Mississippi River Valley Division,
Regional Planning and Environment Division South

South Central Coast Louisiana

Hurricane Ike flooding in Delcambre, Louisiana.

Draft Feasibility Study with Integrated Environmental Impact Statement

November 2019

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Cover Sheet

South Central Coast Feasibility Study with Integrated Environmental Impact Statement
Lead Agency: Department of the Army
U.S. Army Corps of Engineers, New Orleans District
Cooperating Agencies: US Fish and Wildlife Service, Federal Emergency Management Agency

Abstract:

The Louisiana parishes of St. Mary, St. Martin, and Iberia have high levels of risk and vulnerability to coastal storms, exacerbated by a combination of sea level rise and climate change over the study periods. Topography within the study area is low elevation, which combined with the area's, proximity to the Gulf of Mexico, subsiding lands, and rising seas, are contributing factors causing coastal flooding, shoreline erosion, and loss of wetlands. The people, economy, environment, and cultural heritage of coastal areas in South Central Louisiana are at risk from reoccurring damages caused by hurricane and storm surge flooding.

The South Central Coast Louisiana (SCCL) Feasibility study's purpose is to investigate potential structural and nonstructural solution sets in terms of coastal storm risk management. Coastal storm risk management seeks to address coastal storm and flood risk to vulnerable populations, property, ecosystems, and infrastructure along the coast.

The US Army Corps of Engineers, Mississippi Valley Division, New Orleans District (CEMVN) developed hurricane and storm damage risk reduction measures and screened them using preliminary costs and benefits to identify a focused array of National Economic Development (NED) alternatives. In addition to the "No Action" alternative, two nonstructural alternatives were evaluated.

CEMVN's preferred alternative, or tentatively selected plan (TSP) would provide reduced flood risk for all structures in the study area with a First Floor Elevation at or below the 25 year stage based on predicted year 2025 hydrologic conditions. The TSP would reduce flood damage risks for a total of 3,463 structures. The TSP is 100 percent voluntary in nature and is comprised of 2,629 residential structures, 597 commercial structures, 71 public buildings, and 166 warehouses. The estimated total project cost for the NED TSP is $1,421,315,000 at a Fiscal Year (FY) 2019 price level.

Send your comments by:
January 6, 2020

For further information on this statement, please contact

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Comments may also be entered at the project web page:
http://www.mvn.usace.army.mil/About/Projects/BBA-2018/studies/South-Central-Coastal/

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Executive Summary

This report contains the Tentatively Selected Plan (TSP) for the South Central Coast Louisiana Integrated Feasibility Study and Environmental Impact Statement.

The people, economy, environment, and cultural heritage of coastal areas in South Central Louisiana are at risk from damages caused by hurricane and storm surge flooding. South Central Coast Louisiana's topography and low elevation, proximity to the Gulf of Mexico, subsiding lands, and rising seas, are all contributing factors that cause coastal flooding, shoreline erosion, saltwater intrusion, and loss of wetland and marsh habitats, which are conditions that are expected to continue to worsen.

Congress authorized the investigation of alternatives to provide hurricane protection and storm damage risk reduction. Planning to address hurricane protection and storm surge risk reduction (the NED component) was primarily focused on communities and areas located north of the Gulf Intracoastal Waterway (GIWW), but measures for all at-risk structures, both inside and outside of the coastal zone, were considered.

The South Central Coast Louisiana (SCCL) study area encompasses over 2,966 square miles of varying terrain in St. Martin, St. Mary, and Iberia Parishes (Figure ES-1). The majority of the study area borders Vermilion and West Cote Blanch Bays, both adjacent to the Gulf of Mexico. The major physiographic divisions are the Gulf Coast Prairie and the Gulf Coast Marsh. Bayou Teche and Vermilion can be considered two sub-basins in the combined Teche-Vermilion system. The Atchafalaya and Teche-Vermilion Basins contain the dominant hydrologic features, while the western portions of the Lower Grand and Terrebonne Basins are peripherally relevant.

The GIWW is a man-made channel in the study Area. The GIWW is the longest man-made channel crossing the study Area and generally runs along the state's coastal zone boundary. Bayou Teche, a former river channel, is another significant waterway within the study area. The channels and waterways, except for the GIWW, are oriented north to south along the Gulf Coast.

Key water control structures in the study Area include 10 pump stations, Calumet Floodgate East and West, Chareton Floodgate, Bayou Chene, and multiple barge gates at existing navigation channels. Key flood risk reduction systems include Bayou Sale, levees West of Berwick, Morgan City Backwater levees, Wax Lake outlet levees, West Atchafalaya Protection Levee, and East Atchafalaya Protection Levee. Further details on existing relevant infrastructure within the study area can be found in Appendix B: Engineering. Key highways in the Study Area are Interstate 10 and Highway-90. Population centers are mainly north of the GIWW, and the largest include the municipalities of Morgan City, Delcambre, and St. Martinville.

Flood risk management infrastructure in the study area is shown on Figure ES-2.

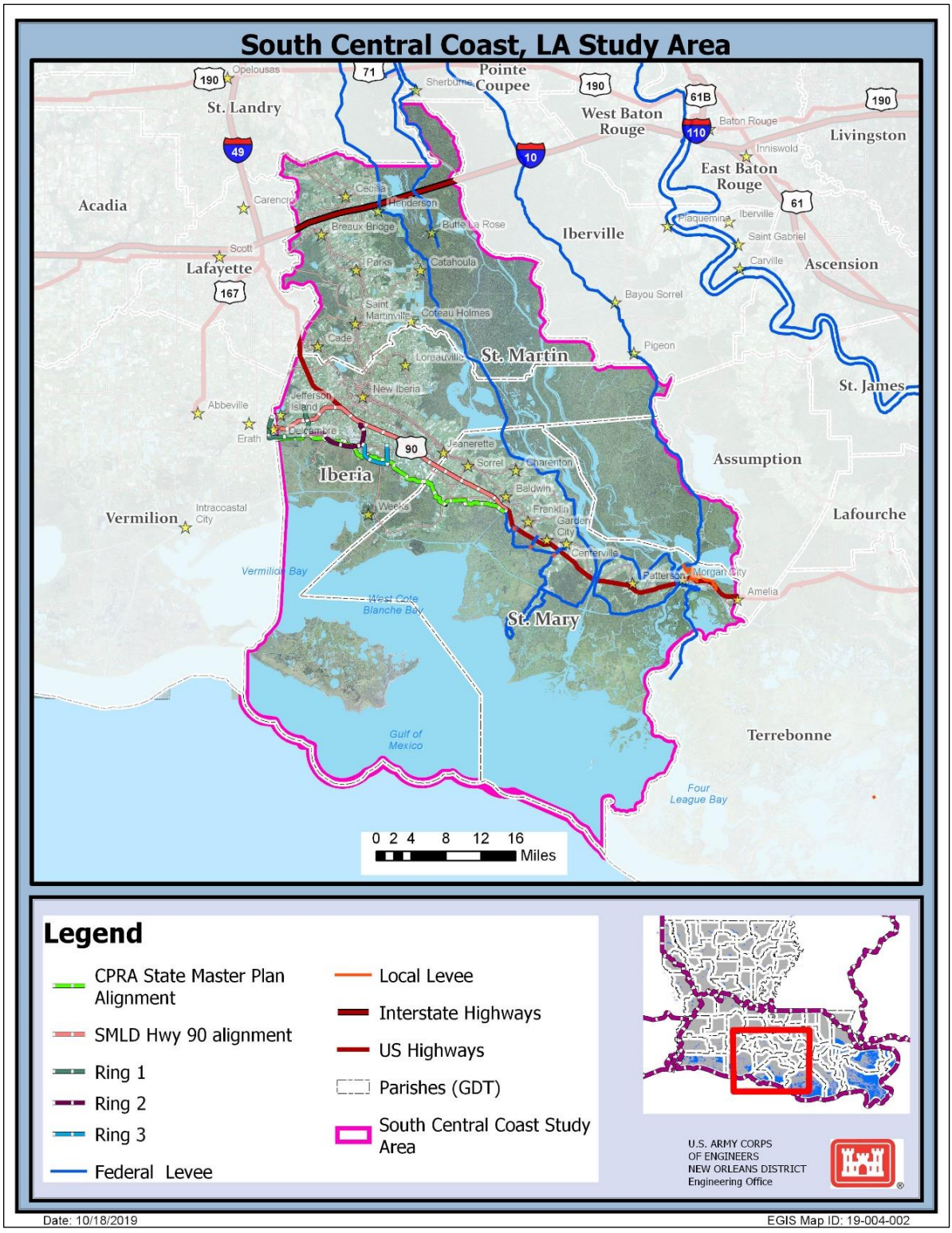

Figure ES-1. South Central Coast Study Area

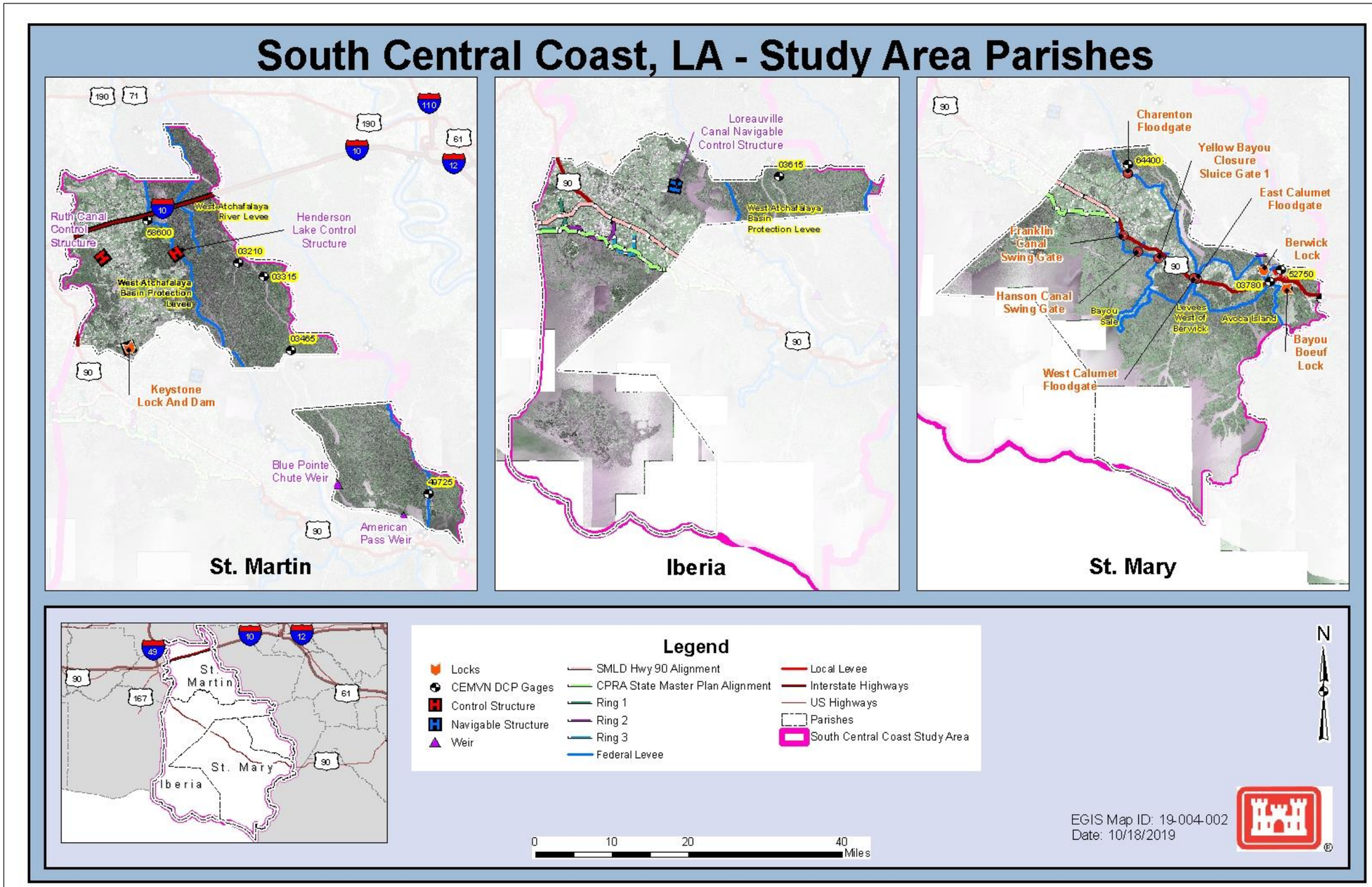

Figure ES-2. South Central Coast Study Area and Flood Risk Management Infrastructure

System-wide problems and opportunities were used to identify and define site-specific problems and opportunities. Problems in the SCCL study area include:

- Hurricanes and tropical storm events pose a significant risk to the communities, ecosystems, and industries of the Louisiana Gulf Coast.
- Numerous storm events, including Hurricanes Barry (2019), Lee (2011) Ike, (2008), Gustav (2008), Rita (2005), Lili (2002), Bertha (2002), Allison (2001), and Andrew (1992), affected the entire study area and resulted in economic damages, loss of property, loss of life, and repeated mandatory evacuation costs.
- Hurricane storm surge causes significant, permanent damage to wetlands. Historically, from 1932 to 2010, the area experienced a net loss of approximately 22,500 acres of wetlands, which reduced the natural resiliency of this area.
- The low elevations and tidal connections to the Atchafalaya River Basin place several of the population centers at risk of flooding from storm surge and hurricanes.
- Exacerbating the flooding is the phenomenon of relative sea level rise (RSLR), which is the combination of water level rise and land subsidence. The highest rates of RSLR of all North America coastal communities are found in the SCCL study area.

Note: The Atchafalaya Floodway, a major drainage system along the eastern side of the study area, is bordered by large Federal levees. The Atchafalaya Floodway largely mitigates for economic damages from riverine flooding, although it does not eliminate flood risk and damages completely. A majority of the area affected within the 50 year flood extent is located on land that the government owns in fee or has existing easements over. Although economic damages, as a result of Atchafalaya Floodway, are not 100 percent mitigated, the low return flood frequency and resulting structural damages would result in low benefits over the 50 year planning horizon. Therefore, solutions associated with residual riverine damages were not pursued. Additionally details regarding riverine flooding frequencies within the Atchafalaya Floodway are discussed in Section 2.8.1 of this report and in Appendix C: Hydraulics, Hydrology, and Climate Preparedness and Resiliency.

Opportunities to reduce damages associated with these problems include:

- Reduce the risk to life safety, land, and property.
- Reduce risk to key nationally significant commodities and critical infrastructure.
- Leverage local, state, and Federal entities efforts to manage flood risk.
- Reduce flooding in low areas of the evacuation corridor and ensure Hwy 90 is a reliable evacuation route.

The Project Delivery Team (PDT) developed four planning objectives to apply to the entire study area for the 50 year period of analysis (2025-2075):

Objective 1. Reduce risk to life safety from hurricanes and storm surge.

Objective 2. Reduce economic loss/damages, as a result of hurricanes and storm surge to structures (i.e. residential, commercial, agricultural, and industrial) within the study area.

Objective 3. Reduce risk to and enhance reliability of primary evacuation route for study area residents and the greater City of New Orleans area (Hwy 90).

Objective 4. Minimize degradation to natural storm surge protection coastal habitat such as marsh and wetland areas.

The following planning constraints, to be avoided or minimized, were identified:

- *Commercial navigation.* The navigations channels in the study area and the GIWW carry significant navigation traffic. Therefore, features that might result in shipping delays or undermine the purposes of authorized navigation projects would likely result in negative NED impacts.
- *Federally listed threatened and endangered species and their critical habitats.*
- *Essential fish habitat (EFH), especially intertidal wetlands.* Conversion of one EFH type to another should be done without adversely impacting various fish species. For example, conversion of shallow open water EFH to marsh EFH.
- *Cultural and historic resources.* Prehistoric and historic archeological sites, buildings, structures, and properties that may be of religious and cultural significance to Indian tribes are located in the study area, including properties included in or eligible for inclusion in the National Register of Historic Places (NRHP), although the majority of cultural and historic resources have not been assessed for eligibility.
- SCCL study is not formulating for Mississippi River and Tributaries (MR&T) deficiencies. The PDT assumed the MR&T authorized designs heights in their estimation of costs and benefits analysis.
- Ecosystem restoration was not investigated due to restrictions in funding authorizations.
- Avoid impacts to existing Federal projects within the study area.

National Economic Development Planning

Hurricane and storm damage risk reduction measures were developed and screened using preliminary costs and benefits to identify a focused array of NED alternatives. As a result of the economics assessment, only two nonstructural alternatives were found to be economically justified. In addition to the “No Action” alternative, the focused array contained these two stand-alone nonstructural alternatives.

Alternatives include:

- Alternative 1- Floodproofing and Elevations of structures within the 25 year storm surge Floodplain
- Alternative 2- Floodproofing and Elevations of structures within the 50 year storm surge floodplain,
- Alternative 3- No Action.

The evaluation of the measures and alternatives determined that nonstructural measures including structure elevations and floodproofing are most cost-effective solution to reduce flood-risk within the study area. The final alternatives evaluation resulted in identification of Alternative 1- Floodproofing and Elevations of structures within the 25 year storm surge Floodplain as the TSP.

The TSP would provide reduced flood risk for all structures in the study area with a First Floor Elevation (FFE) at or below the 25 year stage based on predicted year 2025 hydrologic conditions. The TSP would reduce flood damage risks for a total of 3,463 structures. ES-3 illustrates locations and existing condition modeled flood depths for the identified structures. The TSP is 100 percent voluntary in nature and is comprised of 2,629 residential structures, 597 commercial structures, 71 public buildings, and 166 warehouses. The estimated cost for the TSP is $1,421,315,000 at a Fiscal Year (FY) 2019 price level. Table ES-1 provides a cost summary of the estimated TSP average annual cost and benefits (damages reduced) over the 50 year planning horizon.

A brief summary of the components of the NED TSP includes:

- Elevation of eligible residential structures. This measure requires lifting the entire residential structure or the habitable area to the predicted 2075, 0.01 Annual Exceedance Probability (AEP) flood elevation, unless the required elevation is greater than a maximum of 13 feet above ground level.
- Dry floodproofing of eligible non-residential structures (excluding large warehouses and industrial complexes). Dry floodproofing consists of sealing all areas below the flood risk reduction level of a structure to make it watertight and ensure that floodwaters cannot get inside by making walls, doors, windows, and other openings impermeable to water penetration.
- Floodplain Management Plans. The non-Federal sponsor (NFS) is required to prepare a Floodplain Management Plan in coordination with the U.S. Army Corps of Engineers (USACE) to maintain the integrity of the project. The NFS shall work with the governing bodies within the three parishes to ensure consistency with local development plans and regulations.
- Adoption of more stringent local floodplain regulations. Although communities within the study area cannot change the minimum National Flood Insurance Program standards, the NFS should work with the local governments to adopt local standards that achieve higher levels of flood risk reduction. Examples of potential actions may include replacing elevation requirements based on the 0.01

AEP to the 0.2 year level of risk reduction; implementing a zero rise floodway; and adopting cumulative damages as the trigger for substantial damage determination.

- Adoption of more restrictive parish and municipal building codes, land use and zoning regulations, and other developmental controls. Local governments within the floodplain should be encouraged to adopt, implement, enforce stricter building and housing code requirements, land use and zoning regulations, and other developmental controls aimed at reducing flood risk and flood damage.

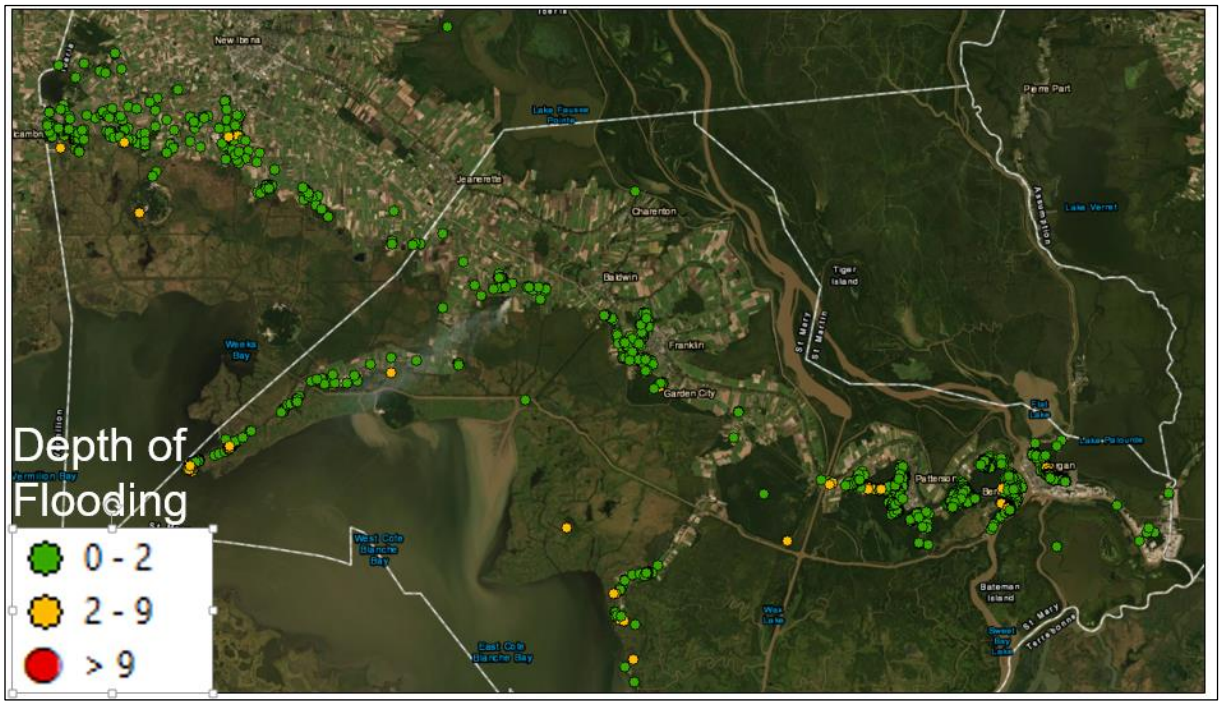

Figure ES-3. Geographic Distribution of Structures in the 25 Year TSP Nonstructural Project.

