direct environmental impacts occur such as in reaches G and H, attempts were made to minimize impacts by placing alignment adjacent to existing canals and also on existing spoil banks. Moving the reaches G and H to Highway 90 to avoid direct impacts was not considered since Alternative 8 was already screened based on the impacts of building on an existing and also having to provide a by-pass roadway. Of the approximately 1,074 acres of land needed for the RP, approximately 292 acres of 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 RP would include the purchase of mitigation bank credits up to a total of approximately 126.64 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 RP.

6.2 MONITORING AND ADAPTIVE MANAGEMENT

The RP has been developed in accordance with USACE planning guidance in ER 1105-2-100 and other 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.

The proposed mitigation action solely includes the purchase of mitigation bank credits. Purchase of credits relieves the CEMVN and non-federal sponsor of the responsibility for monitoring and of demonstrating mitigation success. Credits purchased from a mitigation bank, must be in compliance with the requirements of the USACE Regulatory Program and the bank’s Mitigation Banking Instrument (MBI), which specifies the management, monitoring, and reporting required to be performed by the bank.

6.3 REAL ESTATE AND RELOCATION REQUIREMENTS

A Real Estate Plan (REP) describing the real estate requirements and costs for the Lands, Easements, Rights-of-Way, Relocations, and Disposal Areas (LERRD) to construct the Recommended Plan (RP) can be found in Appendix D. The Coastal Protection and Restoration Authority Board of Louisiana (CPRAB) is the non-Federal Sponsor (NFS) and would 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 total of $11,866,000 for real estate LERRD would include the costs associated with acquisition of real estate interests for the RP (structural features). This structural estimate also includes costs associated with the acquisition of real estate rights for the levee/T-Walls/gates, access, staging, drainage canals, and pump stations. In total, there would be 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 RP.

LERRD not within existing ROW is estimated to be owned by 75 private landowners and includes perpetual easement for earthen levees, floodwalls, roller gates at two railroad crossings, box culverts, and sluice gates; fee estate for borrow; temporary and perpetual road easements; and temporary easements for staging areas. Portions of the RP footprint are within existing ROW or are owned by local or state government agencies. 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 water bottoms.

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.

The estimated 01 Real Estate Costs for the LERRD also includes implementation of the Mitigation Plan for the potential induced flooding at a cost of $84,213,000. This cost reflects real estate interest acquisition costs required for the construction of the mitigation plan project as well as other costs associated with acquiring LERRD for a mitigation plan for potential induced flooding. See section 6.8.1 Risk of Induced Flooding Outside the Project for additional details. The mitigation plan for potential induced flooding may require the acquisition of improved structures, and therefore relocations assistance benefits (P.L. 91-646) are included in the mitigation plan for potential induced flooding total cost. Relocations assistance benefits may be provided to impacted landowners in accordance with Public Law 91-646. Administrative costs include title and legal review, appraisals, appraisal reviews, and NFS monitoring.

The total Real Estate costs LERRD for this project (for structural and non-structural) is estimated to be $96,079,000. This total cost is reflected in the main report with an additional contingency for Total Project Cost Summary, escalated to the Program year 2022 totaling $98,931,000, as shown in the engineering appendix.

In addition, as part of the NFS's responsibility to provide LERRDs for the project, the NFS would be responsible for 100 percent of the cost for facility and utility relocations, which is estimated at a total first cost of $32,405,000. Pipelines within the RP footprint would be relocated in place. Those proposed pipeline relocations would have no acquisition of real estate interests required. NFS relocation costs are discussed in Section 6.5 of this chapter and are also discussed in Section 17 of the REP (Appendix D).

Currently the proposed mitigation action solely includes the purchase of mitigation bank credits, which requires no LERRD responsibility on the NFS. If, based on credit availability or following evaluation of the mitigation bank proposals, it becomes apparent that purchasing bank credits is not cost effective or feasible (including due to lack of satisfactory bids), CEMVN will complete its evaluation of Mitigation Plan Alternative 2 which would evaluate

Corps-constructed mitigation projects within the UBB watershed in the CZ, possibly in combination with a credit purchase. If construction of a mitigation project involves the identification of an acquisition of real estate, the RE plan would be amended at that time. This implementation risk has also been captured in the final overall cost include in engineering appendix. As stated in the engineering appendix, the final mitigation cost, was part of the full Cost and Schedule Risk Analysis (CSRA) to develop contingencies.

A more detailed description of the LERRD required for the project is included in the REP, Appendix D.

6.4 PROJECT BENEFITS

The RP is the NED Plan and is estimated to produce $104 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 RP, families and businesses can rebound much more quickly after a tropical event. Examples of this include:

- Increasing the opportunity to return children to school because 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 project would reduce the flooding of homes, utilities, hospitals and emergency response facilities, all of which reduces public health and safety risks. The project would also reduce the flooding and erosion of transportation routes, which would keep them open for maximum evacuation effectiveness, as well as enabling immediate post-storm access by emergency responders, repair crews, and other critical services. Although public health and safety risks would be expected to be reduced, quantitative benefits are not claimed because evacuation planning and response are the best means to assure the health and safety of the population.

The RP 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, approximately 6,430 structures would be impacted during a 1 percent AEP event. With the RP in place, only approximately 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.

Table 6-1. Study Area Equivalent Annual Damages and Benefits by Reach (FY 22 Price Level; FY 22 Discount Rate; $1,000s)

Reach	Without Project Damages	Residual Damages	Damages Reduced
1a	18,170	1,323	16,847
1b	171	3	168
1c	7,318	178	7,140
1d	9,879	294	9,585
1e	3,692	111	3,581
1f	12,411	874	11,537
1g	208	2	206
2a	3,115	45	3,070
2b	1,190	17	1,173
2c	6,690	167	6,523
2d	35,623	877	34,746
3a	652	59	593
3b	70	0	70
3c	460	0	460
4a	776	74	702
4b	2,418	116	2,302
5a	441	25	416
5b	4,840	160	4,680
5c	260	22	238
Total	108,385	4,348	104,037

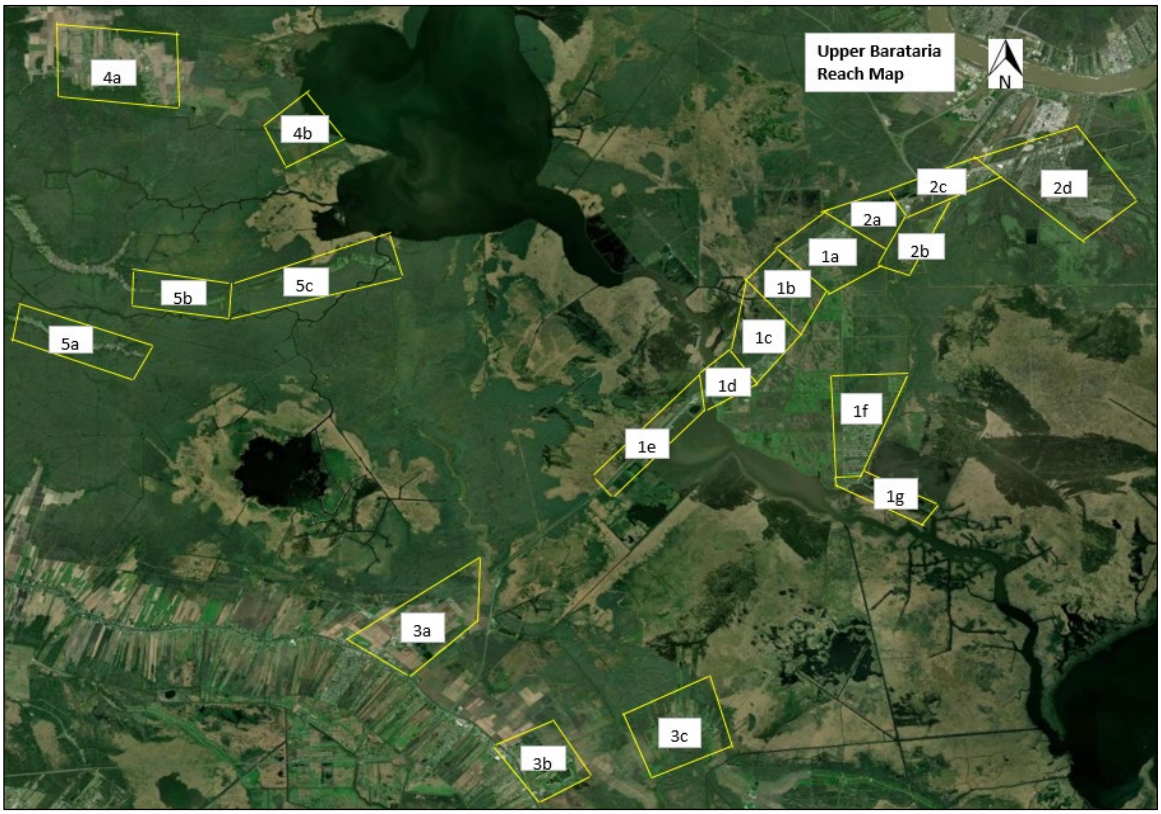

Figure 6-1. Reach Boundaries

The RP 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 RP 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, $104 million in annual damages would be prevented with the project in place, under the Intermediate Relative Sea Level Change (RSLC) Scenario.