Table ES-1. TSP Cost and Benefit Summary

Alternative 1- Elevation and Floodproofing of Structures within the 25 year Floodplain	
First Construction Cost	$1,411,000,000
Cultural Survey Cost	$5,307,000
Interest During Construction	$4,793,000
Total Cost	$1,421,100,000
Average Annual Cost	$52,639,000
Average Annual Benefits	$74,830,000
Net Benefits	$52,639,000
BCR	1.42

The U.S. Army Corps of Engineers, Mississippi Valley Division, New Orleans District (CEMVN) held five study kickoff meetings at the start of the SCCL planning process. These included one resource agency meeting, two community and levee district leaders meetings, and two public meetings (see Appendix J).

The CEMVN issued a Notice of Intent (NOI) to prepare an Environmental Impact Statement for the SCCL project in the Federal Register (Vol. 84, No. 63 on April 2, 2019. The NOI included a 45-day public comment period, ending on May 17, 2019. On April 10, 2019 the CEMVN sent cooperating agency letters to the US Fish and Wildlife Service and National Oceanic and Atmospheric Administration (National Marine Fisheries Service). The CEMVN sent a cooperating letter to the Federal Emergency Management Agency on May 22, 2019. The CEMVN held two public scoping meetings on May 14 and 15, 2019. Appendix J: Public Involvement and Scoping, summarizesthese meetings. Input received from public meetings assisted the project team in refinement of project problems and opportunities, goals, objectives, and potential measures. No known controversial issues with the TSP are known at this time.

At this phase of the study, CEMVN has identified Alternative 1, 25 year Floodplain Nonstructural Plan as the TSP. This alternative would elevate orfloodproofing eligible residential and commercial structures within the 25 year storm surge floodplain. This TSP is recommended for further feasibility level of design. Upon completion of feasibility level of design, a recommended plan is anticipated to be submitted for authorization as a Federal project, with such modifications thereof, in the discretion of the Commander, Headquarters, U.S. Army Corps of Engineers, may be advisable. The non-Federal sponsor, Coastal Protection and Restoration Authority Board (CPRAB), supports the current identification of the TSP, but final approval and letters of support are subsequent to concurrent review of the draft report. CEMVN will continue to coordinate with the CPRAB to complete feasibility level of design on the TSP, once the TSP has been approved as the Recommended Plan for final feasibility level of design evaluation. Once a Recommended Plan is approved for further study, an implementation plan will be refined and evaluation and environmental compliance for the Recommended Plan will be documented in the revised final decision document.

Concurrent review of this draft report includes public, technical, legal, and policy reviews, as well as a Type I Independent External Peer Review. The PDT, CEMVN management, and USACE vertical team representatives throughout the agency will consider comments provided during the review period, prior to providing feedback to a USACE Headquarters Senior Leaders Panel. This panel will consider the evaluation of the significant public, technical, legal, policy and Independen External Peer Review (IEPR) comments on the TSP and other alternatives to determine the endorsement of a recommended plan and proposed way forward to complete feasibility-level design and the final report.

The final feasibility report is anticipated to be submitted in Fall of 2020 to USACE Headquarters. After the final feasibility report is submitted to headquarters, a Chief’s of Engineers Report will be developed for review and approval by the Chief of Engineers, with such modifications as the Chief Engineer deems necessary. Once the Chief of Engineers signs the report, the Chief of Staff sign the notification letters forwarding the Report to the

chairpersons of Senate Committee on Environmental and Public Works and the House of Representatives Committee on Transportation and Infrastructure. The signed Chief of Engineers Report is also provided to the Office of the Assistant Secretary of the Army for Civil Works for review by the Administration.

While the TSP recommended herein, provides a significant suite of measures to reduce coastal storm risk in South Central Louisiana, the plan will not solve all of St. Mary, Iberia, and St. Martin Parish's flooding problems. Under the TSP, there remains residual risk from flooding beyond the design limitations, there are locations within the study area that are outside of the 25 year floodplain that will continue to see impacts to roadways, utilities, and the natural environment as a result of flooding. The CEMVN recognizes the project authority and formulation methodology is limited in what it can provide. It is recommended that additional actions by the sponsor and other entities be considered in a holistic approach to further mitigate coastal storm damages and increase overall resiliency.

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A-9 Executive Order 13807 One Federal Decision Compliance

B Engineering

C Hydraulics, Hydrology & Climate Preparedness And Resiliency

D Economics

E Real Estate Plan

F Glossary Of Acronyms And Terms

G References Cited

H List Of Preparers*

I Distribution List*

J Coordination & Scoping Report

K Nonstructural Implementation Plan

*Indicates sections required in an Environmental Impact Statement

SECTION 1
Introduction

The Integrated Draft Feasibility Report and Environmental Impact Statement documents the plan formulation process, evaluation and comparison, and identification of a Tentatively Selected Plan (TSP) for the South Central Coast Louisiana (SCCL) study area. Impact analysis was completed and described for the TSP on significant resources.

1.1 STUDY SCOPE

The study scope is authorized to address comprehensive investigations of both Coastal Storm Risk Management (CSRM) and Flood Risk Management problems and solutions. The U.S. Army Corps of Engineers, (USACE), Mississippi Vally Division, New Orleans District (CEMVN) considered past, current, and future management and resilience projects underway by the CEMVN and other Federal, state, and local agencies within the study area. The CEMVN performed three overarching efforts:

- Assess the study area's problems, opportunities, and future without project conditions for a 50 year planning horizon 2025-2075,
- Assess the feasibility of implementing system-wide coastal storm damage reduction solutions, and,
- If system wide solutions are not feasible, assess the feasibility of implementing site-specific solutions, including structural, non-structural, and natural and nature-based features, or possibly a combination thereof.

Features recommended in final decision documents would be at a 35 percent design level, utilizing existing data (such as topography and subsurface conditions) as much as possible. During Preconstruction Engineering and Design (PED) phase, CEMVN would use detailed data and final design calculations to perform 100 percent design.

CEMVN prepared this draft feasibility report in accordance with USACE SMART Planning procedures, as authorized in accordance with Section 1001 of the Water Resources and Reform Development Act of 2014, (WRRDA 2014), as amended by Section 1330(b) of the Water Resources Development Act of 2018, (WRDA 2018) and the HQUSACE implementation guidance therefore dated March 25, 2019,and in accordance with the National Environmental Policy Act (NEPA) of 1969 (40 CFR 1500-1508 and the USACE NEPA implementing Engineer Regulation (ER) 200-2-2 (33 CFR 230). This document serves as a draft feasibility report with an integrated draft Environmental Impact Statement (Report). The CEMVN is the lead Federal agency under theNEPA. The Coastal Protection and Restoration Authority Board of Louisiana (CPRAB) is the non-Federal sponsor, subject to continued participation.

This Report documents the CEMVN's planning process for this feasibility study and the evaluation and comparison of a final array of alternatives, including the No Action

Alternative. The CEMVN prepared this Report to comply with NEPA and applicable Federal, state, and local environmental laws and regulations. The outcome of the planning process, as performed up to the date of the draft report, is the identification of the National Economic Development (NED) plan, and designation of the Tentatively Selected Plan (TSP).

1.2 STUDY AUTHORITY

The CEMVN is completing this study under the following authorities:

H.R. Docket 2767, 20 Sep 2006, Southeast Coastal Louisiana, LA,

> Resolved by the Committee on Transportation and Infrastructure of the United States House of Representatives, that, in accordance with section 110 of the River and Harbor Act of 1962, the Secretary of the Army is requested to survey the coast of Louisiana in Iberia, St. Martin, and St. Mary parishes with a view to determine the feasibility of providing hurricane protection and storm damage reduction and related purposes.

The SCCL was originally titled, Southeast Coastal Louisiana. It was renamed South Central Coast Louisiana to avoid confusion with the Southeast Louisiana urban flood control project covering Jefferson, Orleans, and St. Tammany Parishes.

Bipartisan Budget Act (BBA) of 2018, (Public Law 115-123), Division B, Subdivision 1, H. R. 1892—13, TITLE IV, CORPS OF ENGINEERS—CIVIL, DEPARTMENT OF THE ARMY, INVESTIGATIONS:

> where funds are being made available for the expenses related to the completion, or initiation and completion, of flood and storm damage reduction, including shore protection, studies currently authorized or are authorized after the date of enactment of this act, to reduce risk from future floods and hurricanes. The funds are at full Federal expense and funds made available for high-priority studies of projects in States and insular areas with more than one flood related major disaster declared pursuant to the Robert T. Stafford Disaster Relief and Emergency Assistance Act (42 U.S.C. 5121 et seq.) in calendar years 2014, 2015, 2016, or 2017.

Memorandum from R.D. James, Assistant Secretary of the Army (Civil Works), to Deputy Commanding General for Civil and Emergency Operations dated August 9, 2018, SUBJECT: “Policy Guidance on Implementation of Supplemental Appropriations in the Bipartisan Budget Act of 2018.” Enclosure 4, dated July 5, 2018, identifies the studies that will be funded with Supplemental Investigations funds as part of the Long-term Disaster Recovery Investment Plan (LDRIP).

The BBA and H.R. Docket 2767 authorized the proposed South Central Coast Louisiana Project planning and potential construction.

1.3 STUDY STAKEHOLDER AND COORDINATING AGENCIES

The CPRAB executed the feasibility cost-share agreement on October 09, 2018. The State of Louisiana established the CPRAB with authority to articulate a clear statement of priorities and to focus development and implementation efforts to achieve comprehensive coastal protection for Louisiana. The CPRAB's mandate is to develop, implement, and enforce a comprehensive coastal protection and restoration Master Plan (2017). Working with Federal, state, and local political subdivisions, including levee districts, the CPRAB is working to establish a safe and sustainable coast to protect communities, the nation's critical energy infrastructure and Louisiana's natural resources into the future.

The Federal government and the CPRAB may cost share all or a portion of the cost of construction implementation, to the extent that Bipartisan Budget Act (BBA) funds are not made available for construction of the project.The CPRAB is responsible for provision of lands, easements and rights-of-way. The CPRAB remains responsible for all costs of operation, maintenance, repair, replacement, and rehabilitation (OMRR&R) of project features following construction completion.

The CEMVN and the CPRAB have a close working relationship. The CPRAB has been an active participant in every public meeting and ongoing team meetings.

The CEMVN invited the U.S. Fish and Wildlife Service (USFWS), Federal Emergency Management Agency (FEMA), and the National Oceanic and Atmospheric Administration (NOAA), National Marine Fisheries Service (NMFS) to be cooperating agencies in accordance with the NEPA (40 C.F.R. § 1501.6 and § 1508.5) and One Federal Decision, Executive Order (EO) 13807, titled, Establishing Discipline and Accountability in the Environmental Review and Rermitting Process for Infrastructure Projects, 15 August 2017. By letter dated May 17, 2019, the NOAA accepted to be a cooperating agency. However in a letter dated October 2, 2019, NOAA elected to withdraw as a cooperating agency based on the CEMVN's No Affect determination on NOAA/NMFS trust resources. The FEMA and USFWS accepted their role as a cooperating agency by not declining the CEMVN's request (Appendix A-9). A complete list of agencies and local stakeholder is provided in Appendix I: Distribution List.

Other agency stakeholders include, but are not limited to:

- Louisiana Department of Natural Resources (LDNR) Office of Coastal Management (OCM)
- Louisiana Department of Wildlife and Fisheries (LDWF)
- Louisiana Division of Archaeology (LDOA)
- Federally-recognized Indian tribes (collectively referenced as "Tribes")
- U.S. Environmental Protection Agency (EPA)
- National Oceanic Atmospheric Administration (NOAA)
- Federal Emergency Management Agency (FEMA)

Local stakeholders include, but are not limited to:

- St Mary Levee District
- Iberia Levee District
- Chitimacha Tribe of Louisiana (CTL)
- Sierra Club
- Teche-Vermilion Fresh Water District
- Port of Morgan City
- Port of Iberia
- Municipalities and township associated with Iberia Parish
- Municipalities and township associated with St. Martin Parish
- Municipalities and township associated with St. Mary Parish

1.4 PURPOSE AND NEED

Through separate study and funding authorizations, Congress authorized the investigation of alternatives to provide flooding risk reduction to St. Martin, St. Mary, and Iberia Parishes in South Central Louisiana. The Federal objective of water and related land resources planning is to provide the greatest net contribution to the NED consistent with protecting the Nation's environment, pursuant to national environmental statutes applicable executive orders, and other Federal planning requirements.

St. Mary, St. Martin, and Iberia Parishes have high levels of risk and vulnerability to coastal storms, exacerbated by a combination of sea level rise and climate change over the study periods. The study area's low elevation topography, proximity to the Gulf of Mexico, subsiding lands, and rising seas, are contributing factors causing coastal flooding, shoreline erosion, and loss of wetland. The people, economy, environment, and cultural heritage of coastal areas in South Central Louisiana are at risk from reoccurring damages caused by hurricane storm surge flooding.

The Atchafalaya Floodway, a major drainage system along the eastern side of the study area, is bordered by large federal levees. The Atchafalaya Floodway largely mitigates for economic damages from riverine flooding, although it does not eliminate flood risk. A majority of the area affected within the 50 year flood extent is located on land that the government owns in fee or has existing easements over. Although, economic damages as a result of Atchafalaya Floodway are not 100 percent mitigated, the low return flood frequency and resulting structural damages would result in low benefits over the 50 year planning horizon. Therefore, solutions associated with residual riverine damages were not pursued. Additional details regarding riverine flooding frequencies within the Atchafalaya Floodway are discussed in Section 2.8.1 of this report and in Appendix C: Hydraulics, Hydrology, and Climate Preparedness and Resiliency.

The study area had 56 Federal disaster declarations between 1964 and 2016, as a result of hurricanes and tropical storms. The study area experienced repeated storm events including Hurricanes Barry (2019), Isaac (2012), Ike (2008), Gustav (2008), Rita (2005), Katrina (2005), Ivan (2004), Lili (2002), Isidore (2002), Allison (2001), George (1998) and Andrew (1992). The impacts resulted in loss of life, economic damages, repeated mandatory

evacuation costs, and continued degradation of natural defense provided by marsh habitat. Due to projected relative sea level rise, land subsidence, and climate change, the CEMVN forecasts the study area conditions will worsen over the 50 year planning horizon without additional storm mitigative measures.

The SCCL feasibility study's purpose is to investigate potential structural and nonstructural solution sets to address flood risk.

Project implementation would reduce flood risk in the area by increasing sustainability and resiliency to storms for the affected communities.

The SCCL study area encompasses 2,966 square miles of varying terrain in St. Martin, St. Mary, and Iberia Parishes (Figure 1-1). The majority of the study area borders Vermilion and West Cote Blanche Bays, which are located in the Gulf of Mexico. The study area has major thoroughfares and intersections, connecting a large portion of the southern part of Louisiana.

In addition to the adverse impacts resulting from repeated storm events such as Hurricanes Rita, Ike, Gustav, and Barry, this area is also vulnerable to coastal land loss and degradation, which increases risk to communities, habitat, and infrastructure.

Critical infrastructure, including, but not limited to, wastewater treatment plants, strategic petroleum reserves, regional and local hospitals, fire stations, electric power generation plants and substations, and public schools, are currently at risk from storm surge.

Key existing infrastructure at risk from storm surge flooding also includes, but is not limited to:

- Evacuation routes for the residents within the study area and the greater New Orleans area (Hwy 90)
- Port of Morgan City
- Port of West St. Mary and Port of Iberia
- Gulf Intracoastal Waterway and Bayou Teche
- Wax Lake Outlet and Pumping Station
- Keystone Lock and Dam
- Berwick Lock and Bayou Boeuf Lock
- Harry P. Williams Memorial Airport Major transportation corridors

The area is at risk of damages from flooding from tropical storms and hurricanes, which have repeatedly impacted this part of the Louisiana coast. Approximately 177,000 people reside within the study area. The Gulf Intracoastal Waterway (GIWW) transects the study area, with most population centers occurring north of the GIWW. The largest municipalities include Breaux Bridge and St. Martinville in St. Martin Parish; New Iberia, Jeanerette, Delcambre, and Loreauville in Iberia Parish; and Morgan City, Franklin, Patterson, Baldwin, and Berwick in St. Mary Parish. Tribal Lands that the federally-recognized Chitimacha Tribe of Louisana (CTL) exercises sovereignty over encompass the majority of the community of Charenton in St. Mary Parish.

Commercial activities in the study area include the Port of Morgan City, Port of West St. Mary, and Port of Iberia, GIWW and Bayou Teche, Keystone Lock and Dam, Berwick Lock, and Bayou Boeuf (St. Martin, Iberia, St Mary Parishes, Louisiana) Lock, the Wax Lake Outlet and Pumping Station, and the Harry P. Williams Memorial Airport. Highway 90 is a major transportation corridor and key evacuation route within the study area.

The CEMVN and the CPRAB propose to implement coastal stormrisk management measures in the SCCL area. The CEMVN will identify a variety of CSRM strategies that improve the region's flood resiliency, and reduce flood fighting and flood clean-up costs, while meeting the congressionally authorized purposes. The CEMVN's flood risk reduction measures would also strive to promote the culture, and livelihood of the area, while maintaining public safety over the life of the project. While it is impossible to eliminate all flood risk, the goal of this study is to evaluate structural, nonstructural, and nature-based measures to meet the project's goals.

Figure 1-2 shows key existing civil works infrastructure in the study area.