Net benefits are based on these benefit categories:

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

Benefits for the RP using the Federal FY2022 discount rate (2.25 percent) are shown in Table 6-2. The study is using the Intermediate RSLC Scenario to describe expected future

storm risks and to present the benefits of the RP. 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, 2.25% Interest Rate, FY22 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	$68,757	$2,422	$66,336
Intermediate	**$108,385**	**$4,348**	**$104,037**
High	$239,453	$8,536	$230,917

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 RP 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 at the 2.25% Interest Rate in the FY22 Price Level. Further discussion of cost estimates and cost apportionment is provided in the sections below.

Table 6-3. Project Cost Summary

	RP: Alternative 1 – Hwy 90 - Segment 1 Levee Extension 1 percent AEP (100-year future design) (30.6 miles) in length
PED	$227,316
Construction*	$1,097,934
Lands Easements & ROW	$98,931
Construction Management	$121,974
Total Project First Costs	**$1,546,156**
Total Average Annual Project Cost**	$52,514

($1,000s, 2.25% Interest Rate, FY22 Price Level)
* Includes Interest During Construction
** 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 RP is $2,200,300, based on the current Federal FY2022 discount rate (2.25 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 NFS 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 bullets 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 RP. After the District Engineer provides notice of construction completion for the project, or functional portion of the project, the NFS will commence OMRR&R responsibilities associated with the project.

The OMRR&R for the RP 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.

As stated in Section 6.1 the selected Mitigation Requirement was Mitigation Banks, however the final implementation would be based on credit availability or following evaluation of the mitigation bank proposals. If it becomes apparent that purchasing bank credits is not cost effective or feasible (including due to lack of satisfactory bids), CEMVN will complete its evaluation of Mitigation Plan Alternative 2 which would evaluate Corps-constructed mitigation projects within the UBB watershed in the CZ, possibly in combination with a credit purchase. If construction of a mitigation project occurs, OMRR&R activities by the NFS would have to occur, unlike the mitigation banks, where these costs are already captured in the cost for purchasing of credits. As with the overall mitigation cost contingencies, the annual OMRR&R cost also includes contingencies to reflect the cost for maintaining mitigation sites if need. Appendix E of the detailed Mitigation Plan provide additional details on the OMRR&R requirements related to Corps-constructed mitigation projects if needed in the future.

6.7 BENEFIT-COST ANALYSIS FOR THE RECOMMENDED PLAN

The equivalent annual benefits were compared to the annual costs to develop a BCR for the RP. 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 RP is subject to project authorization, appropriation, and availability of funding, however for planning purposes to calculate benefits construction was expected to begin in the year 2022 and continue through the year 2026, which was established as the base year for analysis (A 5-year construction period was selected for planning purposes). The OMRR&R activities would begin in the year 2026 and would continue throughout the 50-year period of analysis. Using the FY 2022 Federal interest rate of 2.25 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 RP were calculated by subtracting the annual costs from the equivalent annual benefits. The net benefits were used to determine the economic justification of the RP. Table 6-4 shows the equivalent annual net benefits for the RP 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 RP. 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 RP under RSLC Scenarios

Scenario	Low RSLR	Intermediate RSLR	High RSLR
Total AA Costs	$52,514	$52,514	$52,514
Without Project EAD	$68,757	$108,385	$239,453
EAD Reduced Benefits	$66,336	$104,037	$230,917
Net Benefits	$13,822	$51,523	$178,403
B/C Ratio	1.3	2.0	4.4

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 1 percent 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. In Bayou Gauche, 64 residential structures 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. In Gheens, 173 residential structures 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. The existing modeling reviewed the inducements under the existing conditions at 2035 (Intermediate RSLR) under varying storm frequencies. Currently, 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 mitigation plan has been developed as part of the RP. Mitigation options such as improvements to existing local levees (Gheens and Mathews), flowage easements, structure raising, dry flood proofing of structure, and acquisitions (buyouts) were all reviewed, but due to the vast scope of this project and the limited amount of available information at this time, the existing local levees or each of the affected parcels could not be assessed 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 RP.

The potential induced damages and mitigation for economic damages would be further addressed during PED, including options to make improvements to the existing local levees (Gheens and Mathews) as mitigation measure. 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 and Climate Change

There is uncertainty about how much sea level change (SLC) would occur in the region. Higher than estimated RSLR could cause saltwater 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, 2.4 feet, and 4.3 feet, respectively. The PDT selected intermediate SLR because the alternatives were in a similar alignment. It was also assumed that changes in sea level rise would have affected the alternatives equally. Because the project was developed using the intermediate RSLR rate, the RP would provide less benefits than anticipated, should the low RSLR rate result and more benefits with the high RSLR rate.

USACE policy, outlined in ER 1100-2-8162, requires that sea level change be considered in project formulation. In particular, policy requires that alternatives be evaluated such that an alternative that performs best across the full range of plausible future conditions should

generally be selected over an alternative that only performs well under one of the scenarios. At the TSP selection step, the team should demonstrate that uncertainty over future sea level conditions does not constitute uncertainty over which alternative will perform the best in the future. In the case of the UBB project, the TSP is the plan that ties into existing high ground and pre-existing levee systems without raising the elevation of those systems or the surrounding high ground. Currently the high points are high enough to prevent flank of surges under different RSLR scenarios under the current period of analysis, however the NFS should continue to monitor the features past the period of analysis in order to adapt to changing risk in the future. Alternative plans considered consisted of alternate levee alignments as well as nonstructural measures. Nonstructural measures (such as house raisings) were evaluated as a stand-alone alternative (limited to hot spots within the basin). This alternative was subsequently eliminated from further consideration because it could not be economically justified. The elimination of this alternative is not sensitive to the uncertainty over sea level change since there is a low population density in the area, which results in low net benefits. However, the TSP can be enhanced with the inclusion of nonstructural measures, provided the implementation of these measures can be economically justified. Alternative levee alignments considered (see Hydraulic Levee Design Exterior Analysis for details) would be impacted by sea level similarly to the TSP alignment. Thus, the choice of the TSP was not highly sensitive to sea level change uncertainty and the team is confident that the TSP is the best choice under all plausible future sea levels.

Although, the recommended plan focuses on CSRM problems, climate change impacts to inland hydrology was also evaluated. The analysis was intended to aid in reducing climate change-related vulnerabilities and enhancing the resilience of Corps projects and local NFS's existing urban drainage facilities. It was also used to inform decisions pertaining to project planning, engineering, operations, and maintenance. The focus of the analysis was on the evaluation of observed and projected trends for project area air temperature, precipitation, and streamflow, based on literature review and USACE climate tools.

The evaluation showed that future changes described in the literature are expected to bring warmer temperatures but varied effects for rainfall frequency and intensity. Because the UBB project area does not include a river, the timeseries toolbox was used to assess changes in precipitation over time at New Orleans Airport and the Paradis weather station. There was some evidence possibly indicating a slow increase in annual rainfall over time and/or a potential change point in the early portion of the record, however the detected trends were not statistically significant.

The Vulnerability Assessment tool was also used to assess potential project vulnerabilities based on projected future climate data. The results of this analysis indicate that that UBB project is located in a watershed that is among the 20% most vulnerable in the USACE portfolio for the Flood Risk Reduction business line, primarily as a result of the population within the 500 year floodplain and the cumulative projected runoff amplification. The future designs of the UBB project and the residents of the project area should be aware of the potential for increased vulnerability in the future due to more frequent rainfall flooding. Although urban drainage measures are not recommended with this recommendation. The NFS should be aware that adaptation measures might be need to their existing drainage

structures to address increase rainfall in the future. The NFS should proactively increase in size, pump houses (if any) sized to accommodate larger pumps in the future, and increased detention areas for storage of rainfall runoff.

6.8.2.2 Storms

Risks associated with the RP 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 the PED phase to provide 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. Additional borings will be taken along the levee alignment and in proposed borrow sites during PED phase. The spacing of these borings will be based on HSDRRS guidance. These soil samples will be classified and tested.

As discussed above, all residents should have evacuated outside of the system, however there is still a risk that a failure of the levee system could have impact on any remaining population. This life safety risk would be significantly lower than the WOP conditions. Based on updated HSDRRS design criteria we would not expect a complete failure of the system.

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 RP 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 El Nino and La Nina effects, which can increase or decrease storms over a period of several years. Additionally, the models do not account for the potential of increased storms due to climate change. Reference the Climate Hydrology Report in Appendix A, Annex 8, for more detailed information.

6.8.3.3 Costs

The risk for costs is in under or overestimating the costs for project features, such as mitigation for potential induced flooding and for impacts from construction. A worst-case scenario of acquisition (buyouts) was assumed for induced flooding mitigation. Mitigation banks, which was based on cost-effectiveness and incremental cost analysis, was the alternative assumed for impacts.

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 RP 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.

6.8.5 Life Safety Risk

Evacuation planning is the primary means to save lives in the study area, which falls within the phase II area of the state of Louisiana evacuation plan. Up to 40 hours ahead of tropical force winds the State of Louisiana will make plans to evacuate the area of impact. Under the

State of Louisiana evacuation planning guidance and local government evacuation planning, residents should be well outside of the study area during hurricane events. As recently as Tropical Storm Sally in 2020, St. Charles Parish called for a mandatory evacuation. Although the storm was expected to be a Category 1 at landfall, and the final landfall was in Alabama, the parish still called for a mandatory evacuation as early as 40-hrs ahead of the storms expected landfall. In past recent storms such as Hurricane Gustav, 90-95 percent of individuals left coastal Louisiana per State mandates (The Times-Picayune, 2008). Even under Hurricane Katrina, when the risk of large events was not fully understood, over 80 percent of St. Charles Parish still evacuated (LSU Stevenson Disaster Management Institute, 2017). The current evacuation map for St. Charles Parish (Figure 6-2) shows both sides of the river would be asked to evacuate at the same time. In addition, if the resident is not physically able to evacuate or needs assistance, St. Charles Parish offers “assisted evacuation” where evacuees will be transported to the parish’s shelter site outside of the storm surge area. Quantitative benefits between the future without project and future with project are not claimed because the evacuation planning and response are the best means to assure the health and safety of the population. Historically under the WOP condition there is limited loss of life when evacuation planning is implemented. The intent of the project is to reduce the damages to homes, utilities, hospitals and emergency response facilities, for residents to return to the study area and recover quickly from storm events. In the long term, the prevention of these damages reduces public health and safety risk. The project also reduces the flooding and erosion of transportation routes, which keeps them open for maximum evacuation effectiveness, as well as enabling immediate post-storm access by emergency responders, repair crews and other critical services. Overall public health and safety risks are expected to be reduced with the Federal action when the ancillary benefits are considered due to the ability for the area to quickly recover after the storm. The risks are also expected to remain reduced since the State of Louisiana guidance is always to stress the importance of evacuation and early action, regardless of the construction of a new levee system.

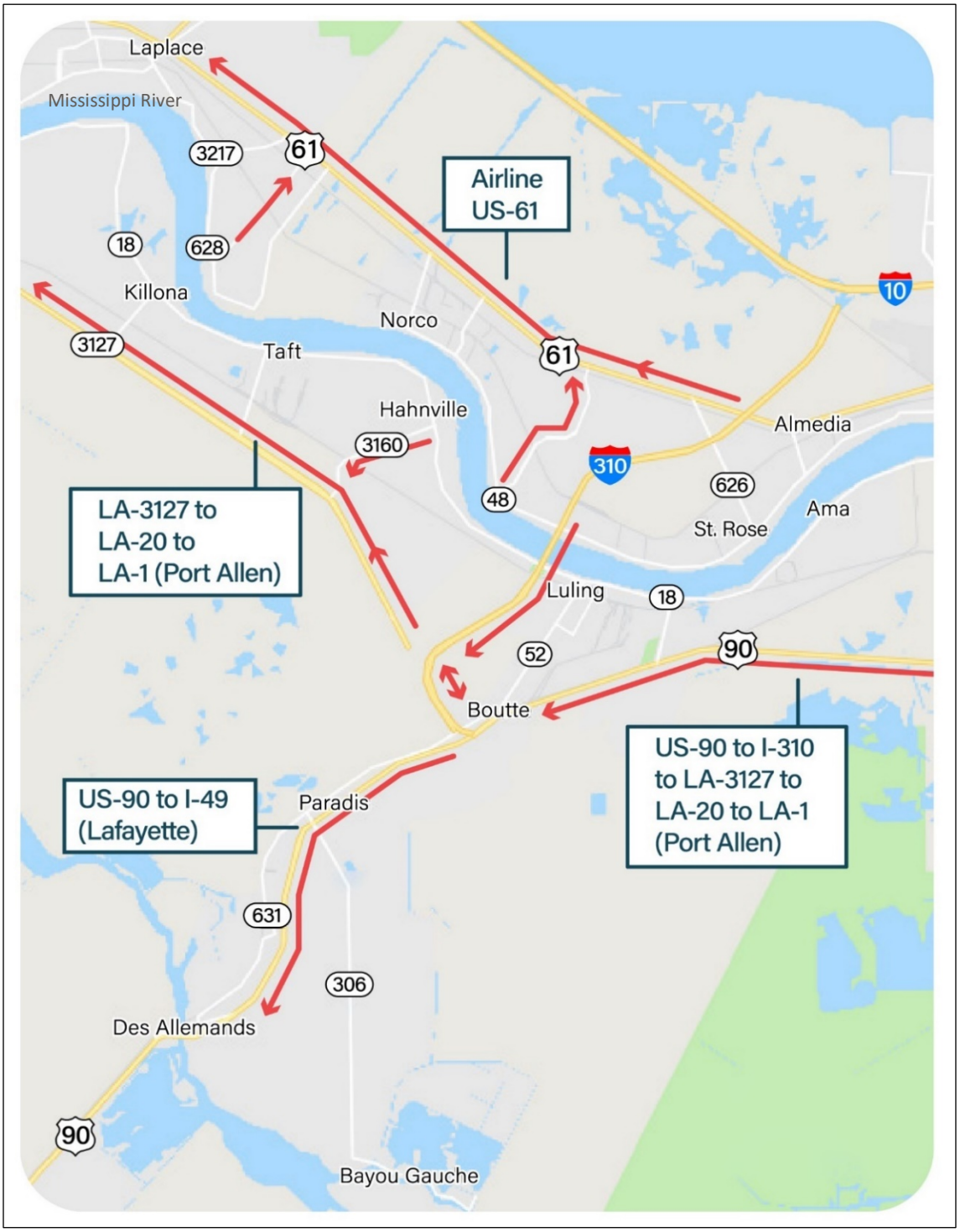

Figure 6-2. St. Charles Parish Evacuation Routes

6.8.6 SLR Assumptions

The reasonable extent of future sea level change can be estimated by using the High sea level scenario in the year 2126, which is about 100 years after the assumed construction completion date. Per ER 1110-2-8159, Life Cycle Performance and Design, major infrastructure such as levees are assumed to have a 100-year project life unless otherwise specified (note that this project life is distinct from the 50-year period of economic analysis that derives from discounting future costs and benefits to net present value). The closest tide gage to the UBB project is the USACE gage on Bayou Barataria at Barataria (MVN gage 82750), in Figure 6-3. The three USACE sea level scenarios are plotted for this gage in Figure 6-4.