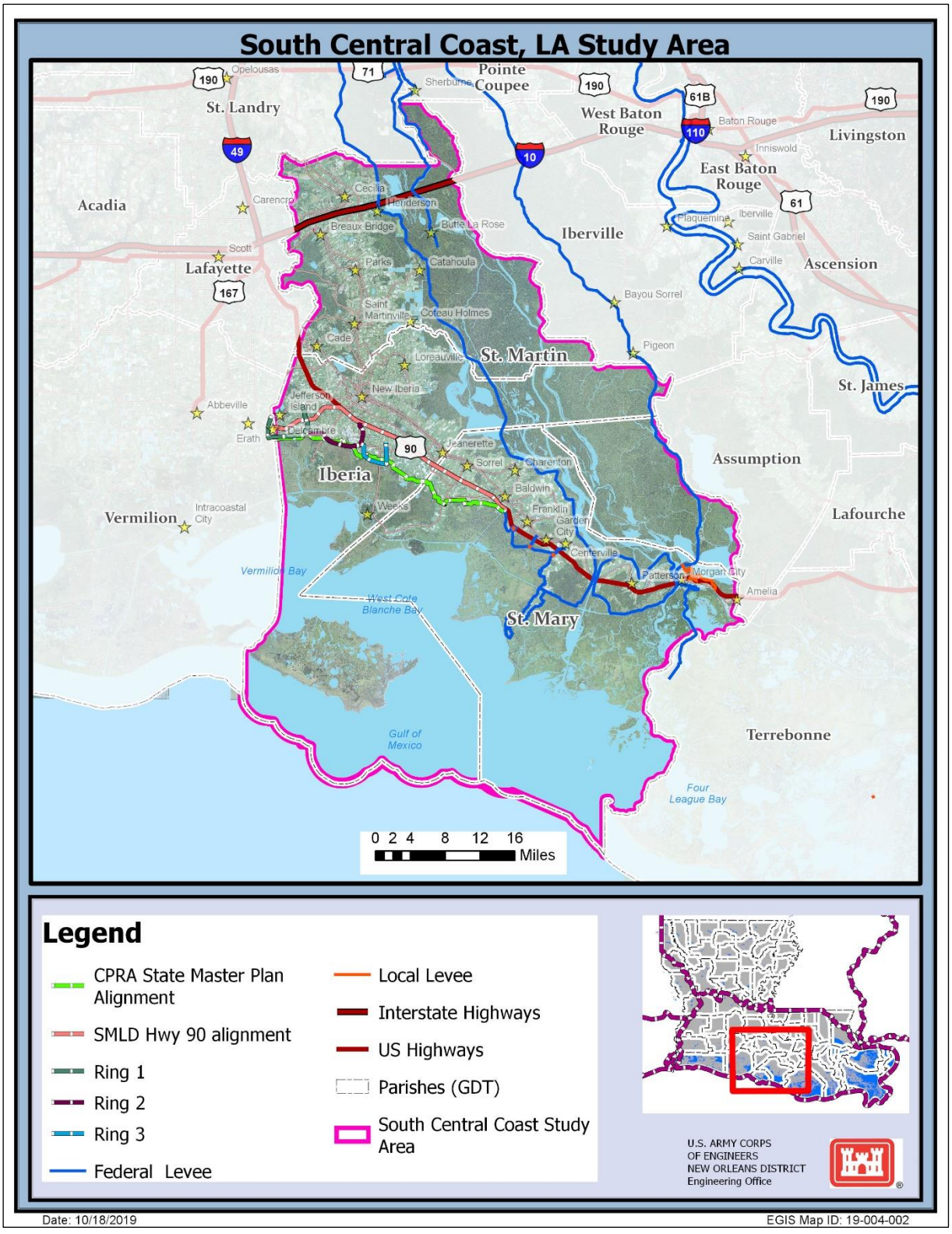

Figure 1-1. South Central Coast, Louisiana Feasibility Study Area

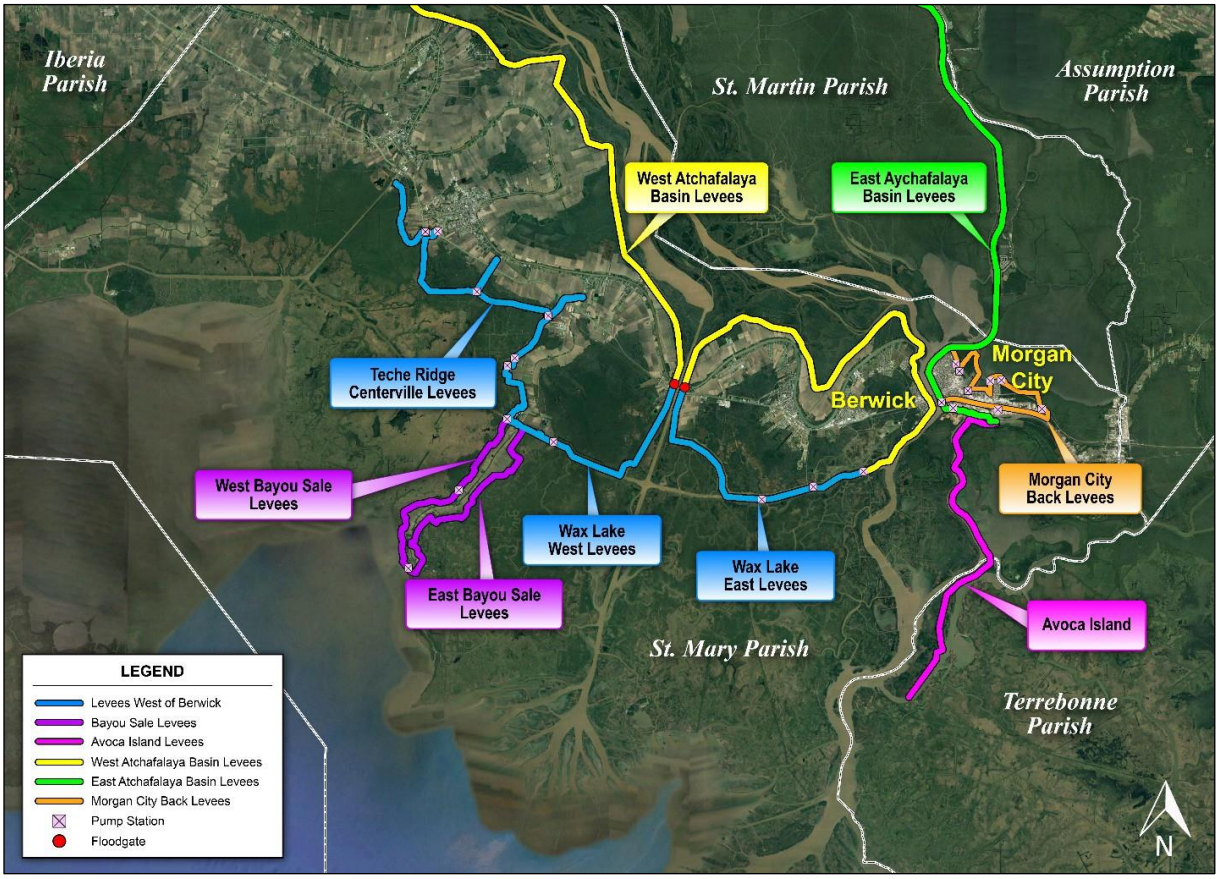

Figure 1-2. Key Existing Civil Works Infrastructure

1.5 FEDERAL INTEREST

The SCCL study area is extremely vulnerable to coastal storm events. Coastal storm risk management is an identified primary mission area of USACE. The SCCL study area is home to these nationally significant industries:

- Cabot Corporation, Columbian Chemicals, and Degussa Engineered Carbon carbon black manufacturing plants, are among the largest carbon black producers in the U.S.
- Ship building and fabricating the oil and gas services and extraction industries vital to the U.S. economy
- The Strategic Petroleum Reserve maintains storage facilities immediately north and west of the study area with transfer and processing infrastructure traversing the area.
- The study area is the heart of the sugar cane production area for the state. Out of the 11 raw sugar-manufacturing mills in Louisiana, five are located in the study

area including Sterling Sugars, St. Mary Co-op, Enterprise Factory, Cajun Sugar Co-op, and LA Sugar Cane, Inc.

- The area, designated as the Atchafalaya National Heritage Area, depends on unique Creole and Cajun tourism opportunities.
- The study area is comprised of ecosystems having national significance as demonstrated by the presence of Bayou Teche National Wildlife Refuge (NWR) and the State of Louisiana Marsh Island Wildlife Refuge and the Attakapas and Atchafalaya Delta Wildlife Management Areas (WMA).

A federal interest exists in the reduction of life safety risk to approximately 177,000 residents within the study area. In addition, coastal storms can impact Highway 90, which transects the study area, and is a key evacuation route for area residents and the City of New Orleans 393,292 residents (2017).

1.6 PROBLEMS AND OPPORTUNITIES

1.6.1 Problems

Hurricanes and storm surge events pose a significant risk to the communities, ecosystems, and industries of the Louisiana gulf coast. This area suffered from recent disasters and will continue to suffer from natural disasters without some form of flood risk solution. Repeated storm events including recent Hurricanes Rita, Ike, Gustav, and Andrew, made landfall affecting the entire study area, resulted in loss of life, property, and repeated mandatory evacuation costs. Historically, from 1932 to 2010, the area experienced a net loss of approximately 22,500 acres of wetlands reducing the natural resiliency of this area. Continued wetlands losses impact migratory species, the ecological nurseries of the Gulf of Mexico, and various commercial and recreational activities. The study area is relatively flat with nearly all areas at an elevation below elevation 10 feet (North American Vertical Datum of 1988). The low elevations and tidal connections to the Atchafalaya River Basin place several of the population centers at risk of flooding from storm surge and hurricanes. Exacerbating the flooding is the phenomenon of relative sea level rise (RSLR), which is the combination of water level rise and land subsidence. The South Central Coast Study area has the highest rates of RSLR in North America coastal communities. Soils within southeast Louisiana are generally characterized by as weak and at risk for general subsidence and the global incidence of sea level rise.

Sea level rise increases risk by increasing the initial water elevation (stillwater) that hurricanes have an effect on, thereby increasing storm surge and wave elevations. RSLR is a combination of eustatic sea-level rise and subsidence. Figure 1-3 depicts the combined effects of subsidence and sea level rise.

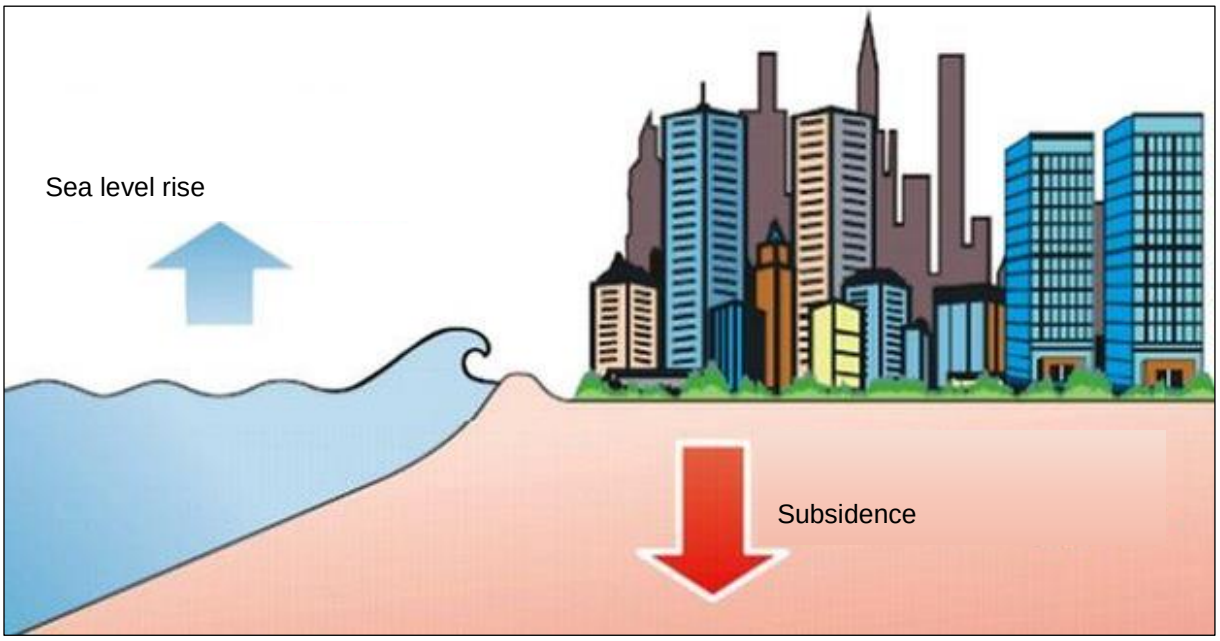

Figure 1-3. Graphical Depiction of Subsidence and Sea Level Rise Effects
(Adapted from Erkens et al., 2015)

Planning for anticipated subsidence, both short-term and long-term, is included in this evaluation. During the design of individual reaches, geologists and geotechnical engineers examined site-specific soil conditions and estimate long-term settlement and subsidence in the barriers. For levee alternatives over soft foundations, engineers typically recommend construction in several lifts. This allows the foundation soils to consolidate and gain in shear strength. When future lifts are constructed to higher elevations, the footprint of the levee system does not need to increase. Final construction lifts are typically constructed with a foot or more of added height in anticipation of long-term settlement. This added height assures the levee crown elevation will be at or above the design elevation.

The combined effect of subsidence, settlement, and sea level rise will continue and increase risk of overtopping levees. This in turn increases:

- Risk to life safety
- Risk of damage to property & infrastructure
- Regional economic impacts
- Risk to cultural heritage, population, other social effects
- Risk of environmental damages and human health safety impacts from industrial flooding

Due to subsidence, consolidation, and potential sea level rise, changes over time to the hurricane risk reduction measures are dynamic.

1.6.2 Opportunities

Because USACE's top priority is public safety, this study will identify what areas within the study area are at the highest risk, drivers of the risk (storm surge or riverine), and potential mitigative features. If the CEMVN and CPRAB implements structural or non-structural mitigative features, these features would reduce flood damage risk to land property. Additionally, reducing flood risk and associated damages would reduce the risk to key nationally significant commodities and critical infrastructure.

Multiple local, state, and Federal entities work within the study area. Coordination of this project during the study phase has leveraged multiple efforts to manage flood risk.

The study area has an identified evacuation corridor, servicing the study area and the greater of New Orleans area. The project has the potential to reduce flooding in low areas of the evacuation corridor and ensure I-49 is a reliable evacuation route.

The planning team will evaluate multiple lines of defense for reducing flood risk to the study area. This evaluation will include an analysis of the Federal interest in restoring key coastal land and wetland loss as an engineering with nature measure. These measures will need to be justified in the NED account.

1.7 PLANNING GOALS/OBJECTIVES

Goal 1: Increase sustainability and resiliency of communities to coastal flood events.

Objective 1a. Reduce risk to life safety from hurricanes and storm surge flooding.

Objective 1b. Reduce economic loss/damages, as a result of hurricanes and storm surge flooding to structures (i.e. residential, commercial, agricultural, and industrial) within the study area.

Objective 1c. Maintain availability of key evacuation route (Hwy 90) for residents within the study area and the greater New Orleans area.

Goal 2: Maintain and sustain the resiliency of natural ecosystem to reduce flood damages.

Objective 2a. Minimize degradation to vulnerable coastal habitat and wetland areas.

1.8 PLANNING CONSTRAINTS AND CONSIDERATIONS

A planning constraint limits the extent of the plan formulation process. It is a statement of considerations that the alternative plans should avoid or minimize impacts. Constraints considered for the SCCL project are:

- Appropriation authority does not allow for development of measures or alternatives outside of Coastal Storm Risk Management or Flood Risk Management.
- Avoid, minimize, and/or mitigate impacts to environmental resources, particularlywetlands, within the study area.

- Avoid and/or minimize impacts to cultural resources.
- Avoid and/or minimize locating project features on lands known to have Hazardous, Toxic, and Radioactive Waste (HTRW) concerns.
- Resource constraints – the study will be compliant with 3 years and $3 million SMART planning guidelines, as authorized in accordance with Section 1001 of the Water Resources and Reform Development Act of 2014, (WRRDA 2014), as amended by Section 1330(b) of the Water Resources Development Act of 2018, (WRDA 2018) and the HQUSACE implementation guidance therefore dated March 25, 2019. In order to meet time and money constraints, existing data and information for all resources will inform the study. No new surveys or data collection will occur during planning phase.
- Endangered Species and Critical Habitat Study-specific constraints will be included in measure feasibility determinations.
- Avoid impacts to the functions of other federal investment projects in the vicinity (GIWW, MR&T, etc.).
- Comply with time of year restrictions for threatened and endangered (T&E) species.

1.9 STUDY CONSIDERATIONS

The alternative plans should avoid or minimize impacts. Criteria that are considerations for the study:

- The added benefit to local insurance rates if a structure has FEMA accreditation (and the negative impact if accreditation is lost).
- If the study suggests increasing the height of hard structures (floodwalls, closure structures), it may be cost-prohibitive. This may limit the maximum effective risk reduction.
- The proposed project should avoid 404(c) areas if possible. The CEMVN will conduct early coordination with EPA as needed.
- Existing levee systems have very little open land adjacent to the system. Increases in elevation to existing levees and/ or new levees may be dependent upon availability of adjacent lands.
- Wetland mitigation banks are increasingly difficult to find and afford within designated watersheds.
- The CEMVN will thoroughly consider Environmental Justice.
- The CEMVN will identify and address any potential transfer of flood risk to areas outside the study area.
- Minimize impacts to parish and community tax base.
- Avoid, minimize, and/or impacts to existing environmental resources.
- The recommended plan should maintain cultural and socio-economic cohesiveness across different neighborhoods and avoid isolating neighborhoods.
- Leverage and combine all available resources (federal, state, local) to maximize funding for coastal storm risk management studies and projects.

- Integrate structural, nonstructural, and Natural and Nature-Based Features.
- Avoid, minimize, and/or mitigate socio-economic and environmental justice impacts on neighboring cities like Delcambre, Louisiana.
- Avoid, minimize, and/or mitigate for adverse effects to National Register of Historic Places-listed or eligible buildings, structures, objects, archaeological sites, and/or properties of religious or cultural significance to Tribes.

1.10 PRIOR REPORTS AND EXISTING WATER PROJECTS

The SCCL study area is a critical area to enhance resiliency to coastal storm surge in the region. Other study efforts along the coast include South West Coastal Louisiana, Morganza to the Gulf of Mexico, and Larose to Golden Meadow projects (Table 1-1). Figure 1-4 shows the location of the SCCL study area in comparison to other projects already authorized and in various stages of implementation.

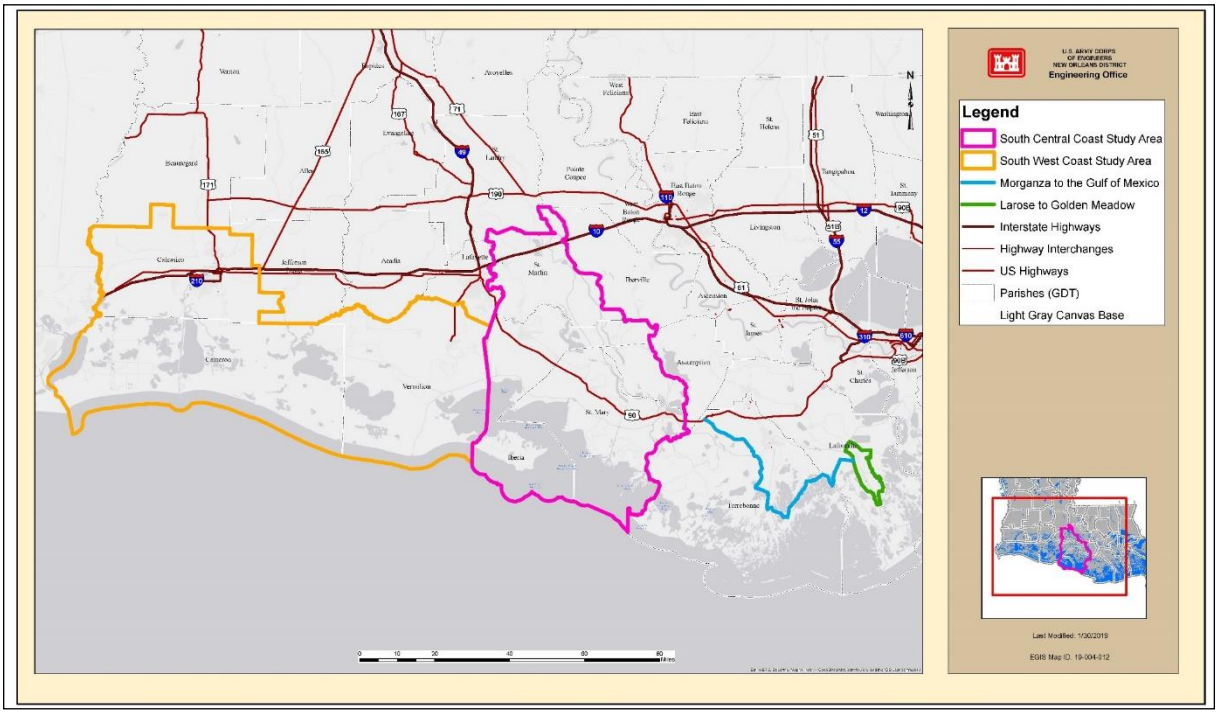

Figure 1-4. Comprehensive Coastal Risk Management Louisiana Coast

The CEMVN's initial alternative evaluation focused on reevaluation of the CPRAB's *South Central Coastal Louisiana Flood Protection Study* (2017) recommendations as well as potential levee alignments proposed at initial public meetings. These levee alignments run east to west across the study area, and include ring levees near population centers, and the Highway 90 right-of-ways (Figure 1-1). The CEMVN utilized prior reports and existing data to inform formulation and evaluation of SCCL measures. Prior reports referenced are listed in Table 1-1.