Figure 6-3. Location of Barataria Gage Relative to UBB Project Location

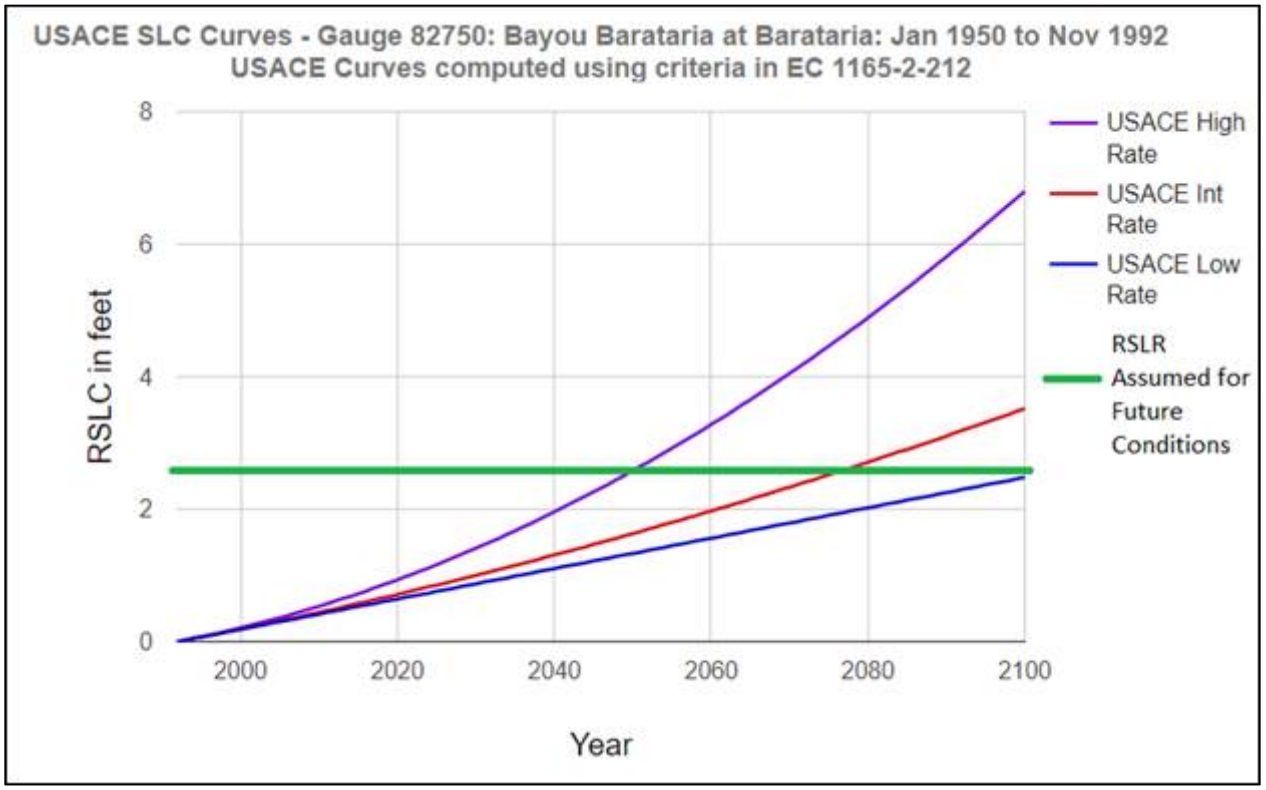

Figure 6-4: Sea Level Projections for Bayou Barataria at Barataria

The High scenario for relative sea level change between the assumed 50-year to 100-year project lifecycle, in the year 2098, at this gage is approximately 7 feet. The extent of inundation at this sea level was visualized using the NOAA Sea Level Rise Viewer and is shown in Figure 6-5. It is no surprise that the UBB project area is largely covered by this degree of sea level change. This represents the maximum extent of potential impact for the project area and sets the strategic decision context for the project analysis of climate change.

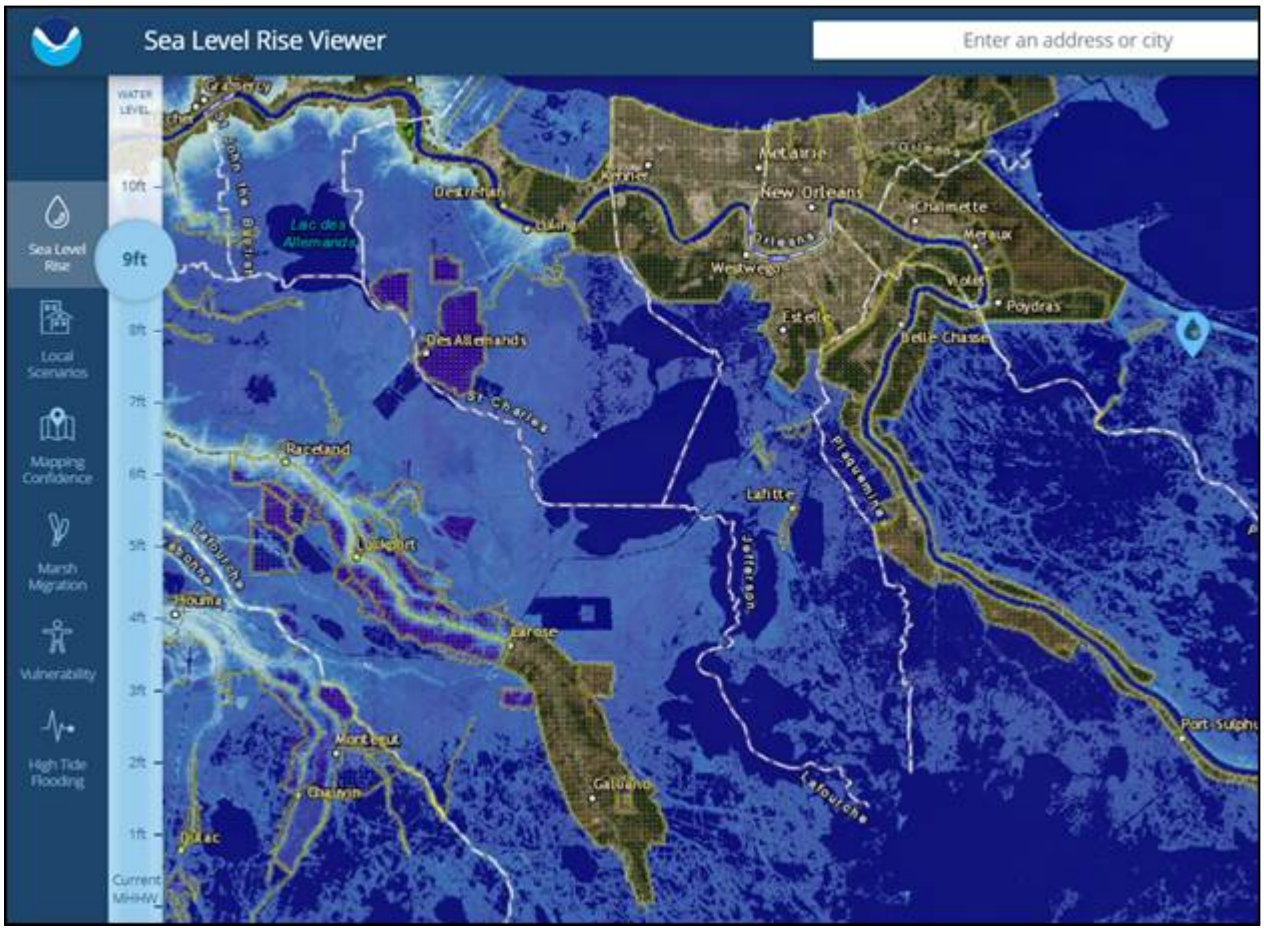

Figure 6-5. Inundation and Mean Sea Level in the Year 2123 under the USACE High Sea Level Scenario

Note: This represents the maximum plausible upper range of future conditions facing the UBB project.

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Section 7
Mitigation

The appropriate application of mitigation is to formulate an alternative that first avoids and then minimizes impacts and only seeks to compensate for unavoidable adverse impacts. The UBB project has done and continues to do this through coordination with the resource agencies and CEMVN engineering during the planning and advanced design phases.

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. 40 C.F.R. § 1508.10 defines mitigation as the following actions:

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

During planning for the UBB project, measures to avoid and minimize impacts to significant resources were employed to the extent practicable. Appendix E provides an table with a general overview of the measures to avoid and minimizing impacts to the final array of alternatives discussed in Section 4.6. Nonetheless, unavoidable impacts to freshwater emergent marsh, swamp, and BLH habitat would occur from construction of the project and would be offset through compensatory mitigation. Currently, CEMVN has tentatively identified approximately 725 acres of direct impacts from the RP. Approximately 292 acres (and 95 AAHUs) of Bottomland Hardwood (BLH), 168 acres (and 111 AAHUs) of Cypress-Tupelo Swamp, and 267 acres (and 126 AAHUs[1]) of Fresh Marsh are anticipated to be impacted with construction of the RP. As advanced design proceeds, any design changes that incur additional impacts requiring mitigation would be addressed in supplemental NEPA documentation for those changes. Because several habitat types would be impacted from the UBB project, the overall mitigation plan would consist of a project or set of projects for each habitat type impacted. As such, the overall mitigation plan for UBB would include a BLH feature, a Swamp feature, and a Fresh Marsh feature.

[1] Includes the mitigation of 95 acres of open water impact mitigated through marsh creation

The USACE will update the mitigation plan as necessary, in coordination with the USFWS and other resource agencies, that would fully compensate for any additional unavoidable impacts not captured under the feasibility report investigation.

Proposed Compensatory Mitigation

Recent mitigation actions completed on several large projects (Hurricane Storm Damage Risk Reduction System, Plaquemines New Orleans to Venice Levee System, Comite) with large impacts to multiple habitat types has shown that, when mitigation bank credits are available for purchase, purchase of mitigation bank credits are normally selected as the RP to mitigate project induced impacts due to their cost effectiveness. As such, the purchase of mitigation bank credits will be pursued to mitigate the impacts to all habitat types incurred by the UBB project. It is not known which banks nor how many credits would be available at the time of project implementation, however, the market has historically responded to the need for mitigation bank credits. A detailed mitigation plan evaluation of recent credit cost vs Corps-constructed mitigation projects was conducted under Appendix E. As such, a general mitigation bank alternative was considered to meet the mitigation requirement. During Pre-construction Engineering Design (PED), an analysis of banks approved through the CEMVN Regulatory 404 Program and the in-kind credits available for purchase would be conducted to ensure full satisfaction of the UBB mitigation requirement is completed.