Table 1-1. Prior Relevant Reports for South Central Coast Study Area

Title of Report	Owner	Date	Purpose
Lower Atchafalaya Basin Floodway System	U.S. Army Corps of Engineers, New Orleans District	1928	The Lower Atchafalaya Basin Floodway System project has two mutually supporting goals: to preserve the habitat of nation's largest and oldest river-basin swamp and to ensure that the Lower Atchafalaya Basin can pass a floodwater of 1.5 million cubic feet per second as required by the Mississippi River and Tributaries Project (MR&T).
Larose to Golden Meadow Hurricane Protection	U.S. Army Corps of Engineers, New Orleans District	1965	The project consists of a ring levee approximately 40 miles in length protecting the areas along the east and west banks of Bayou Lafourche, extending from Larose to just south of Golden Meadow. Floodwalls were constructed in areas where the congested nature of improvements and limited right-of-way prevented the construction of levees. The project also provides for the construction of navigable floodgates on Bayou Lafourche at the upper and lower limits of the study area. In lieu the eight gravity drainage structures that were authorized as part of the project, the locals chose to pay the additional cost for the pumping stations.
Lower Atchafalaya Basin Floodway System	U.S. Army Corps of Engineers, New Orleans District	1982	The Water Resources Development Act of 1986 authorized the Corps to develop recreation opportunities within the lower Atchafalaya Basin Floodway System. Facilities include features such as boat landings, campgrounds and an interactive visitor center. New boat landings have been constructed at Simmesport and Myette Point. Additional boat landings are planned for Bayou Sorrel, Krotz Springs, Butte LaRose, and Bayou Pigeon. These sites will include launch ramps, parking, access roads, rest rooms, drinking water, lighting, piers and other features.
Coastal Wetlands Planning, Protection and Restoration Act program	U.S. Army Corps of Engineers, New Orleans District	1990	The Coastal Wetlands Planning, Protection and Restoration Act program (CWPPRA or "Breaux Act") provides for targeted funds to be used for planning and implementing projects that create, protect, restore and enhance wetlands in coastal Louisiana. It was passed in 1990. As of April 2018, the CWPPRA Program has 218 authorized projects, 113 of which have been constructed. Another 14 projects are under construction, 26 are in the engineering & design phase, & 46 have been deauthorized or transferred to another program. The CWPPRA Program anticipates receiving about $72.8 M in Federal funds for FY19. Key CWPPRA project near or within the study area include: Freshwater Introduction South of Highway 82, South White Lake Shoreline Protection Boston Canal/Vermilion Bay Shore Protection, Four Mile Canal Terracing and Sediment Trapping, Little Vermilion Bay Sediment Trapping, Lake Portage

			Land Bridge, Sediment Trapping at "The Jaws", Bayou Sale Shoreline Protection, Cote Blanche Hydrologic Restoration, FWB Bank Stabilization, FWB Wetland Protection, Pecan Island Terracing, Oaks/Avery Canal Hydrologic Restoration,
Port of Iberia	U.S. Army Corps of Engineers, New Orleans District	2005	The purpose of this study is to determine the feasibility of deepening the existing navigation channels between the POI and the Gulf of Mexico. An August 2002 reconnaissance report recommended continuing the feasibility phase of deepening the Commercial Canal, portions of the Gulf Intracosatal Waterway (GIWW) and Freshwater Bayou (FWB) from an average depth of 12-feet to a depth of 20-feet from the POI to the Gulf of Mexico. The POI limited the study scope to a maximum authorized depth of 20-feet.
St. Mary Levee District Master Plan	St. Mary Parish	2010	The plan identifies parish hurricane protection, backwater flooding, and related needs such as saltwater intrusion.
Breaux Bridge Comprehensive Long-Range Resiliency Plan	Breaux Bridge, LA	2012	A plan to use infill development in targeted areas to manage growth and ensure long-term resilience
Iberia Parish Hurricane Protection Master Plan	Iberia Parish	2012	Comprehensive plan to provide protection from flooding, saltwater intrusion, tidal and storm surges associated with tropical storms and hurricanes for the lands and residents of Iberia parish.
Final Issue Evaluation Study Report: Design Criteria site-adaptation for proposed Morganza to the Gulf Levee System	U.S. Army Corps of Engineers, New Orleans District	2013	Issue Evaluation Study Report summaries the findings of the Phase II evaluation of the proposed Morganza to the Gulf storm-surge risk reduction project. This project aims to protect people and property as well as the remaining fragile marsh from hurricane storm surge in the vicinity of Houma, Louisiana. The area has been affected by an extreme deterioration of coastal marshes as a result of saltwater intrusion, land subsidence and the lack of sediment deposits from the Mississippi River and its tributaries. This deterioration has led to increased hurricane and storm surge inundation. The area is also significantly affected by tides emanating from the Gulf of Mexico.
South West Coastal Louisiana Final Feasibility Report and Programmatic EIS	U.S. Army Corps of Engineers, New Orleans District	2015	The Southwest Coastal Louisiana project proposed by the U.S. Army Corps of Engineers will provide non-structural hurricane and storm surge damage risk reduction measures, as well as ecosystem restoration features, in the 4,700 square mile study area located in Calcasieu, Cameron, and Vermilion Parishes in southwest Louisiana.
Coastal Protection and Restoration Authority of Louisiana. South Central Coast Louisiana Flood Protection Study	Coastal Protection and Restoration Authority of Louisiana.	2017	Coastal Protection and Restoration Authority of Louisiana funding a flood risk and coastal storm risk reduction study to determine the feasibility, cost, impact, and conceptual design of risk reduction measures. The study was complete in 2017. The USACE study effort used data and information developed and presented in the report. .

Louisiana's Comprehensive Master Plan	Coastal Protection and Restoration Authority of Louisiana.	2017	Following Hurricanes Katrina and Rita in 2005, the Louisiana Legislature created the CPRABB and tasked it with coordinating the local, state, and Federal efforts to achieve comprehensive coastal protection and restoration. CPRABB developed a master plan to guide efforts toward a sustainable coast.
Restoring the Mississippi River Delta	Restore the Mississippi River Delta	2018	Recommendations for Coastal Restoration Projects and Programs in Louisiana

SECTION 2
Inventory and Forecasted Conditions (Affected Environment)

2.1 INTRODUCTION

The CEMVN inventoried the applicable social, economic, and environmental factors for the study area (St. Martin, Iberia, and St. Mary Parishes, as well as the area of potential effect). The study area includes an array of private, local, state and federally-managed lands. The CEMVN used applicable social, economic, and environmental factors as the foundation of the analysis, to evaluate and compare alternatives and ultimately select the CEMVN's Tentatively Selected Plan (TSP). These factors establish a baseline to measure the proposed action's impacts.

The study area (as described in Section 1 also includes the following:

- Gulf of Mexico, Gulf coastal areas, coastal marshes, Atchafalaya River and floodplain, and adjacent lands (agriculture, urban, and wildlife habitat);
- Constructed public and private facilities within the study area;
- Areas in and outside the study area receiving flood inundation; and,
- Areas of influence (areas in and outside the study area) varies based on the resource and were tailored to capture the measureable impacts.

2.2 RESOURCES NOT EVALUATED IN DETAIL

The CEMVN considered relevant environmental resources that would potentially be impacted by the proposed alternatives and eliminated resources that were not in the area of potential affect, or would not be impacted by any of the alternatives, from further evaluation. These resources include:

- Geology and Topography
- Wild and Scenic Rivers (there are no designated wild and scenic rivers in or near the study area)
- Mineral and Energy Resources

The CEMVN focused on information gathered from this study area and the area of potential affect. If the CEMVN used data from outside this area in their analysis, rationale is provided in Section 2.3.

2.3 RELEVANT RESOURCES FOUND IN THE STUDY AREA

The CEMVN focused its evaluation on those resources potentially affected by any of the alternatives. This section briefly describes the following resources (Appendix A-1: Environmental Resources describes these resources with more detail):

- Hydrology
- Floodplains
- Navigation and Public Infrastructure
- Socio-economics
- Land Use
- Aquatic Resources (coastal shorelines, vegetation and estuaries, invasive plant species, wetland loss, and rare, unique, and imperiled vegetative communities)
- Fish and Wildlife Resources
- Threatened/Endangered Species and Other Protected Species of Concern
- Cultural, Historic, and Tribal Trust Resources
- Environmental Justice
- Soils
- Aesthetics and Visual Resources
- Water Quality and Salinity
- Air Quality
- Noise
- Hazardous, Toxic, & Radioactive Aaste
- Sustainability, Greening, and Climate Change

The period of analysis is 50 years (2025- 2075).

2.4 GENERAL SETTING

The study area (Figure 1-1) is located in South Central Louisiana and includes all of St. Mary, Iberia, and St. Martin Parishes encompassing approximately 2,966 square miles (mi^2). St Martin Parish is located in the northern section of the study area and split into two non-contiguous areas when Iberia Parish was created in 1,868. Iberia Parish is 1,031 mi^2 in size (574 mi^2 of land and 456 mi^2 of water). The St. Mary Parish is 1,119 mi^2 (555 mi^2 of land and 564mi^2 of water). These parishes are primarily rural with navigation, agriculture, and oil industry influences.

2.5 GEOMORPHIC AND PHYSIOGRAPHIC SETTING

The study area contains a mosaic of extensive coastal marshland, natural ridges, forests, and agriculture (primarily sugar cane, soybeans, and rice). Scattered in the study area are salt domes. Salt domes are largely subsurface geologic structures consisting of a vertical cylinder of salt embedded in horizontal or inclined strata. In the broadest sense, the term includes both the core of salt and the strata surrounding and domed by the core. Major accumulations of oil and natural gas are associated with salt domes in the United States.

Overbank flood sedimentation of rivers in southeast Louisiana formed natural ridges (Fisk, 1944). The rivers involved in creating these natural levees were prior tributaries of the Mississippi River.

2.6 NATURAL ENVIRONMENT GENERAL SETTING

This riverine ecoregion extends from southern Illinois, at the confluence of the Ohio River with the Mississippi River, south to the Gulf of Mexico. The Mississippi River watershed drains all or parts of 31 states, 2 Canadian provinces, and approximately 1,243,000 miles^2 before the river finally reaches the Gulf of Mexico. The Mississippi Alluvial Plain is mostly a broad, flat alluvial plain with river terraces, swales, and levees providing the main elements of relief. Soils are typically finer-textured and more poorly drained than the upland soils of adjacent ecoregions. The widespread loss of forest and wetland habitat has affected wildlife and reduced bird populations, although it is still a major bird migration corridor. The batture lands and the Mississippi River are hydrologically connected. These lands are flood-prone, and contain remnant habitat for “big river” species (e.g., pallid sturgeon) as well as riverfront plant communities. The study area has five sub-ecoregions to the Mississippi Alluvial Plain (See Appendix A-1 for a large map of the sub-ecoregions).

2.7 CLIMATE

The climate is subtropical marine with long humid summers and short moderate winters. The average high and low temperatures are 78.8 and 58.8°F respectively, with August being the warmest and January the coolest. Average annual rainfall is 60 inches; with June the wettest and March the driest month (Your Weather Service, 2018). During the summer, prevailing southerly winds produce conditions favorable for afternoon thundershowers. Frontal movements producing squalls and sudden temperature drops occur during the colder seasons. River fogs are prevalent in the winter and spring when the temperature of the major water bodies is somewhat colder than the air temperature. Since 1856, a total of 63 hurricanes have made landfall within 65 nautical miles of Morgan City, LA (NOAA, 2018).

2.8 STUDY AREA RESOURCES

2.8.1 Water Environment (Hydrology and Hydraulics)

The study area intersects five hydrologic basins: Bayou Teche, Vermilion, Atchafalaya, Terrebonne, and Lower Grand (Figure 2-1). Bayou Teche and Vermilion are two sub-basins in the combined Teche-Vermilion system. The Atchafalaya and Teche-Vermilion Basins contain the dominant hydrologic features while the western portions of the Lower Grand and Terrebonne Basins are peripherally relevant. Appendix A-1 contains further details about Lower Grand and Terrebonne Basins, and the study area’s five hyrdrologic basins. The study area experiences a diurnal tidal signal with one daily high and low tide. The tidal range in the Atchafalaya Bay near the Wax Lake outlet is approximately 2.5 feet. (NOAA 2018).

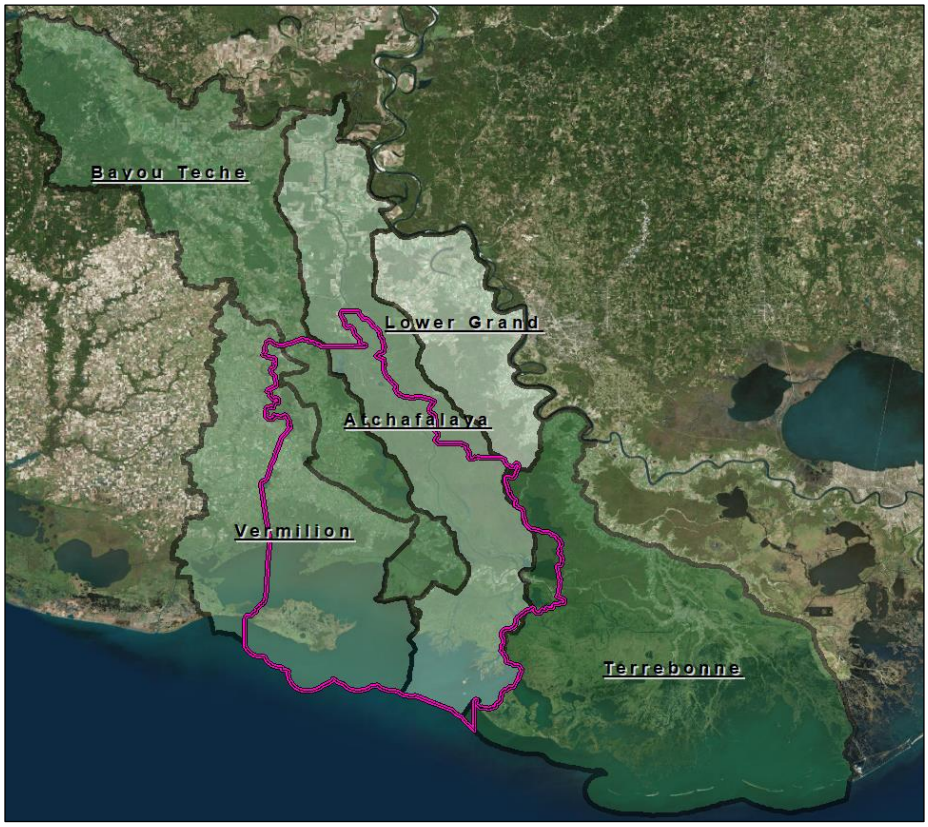

Figure 2-1. Schematic Delineating the Individual Basin Boundaries Overlaid with the Study Area

Riverine

The Atchafalaya Basin contains the Atchafalaya River (137 miles long), a large freshwater feature that spans the entire study area (north to south). The basin begins at the Old River Control Structure located upstream of Simmesport and ultimately drains into the Gulf of Mexico.

The Atchafalaya receives 30 percent of the longitudinal flow from the Mississippi River, as well as the entire Red River, averaging 225,000 cfs. The floodway, bordered by large Federal river levees, directs flow south towards the Atchafalaya Bay near Morgan City or via the Wax Lake outlet between Centerville and Calumet.

The Atchafalaya Floodway, a major drainage system along the eastern side of the study area, is bordered by large Federal levees. The Atchafalaya Floodway largely mitigates for economic damages from riverine flooding, although it does not eliminate flood risk and damages completely. A majority of structures affected within the 50 year flood extent are located on land owned that is government ownership. Figure 2-3 illustrates the 50 year flood extent and affected structures within the Atchafalaya floodway. Remaining private structures generally have an existing easement. Although, economic damages, as a result of

Atchafalaya Floodway, are not 100 percent mitigated, the low return flood frequency and resulting structural damages would result in low benefits over the 50 year planning horizon. Therefore, solutions associated with residual riverine damages were not pursued. Additionally details regarding riverine flooding frequencies within the Atchafalaya Floodway are discussed in Section 2.8.1 of this report and in Appendix C: Hydraulics, Hydrology, and Climate Preparedness and Resiliency.

Figure 2-2 lists the riverine floods of record through 1997. Prior to 1928, the design of the Mississippi River and Tributary levees were based upon arbitrary freeboard above the highest stages on record. The 1927 flood is the largest flood of record, resulting in the Flood Control Act of 1928 and changes to how the river was analyzed and operated. The largest event since 1927 was the flood of 1973, which was one of the two times that the Morganza spillway has been operated. The Morganza spillway structure was opened for a total of 57 days (April 17 to June 13, 1973).

	Maximum Flow (1,000 c.f.s.)				
Date	Tarbert Landing*	Date	Simmesport	Date	Total Lat.
15 May 1912	1,499	(9 May 12)	413		1,912
16 May 1922	1,437		387		1,824
18-20 May 1927	1,779		563		2,342
28 Feb 1937	1,467	(27 Feb 37)	471		1,938
11 Apr 1945	1,520	(28 Apr 45)	661		2,181
26 Feb 1950	1,458	(5 Mar 50)	633		2,091
8 Jun 1957	933	(12 Jun 57)	458		1,451
23 May 1958	984		495		1,479
16 May 1973	1,498	(12 May 73)	781	(16 May 73)	2,261
16 Feb 1974	1,174	(12 Feb 74)	563	(12 Feb 74)	1,709
19 Apr 1975	1,216	(17 Apr 75)	719	(18 Apr 75)	1,921
23 Apr 1979	1,419	(30 Apr 79)	605	(23 Apr 79)	2,014
31 May 1983	1,470		680		2,150
27 Mar 1997	1,480	(26 Mar 97)	637	(28 Mar 97)	2,112

* Red River Landing used before 1963

Figure 2-2. Floods of Record for the Mississippi-Atchafalaya River System up to 1997
(Morganza Water Control Manual)

The 2011 Mississippi River flood event represents the second time that the Morganza Spillway was opened to divert Mississippi River water into the Morganza Floodway (2011 Atchafalaya Basin Inundation Data Collection and Damage Assessment Project Report).

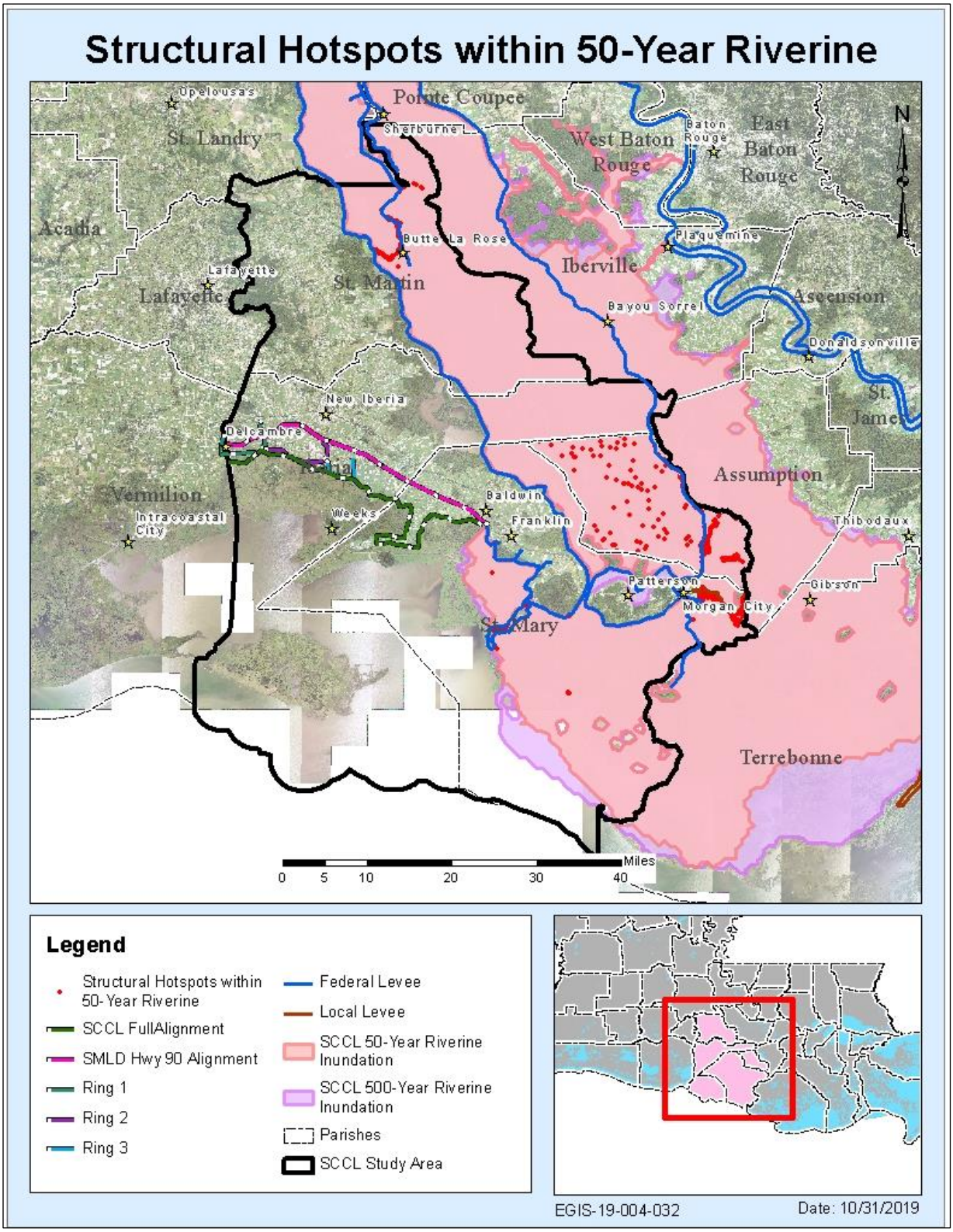

Figure 2-3. Atchafalaya Riverine 50 Year Flooding Extent With Structure Affected

Storm Surge

The study area experiences localized flooding from excessive rainfall events. However the primary cause of flooding events resulting in significant economic damages is storm surge from hurricanes and tropical storms. Storm surges associated with Category 1 or higher hurricanes (Barry, Lili, Rita, Gustav, and Ike) greatly impacted the study area. The storms inundated structures and resulted in billions of dollars in damages to south central Louisiana. Hurricane storm surge also causes significant permanent damage to natural flood barriers such as wetlands. Figure 2-4 illustrates storm surge existing conditions depths for the 25 year and 50 year events at critical infrastructure locations. Hurricane surge forms ponds in stable, contiguous marsh areas and expands existing, small ponds, as well as removes material in degrading marshes (Barras, 2007). Fresh and intermediate marshes appear to be more susceptible to surge impacts, as observed in Barras (2006).

Appendix A-1 details the Category 1 or higher hurricanes of relevance to the study area. Appendix A-1 also shows current condition storm surge depth during 25 year and 50 year storm events.

Relative Sea Level Rise

In coastal Louisiana, relative sea level rise (RSLR) is the term applied to the local change in sea level relative to the elevation of the land at a specific point on the coast. The RSLR is a combination of the change in global sea level and the change in land elevation. According to the Intergovernmental Panel on Climate Change (IPCC 2007), the global mean sea level rose at an average rate of about 1.7 mm/yr during the 20th Century. Recent climate research documented global warming during the 20th Century, and predicted either continued or accelerated global warming for the 21st Century and possibly beyond (IPCC, 2007) (Figure 2-4).

Land elevation change can increase (accreting) or decrease (subsiding). Land elevations decrease due to natural causes, such as compaction and consolidation of historic deposits and faulting, and human influences such as sub-surface fluid extraction and drainage for agriculture, flood protection, and development. Forced drainage of wetlands results in lowering of the water table resulting in accelerated compaction and oxidation of organic material. Coastal Louisiana and the study area have forced drainage. Land elevations increase because of sediment accretion (riverine and littoral sources) and organic deposition from vegetation. Vertical accretion in most of the study area, however, is insufficient to offset subsidence, causing an overall decrease in land elevations. The combination of subsidence and global sea level rise is likely to cause the landward movement of marine conditions into estuaries, coastal wetlands, and fringing uplands (Day and Templet, 1989; Reid and Trexler 1992).

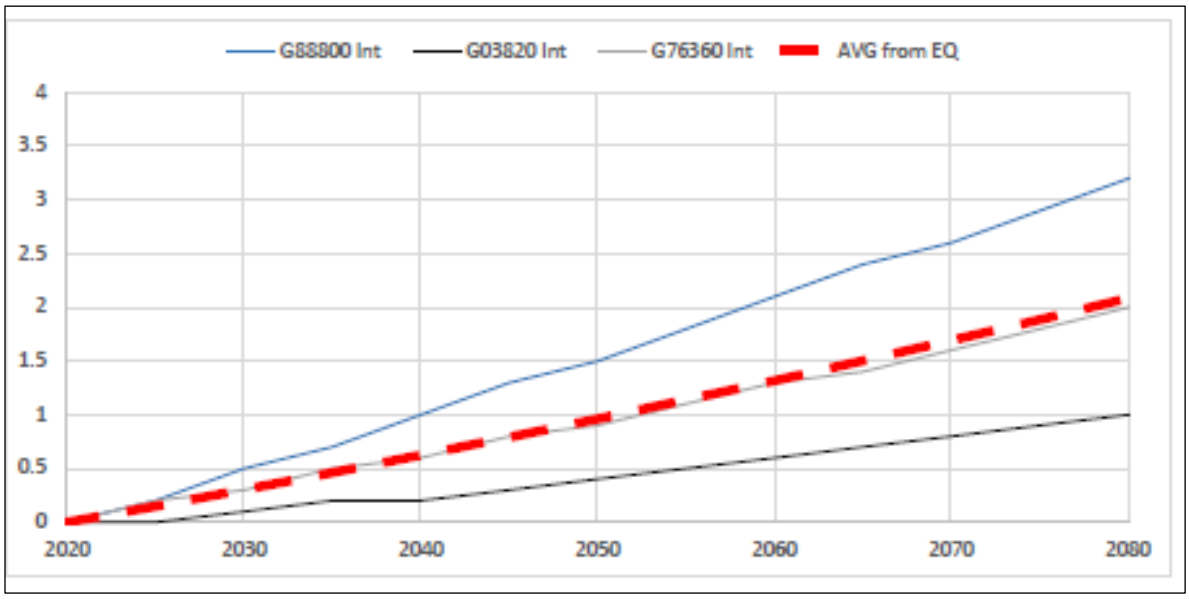

Figure 2-4. The Relative Sea Level Change in feet for the South Central Coast Study Area. Low (black), Intermediate (red), high (blue)

Floodplains

Natural Floodplain. Floodplains are the low, flat, periodically inundated lands adjacent to rivers and are subject to the erosion and deposition processes. As distinguished from the floodplain, a river's floodway is the dry zone typically between levees, designed to convey floodwaters. It is only during and after major flood events, the connections between a river, its floodway and its floodplain become more apparent. These areas form a complex physical and biological system that not only supports a variety of natural resources but also provides natural flood and erosion control. In addition, the floodplain represents a natural filtering system, with water percolating back into the ground and replenishing groundwater.The Atchafalaya subbasin is located between two north-south trending flood protection levees located just east of Lake Fausse Pointe and near the eastern end of Iberia Parish. The Atchafalaya River floodplain (Figure 2-5) serves as an important shipping channel, supports a variety of commercial and recreational activities, and provides habitat for a diverse array of plants and wildlife. Most of the water moving through the Atchafalaya subbasin in Iberia Parish eventually exits the basin through the Wax Lake Outlet, located south of Iberia Parish in St. Mary Parish.

Regulatory Floodplain. For land use planning purposes, the regulatory floodplain includes all lands within reach of a 100-year flood. The Federal Emergency Management Agency (FEMA) produces floodplain maps, defining the 100-year (or “regulatory”) floodplain in order to implement the National Flood Insurance Program. Figure 2-6 shows the FEMA 100-year and 500-year floodplains.

A common misconception about the 100-year flood is it represents the peak flow from historical records, or it will occur once every 100 years. In fact, a 100-year flood has a 26 percent chance of occurring during a 30-year period, the length of many home mortgages. The 100-year flood is a statistically derived regulatory standard used by Federal agencies, and most states, to administer floodplain management programs. Acres of floodplain within each type as defined by FEMA are listed in Table 2-1.

The probability and extent of flooding are increasing throughout the floodplains in the study area due to RSLR and changes in precipitation due to climate change. The FEMA may change the regulatory floodplains based on changes in flood frequency.

Table 2-1. Acres of Floodplain Type

Flood Zone	Acreage	% of Study Area
A-100Year Floodplain	613,102	32.298%
AE-100Year floodplain	285,386	15.034%
AH – 100Yr Shallow Floodplain	66	0.003%
AO- 100Yr Shallow Floodplain	167	0.008%
Open Water	479,389	25.254%
VE- Coastal Floodplain	296,561	15.623%
X_500YR	45,877	2.417%
X_LEVEE	83,851	4.417%
Minimal Flood Risk	93,852	4.944%

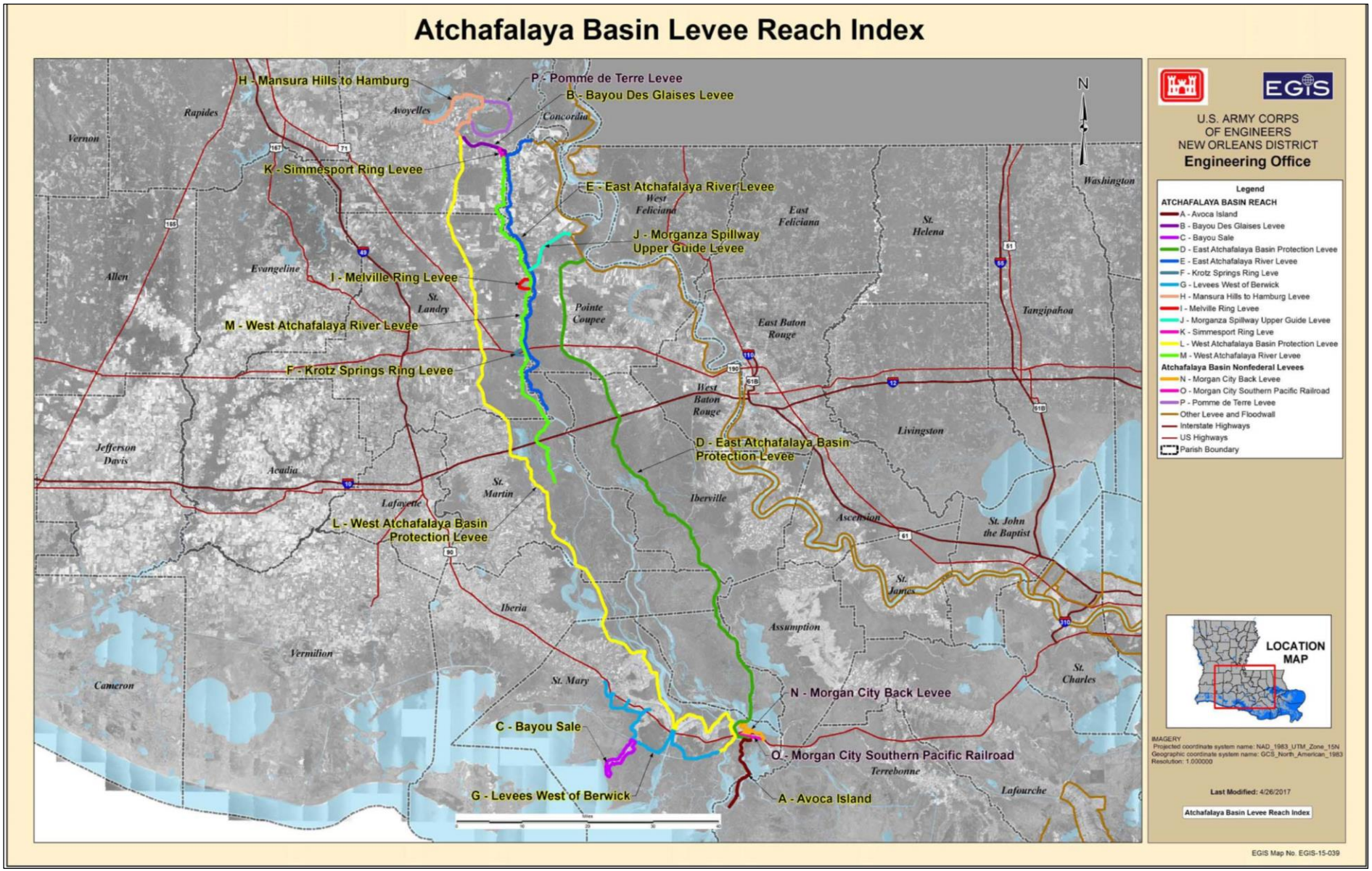

Figure 2-5. The Atchafalaya River's Floodplain and Associated Levees

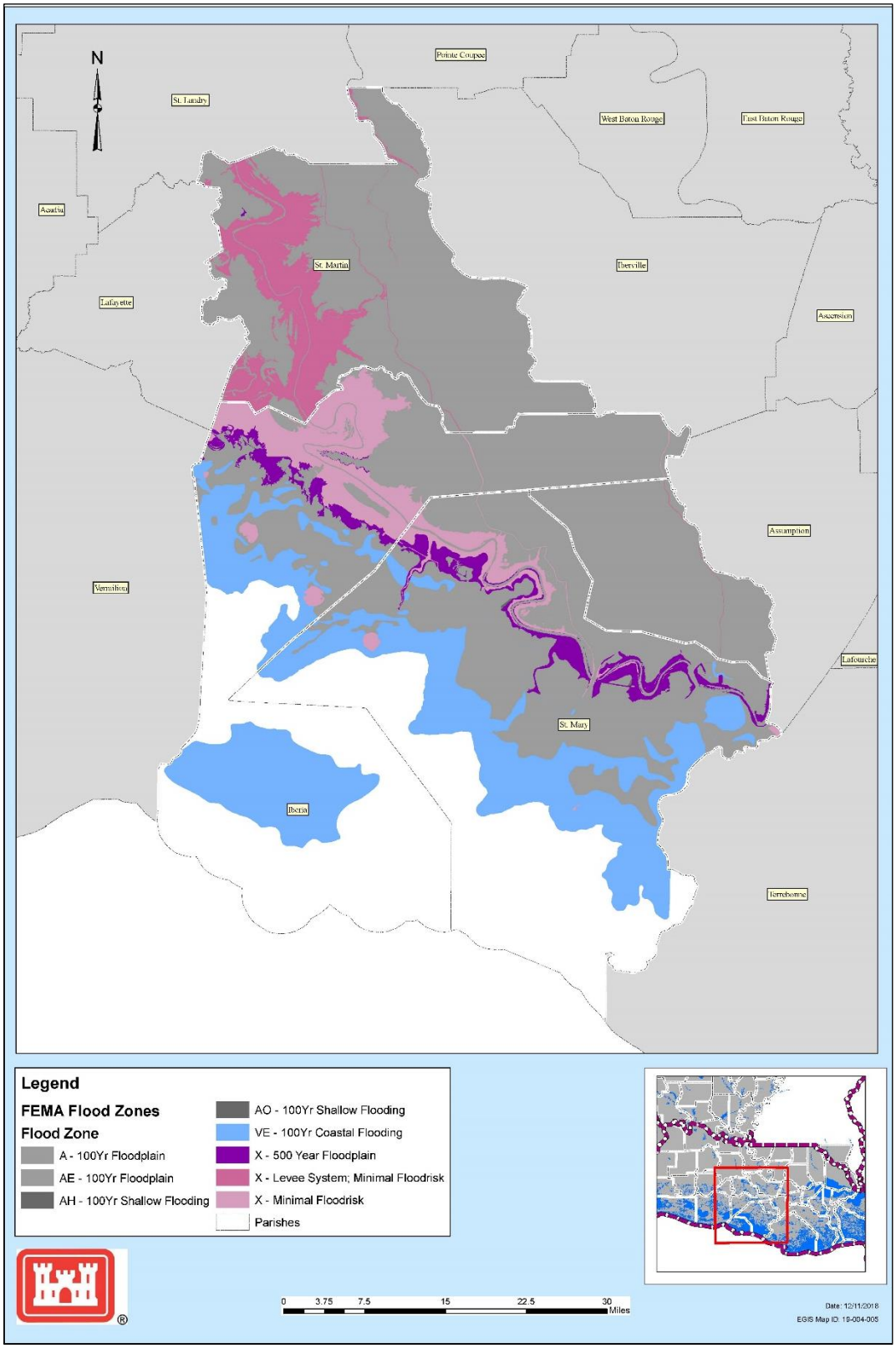

Figure 2-6. South Central Coast, LA – FEMA 100-Year and 500-Year Floodplains

2.8.2 Navigation and Public Infrastructure

Key existing infrastructure at risk from storm surge and/or riverine flooding include:

- Gulf Intracoastal Waterway and Bayou Teche
- Evacuation routes for South Central Coast Louisiana residents and the greater New Orleans area (Hwy 90/future I-49 corridor)
- Port of West St. Mary,Port of Iberia, Port of Morgan City
- Keystone Lock and Dam
- Berwick Lock and Bayou Boeuf Lock
- Wax Lake Outlet and Pumping Station
- Harry P. Williams Memorial Airport Major transportation corridors
- Major transportation corridors

Flood Risk Reduction Structures. The study area has significant levees, pumping stations, canals, and other constructed features to reduce Atchafalaya River flood damages. Figure 1-2 shows the key federally-constructed structures in the study area. The completion of the 1940s levees accentuated the natural filling of the Atchafalaya Basin with sediment. The South Central Coast study area contains the following levee systems, or segments:

- Southern West Atchafalaya River Levee,
- Southern West Atchafalaya Basin Protection Levee,
- Southern East Atchafalaya River Levee,
- Levees West of Berwick,
- Bayou Sale Levees,
- Avoca Island Levee
- Morgan City's Back Levee and floodwall
- Southern Pacific Railroad Levee

The East Atchafalaya Basin Protection Levee and the West Atchafalaya Basin Protection Levee are two main reaches that provide flood risk reduction for the areas outside of the floodway. After the levees were constructed, sediment was directed into an area about one-third the size of the original basin.

During the mid- 19th century, manmade channel alterations, including the removal of a large logjam and dredging, permanently connected the Atchafalaya River to the Mississippi River. From then until the completion of the Old River Control Structure in 1963, the Mississippi was increasingly diverting flow into the shorter and steeper path of the Atchafalaya River. Approximately, 30 percent of the latitudinal flow water from the Mississippi, Red, and Black Rivers is diverted into the Atchafalaya at the Old River Control Structure. This flow diverts on average 25 percent of the Mississippi River flow down the Atchafalaya.

During the period of 1960–1980, oil and gas exploration and development in Louisiana increased dramatically. Dredging occurred in numerous large access canals and pipeline canals through deep swamp areas, across bayous, and across the Atchafalaya River. In

some areas of the basin, there are 2 km or more of access canals to every 1 km of natural bayou. These large channels (30–50 m wide by 2–3 m deep) have fundamentally changed the hydrology of the swamps. Deep swamp areas that were hydraulically isolated from sediment were connected directly to the river and its sediment. The increased sedimentation load caused rapid filling. The USGS has measured sediment deposition rates of up to 30 cm per year where these channels enter open water, and 4 cm per year on adjacent floodplains. In some places natural bayous have filled in due to flow capture by access canals.

2.8.3 Socio-Economics (The Human Environment)

The study area encompasses three parishes, Iberia, St. Martin, and St. Mary. The parish seats are New Iberia, St. Martinville, and Franklin, respectively.

Population and Housing

Table 2-2 shows the population trend in the three-parish area from 1970 to 2010 and projections through 2040. Population in the three parishes is predicted to be steady through 2020, but decreasing through 2040. Statewide population is predicted to rise over this period. The trend in household formation, shown in Table 2-3, is predicted to level off by 2020 and show little growth through the year 2040.

Table 2-2. Population in the Study Area (1000s)

Parish	1970	1980	1990	2000	2010	2020	2030	2040
St. Martin	57.48	64.32	68.25	73.17	73.25	73.27	68.99	65.05
St. Mary	32.50	40.52	44.12	48.58	52.26	54.27	53.29	52.23
Iberia	60.84	64.55	57.99	53.38	54.54	52.63	51.57	50.84
State Total	3650.20	4226.70	4221.53	4471.89	4545.0	4732.42	4816.69	4868.18

U.S. Census Bureau; Moody's Analytics (ECCA) Forecast

Table 2-3. Number of Households in the Study Area (1000s)

Parish	1970	1980	1990	2000	2010	2020	2030	2040
St. Martin	15.62	20.10	22.89	25.40	26.81	28.02	27.61	26.95
St. Mary	8.44	12.27	14.68	17.20	19.27	20.90	21.47	21.78
Iberia	16.10	20.13	19.42	19.31	20.44	20.60	21.13	21.58
State Total	1053.61	1418.77	1499.82	1660.62	1734.57	1887.22	2010.60	2104.10

U.S. Census Bureau; Moody's Analytics (ECCA) Forecast

Employment, Business, and Industrial Activity Future Without Project Condition

Nonfarm employment is expected to decrease by the year 2040 (U.S. Census Bureau). The leading employment sectors are Trade, Transportation, Utilities, and Government, Local

Government, and Office Using Industries. The Unemployment Rate in all three parishes is generally higher than the State of Louisiana Unemployment Rate (Table 2-4).

Table 2-4. Unemployment Rates in the Study Area

Parish	1990	2000	2010	2020	2030	2040
St. Martin	5.62	5.56	7.95	7.81	8.03	7.60
St. Mary	6.28	7.39	9.41	9.05	8.90	8.49
Iberia	4.66	5.80	8.61	9.31	9.57	9.06
State Total	6.20	5.30	7.97	6.88	7.06	6.71

U.S. Census Bureau; Moody's Analytics (ECCA) Forecast

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.

Transportation

The transportation infrastructure includes major roads, highways, railroads, and navigable waterways that have developed historically to meet the needs of the public. Interstate 10 (I-10), an east-west bi-coastal thoroughfare that connects Houston and Baton Rouge, crosses the northern part of the area and is a primary route for hurricane evacuation and post-storm emergency response. US-90, another evacuation and emergency response route, is located south of I-10.

Airports

Acadiana Regional Airport with an 8,002-foot long, 200-foot wide concrete runway and fully instrumented airfield, is located just north of U.S. Highway 90 (the future Interstate 49 corridor) and just south of Louisiana Highway 182. The airport also features direct rail access, a 5,000-foot lighted water runway for amphibious aircraft, and a rail-to-truck offloading facility.

The airport's close proximity to the Port of Iberia and its 16-foot-deep main navigation channel spotlights the intermodal transportation available.

The Harry P. Williams Memorial Airport is approximately 8 miles west of Morgan City, St. Mary Parish. The airport serves the energy exploration and production industry with a helicopter emphasis.

In September 2005, after Hurricanes Katrina and Rita devastated virtually the entire southern part of Louisiana, Harry P. Williams Memorial Airport played a vital role in rescue

and recovery operations. The Perry Flying Center became a staging point for Coast Guard and other military rescue aircraft during the massive rescue operation in the New Orleans area. After Hurricane Rita passed, Harry P. Williams Memorial Airport served as a hub for Navy and Marine rescue aircraft for many days.

Community and Regional Growth (Income)

Community and regional growth primarily track population and employment trends described in the preceding sections. Table 2-5 shows per capita growth in income since 1970 and predictions through the year 2040.

Table 2-5. Per Capita Income, 1970-2040

Parish	1970	1980	1990	2000	2010	2020	2030	2040
St. Martin	2,142	6,966	10,829	17,912	32,060	45,678	70,747	110,861
St. Mary	2,919	8,740	12,716	21,608	35,400	43,991	59,886	82,423
Iberia	2,653	8,863	13,517	20,423	34,986	43,427	60,068	83,442
State Total	170,960	477,970	828,524	1,295,073	2,123,377	2,842,042	4,017,923	5,786,992

U.S. Census Bureau; Moody's Analytics (ECCA) Forecast

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 area is comprised of communities with a long history and long-established public and social institutions including places of worship, schools, and community associations.

Recreation Resources

This resource is institutionally important because of the Federal Water Project Recreation Act of 1965, as amended and the Land and Water Conservation Fund Act of 1965, as amended. Recreational resources are technically important because of the high economic value of these recreational activities and their contribution to local, state, and national economies. Recreational resources are publicly important because of the 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.