Because the purchase of mitigation bank credits relieves the CEMVN and the NFS of the responsibility for monitoring and of demonstrating mitigation success (the 404 Regulatory program regulates the completion of these actions as specified by the bank's Mitigation Banking Instrument), neither a monitoring nor adaptive management plan is necessary for the mitigation. However, if it becomes apparent that purchasing bank credits is not cost effective or feasible (including due to lack of satisfactory bids), CEMVN will complete its evaluation of Mitigation Plan Alternative 2 which would evaluate Corps-constructed mitigation projects within the UBB watershed in the CZ, possibly in combination with a credit purchase. If construction of a mitigation project occurs, a monitoring and adaptive management plan would be created at that time

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. The following describes the impacts from purchasing mitigation bank credits for every feature of the mitigation plan for UBB.

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 126 AAHUs[2]. 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 significant resources

[2] Includes the mitigation of 95 acres of open water impact mitigated through marsh creation

would be incurred from the purchase of these credits for the UBB mitigation. However, depending on the amount of marsh mitigation bank credits available in the basin at the time of credit purchase for the UBB mitigation, use of mitigation bank credits to offset UBB marsh impacts may significantly reduce the number of credits available to permittees to compensate for marsh impacts authorized by Department of the Army Section 10/404 permits. In the event sufficient credits are not available to offset impacts associated with a proposed permit, the district engineer would determine appropriate permittee responsible compensatory mitigation based on the factors described in 33 CFR Part 332.3(b).

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 significant resources would be incurred from the purchase of these credits for the UBB mitigation. However, depending on the amount of BLH mitigation bank credits available in the basin at the time of credit purchase for the UBB mitigation, use of mitigation bank credits to offset UBB BLH impacts may significantly reduce the number of credits available to permittees to compensate for BLH impacts authorized by Department of the Army Section 10/404 permits. In the event sufficient credits are not available to offset impacts associated with a proposed permit, the district engineer would determine appropriate permittee responsible compensatory mitigation based on the factors described in 33 CFR Part 332.3(b).

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 significant resources would be incurred from the purchase of these credits for the UBB mitigation. However, depending on the amount of swamp mitigation bank credits available in the basin at the time of credit purchase for the UBB mitigation, use of mitigation bank credits to offset UBB swamp impacts may significantly reduce the number of credits available to permittees to compensate for swamp impacts authorized by Department of the Army Section 10/404 permits. In the event sufficient credits are not available to offset impacts associated with a proposed permit, the district engineer would determine appropriate permittee responsible compensatory mitigation based on the factors described in 33 CFR Part 332.3(b).

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Section 8
Environmental Laws and Regulations

8.1 EXECUTIVE ORDER 11988 FLOODPLAIN MANAGEMENT

Executive Order (E.O.)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 (LADNR). 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 MAGNUSON-STEVENSONS FISHERY CONSERVATION AND MANAGEMENT ACT OF 1974

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 EFH through regulations promulgated by the NMFS and the Gulf of Mexico Fishery Management Council. To assist in meeting consultation requirements, the NMFS local field office reviewed the study area and provided comments on January 13, 2020. A copy of the letter, which is included in Appendix F, contained the following recommendations:

EFH Conservation Recommendations

1. A revised EFH assessment should be provided to the NMFS for review and included in the final EIS. The revised assessment should clarify, delineate, and quantify impacts to EFH by habitat type differentiating between the flood side and the protected side of all structures. Inconsistencies in acres within the draft EIS and the Fish and Wildlife Coordination Act Report should be reconciled.

Response: An updated EFH assessment has been placed in the most recent draft version of the UBB IFR/EIS. Current impacts to EFH are identified as approximately, 267 acres of fresh marsh (95 AAHUs), and 95 acres (6.85 AAHUs) of water bottom. Additional information on the impacts to EFH may be found in Section 5 of the IFR/EIS.

2. Cross sectional views for all structures (e.g., channel barge floodgate, stop log floodgate, roller floodgate, and culverts with sluice gates) and operation plans should be provided and be assessed to determine if construction of levees and water control structures would impact fisheries access and water exchange in the Upper Barataria Basin. Sufficient information should be provided to assess the change in cross sectional area under the with and without project action for any water control structure in Godchaux Canal to fully assess potential impacts to EFH. Any structure installed under the access road in the Canal should be comprised of open culverts and maximize maintaining the existing cross-sectional area.

Response: During the pre-construction project engineering and design phase (PED) detailed designs and operations plans would be completed as well as additional H&H modeling to verify the impacts analysis in the EIS. If modeling identifies unavoidable impacts not addressed in the EIS, additional NEPA documentation would be completed and the plan to fully mitigate these impacts presented. Coordination with the resource agencies would continue during advanced design to ensure impacts are avoided to the maximum extent practicable before mitigation is pursued.

3. A mitigation and monitoring plan should be developed which fully compensates for all EFH impacts. We also request the EFH mitigation plan be coordinated with NMFS. To avoid additional mitigation for temporal impacts, the NMFS recommends implementation of the mitigation plan concurrent with the construction of the development.

Response: Section 7 includes a plan to fully mitigate all impacts. The purchase of mitigation bank credits does not require a mitigation/monitoring plan. If at the time of implementation, sufficient in-kind mitigation bank credits are not available or not cost efficient, Corps constructed sites would be developed to fully mitigate impacts to EFH in coordination with NMFS and a supplemental NEPA document would be prepared. Mitigation and monitoring plans would be created in coordination with the resource agencies at this time and be included in this documentation. Every effort to mitigate concurrent with construction will be made to avoid temporal impacts that would require additional mitigation.

Following the second public review and comment period, the NMFS provided updated comments on January 28, 2021. A copy of the letter, included in Appendix F, contained the following recommendations:

1- A complete final EFH assessment should be provided to the NMFS incorporating all activities associated with this project, including a description of measures to avoid, minimize, mitigate, or offset the adverse impacts of the proposed activities on EFH.

Response: An assessment of potential impacts to EFH can be found in response 1 above and in Section 5 of the UBB IFR/EIS. Measures currently outlined to mitigate for the adverse impacts associated with the proposed action may be found below. Additional information may be found in Section 7 of the IFR/EIS

Mitigation measures:

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

2- Avoidance and minimization of direct wetland impacts should be pursed to the greatest extent practicable. The EFH assessment should also include updated details delineating and quantifying impacts to EFH by habitat type, as well as differentiating between the flood side EFH and the protected side of all structures. The NMFS recommends tabular format, maps, and KMZ files be provided to inform the EFH assessment.

Response: An assessment of potential impacts to EFH impacts can be found in response 1 above and in Section 5 of the UBB IFR/EIS. Wetland Value Assessments have been run in coordination with the resource agencies using shapefiles/KMZs to identify where impacts to EFH are project to occur. During PED, impacts would be reassessed to include any changes in design and results of modeling efforts. Coordination with the resource agencies would

continue during PED to ensure impacts are avoided to the maximum extent practicable before mitigation is pursued.

3- The NMFS continues to be concerned the proposed levee alignment and all remaining gate structures may reduce tidal drainage/exchange in the UBB. Impediments to drainage may increase inundation stress of wetlands and could increase wetland loss. To assess potential structure related fisheries access impacts in the UBB, the NMFS recommends operation plans should be provided, including triggers for gate closures (e.g., named storm events in the Gulf of Mexico, fixed water level elevations, crest setting, estimated frequency of closures, etc.).

Response: During PED detailed designs and operations plans would be completed as well as additional H&H modeling to verify the impacts analysis in the EIS. If modeling identifies unavoidable impacts not addressed in the EIS, additional NEPA documentation would be completed and the plan to fully mitigate these impacts presented. Coordination with NMFS would continue through advanced design and the development of the operation and maintenance plan.

4- The USACE should provide an alternatives analysis and hydrological modeling results for all structures justifying:

(1) how particular locations were selected for each structure,
(2) why each structure is needed, and
(3) how the size and type of each structure was determined.

Response: The alternative analysis detailing the need and selection of structures may be found in Section 4 – Formulate Alternative Plans of the IFR/EIS. Additionally, during PED, designs would be advanced and further informed by H&H modeling. If changes to structure location, size, or type is warranted, this information would be shared with the resource agencies and may be addressed in additional NEPA documentation, if necessary. Coordination with the resource agencies would continue during advanced design to ensure impacts are avoided to the maximum extent practicable.