The entire study area is within the Atchafalaya National Heritage Area and is comprised of ecosystems having national significance. The Atchafalaya Basin Floodway System, situated within the Atchafalaya National Heritage Area, contains one of the largest bottomland

hardwood forest swamps in North America including significant cultural, historic, scenic, and recreational resources. This Inland Swamps ecoregion of Louisiana is a haven for wildlife providing numerous consumptive and non-consumptive recreation opportunities. Consumptive recreation includes hunting, fishing for freshwater and saltwater species, and trapping alligators and nutria. Non-consumptive recreation includes wildlife viewing, sightseeing, boating, camping, and environmental education/interpretation. The study area extends into Deltaic Coastal Marshes and Barrier Islands ecoregion dominated by brackish and saline marshes. The connectivity throughout this area incorporates the following existing recreational features: private boat launches, public boat launches, public campgrounds, paddling/canoe trails, and shooting ranges. This connectivity also includes the 135-mile-long Bayou Teche National Water Trail, designated so in 2015 as the 17th water trail in the country and the first in Louisiana (https://www.louisianatravel.com).The mild climate, abundance of natural resources, and unique Spanish and French Acadian heritage provide exceptional recreational opportunities for local, national, and international visitors.

In 1967, the Land and Water Conservation Fund (L&WCF) approved some of the parks noted in Table 2-6. Section 6(f)(3) of the L&WCF Act assures once an area has been funded with L&WCF assistance, it is continually maintained for public recreation use unless the National Park Service (NPS) approves substitution property of reasonably equivalent usefulness and location and of at least equal fair market value. The CEMVN would make an evaluation to determine if any of the project alternatives impact land acquired using L&WCF assistance. Table 2-6 highlights the extensive network of recreation resources within the study area currently established at the public level.

Table 2-6. Public Recreation Resources within the Study Area

Public Area	Size (acres)	Parish	Managing Agency	Recreation		Boat Launch	Recreational Highlights
				Consumptive	Non-consumptive		
State Parks							
Cypremort Point State Park	185	St. Mary	Louisiana State Parks	fishing, crabbing	water skiing, windsurfing, sailing, swimming, camping	Yes	This Louisiana State Park site has received assistance from the L&WCF: A half-mile stretch of a man-made beach; a 100-ft fishing pier; 6 cabin rentals, 2 pavilion rentals
Lake Fausse Pointe State Park	6,000	St. Martin, Iberia	Louisiana State Parks	fishing	hiking, camping, boating, canoeing	Yes	8 cabin rentals, 4 pavilion rentals, 17 premium campsites, 33 improved campsites, 5 canoe campsites, 7 backcountry campsites, primitive camping area
Longfellow-Evangeline State Historic Site		St. Martin	Louisiana State Parks	No	hiking, interpretive trails	No	This Louisiana State Park site has received assistance from the L&WCF: tours, group pavilion, museum/historic buildings, outdoor classroom, picnic areas, historic and/or nature programs, hiking trails
Wildlife Management Areas							
Atchafalaya Delta WMA	137,695	St. Mary	LDWF	fishing, hunting, trapping	birding, camping	No	Accessible via boat, 2 campgrounds with primitive restrooms, houseboat mooring
Attakapas Island WMA	27,962	St. Mary, St. Martin, Iberia	LDWF	fishing, crawfishing, hunting, trapping	birding, camping, hiking	No	Accessible via boat, 3 primitive campgrounds, 1 campground with picnic tables, approximately 30 miles of trails
Sherburne WMA	11,780	St. Martin	LDWF	fishing, hunting, trapping	shooting range, camping	Yes	Part of the 44,000 acre Sherburne Complex managed by LDWF, 2 campgrounds- 1 primitive and 1 with running water, ATV trails and all-weather roads
National Wildlife Refuge							
Atchafalaya NWR	15,222	St. Martin and into Iberville	USFWS/ LDWF	fishing, hunting	birding, photography, camping	Yes	Established in 1986 from the L&WCF, Part of the 44,000 acre Sherburne Complex managed by LDWF, restrooms, fishing pier, nature trail, ATV trail, 45,000 visitors annually
Bayou Teche NWR	9,028	St. Mary Parish	USFWS	fishing, hunting	birding, photography, paddling, hiking	Yes	Also referred to as the Louisiana Black Bear NWR, this site has received assistance from the L&WCF, interpretive boardwalk trail, 3 paddling trails, 6,000 visitors annually
State Wildlife Refuge							
Marsh Island NWR	71,000	Iberia	LDWF	fishing, shrimping, crabbing	boating, birding	No	Accessible via boat

Other Social Effects (OSE)

In accordance with the USACE Institute for Water Resources (IWR) handbook in Applying Other Social Effects in Alternatives Analysis (USACE, 2013), the CEMVN identified seven social factors describing the social fabric of a community. The seven social factors include:

- physical healthcare and safety
- Regional healthcare
- Employment opportunities
- Community cohesion
- Vulnerable groups
- Residents of study team
- Recreational activities. Existing conditions description for each of these resources are provided in previous above.

2.8.4 Environmental Justice

Appendix A-3 has additional Environmental Justice background material.

SCCL Methodology

Environmental Justice is institutionally significant because of Executive Order 12898 of 1994 (E.O. 12898) and the Department of Defense's Strategy on Environmental Justice of 1995, directing Federal agencies to identify and address any disproportionately high adverse human health or environmental effects of Federal actions to minority and/or low-income populations. Minority populations are those persons who identify themselves as Black, Hispanic, Asian American, American Indian/Alaskan Native, Pacific Islander, some other race, or a combination of two or more races. A minority population exists where the percentage of minorities in an affected area either exceeds 50 percent or is meaningfully greater than in the general population. Low-income populations as of 2017 are those whose income are no greater than $25,094 for a family of four. The Census Bureau defines a "poverty area" as a census tract or block group with 20 percent or more of its residents below the poverty threshold and an "extreme poverty area" as one with 40 percent or more below the poverty level. This resource is technically significant because the social and economic welfare of minority and low-income populations may be positively or adversely impacted by the proposed actions. This resource is publicly significant because of public concerns about the fair and equitable treatment (fair treatment and meaningful involvement) of all people with respect to environmental and human health consequences of Federal laws, regulations, policies, and actions.

The methodology, consistent with E.O. 12898, to accomplish this EJ analysis includes identifying populations that are exposed to high levels of environmental stressors and low-income or minority populations within the study area using up-to-date economic statistics, aerial photographs, and U.S. Census Bureau 2013-2017 American Community Survey (ACS) estimates. EPA has developed a new EJ mapping and screening tool called

EJSCREEN, based on nationally consistent data and an approach that combines environmental and demographic indicators in the form of EJ indexes. This information highlights geographic areas and the extent they may be candidates for further review, including additional consideration, analysis or outreach. Environmental indicators typically are direct or proxy estimates of risk, pollution levels or potential exposure (e.g., due to nearby facilities). Demographic indicators are often used as proxies for a community's health status and potential susceptibility to pollution. Environmental and demographic data and indicators may be viewed separately or in combination.

EJSCREEN screening criteria include:

1) Air pollution
   a) PM2.5 level in air.
   b) Ozone level in air.
   c) NATA air toxics:
      i) Diesel particulate matter level in air.
      ii) Air toxics cancer risk.
      iii) Air toxics respiratory hazard index.
2) Traffic proximity and volume: Amount of vehicular traffic nearby, and distance from roads.
3) Lead paint indicator: Percentage of housing units built before 1960, as an indicator of potential exposure to lead.
4) Proximity to waste and hazardous chemical facilities or sites: Number of significant industrial facilities and/or hazardous waste sites nearby, and distance from those:
   a) National Priorities List (NPL) sites.
   b) Risk Management Plan (RMP) Facilities.
   c) Hazardous waste Treatment, Storage and Disposal Facilities (TSDFs).
5) Wastewater discharge indicator: Proximity to toxicity-weighted wastewater discharges

If an EJ area's exposure to the environmental indicators listed previously is at or above the 80th percentile in the state and the federal action exacerbates any of those environmental risks, a potential disproportionate impact may occur. The EJ study area includes Iberia, St. Martin and St. Mary Parishes.

Existing Conditions

Each parish in the study area is majority white. Iberia Parish is the largest with a population of about 73,300, and 39 percent are minority. The majority of the minority population are Black/African American. St. Martin and St. Mary each have a population of approximately 53,000. About 40 percent of Iberia and St. Mary's population is Black, Native American, Asian, Native Hawaiian, Some other Race alone, or Two or More Races (minority). The ACS 2017 total population of the three-parish area is approximately 179,500. Hispanic ethnicity is between 3 and 7 percent of the population. (Table 2-7).

Table 2-7. Census Information

Parish	Total Population	White	Black	Native American	Asian	Native Hawaiian	Some Other Race1	Percent Minority
Iberia	73,346	45,077	23,101	78	2,035	-	3,055	39%
St. Martin	53,609	35,372	15,768	328	537	0	1,604	34%
St. Mary	52,578	31,960	16,362	562	730	7	2,957	39%
Hispanic Population	**Total Population**	**Hispanic**	**% Hispanic**					
Iberia	73,346	2,961	4%					
St. Martin	53,609	1,504	3%					
St. Mary	52,578	3,598	7%					

[1] includes some other race alone and two or more races

While the parishes in the study area, taken as a whole, are majority white, there are minority communities throughout the study area. A review of 21 communities in the study area, (see EJ Appendix A-3 or community listing), shows six have at least 50 percent or more of population identifying as non-white. Particularly, Baldwin, Charenton, Franklin, Glencoe, Jeanerette and St. Martinville each have a minority population as the majority while all 21 communities have less than 50 percent Hispanic population. Six of the 21 communities have predominate minority populations majorities, 16 of the 21 communities have at least 20 percent or more of their population with incomes below poverty. Seventeen communities are identified as either having 50 percent or more of the population identifying as a minority or 20 percent or more of the population below the poverty threshold.

2.8.5 Cultural, Historic Resources and Tribal-Trust Resources

The cultural prehistory and history of South Central Coast Louisiana is a very rich one shared with much of the southeast. The generalized cultural chronology for Louisiana according to (Rees 2010:12) has five primary archaeological periods:

- Paleoindian (11,500-8000 B.C.)
- Archaic (8000-800 B.C.)
- Woodland (800 B.C.-1200 A.D.)
- Mississippian (1200-1700 A.D.)
- Historic (1700 A.D.-present)

Historic Properties

The CEMVN identified historic properties within the study area based on a review of the National Register of Historic Places (NRHP) database, the Louisiana Division of Archaeology (LDOA) *Louisiana Cultural Resources Map* (LDOA Website), historic maps, pertinent regional and local cultural resources investigations, historic aerial photography,

and other appropriate sources. This review revealed: Iberia Parish has 32 properties and historic districts listed on the NRHP including one National Historic Landmark (NHL; Shadows-on-the-Teche), the Downtown New Iberia Commercial and East Main Street Historic Districts, and Avery Island; listed on the NRHP at the local, state and national levels of significance for all four NRHP criteria (history, association with significant individuals, architecture, and archaeology); St. Martin Parish has a total of 25 properties and historic districts, including one NHL (Acadian House) and the Breaux Bridge and St. Martinville Historic Districts, and; St. Mary Parish has a total of 29 NRHP properties and historic districts, including Morgan City, Franklin, and Patterson Commercial Historic Districts.

At least 23 terrestrial and naval Civil War battles ranging from small skirmishes to major decisive battles occurred within the study area. Additionally, the National Park Service's American Battlefield Protection Program (ABPP; 54 U.S.C. 380101-380103), Civil War Sites Advisory Commission (Public Law 101-628), has assigned Preservation Priorities (https://www.nps.gov/abpp/battles/bystate.htm) for two individual battlefields located in St. Mary Parish: Irish Bend (Preservation Priority: II.3) and Fort Bisland (Preservation Priority: IV.1).

Following the Great Mississippi Flood of 1927, Congress established the Mississippi River & Tributaries Project authorized by the 1928 Flood Control Act. The Mississippi River & Tributaries Project directed the USACE to design a flood control system within the lower Mississippi Valley to pass a major flood to the Gulf of Mexico (Reuss 1998). The Atchafalaya Floodway was a major component of this public works project and as a result the study area contains multiple mid-20th century flood control structures (e.g., Bayou Boeuf Lock (1954), Berwick Lock (1950), East and West Calumet Floodgates (1950), and the Charenton Floodgate (1948)). Assessments to determine if these flood control structures possess the significance and integrity necessary for listing on the NRHP would be required if the selected plan proposes impacts to any of these resources.

Tribal Trust Resources

Six federally-recognized Tribes identified the three study area parishes as geographic areas of current and/or ancestral interest:

- Alabama-Coushatta Tribe of Texas (ACTT)
- Chitimacha Tribe of Louisiana (CTL)
- Coushatta Tribe of Louisiana (CT)
- Jena Band of Choctaw Indians (JBCI)
- Mississippi Band of Choctaw Indians (MBCI)
- Tunica-Biloxi Tribe of Louisiana (TBTL)

Each Tribe has a Tribal Historic Preservation Officer (THPO) who assumes the responsibilities of the Louisiana State Historic Preservation Officer of the Department of Culture Recreation and Tourism (SHPO) for cultural resources within their Tribal Lands, and who consults with Federal agencies on activities that may impact archaeological sites of interest on or off Tribal Lands [as defined in 36 CFR § 800.16(x)]. Of these Tribes, only the

CTL currently holds lands within the study area and exercises sovereignty over that land. The present Chitimacha reservation is located within the northern part of the community of Charenton, in St. Mary Parish, along Bayou Teche (https://www.census.gov/tribal/?st=22&aianihh=0635). The Tribe currently holds 445 acres of land in trust of the Federal Government/Reservation and an additional 500 acres of tribally owned lands. Prior to European settlement of the study area, the Chitimacha occupied about one-third of what is now Louisiana and holds ancestral interests in the entirety of the study area (http://www.chitimacha.gov).

2.8.6 Land Use

The 2011 National Land Cover Database (NLCD) Data includes the most up-to-date data concerning the study area. Table 2-8 depict the study area's various land uses.

According to the NLCD database, the study area had a slight increase in developed impervious surfaces between 2006 and 2011. This is noteworthy as increases in impervious surfaces can lead to lower water quality, higher nutrient loads, and increased stormwater runoff. Still, 96 percent of soils overall, had a loss of less than 1 percent of impervious soils in the study area. In the planning area outside the study area, there were increases in impervious soils, but at a slower rate.

Table 2-8. Land Cover

Land Cover	Acreage
Barren Land	8,549
Cultivated Crops	241,321
Deciduous Forest	4,620
Developed, High Intensity	3,318
Developed, Low Intensity	45,336
Developed, Medium Intensity	4,415
Developed, Open Space	26,780
Emergent Herbaceous Wetlands	252,894
Evergreen Forest	349
Hay/Pasture	44,509
Herbaceous	3,996
Mixed Forest	1,3109

Open Water	136,620
Shrub/Scrub	3,400
Woody Wetlands	595,191

Cities, Towns, and Villages

Table 2-9 lists the study area's major cities, towns, and villages.

Table 2-9. Study Area Overview

Parish	Total Area (mi^2)	Land Area (mi^2)	Water Area (mi^2)	Industry	Cities, Towns and Villages	State & Federal Natural Areas
St. Martin	816	744	73	Agriculture Fishing Tourism	Henderson Arnaudville Breaux Bridge Broussard St. Martinville	Atchafalaya NWR Attakapas State WMA
Iberia	1,031	574	456	Oil and Gas Shipping Agriculture Fishing	Jeanerette New Iberia Delcambre Loreauville	Shell Keys NWR Attakapas State WMA
St Mary	1,119	555	561	Oil and Gas Agriculture Tourism Fishing	Franklin Morgan City Patterson	Bayou Teche NWR Attakapas State WMA Cypremont Point State Park

Land Use and Emergency Operations Plans

Master plans, in general, present an inventory of land resources; land classifications; development plans, emergency operations, and many other planning opportunities. The focus areas provide management concepts for environmental stewardship of environmentally sensitive areas and other lands; existing and expanded facilities; and connections between people and nature. Each CEMVN alternative must consider how planning by USACE, agencies, state, local, and private entities would be affected by the proposed action(s). The proposed action must be consistent with the master plans. The three parishes each have emergency management plans. These plans aim to reduce the loss of life, suffering, and property damage from emergencies and/or disasters. All federal and state regulations, authorities, and other directives have been taken into account when creating the emergency operations plan (EOP). The EOP is intended to be broad enough to cover any disaster while also maintaining specific instructions for each individual disaster possibility. Appendix A-1 documents the known planning tools in the study area.

2.8.7 Aesthetics and Visual Resources

Aesthetics and visual resources are institutionally important because of the laws and policies affecting visual resources, most notably NEPA and the USACE ER 1105-2-100. Visual resources are technically important because of the high value placed on the preservation of unique geological, botanical, and cultural features. Aesthetic resources are publically important since environmental organizations and the public support the preservation of natural pleasing vistas.

The entire study area is within the Atchafalaya National Heritage Area. This national heritage area has unique attributes as both a place and a concept.

Physically, heritage areas are regions with concentrations of significant natural, scenic, cultural, historic, and recreational resources. (Louisiana Department of Culture, Recreation & Tourism 2010).

The Atchafalaya Basin Floodway System, situated within the Atchafalaya National Heritage Area, contains one of the largest bottomland hardwood forest swamps in North America, including significant cultural, historic, scenic and recreational resources. It is a magnificent wilderness; home to abundant wildlife, endangered species and critical black bear habitat, and with superb recreational and commercial fishing, trapping, and hunting. The areas within the Atchafalaya Basin Floodway System give the viewer near unobstructed views of an aesthetically pleasing ephemeral landscape. Approximately 400,000 acres of the Atchafalaya Basin is publicly-owned land. These public lands help ensure the unique natural resources offered in the basin are protected for future generations to experience.

The Bayou Teche Byway is a 184-mile long Louisiana Scenic Byway along Bayou Teche, through rural landscapes and culturally significant Cajun communities. Dense patches of oaks and other native bottomland hardwoods, draped with Spanish moss, line the banks of the bayou. The landscape here is pastoral and serene, adding to the visual quality of the area. Bayou Teche and its relationship with man can be traced back to the native Chitimacha Tribe. Their legend of the bayou's origin is of an enormous snake that, when killed by Chitimacha warriors, broadened, curved, and deepened the place where its enormous body lay (http://chitimacha.gov). The surrounding habitat is composed of a broad mixture of open fields fronting the major thoroughfares of the region, surrounded by a backdrop of deep-wooded inland swamps. The scenery has remained mostly rural and natural along state and local corridors. Along Hwy 90/future I-49 corridor, the scenery changes to more developed, with commercial and industrial development surrounding local townships.

Brackish and saline marshes dominate the Deltaic Coastal Marshes and Barrier Islands ecoregion south of theGIWW. Based on available aerial photography, the visual conditions have changed significantly over the past 20 years due to the growth of urban development and the loss or conversion of swamps into marsh, or open water areas. Prevalent within the study area is undeveloped land occasionally broken up by maritime-related industry and private fishing camps and boat moorings. Unnatural straight channels and related spoil

banks, cutting through the coastal marsh, contrast the natural landscape combination of marsh and meandering waterways. Navigation for petroleum, fisheries or other related resources most likely caused this development.

2.8.8 Water Quality and Salinity

In general, water quality concerns relate to land use oil and gas activities, saltwater intrusion,, and agriculture. Shoreline configurations and elevations, surface water budget, land cover and use, and regional weather influence water quality. The study area consists of low relief topography to the north and estuary in the south. Water salinity increases in the south of the study area near estuary habitats. The area includes the Vermilion, Bayou Teche, Atchafalaya River Basins.

The Louisiana Department of Environmental Quality (LDEQ)strives to meet the Federal Water Pollution Control Act, commonly known as the Clean Water Act (CWA) requirements. One of the primary CWA sections addressed by each state is § 303(d). Section 303(d) requires each state shall identify water quality-limited stream segments with limited water quality requiring Total Maximum Daily Loads (TMDL) within its boundaries for which the required effluent limitations are not stringent enough. The LDEQ may add additional water quality parameters for each identidied stream segment such as:

- Technology-based effluent limitations required by sections 301(b), 306, 307 or other sections of the Act;
- More stringent effluent limitations (including prohibitions) required by either state or local authority preserved by § 510 of the Act or federal authority (law, regulation, or treaty); and
- Other pollution control requirements (e.g., best management practices) required by local, state, or federal authority are not stringent enough to implement any water quality standards applicable to such waters.

The 2018 Water Quality Inventory Report (LDEQ, 2018) indicated that 50 percent of the 12 water body subsegments within the Atchafalaya Basin were fully supporting their three primary designated uses. However, 50 percent of the subsegments were not supporting their designated use for fish and wildlife propagation. The suspected causes for these water quality problems include fecal coliform, suspended solids, sedimentation/siltation, mercury, turbidity, and low concentration of dissolved oxygen. The suspected sources of the water quality problems include crop production, petroleum activities, channelization, dredging, industrial point sources, waste storage, tank leaks, and spills (LDEQ, 2004).

The area has experienced hydromodification via the construction of water control structures, canals, and embankments. Chemical transformations occurring in the estuary can be biologically mediated by estuary wetlands (Mitsch and Gosselink 2000); a diversity of wetland types exist within the study area, affected by geomorphology and anthropogenic factors. Weather patterns can affect marine influence, flow direction, water level, and wetlands biogeochemistry (Gosselink, 1984). Timing and amount of precipitation can also affect water quality (Demcheck et al., 2004).