5- Additionally, it is unclear why the roller floodgate at Bayou Gauche is included as a project feature and remains consistent with the project authority. The roller floodgate does not appear to be required for flood protection since it is located on the flood side of the proposed levee.

Response: The roller gate at Bayou Gauche is located across a roadway and would be along the alignment, allowing access to the flood side of the system.

,
6- Construction of the levee system could also potentially induce flooding internally and externally to the levee alignment due to heavy rainfall events and high tides. Therefore, NMFS recommends conducting additional hydrologic modeling to assess the potential for large-scale indirect impacts on wetlands and the project incorporate features to mitigate for

any potential to reduce water exchange and increased hydroperiod of the UBB. The final EFH assessment should include the results of the assessment and associated mitigative measures.

Response: During PED detailed designs would be completed as well as additional H&H modeling to verify the impacts analysis in the EIS. If modeling identifies unavoidable impacts not addressed in the EIS, supplemental NEPA documentation would be completed and the plan to fully mitigate these impacts presented. Coordination with the resource agencies would continue during advanced design to ensure impacts are avoided to the maximum extent practicable before mitigation is pursued. If necessary, mitigation and monitoring plans would be created in coordination with the resource agencies and be included in the supplemental NEPA documentation.

7- Unavoidable impacts to EFH will require mitigation. The second draft of the EIS states mitigation measures will be considered in the following order:

(1) purchase of mitigation bank credits to offset impacts to fresh marsh, and/or
(2) potential USACE constructed marsh mitigation sites in approximately 367 acres of open water. If the purchase of wetland credits from an USACE approved mitigation bank within the appropriate watersheds is not available then the USACE should develop, in coordination with NMFS, a mitigation and monitoring plan which fully compensates for all EFH impacts. This robust mitigation and monitoring plan should be presented to NMFS for review prior to release of the final EFH assessment and EIS.

Response: Concur. In the event mitigation bank credits are not available, USACE will coordinate with NMFS on the selection of Corps constructed mitigation projects to ensure all impacts to EFH are fully mitigated for.

8. If the purchase of wetland credits from an USACE approved mitigation bank within the appropriate watersheds is not available then the USACE should develop, in coordination with NMFS, a mitigation and monitoring plan which fully compensates for all EFH impacts. This robust mitigation and monitoring plan should be presented to NMFS for review prior to release of the final EFH assessment and EIS.

Response: If at the time of implementation, sufficient in-kind mitigation bank credits are not available, Corps constructed sites would be developed to fully mitigate impacts to EFH in coordination with NMFS and a supplemental NEPA document prepared. Mitigation and monitoring plans would be created in coordination with the resource agencies at this time and would be included in the supplemental NEPA document.

9- To avoid additional mitigation for temporal impacts, NMFS recommends implementation of the mitigation plan concurrent with the construction of the development.

Response: Every effort to mitigate concurrent with construction will be made to avoid temporal impacts that would require additional mitigation.

10- The preliminary mitigation analysis, approximate total acres, and Average Annual Habitat Units of impacts to fresh marsh provided in the second draft of the EIS should be refined to verify:

(1) the final assessment of acres of impacts to EFH,
(2) the final WVA analysis,
(3) the types of mitigation required, and
(4) the final project design.

Response: During PED, verification of the acres impacted by final design would be conducted. WVAs for all impacted habitat types would be rerun and the mitigation plan verified/adjusted in coordination with the resource agencies, if necessary, to ensure full satisfaction of the mitigation requirement. Supplemental NEPA documentation would be prepared if warranted.

11- Open water should also be included among the habitat types requiring mitigation.

Response: Open water impacts have been assessed and included in the EIS along with the other habitat types requiring mitigation.

12- Estimates of all direct and indirect project related impacts to tidally influenced habitat should be refined for inclusion in the project's final EFH assessment and EIS.

Response: During PED if the H&H modeling identifies impacts not addressed in the EIS, additional NEPA documentation would be completed identifying these impacts and the plan to fully mitigate them.

On March 16, 2021 the NMFS provided a response via email stating they had received the USACE's final response for the Upper Barataria Basin Flood Control Feasibility Study. This email served as confirmation that the USACE had addressed NMFS's concerns and concluded the EFH consultation for this phase of the study. The NMFS stated they look forward to additional consultation with USACE during the PED phase of the project.

8.4 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. A Final CAR was provided on October 27, 2021 which clarified USFWS position and recommendations on the project. This Final Fish and Wildlife Coordination Act Report does fulfill the requirements of the Fish and Wildlife Coordination Act (FWCA) (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.) as the final report of the Secretary of the Interior as required by Section 2(b) of the FWCA. When the above mentioned EFH and indirect impact analyses are completed, the Service will submit a revised Final Report, or a supplement to this Final Report of the Secretary of the Interior as required by Section 2(b) of the FWCA. All three CARs are included in Appendix F. Pertinent language from the CAR and responses to the USFWS recommendations are as follows:

This Final Fish and Wildlife Coordination Act Report provides an analysis of fish and wildlife resource impacts associated with the final array of alternatives, including that of the newly developed 100-year storm event protection alternative. This new 100-year event protection alternative has been selected as the Recommended Plan (RP). A robust indirect impact analysis using hydrologic modeling could not be completed during the project's feasibility phase. A rudimentary indirect impact analysis was conducted to evaluate the likelihood of major indirect impacts to enclosed wetlands. That cursory analysis suggests that a with-project water level rise impact to fresh marsh is anticipated and associated marsh impacts were quantified. A robust indirect analysis is needed during the project's post-authorization phase to confirm the assumptions used in the cursory impact assessment. Additionally, impacts to estuarine fisheries access and Essential Fisheries Habitat (EFH) are also cursory and need to be addressed during postauthorization.

If the Record of Decision (ROD) to authorize the project does not include recommendations to conduct the hydrologic modeling needed to determine indirect hydrology impacts, the Service recommends that the Corp's Report not be submitted for authorization until the indirect hydrologic impact modeling and subsequent impact assessment is completed. If the ROD recommends that the Corps completes the indirect impact modeling, funds the Service to quantify those impacts, discloses those results as required by NEPA, and agrees to mitigate all fish and wildlife impacts, the Service would continue to coordinate with Corps on further planning and would be able to provide a final report in accordance with Section 2(b) of the FWCA for the Corps' implementation of the RP.

Because hydrologic modeling to determine project-induced water level rise upstream of the Bayou Des Allemands floodgate has not been conducted, the total fresh marsh impacts presented above are conditional or preliminary, and will need to be updated once that modeling has been completed. When that modeling has been completed, and information regarding the operation plan for the Bayou Des Allemands floodgate and other project water control structures is available, a final and complete evaluation of project effects on fish and wildlife resources can be made, and we can then fulfill our reporting responsibilities under Section 2(b) of the FWCA. 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 FWCA. Regarding indirect project effects, the Service recommends:

USFWS 1. The with and with-out project channel cross-sectional area (in square feet) should be provided for all project water control structures to enable assessment of potential structure-related fisheries access impacts.

USACE 1. Concur. As design continues to advance during PED, additional detail regarding the channel cross sections will be provided to the Service.

USFWS 2. Floodgate operation plans and closure criteria are needed for all actively operated water control structures to assess impacts to fisheries access and hydrology impacts.

USACE 2. Concur. Additional detail regarding the floodgate operation plans and closure criteria will be developed during PED and coordinated with the Service to verify the CEMVN's fisheries access and hydrology impacts assessments.

USFWS 3. For each water control structure, information should be provided regarding how the structure location was selected, why the structure is needed, and how the structure size and type was determined.

USACE 3. Concur. Currently there is information in the H&H appendix explaining why structures were placed in locations along the levee reaches. As part of the initial H&H analysis, a HECRAS model was conducted to ensure there were enough drainage features in the area of interest south of highway 90 and the levee. That analysis is included in the H&H section of the ENG appendix. This information will be verified through additional modeling conducted in PED.

USFWS 4. Hydrologic modeling of stages throughout the wetlands upstream of the Bayou Des Allemands floodgate should be conducted to evaluate the magnitude and spatial extent of with-project water level rise.

USACE 4 Concur. Hydrologic model outputs for FWOP and FWP stages throughout the wetlands upstream of the Bayou Des Allemands floodgate will be conducted prior to construction.

USFWS 5. The Record of Decision (ROD) document to be prepared should include a recommendation for conducting the needed hydrologic modeling for determining project indirect hydrology impacts.

USACE 5. Concur. The ROD will include the commitment to conduct hydrologic modeling to verify CEMVN's indirect impact assessment.

USFWS 6. The project floodgate structures should be designed to handle the discharge associated with the two Mississippi River diversions (identified in the 1993 CWPPRA Louisiana Coastal Wetlands Restoration Plan) without corresponding wide-scale hydroperiod increases.