Tidal surges from Hurricanes Katrina, Rita, Gustav, and Ike deposited enormous amounts of salt in the sugarcane fields of coastal Louisiana in a period of active tropical weather from 2005 to 2008, resulting in soil salinity levels ranging from 268 to 4,329 parts per million. High levels are attributed to proximity to salty water subject to tidal movement and a high water table. While storm surge has an impact to crops such as sugarcane, for more than 200 years the sugarcane industry has survived the aftermath of countless tropical storms primarily because Louisiana's high rainfall serves to mitigate the damage to sugarcane caused by soil salinity (Viator et al., 2011).

Invasive species, such as hydrilla, giant salvia, and water hyacinth, show rapid growth and in some cases higher tolerance to salinity, have a huge economic impact on a range of activities including farming, fishing and recreational sports. Invasive species choke native plant species, stunt fish population, crowd out waterfowl, reduce water volume, make the water reservoirs impenetrable to boats, and hurt recreational as well as commercial fishing.

Wind, rain, tides, and freshwater influx from streams and diversions are variables causing salinity fluctuation, and play a vital role in the health of the basin's estuaries.

2.8.9 Aquatic Resources

The study area has a wide variety of wetlands, estuaries, lakes, streams, and rivers. This section briefly discusses the study area's dominant aquatic resources.

Gulf Coastal Shorelines

Between 1932 and 2016, while other basins in Louisiana were losing land, the Atchafalaya Basin gained over 6 square miles (4,000 acres) of wetlands. The Atchafalaya River is the last major tributary of the Mississippi River. Atchafalaya receives, on average, 30 percent of the combined flow of the Mississippi and Red Rivers, or around 300,000 cubic feet of water per second.

In 1942, the CEMVN dredged a channel from the Atchafalaya River to the Gulf of Mexico to decrease water levels moving past Morgan City, splitting the flow of water and sediment between the Atchafalaya River and the Wax Lake Outlet. Over time, sediment filled in the Wax Lake, and the Wax Lake Delta emerged. The Atchafalaya River delta has also grown with an increase of sediment settling out at the river reaches the Gulf of Mexico.. This new land pushing out into the Gulf has continued over the years, despite challenges affecting many areas of Louisiana's coast including land subsidence, sea level rise, and hurricanes. The land built and sustained by the Wax Lake Outlet is swamp and marsh habitat that is teeming with life, and the Wax Lake Delta is a picture of a living, thriving delta.

However, in most areas along the Louisiana coast, shorelines are vanishing at an alarming rate. Shorelines on either side of the Atchafalaya basin are being lost (Figure 2-6). Since the 1930s, about 2,000 square miles of land have turned into open water – an area nearly the size of the state of Delaware. Between 1932 and 2016, the Terrebonne Basin lost more than 500 square miles (30,000 acres) of wetlands. This basin is the remnants of an old delta

complex formed when the main flow of the Mississippi River drained into this area 500-2,500 years ago.

Gulf coastal shorelines, located along the northern rim of the Gulf of Mexico, provide essential and critical shelter, nesting, feeding, roosting, cover, nursery, and other habitats and life requirements for fish and wildlife. They function as the boundary between marine and estuarine ecosystems and provide protection to the estuarine wetlands, bays, and other inland habitats. Coastal shorelines, as well as other coastal landscape features such as shoals, coastal marshes, and forested wetlands, can provide a significant and potentially sustainable buffer from wind wave action and storm surge generated by tropical storms and hurricanes. Rapid deterioration of the barrier coast is resulting in a transformation of low-energy, semi-protected bays into high-energy, open marine environments (Stone et al., 2005).

Lakes and Rivers

The study area has two primary subbasins (see Appendix A-1 for additional subbasin information).

The Vermilion subbasin is located west of Bayou Teche and drains in a general southerly direction towards Vermilion Bay and West Cote Blanche Bay. The Vermilion subbasin contains the GIWW, traversing Iberia Parish both inland of and along the shore of Vermilion Bay. In addition, other water bodies include Lake Peigneur on the border with Vermilion Parish, Spanish Lake on the border with St. Martin Parish, Bayou Petite Anse, Bayou Carlin, Bayou Patout, and many other streams and canals.

The Bayou Teche subbasin is present in the central part of the parish and extends from near the western bank of Bayou Teche eastward to include Lake Fausse Pointe. Lake Fausse Pointe, located in Iberia and St. Mary Parishes, is a large, shallow lake separated from the Atchafalaya River floodway by a levee. At an average estimated water-surface elevation of about 2 feet above NGVD 29, the lake has a surface area of about 24 square miles and an average depth of about 3 feet (Shampine, 1971). Lake Paluorde lies just northeast of Morgan City. This lake is approximately 11,000 acres of shallow, marshy edges.

Table 2-10. Predicted Acreage Loss of Different Wetland Types in Study Area

Region	Fresh Marsh Acres in 1990	Intermediate Marsh Acres in 1990	Brackish Marsh Acres in 1990	Saline Marsh Acres in 1990	Total Marsh Acres in 1990	Swamp Acres in 1990	Fresh Marsh Lost by 2050	Intermediate Marsh Lost by 2050
N. Wax Lake	2,770	0	0	0	2,770	2,340	460	0
Wax Lake	43,61	0	0	0	43,610	10,255	5,860	0
Atchafalaya Bay	2430	0	0	0	2430	0	Gain	0
Atchafalaya Total	48,810	0	0	0	48,810	12,595	Gain	0
TECHE/VERMILION BASIN								
Cote Blanche	43,470	2,690	0	0	46,160	12,430	510	250
Vermilion Bay	6,610	29,970	36,660	0	73,240	5,960	0	3,950
Marsh Island	0	0	49,390	7,080	56,470	0	0	0
Rainey Marsh	245	7,770	47,990	2,410	58,415	0	0	780
Teche/Vermilion	50,325	40,430	134,040	9,490	234,285	18,390	510	4,980
Region 3 Total	298,330	92,680	240,750	140,155	771,915	183,384	5,975	23,590

Louisiana Coastal Wetlands Conservation and Restoration Task Force and the Wetlands Conservation and Restoration Authority, 1999

Coastal Zone Federal Consistency

The "Coastal Zone Management Act of 1972, Section 307" (CZMA), called the “Federal consistency” provision, gives states a strong voice in Federal agency decision making, which they otherwise would not have, for activities affecting a state’s coastal uses or resources. The Federal consistency provision is a major incentive for states to join the National Coastal Zone Management Program and is a powerful tool that state programs use to manage coastal activities and resources and to facilitate cooperation and coordination with Federal agencies.

The Office of Coastal Management (OCM) of the Louisiana Department of Natural Resources (LDNR) is charged with implementing the Louisiana Coastal Resources Program (LCRP). The OCM regulates development activities and manages the resources of the Coastal Zone, especially those that have a direct and significant impact on coastal waters.

Appendix A-1 has 3 maps showing the coastal zone in Iberia, St. Martin, and St. Mary Parishes. Appendix A-8 includes the CEMVN’s preliminary Coastal Zone Consistency Determination and relevant coordination. These documents include more detailed baseline coastal zone conditions.

Vegetation and Estuary Resources

The study area consists of open water ponds and lakes, Gulf shorelines, and freshwater, intermediate, brackish, and saline marsh (Table 2-12) (additional maps are in Appendix A-1). These aquatic areas contain a wide variety of vegetation.

Mississippi Alluvial Plain vegetation includes:

- Cypress and tupelo-gum found in low-lying areas typically adjacent to waterways, dominate swamp habitats.
- Riverine habitats along stream and river bottoms and bottomland forests are comprised of water tupelo, willow, sycamore, cottonwoods, green ash, pecan, elm, cherrybark oak, and white oak; these are often interspersed with Chinese tallow. Depending upon the locations, riverine habitats grade into higher elevated and better drained areas comprised of oak-pine forests.
- Oak-pine forest types dominate the better drained areas especially surrounding Lake Charles and Sulfur and include longleaf pine, loblolly pine, slash pine, sweetgum, elm, southern red oak, water oak, black gum and Chinese tallow.
- Pasture and rangelands with mixtures of perennial grasses and legumes (e.g., bermundagrass, Pensacola bahiagrass, tall fescue, and white clover) comprise the majority of the outlying areas surrounding Abbeville, Erath, and Delcambre.

Mississippi Alluvial Plain consists of back barrier vegetated areas; freshwater, intermediate, brackish, and saline marsh; interspersed with bayous, lakes, ponds and other waters may have submerged aquatic vegetation (SAVs). Vegetation typically follows the salinity gradient (O’Neil 1949; Chabreck et al. 1972; Gosselink et al. 1979; Visser et al. 2000).

- Gulf shoreline vegetation includes sea-beach orach, sea rocket, pigweed, beach tea, salt grass, seaside heliotrope, common and sea purslane, marsh-hay cordgrass, and coastal dropseed (LCA, 2004, Gosselink et al., 1979).
- Marsh types: Visser et al. (2000), expanding on previous studies by Penfound and Hathaway (1938) and Chabreck (1970), classified freshwater marsh in the Chenier Plain as a combination of maidencane and bulltongue arrowhead; intermediate marsh as sawgrass, saltmeadow cordgrass, and California bulrush; brackish marsh as saltmeadow cordgrass, chairmaker's bulrush, and sturdy bulrush; and saline marsh as smooth cordgrass, needlegrass rush, and saltgrass.
- Submerged Aquatic Vegetation: wild celery, duckweed, pickerelweed, sago pondweed, southern naiad.

Invasive Plants

Invasive plants found within the study area include water hyacinth, alligatorweed, hydrilla, common salvinia, giant salvinia, Chinese tallow, Chinese privet, Cogon grass, Johnsongrass, Japanese privet, Japanese honeysuckle, common ragweed, rescuegrass, sticky Chickweek, purple nutsedge, mimosa tree. These invasive species compete with native flora for resources such as nutrients and 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 affecting plankton biomass production. Alligatorweed, Chinese tallow and Chinese privet are of minimal wildlife value and can proliferate until nearly monocultural stands exist, limiting food available for wildlife.

Rare, Unique, and Imperiled Vegetative Communities

The Louisiana Natural Heritage Program (LNHP) documented the following rare, unique, and imperiled communities. Vegetation communities contribute to the diversity and stability of the coastal ecosystem. Table 2-11 displays information from the LNHP database identifying rare, unique or imperiled vegetative communities within the study area. See Appendix A-1 for detailed information concerning important vegetative community resources within the study area.

Table 2-11. Louisiana Natural Heritage Program Rare, Unique, or Imperiled Vegetative Communities within the Study Area

Vegetative Communities	Basins or Parish
Coastal Live Oak-Hackberry	Iberia
Cypress Swamp	Iberia, St. Mary
Cypress-Tupelo Swamp	Iberia, St. Martin, St.
Salt Dome Hardwood Forest	Iberia, St. Mary
Freshwater Marsh	St. Mary
Hardwood Slope Forest	St. Mary
Live Oak Natural Levee Forest	St. Mary
Vegetated Pioneer Emerging	St. Mary

(http://www.wlf.louisiana.gov/wildlife/species-parish-list?tid=228&type_1=fact_sheet_community) December 2, 2018

2.8.10 Fish and Wildlife Resources

Fisheries Resources

The study area contains a variety of aquatic habitats, including rivers, bayous, canals, lakes, ponds, shallow open water areas, the Gulf of Mexico, and estuarine marsh and embayments. Salinity and habitat structure (submerged aquatic vegetation, marsh, tidal creeks, deep water, oyster reefs, and benthic substrate) are the primary drivers affecting the distribution of fish and macrocrustaceans throughout the area. There are three general types of aquatic animals: freshwater resident, estuarine resident, and transient marine species. Gosselink et al. (1979) provides an extensive overview of benthic resources in the area. The bottom estuarine substrate or benthic zone regulates or modifies most physical, chemical, geological, and biological processes throughout the entire estuarine system via benthic effect (Day et al. 1989).

Gulf of Mexico near-shore benthic habitats are more thoroughly studied and for longer periods, resulting in a greater understanding of status and trends. Within the Gulf of Mexico, four benthic habitats have protracted temporal and synoptic data: oyster reefs, seagrasses, mangroves, and coastal wetlands (NOAA, 2013). Mangroves are in southeastern Louisiana and not located within study area. Although wigeon grass is common along coastal Louisiana, true seagrass meadows, containing turtle grass, manatee grass, shoal grass and star grass currently occur only east of the Mississippi River near the Chandeleur Islands (Handley et al., 2007). Gosselink et al., (1979) describes the coastal wetland benthic community in the study area.

Oysters and mussels from the epibenthic community provide commercial and recreational fisheries throughout the Gulf and the study area (Appendix A-1, LDWF, 2018). They also create oyster reef habitats used by many marine and estuarine organisms.

Salinity and submerged vegetation affect the distribution of fish and macrocrustaceans throughout the area with three general types: freshwater, resident, and transient marine

species. Some freshwater species, may tolerate low salinities, generally live in the freshwater portions of the more interior and northern-most regions of the area. Resident species are generally smaller and do not commonly migrate very far. Marine transient species spend a portion of their life cycle in the estuary, generally spawning offshore or in high-salinity bays, and use coastal marshes as nursery areas (Herke 1971, 1995).

Essential Fish Habitat (EFH)

In the Magnuson-Stevens Fishery Conservation and Management Act, Congress defined EFH as "...those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." Three fishery management councils - the Gulf of Mexico, South Atlantic, and U.S. Caribbean - are responsible for identifying EFH for federally managed species in the southeast United States. In addition, NOAA National Fisheries Management Service (NMFS) manages highly migratory species, such as tunas, billfish, and sharks, and have EFH designations in these areas of the Southeast as well. The Gulf of Mexico Fishery Management Council has designated and described EFH for 53 managed species.

Federal agencies are required to consult with NMFS when the agency's activities, including permits and licenses they issue, may adversely affect EFH and respond to NMFS recommendations for protecting and conserving EFH. The NMFS must also include measures to minimize the adverse effects of fishing gear and fishing activities on EFH as well.

The CEMVN used the online EFH mapping tool ($NOAA_2$, 2018) to collect preliminary study area EFH information. Appendix A-1 contains figures displaying EFH for coastal migratory pelagics (king mackerel, Spanish mackerel, and cobia); shrimp (brown, white and pink shrimp); red drum; and stone crab, respectively.

Wildlife Resources

Coastal and especially estuarine wildlife is taxonomically diverse with distributions shaped by landforms, climate, salinity, tides, vegetation, other animals and human activities (Day et al. 1989). Area estuarine wetlands and barrier habitats have historically provided many different species of birds and other wildlife with shelter, nesting, feeding, roosting, cover, nursery, and other life requirements. These habitats provide neotropical migrants with essential staging and stopover habitat (Stoffer and Zoller 2004, Zoller 2004). Coastal wetlands attract thousands of trans-Gulf migrant birds during their peak migratory months of April to May and August through October. The majority of these birds fly to and from parts of Mexico, and the wetlands offer the birds an important stop-over on their migration. Millions of ducks and geese use the area from September through February. Over 300 species of birds have been recorded in the area, making this region a popular destination for visiting birders, wildlife photographers, and hunters. However, climate and seasonal availability of resources affect birds and other wildlife use of estuaries. (Day et al. 1989). Vegetated habitats within urban and suburban areas, such as bottomland hardwood (BLH) and swamp habitats along

streams, lakes, and other waterways, provide critical breeding bird habitats (Wakeley and Roberts 1996).

Migratory Birds

Among the several sources documenting Louisiana birds, Lowery (1974) indicates the area supports shorebirds (e.g., piping plover, sandpipers, gulls, stilts, skimmers, and oystercatchers); ducks and geese (e.g., mottled duck, mallard, fulvous tree-duck, pintail, teal, wood duck, scaup, mergansers, and Canada goose); herons, egrets, ibis, and cormorants; hawks and owls (e.g., bald eagle, osprey, and barred owl); belted kingfisher; woodpeckers and sapsuckers; marsh birds (e.g., rails and gallinules); and various songbirds (e.g., wrens, flycatchers, swallows, warblers, and vireos). Waterfowl, seabirds, coots, and rail populations are stable within the region.

In Louisiana, the primary nesting period for forest-breeding migratory birds occurs between April 15 and August 1. Some species or individuals may begin nesting prior to April 15 or complete their nesting cycle after August 1, but the vast majority nest during this period.

Colonial nesting waterbird rookeries (e.g., herons, egrets, ibis, night herons, and roseate spoonbills) are found throughout and generally show stable or increasing populations. Habitat loss and fragmentation is among the most pervasive threats to the conservation of biological diversity (Rosenberg et al., 1997). The study area's bottomland hardwoods, swamp, and other riverine habitats provide travel corridors for birds and other wildlife connecting populations that have been effected by habitat loss and fragmentation.

Bald Eagles

The proposed study area may provide nesting habitat for the bald eagle (*Haliaeetus leucocephalus*). The Bald eagle was officially removed from the List of Endangered and Threatened Species as of August 8, 2007. However, the bald eagle remains protected under the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act. The Louisiana Department of Wildlife and Fisheries (LDWF) has not collected comprehensive bald eagle survey data since 2008, and new active, inactive, or alternate nests may have been constructed within the proposed study area since that time.

Bald eagles typically nest in large trees located near coastlines, rivers, or lakes supporting adequate foraging from October through mid-May. In southeastern Louisiana parishes, eagles typically nest in mature trees (e.g., baldcypress, sycamore, willow, etc.) near fresh to intermediate marshes or open water. Major threats to this species include habitat alteration, human disturbance, and environmental contaminants. Furthermore, bald eagles are vulnerable to disturbance during courtship, nest building, egg laying, incubation, and brooding. Disturbance during these periods may lead to nest abandonment, cracked and chilled eggs, and exposure of small young to the elements. Human activity near a nest late in the nesting cycle may also cause flightless birds to jump from the nest tree, thus reducing their chance of survival.

Mammals

Most estuarine mammals show distributions or behaviors related to salinity patterns (Day et al. 1989). Large herbivores and carnivores include manatee, coyote, red wolf, ringtail, and river otter; smaller herbivores include swamp rabbit, fulvous harvest mouse, eastern wood rat, and nutria. Populations of furbearers (nutria, muskrat, mink, otter, and raccoon) and game mammals (rabbits, squirrels, and white-tailed deer) have been stable or increasing within the study area. Prior to the introduction of nutria to Louisiana in 1930s, no invasive wildlife species were present. A substantial population increase of nutria is attributed to declines in the price of pelts (Baroch et al., 2002).

Amphibians and Reptiles

Common species of amphibians and reptiles include the Gulf coast salt marsh snake, Gulf coast toad, pig frog, American alligator, diamondback terrapin, Mediterranean gecko, Texas horned lizard, red-eared slider; and snakes (e.g., plain-bellied water snake, banded water snake). Various lizards, and skinks are found within the study area (LDNR, 2018). Amphibian and reptile population data is limited, with the exception of the American alligator whose population continues to remain stable (LDWF, 2018).

2.8.11 Threatened/Endangered Species and Other Protected Species of Concern

The CEMVN initiated discussions with USFWS and the NMFS at a resource meeting on November 6, 2018. Subsequently, the USFWS provided a Fish and Wildlife Coordination Act planning aid letter (PAL) dated November 20, 2018 (Appendix A-7). In the PAL, the USFWS identified federally threatened and endangered species.

There are nine threatened or endangered species (T&E) and four At Risk species known or believed to occur in the area (Table 2-12). There are no threatened or endangered plants. Detailed descriptions of critical habitats and T&E species is in Appendix A-5. The CEMVN solicited the LDWF's Natural Heritage Database for state-listed species as well (Table 2-12).

Table 2-12. Federally- and State-listed Threatened and Endangered Species in the South Central Coast, LA Study Area

Animal	Species	Scientific Name	Status*		Parish
			State	Federal	
Birds	Snowy plover	*Charadrius alexandrinus*			St. Mary
	Piping plover	*Charadrius melodus*	T/E	T	St. Mary
	Gull-billed Tern	*Gelochelidon nilotica*			Iberia, St. Mary
	Bald Eagle	*Haliaeetus leucocephalus*	E	Delisted but federally protected	Iberia, St. Mary, St. Martin
	Roseate Spoonbill	*Platalea ajaja*			Iberia, St. Mary, St. Martin
	American Swallow-tailed Kite	*Elanoides forficatus*			St. Martin
	Common Ground-Dove	*Gelochelidon nilotica*			Iberia
	Osprey	*Pandion haliaetus*			St. Martin
	Golden-Winged Warbler	*Vermivora cyanoptera*		AR	
	Eastern Black Rail			AR	
	Red Knot	*Calidris canutus rufa*		T	Iberia, St. Mary
Fish	Paddlefish	*Polyodon spathula*			St. Mary, St. Martin
	Pallid Sturgeon	*Scaphirhynchus albus*	E	E	Iberia, St. Mary, St. Martin
Mammals	Louisiana Black Bear	*Ursus americanus luteolus*	T	Delisted but federally protected	St. Mary, St. Martin
	Eastern Harvest Mouse	*Reithrodontomys humulis*			St. Martin
	West Indian Manatee	*Trichechus manatus*		E	Iberia, St. Mary, St. Martin
Crustacean	Old Prairie Crawfish	*Fallicambarus macneesei*			St. Martin
Reptiles	Alligator Snapping Turtle	*Macrochelys temminckii*	Restricted Harvest	AR	Iberia
	Green Sea Turtle	*Chelonia mydas*		E	Iberia, St. Mary, St. Martin
	Hawksbill Sea Turtle	*Eretmochelys imbricata*		E	Iberia, St. Mary, St. Martin
	Kemp's Ridley Sea Turtle	*Lepidochelys kempii)*		E	Iberia, St. Mary, St. Martin
	Leatherback Sea Turtle	*Dermochelys coriacea*		T	Iberia, St. Mary, St. Martin
	Loggerhead Sea Turtle	*Caretta caretta*		E	Iberia, St. Mary, St. Martin
Insect	Monarch Butterfly	*Danaus plexippus plexippus*		AR	Iberia, St. Mary, St. Martin

http://www.wlf.louisiana.gov/wildlife/species-parish-list?tid=228&type_1=fact_sheet_animal Dec 2, 2018 and the DRAFT USFWS Planning Aid Letter, dated Nov 20, 2018 (Appendix A7
E -Endangered = Taking or harassment of these species is a violation of state and Federal laws.**T**-Threatened = Taking or harassment of these species is a violation of state and Federal laws.**T/E**-Threatened/Endangered = Taking or harassment of these species is a violation of state and Federal laws.
Prohibited = Possession of these species is prohibited. No legal harvest or possession.
Restricted Harvest = There are restrictions regarding the taking and possession of these species.
AR-At Risk = Proposed for listing under the ESA by the Service; 2). Candidates for listing under the ESA, meaning the species has a "warranted but precluded 12-month finding"; or 3) Petitioned for listing under the ESA, meaning a citizen or group has requested the Service add them to the list of protected species.