USACE 6. Acknowledged. Although these projects have been identified in the 1993 CWPPRA Louisiana Coastal Wetlands Restoration Plan, they are not currently authorized for construction. As such, they are not existing projects that the UBB needs to modify its design to accommodate. However, during PED, if the proposed gate, flood wall, and associated drainage structures for the UBB project can be designed to accommodate these projects without incurring additional significant costs, the USACE would consider such actions at that time.

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

USFWS 8. Estimates of all direct and indirect project-related wetland impacts should be refined during the post-authorization phase.

> USACE 8. 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 9. 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 9. Concur. All efforts will be made to avoid and minimize direct and indirect impacts to wetlands.

USFWS 10. 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 10. Acknowledged. Beneficial use of organic soils will be explored during advanced design should their removal from the project site be necessary.

USFWS 11. Forest clearing associated with project features should be conducted during the fall or winter to minimize impacts to nesting migratory birds, when practicable.

USACE 11. 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 12. 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 12. Concur. USACE will conduct on site surveys, in coordination with USFWS, to determine the presence of any nesting bald eagles.

USFWS 13. 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 13. Concur. The USACE will continue to coordinate with the resource agencies throughout the project phases.

USFWS 14. 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 14.a. Concur. A Final Mitigation Plan is 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 14.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 14.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 14.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 14.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 14.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 14.g. Concur. 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.

h. The Corps 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 F of the CAR.

USACE 14.h. Concur.

i. A mitigation plan 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.

USACE 14.i. Concur. A Final Mitigation Plan has been included in the Final EIS. See Appendix E for details.

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.

1. *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.

2. *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.

3. *Provide without project Bayou des Allemands cross-sections where the floodgate would be installed.*

   USACE 3. Concur. Further detail on the Bayou des Allemands cross-sections at the floodgate would be provided during PED.

4. *To assess possible indirect project impacts, provide hydrologic model outputs on FWOP and FWP stages within the protected area wetlands following a variety of heavy rainfall events.*

   USACE 4 Concur. During PED additional H&H modeling will be conducted to verify previously provided hydrologic model outputs for FWOP and FWP stages within the protected area wetlands during rainfall events.

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 impacts and project-induced hydroperiod impacts are not available, the Service cannot fulfill its Coordination Act responsibilities at this time. If the Record of Decision (ROD) to authorize the project does not include recommendations to conduct the hydrologic modeling needed to determine indirect hydrology impacts, the Service recommends that the Corp's Report not be submitted for

project authorization until the indirect hydrologic impact modeling and subsequent impact assessment is completed. If the ROD recommends that the Corps completes the indirect impact modeling, funds the Service to quantify those impacts, discloses those results as required by NEPA, and agrees to mitigate all fish and wildlife impacts, the Service would continue to coordinate with Corps on further planning and would be able to provide a final report in accordance with Section 2(b) of the FWCA for the Corps' implementation of the RP. 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 RP.

8.5 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.

8.6 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) was released for a 30 day public notice and review period from December 11, 2020 until January 10, 2021, concurrently with the second draft report release. A copy of the Section 404(b)(1) is included as Appendix H.

8.7 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 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).

8.8 HAZARDOUS, TOXIC, AND RADIOACTIVE WASTE

CEMVN is obligated under 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 states 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 has been completed for the Recommend Plan and the results are in section 3.1.10, and a copy of this Phase I ESA will be maintained on file at CEMVN. Based on the recent 2021 HTRW investigation and previous HTRW investigations conducted in this area (see section 3.1.10), there is a low-risk for finding HTRW issues with the Recommended Plan. Given the northern and southern alignments are generally next to subdivisions/undeveloped areas and not industrial areas, and given existing levees have already received environmental clearance and undergo regular maintenance, a low risk classification has been assigned. 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 may be required prior to construction.

8.9 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.

8.10 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.

8.11 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 MVN'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 an email stating 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.

8.12 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/)

Moreover, the USACE Planning Guidance Notebook (ER 1105-2-100) 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 MVN'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.

8.13 ITEMS REFINED AT A LATER DATE

This concludes USACE's feasibility study; however, there are a number of tasks associated with state and federal statute and regulatory requirements that will be completed during the project design and engineering phase. The following items will be refined at a later date.

MBTA - 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. If a nesting prevention plan is necessary, it would be prepared in coordination with USFWS.

HTRW - Based on the recent 2021 HTRW investigation and previous HTRW investigations conducted in this area (see section 3.1.10), there is a low-risk for finding HTRW issues with the Recommended Plan.

NHPA - On June 14, 2019, USACE posted a NHPA/NEPA Public Notice (Appendix C) 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.

EJ - Any potentially induced flooding which may occur will be further evaluated at PED once local government plans for local levels are implemented which could change the hydrology and reduce induced flooding.

EFH - USACE will continue to coordinate with the NMFS and any potential impacts to EFH will be further evaluated in PED.

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's scoping requirements 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, 2019. Public meetings were held at the Edward Dufresne community center in Luling on Jan 7, 2020, and Thibodeaux library on Jan 9, 2020. Input received from public meetings assisted the project team in optimizing the TSP during feasibility level of design.

After the final feasibility phase, the public was given a chance to review the second draft. The review period was from December 15, 2020 to Jan 29, 2021. CEMVN held two public meetings on Jan 12 and 13, 2021 through a virtual presentation on WebEx and USACE Facebook. Input received from public meetings assisted the project team in refinement of the Recommended Plan.

Preparation of the first and second IFR and DEIS, and final IFR-EIP 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 final IFR-EIS:

- Louisiana Department of Wildlife and Fisheries
- U.S. Department of Commerce, National Marine Fisheries Service
- U.S. Department of the Interior, Fish and Wildlife Service
- Louisiana Department of Natural Resources, Coastal Management Division
- Louisiana Department of Natural Resources, Coastal Restoration Division
- Louisiana State Historic Preservation Officer
- Louisiana Department of Environmental Quality
- FEMA
- USGS

9.1 VIEWS OF THE NON-FEDERAL SPONSOR

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

Section 10
Implementing the Recommended Plan and Summary of Findings

10.1 IMPLEMENTING THE PLAN

The RP 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, 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

Pursuant to the model Project Partnership Agreement (PPA) for structural CSRM projects, the NFS share is 35 percent of total project first costs. Participation in National Flood Plain Insurance Program and other applicable Federal floodplain management programs is required. Non-Federal interest must provide LERRDs; fair market value is credited to the non-Federal share. When the value of LERRD is less than 35 percent, the difference must be provided in cash during construction. 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 RP.

Table 10-1. Cost Share

Description	Cost	Contingency	Contingency Cost	Project First Cost
PED	$167,144,000	36%	$60,172,000	$227,316,000
Construction	$807,305,000	36%	$290,630,000	$1,097,934,000
Lands, Easements, Rights-of -Way, Relocations, and Disposal Area (LERRD)	$79,145,000	25%	$19,786,000	$98,931,000
Construction Management	$89,687,000	36%	$32,287,000	$121,974,000
			Project First Cost:	$1,546,156,000
			Local Cost Share (35%)	$541,154,600
			Government Share (65%)	$1,005,001,400

10.3 FEDERAL RESPONSIBILITIES FOR THE RECOMMENDED PLAN

The Federal government will be responsible for Pre-construction 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 RECOMMENDED PLAN

Federal implementation of the project for coastal risk management includes, but is not limited to, the following required items of local cooperation to be undertaken by the non-Federal sponsor in accordance with applicable Federal laws, regulations, and policies:

a. Provide 35 percent of construction costs, as further specified below:

1. Provide, during design, 35 percent of design costs in accordance with the terms of a design agreement entered into prior to commencement of design work for the project;

2. Provide all real property interests, including placement area improvements, and perform all relocations determined by the Federal government to be required for the project;

3. Provide, during construction, any additional contribution necessary to make its total contribution equal to at least 35 percent of construction costs;

b. Prevent obstructions or encroachments on the project (including prescribing and enforcing regulations to prevent such obstructions or encroachments) that might reduce the level of coastal storm risk reduction the project affords, hinder operation and maintenance of the project, or interfere with the project's proper function;

c. Inform affected interests, at least yearly, of the extent of risk reduction afforded by the project; participate in and comply with applicable Federal floodplain management and flood insurance programs; prepare a floodplain management plan for the project to be implemented not later than one year after completion of construction of the project; and publicize floodplain information in the area concerned and 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;

d. Operate, maintain, repair, rehabilitate, and replace the project or functional portion thereof at no cost to the Federal government, in a manner compatible with the project's authorized purposes and in accordance with applicable Federal laws and regulations and any specific directions prescribed by the Federal government;

e. Give the Federal government a right to enter, at reasonable times and in a reasonable manner, upon property that the non-Federal sponsor owns or controls for access to the project to inspect the project, and, if necessary, to undertake work necessary to the proper functioning of the project for its authorized purpose;

f. Hold and save the Federal 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 Federal government or its contractors;

g. Perform, or ensure performance of, any investigations for hazardous, toxic, and radioactive wastes (HTRW) that are determined necessary to identify the existence and extent of any HTRW regulated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 U.S.C. 9601-9675, and any other applicable law, that may exist in, on, or under real property interests that the Federal government determines to be necessary for construction, operation and maintenance of the project;

h. Agree, as between the Federal government and the non-Federal sponsor, to be solely responsible for the performance and costs of cleanup and response of any HTRW regulated under applicable law that are located in, on, or under real property interests

required for construction, operation, and maintenance of the project, including the costs of any studies and investigations necessary to determine an appropriate response to the contamination, without reimbursement or credit by the Federal government;

i. Agree, as between the Federal government and the non-Federal sponsor, that the non-Federal sponsor shall be considered the owner and operator of the project for the purpose of CERCLA liability or other applicable law, and to the maximum extent practicable shall carry out its responsibilities in a manner that will not cause HTRW liability to arise under applicable law; and

j. Comply with the applicable provisions 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 the Uniform Regulations contained in 49 C.F.R Part 24, in acquiring real property interests necessary for construction, operation, and maintenance of the project including those necessary for relocations, and placement area improvements; and inform all affected persons of applicable benefits, policies, and procedures in connection with said act.

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 UBB. 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 were considered and incorporated into the final report, as appropriate.

A 45-day state and agency review period also occurred on the final draft. All comments received during this period were considered prior to USACE making a final decision on the RP and in preparing the Record of Decision (ROD).

The recommendations 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 recommendations may be modified before they are transmitted to the Congress as proposals for authorization and implementation funding.

STEPHEN F. MURPHY
Colonel, Corps of Engineers
District Commander

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Section 12
References and Resources

Bryant and Chabreck, 1998

CEQ, 1997

Conner and Day, 1988

Connor et al, 1981

EPA. 2016. What climate change means for Louisiana. https://19january2017snapshot.epa.gov/sites/production/files/2016-09/documents/climate-change-la.pdf

Executive Order 13175. Consultation and Coordination with Indian Tribal Governments. Federal Register 65 (9 November): 67249; https://www.gpo.gov/fdsys/pkg/FR-2000-11-09/pdf/00-29003.pdf; Internet; accessed 11/16/2017.

Girard, Jeff, Chip McGimsey, and Dennis Jones, 2018. Louisiana's Comprehensive Archaeological Plan. State of Louisiana Department of Culture, Recreation and Tourism, Office of Cultural Development, Division of Archaeology, Baton Rouge.

Hieb EE, Carmichael RH, Aven A, Nelson-Seely C, Taylor N (2017) Sighting demographics of the West Indian manatee Trichechus manatus in the north-central Gulf of Mexico supported by citizen-sourced data. Endangered Species Res 32:321-332.

House of Representatives Document No. 308. 88th Congress 2nd Session. Chief of Engineers Report: Survey Report of Upper Barataria, Louisiana.

Kozlowski, 2002

Louisiana Department of Environmental Quality, Louisiana Digital Elevation Dataset source, UTM Zone 15 NAD83, LOSCO (2004) [24KDEM_LDEQ_2004]": Louisiana Oil Spill Coordinators Office 2001. https://catalog.data.gov/dataset/louisiana-digital-elevation-dataset-from-ldeq-source-data-utm-zone-15-nad83-losco-2004-24k-2004

Louisiana Department of Health. Emergency Preparedness. 2016 Flood Confirmed Storm-Related Deaths. http://ldh.la.gov/index.cfm/page/2553; Internet accessed (date)

Louisiana Department of Wildlife and Fisheries, Louisiana Natural Heritage Program. August, 2009. The Natural Communities of Louisiana.

Louisiana Statewide Comprehensive Water Based Floodplain Management Program (LWFMP). Phase 1 Investigation Report. May 2018.

Moody's Analytics. 2017. Economic and Consumer Credit Analytics Forecast. https://www.moodysanalytics.com/solutions-overview/economic/economic-forecasts.

National Environmental Policy Act of 1969. 1970. Vol. 83, secs. 1-207, 852; http://www.gpo.gov/fdsys/pkg/STATUTE-83/pdf/STATUTE-83-Pg852.pdf. Amended 1975. Statutes at large, Vol. 89, sec. 102, 424;

http://www.gpo.gov/fdsys/pkg/STATUTE-89/pdf/STATUTE-89-Pg424.pdf; Internet; accessed 11/16/2019.

National Park Service, 1995. How to Apply the National Register Criteria for Evaluation. National

NMFS 1998

Rees, Mark A., 2010. Archaeology of Louisiana. Louisiana State University, Baton Rouge.

Register Bulletin No. 15. U.S. Dept. of the Interior, National Park Service, Cultural Resources, Washington, D.C. https://www.nps.gov/nr/publications/bulletins/pdfs/nrb15.pdf

S. VijayaVenkataRaman, S. Iniyan, & Ranko Goic. 2012. A review of climate change, mitigation, and adaptation. Renewable and Sustainable Energy Reviews. 16: 878-897.

Swenson and Turner, 1987

Terrell, Dek. Lewis Terrell and Associates. 2016. The Economic Impact of the August 2016 Floods on the State of Louisiana. Report Commissioned by Louisiana Economic Development. http://gov.louisiana.gov/assets/docs/RestoreLA/SupportingDocs/Meeting-9-28-16/2016-August-Flood-Economic-Impact-Report_09-01-16.pdf.

USACE. ER 1100-2-8162, 2019. Global Changes. Incorporating Sea Level Change in Civil Works Programs.

USACE. Implementation Guidance for Section 1005 of the Water Resource Reform and Development Act of 2014 (WRRDA 2014), Project Acceleration, 20 March 2018.

https://www.publications.usace.army.mil/Portals/76/Users/182/86/2486/ER_1100-2-8162.pdf?ver=2019-07-02-124841-933

U.S. Bureau of Labor Statistics. 2019. State and County Employment and Wages. https://www.bls.gov/data/#employment.

U.S. Census Bureau. 2019. Population and Housing Unit Estimates Datasets. https://www.census.gov/programs-surveys/popest/data/data-sets.html.

U.S. Census Bureau. 2019. Income. https://www.census.gov/topics/income-poverty/income.html.

U.S. Fish and Wildlife Service. National Bald Eagle Management Guidelines. May 2007.

http://www.fws.gov/southeast/es/baldeagle/NationalBaldEagleManagementGuidelines .pdf.

White, K.D. & Arnold J.R. 2015. Recent US climate change and hydrology literature applicable to US Army Corps of Engineers missions – Lower Mississippi River Region. *Institute for Water Resources*. Pp 1-41.

40 CFR 1500-1508, Council on Environmental Quality Regulations for Implementing the Procedural Provisions of NEPA.

2013-2017 American Community Survey (ACS) 5 year estimates. https://www.census.gov/programs-surveys/acs/technical-documentation/table-and-geography-changes/2017/5-year.html

Websites

http://www.usace.army.mil/Missions/Civil-Works/Tribal-Nations/

https://byways.louisianatravel.com/sites/default/files/resources/Wetlands%20Trail.pdf

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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
CEMVN	USACE New Orleans District
CEQ	Council on Environmental Quality
CNO	Choctaw Nation of Oklahoma
CPRAB	Coastal Protection and Restoration Authority Board
CSRM	Coastal Storm Risk Management
CT	Coushatta Tribe of Louisiana
CTL	Chitimacha Tribe of Louisiana
CWA	Clean Water Act
E	
EAD	Equivalent Annual Damages
EC	Engineer Circular

EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
EJ	Environmental Justice
EM	Engineering Manual
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
FWCA	Fish and Wildlife Coordination Act
FWOP	Future With Out Project

H

H&H	Hydraulics and Hydrology
HPTRM	High Performance Turf Reinforced Mat
HSDRRS	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

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
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NNBF	Natural and Nature Based Features
NOAA	National Oceanic and Atmospheric Administration
NRHP	National Register of Historic Places
NRCS	Natural Resources Conservation Service
NS1	Non-Structural
NSI	National Structure Inventory

O

O&M	Operation and Maintenance
OMRR&R	Operations, Maintenance, Repair, Rehabilitation, and Replacement
OSE	Other Social Effects

P

P&G	Policy and Guidance
PA	Programmatic Agreement
PDT	Project Delivery Team
PED	Pre-construction 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
RSLC	Relative Sea Level Change
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
USDA	US Department of Agriculture
USFWS	US Fish and Wildlife Service
USGS	United States Geological Survey

V

VOC	Volatile Organic Compound

W

WMA	Wildlife Management Area
WVA	Wetland Value Assessment