2.8.12 Air Quality

The project area is subject to air pollutants from mobile sources including vehicles traveling on city roads near and immediately adjacent to the existing levee systems. Due to dissipation by wind, pollutants from these sources do not attain high enough concentrations to warrant measurement or to result in degradation to sensitive resources. Noise

The Noise Control Act of 1972 (P.L. 92-574) directs federal agencies to comply with applicable federal, state, interstate and local noise control regulations. In 1974, USEPA provided information suggesting that continuous and long-term noise levels in excess of day-night sound level 65 A-weighted decibels (dBA) are normally unacceptable for noise-sensitive land uses such as residences, schools, churches, and hospitals. Each parish in the study area has ordinances dealing with noise (https://library.municode.com/la). These range from ambient noise in different residential and commercial zones to noise control for animals and birds.

Ambient noise levels within the study area are influenced by land uses including industrial, commercial, residential and agricultural areas. Noise sources include primarily vehicular traffic trains, and large transport vehicles travelling in the project area. Secondary noise sources include industrial activities and construction. and along county and township roads.

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Ambient noise levels within the study area are influenced by land uses including industrial, commercial, residential and agricultural areas. Noise sources include primarily vehicular traffic, trains, and large transport vehicles travelling in the study area. Secondary noise sources include industrial activities and construction. and along parish and township roads.

2.8.14 Hazardous, Toxic, and Radioactive Waste

Hazardous, Toxic, and Radioactive Waste (HTRW) includes any material listed as a “hazardous substance” under the Comprehensive Environmental Response, Compensation and Liability Act, 42 U.S.C. 9601 et seq (CERCLA). [See 42 U.S.C. 9601(14). Hazardous substances regulated under CERCLA include "hazardous wastes" under Sec. 3001 of the Resource Conservation and Recovery Act, 42 U.S.C. 6921 et seq; "hazardous substances" identified under Section 311 of the Clean Water Act, 33 U.S.C. 1321, "toxic pollutants" designated under Section 307 of the CWA, 33 U.S.C. 1317, "hazardous air pollutants"

designated under Section 112 of the Clean Air Act, 42 U.S.C. 7412; and "imminently hazardous chemical substances or mixtures" the EPA has taken action under Section 7 of the Toxic Substance Control Act, 15 U.S.C. 2606; these do not include petroleum or natural gas unless already included in the above categories.

The CEMVN used the EPA's Envirofacts web site mapper to identify 9,855 EPA-regulated facilities within or in close proximity to the study area (EPA, 2018).

Known facilities include:

- stationary sources of air pollution (such as electric power plants, steel mills, factories, and universities) regulated by EPA, state and local air pollution agencies (Clean Air Act),
- clean up projects at the worst known hazardous waste sites (CERCLA),
- large direct emissions sources and suppliers of certain fossil fuels and industrial gases and greenhouse gas (GHG) (Consolidated Appropriations Act (H.R. 2764; Public Law 110--161)),
- companies issued permits to discharge wastewater into rivers (Clean Water Act),
- facilities that are regulated by EPA regulations for radiation and radioactivity 40 CFR Parts 191 and 194; 40 CFR Part 61; and 40 CFR Part 300.
- hazardous waste handlers, (Resource Conservation and Recovery Act)
- Facilities that manufacture, process, or otherwise use these chemicals in amounts above established levels must report how each chemical is managed through recycling, energy recovery, treatment, and releases to the environment (Toxic Substances Control Act of 1976), and
- Facilities engaging in production, importation, use, and disposal of specific chemicals including polychlorinated biphenyls, asbestos, radon and lead-based paint (Toxic Substances Control Act of 1976).

Given the level of ongoing development in the region, it is difficult to accurately identify all of the potential hazardous materials existing within or adjacent to the study area. Federal law requires site-specific due diligence on a case-by-case basis before development can take place.

2.8.15 Soils

Sedimentation and Erosion

Rivers and waterways in the study area influence the movement of sediment throughout the area. The rivers and interior lakes they enter (Lake Peigneur, Lake Fausse Pointe, Flat Lake, Grand Lake, Yellow Bayou, and Spanish Lake) act as sediment sinks. Overbank deposition into adjacent marshes is minimal in these low flow rivers. Sediments in the interior lakes can be re-suspended and deposited in adjacent marshes during storm events and cold front passages. Extensive hydrologic alterations within the area (levees, channels, roads, locks, control structures, etc.) influence sediment movement throughout. Sediments

in the rivers that make it to the coast are deposited at the mouths and generally move westward nourishing the beaches and marshes.

A significant source of sediment is the Atchafalaya River (McBride et al., 2007). Sediment travels to the Atchafalaya Bay and spreads throughout the bay area through tidal exchange at the Gulf and from flooding during storm events. A large percentage of Atchafalaya River sediments are deposited along the Gulf shoreline near Freshwater Bayou as mudflats while coarser sediments continue westward along the shoreline.

The Louisiana coast has approximately 350 miles of sandy shoreline along its barrier islands and gulf beaches; however, there are about 30,000 miles of land-water interface along bays, lakes, canals, and streams. Most of these shores consist of muddy shorelines and bank lines, and virtually all are eroding. In many instances, rims of firmer soil around lakes and bays, and natural levees along streams have eroded away leaving highly organic marsh soils directly exposed to open water wave action. High rates of Gulf shoreline erosion occur from the vicinity of Rollover Bayou, west to the Mermentau River. Accelerated shoreline loss occurs where erosion has caused Gulf, lake, and channel shorelines to intersect interior water bodies.

Prime and Unique Farmlands

Prime farmland is one of several kinds of important farmland defined by the U.S. Department of Agriculture. It is of major importance in meeting the Nation's short- and long-range needs for food and fiber. Because the supply of high-quality farmland is limited, the U.S. Department of Agriculture recognizes that responsible levels of government, as well as individuals, should encourage and facilitate the wise use of our Nation's prime farmland.

About 118,654 acres in St Mary Parish, or nearly 27 percent of the total acreage, meets the soil requirements for prime farmland. Scattered areas of this land are mainly in the northwestern and central parts of the parish. All areas of this prime farmland are used for crops. The crops grown on this land, mainly bahiagrass, common bermudagrass, cotton lint, rice, soybeans, sugarcane, tall fescue, improved bermudagrass, corn, wheat, sweet potatoes, and grain sorghum account for a majority of the parish’s total agricultural income each year.

The CEMVN found limited and dated prime and unique soil information for Iberia and St Martin Parishes. Iberia Parish has 376,960 acres of land with 144,748 acres of prime farmland (38.3 percent). St. Martin Parish has 471,040 acres of land with 240,054 acres of prime land (50.9 percent) (Ramsey, 1981).

A recent trend of increased industrial and urban land use in some parts of the study area has been the loss of some prime farmland. The loss of prime farmland to other uses puts pressure on marginal lands, that are generally more erodible, droughty, and less productive and cannot be easily cultivated.

The majority of the Gulf Coast Marshes consists of wetland type soils and shorelines that are prone to frequent flooding and not suitable for agricultural use. Prime farmland soils are best suited for producing food, feed, forage, fiber, and oilseed crops, and possess qualities that are favorable for crop production using only acceptable farming methods (NRCS Soil Survey of St Mary Parish, June 2007). Several soil types exist meeting those qualities and are identified as prime farmlands (Appendix A-1). Urban areas, like New Iberia and Morgan City, as well as industrial areas have excluded some prime farmlands from agricultural use.

2.8.16 Sustainability, Greening, and Climate Change

Executive Order (EO) 13423, Strengthening Federal Environmental, Energy, and Transportation Management (January 24, 2007), directs Federal agencies to conduct their environmental, transportation and energy-related activities in an environmentally, economically and fiscally sound and sustainable manner. The USACE strives to protect, sustain, and improve the natural and man-made environment of the Nation, and is committed to compliance with applicable environmental and energy statutes, regulations, and Executive Orders. Sustainability is an overarching concept that encompasses energy, climate change, and the environment to ensure Federal activities do not negatively impact resources for future generations. Proposed alternative plans must provide for sustainable solutions addressing both short- and long-term environmental as well as social and economic considerations.

Greenhouse gases (GHGs) are components of the atmosphere trapping heat relatively near the surface of the earth and contribute to the greenhouse effect (or heat-trapping) and climate change. Most GHGs occur naturally in the atmosphere from natural processes and events, but increases in their concentration result from human activities such as burning fossil fuels. Several studies conclude global temperatures are expected to continue to rise as human activities continue to add carbon dioxide (CO_2), methane, nitrous oxides, and other GHGs to the atmosphere. Whether rainfall increases or decreases remains difficult to project for specific regions.

In 2010, the Council on Environmental Quality (CEQ) released draft guidance on when and how Federal agencies should consider GHG emissions and climate change in NEPA analyses. This draft guidance includes a presumptive effects threshold of 27,563 tons of CO_2 equivalent emissions from a Federal action annually (CEQ, 2010). In 2017, CEQ withdrew Final Guidance for Federal Departments & Agencies on GHG Emissions and Effects of Climate Change in NEPA Reviews.

Climate change impacts within the study area would likely involve increased temperatures (Figure 2-7) and increased precipitation leading to further altered (flashier) hydrologic conditions (Figure 2-8). Annual average temperatures across Louisiana show a trend towards increasing temperature. Any changes in hydrologic conditions occurring within the study area would likely result from less frequent but more intense warm-weather precipitation events, moderately to severely reduced summer flow conditions and degraded water quality.

The character of riparian habitats may also change and invasive species may move into the area with changing climate. Extreme rainfall events and flooding have increased during the last century and these trends are expected to continue, causing erosion, declining water quality, and negative impacts on transportation, agriculture, human health, and infrastructure. The range and distribution of fish and other aquatic species will likely change, and an increase in invasive species would also likely occur.

Additional climate change baseline information is found in Appendix C: Hydraulics, Hydrology, and Climate Preparedness and Resiliency.

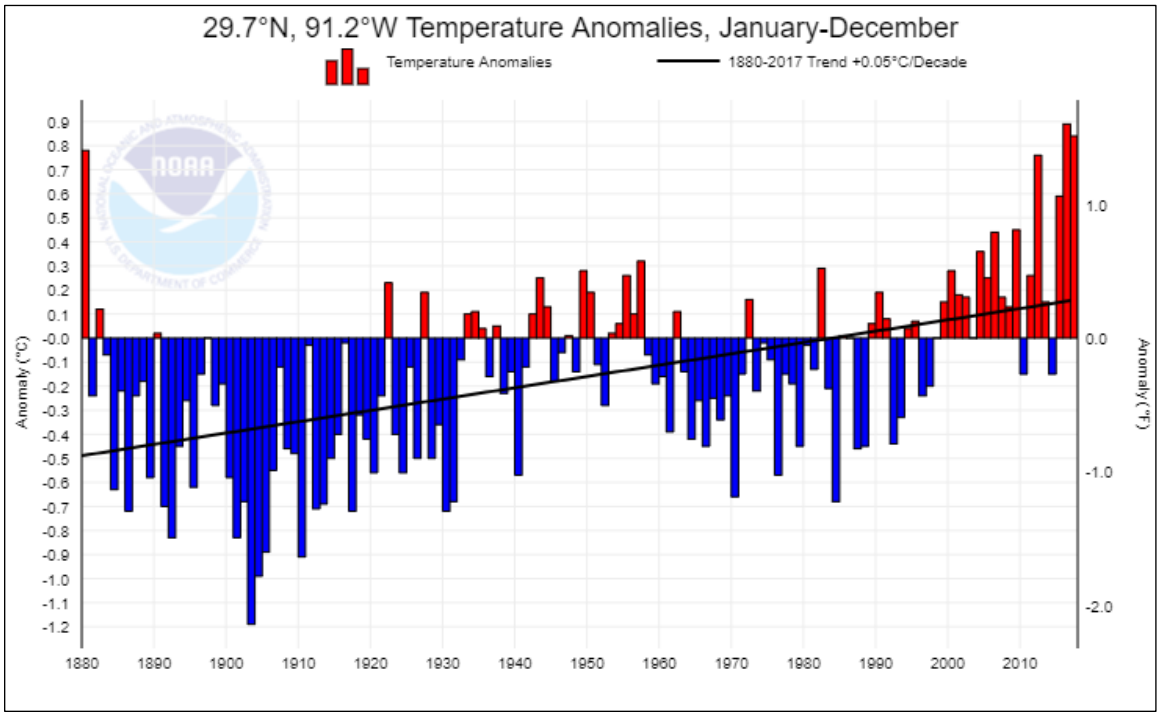


Figure 2-7. Temperature Trend in Louisiana 1880 – 2018 (NOAA[1], 2018)

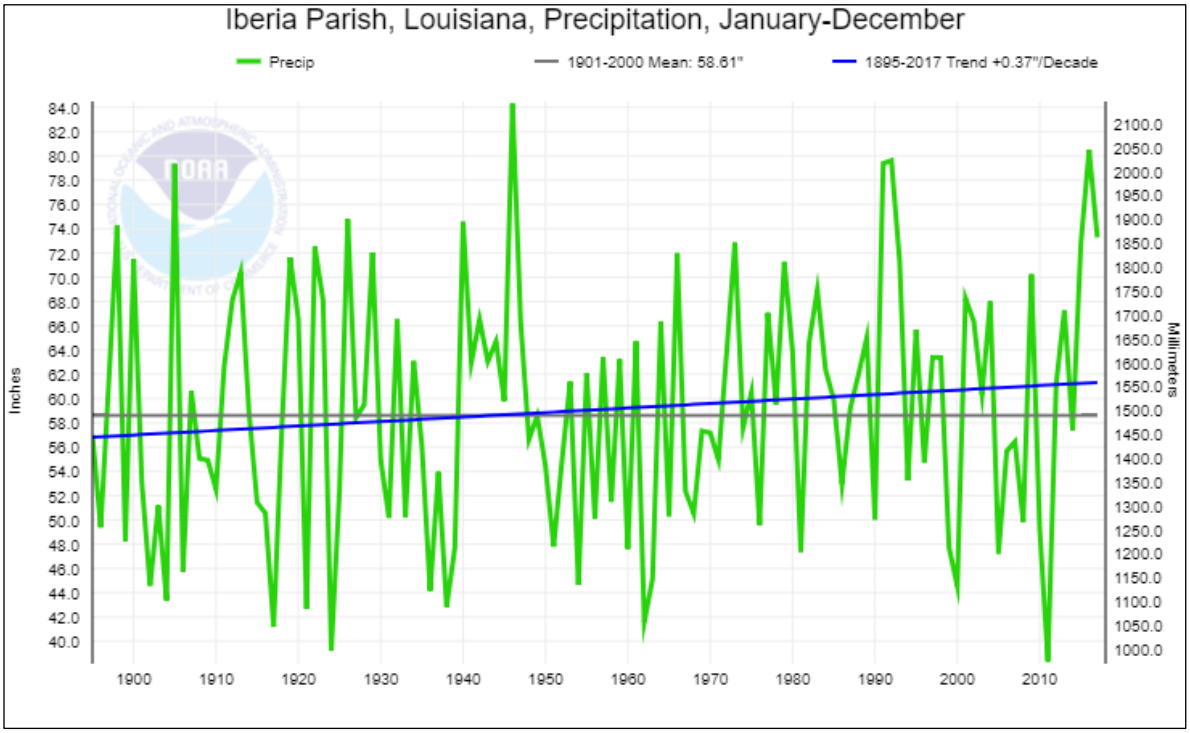


Figure 2-8. Iberia Parish, Louisiana Annual Precipitation in Inches from 1880-2018 (NOAA[1], 2018)

SECTION 3
Formulation of Alternatives

Plan formulation was conducted with a focus on achieving the Federal objective of water related resources, which is to contribute to National Economic Development (NED). Formulation was consistent with protecting the Nation's environment, pursuant to national environmental statues, applicable executive order, and other Federal planning requirements. Plan formulation also considers all effects, beneficial or adverse, to each of the four evaluation accounts identified in the Principles and Guidelines (1983), which are National Economic Development, Environmental Quality, Regional Economic Development, and Other Social Effects. CEMVN's goal for this study was to identify a comprehensive strategy to address existing and future coastal and flood risk management. However, the long-term strategy in South Central Louisiana needs to be a layered solution including elements executed by the non-Federal sponsor, other Federal agencies, the State of Louisiana and/or non-governmental organizations.

The plan formulation strategy for this study prioritizes the creation of plans that will accrue benefits from protecting structure and facilities as well as environmental resources. Following this strategy, the PDT completed four iterations of the planning process and identified measures, including structural, nonstructural, and nature based measures.

3.1 ALTERNATIVE FORMULATION STRATEGY

This study was authorized due to identified coastal storm and flood risks within the study area. CEMVN formulated measures to reduce risk to residents, industries, businesses, and critical infrastructure.

CEMVN inventoried initial set of concepts for consideration from multiple sources as shown in Figure 3-1. Only measures that met the following criteria were carried forward into the initial array of features:

- Meets the definition of a feature ("a project or an activity that can be implemented at a specific geographic site to address one or more planning objectives");
- Not part of the future without project condition;
- Addresses one or more of the South Central Coast planning objectives;
- Does not violate any of the South Central Coast planning constraints.

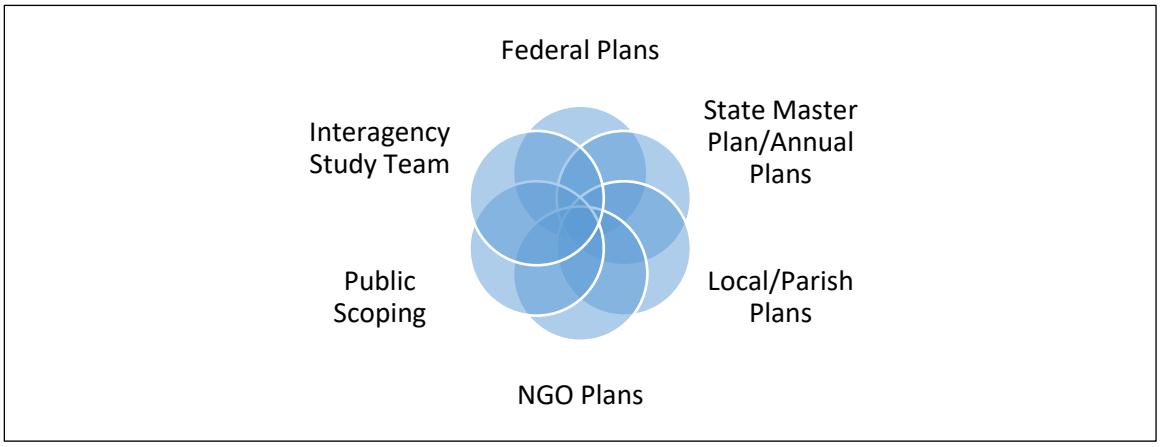


Figure 3-1. Sources of Possible Solutions in the Study Area

Measures were categorized into three main categories: Structural, Nonstructural, and Natural and Nature based defined as follows:

1. Structural measures are constructed measures designed to counteract a flood event in order to reduce the hazard or to influence the course or probability of occurrence of the event.
2. Nonstructural measures are permanent or contingent measures applied to a structure and/or its contents that prevent or provide resistance to damage from flooding. Nonstructural measures differ from structural measures in that they focus on reducing consequences of flooding instead of focusing on reducing the probability of flooding.
3. Natural and Nature Based (measures work with or restore natural processes with the aim of wave attenuation and storm surge reduction.

The CEMVN completed four planning iterations of the planning process between the project initiation and the TSP milestone. Planning iterations require a PDT to complete the entire planning process, a single step, or any portion of the planning process for the purposes of reducing uncertainty with each iteration. Iterations repeat, elaborate, refine, correct, or complete a part of the planning process. SCCL planning iterations were a data driven process as such they differ from one another primarily with regard to the information that was utilized and the detail included in the measure evaluation. Figure 3-2 shows the planning process for this study.

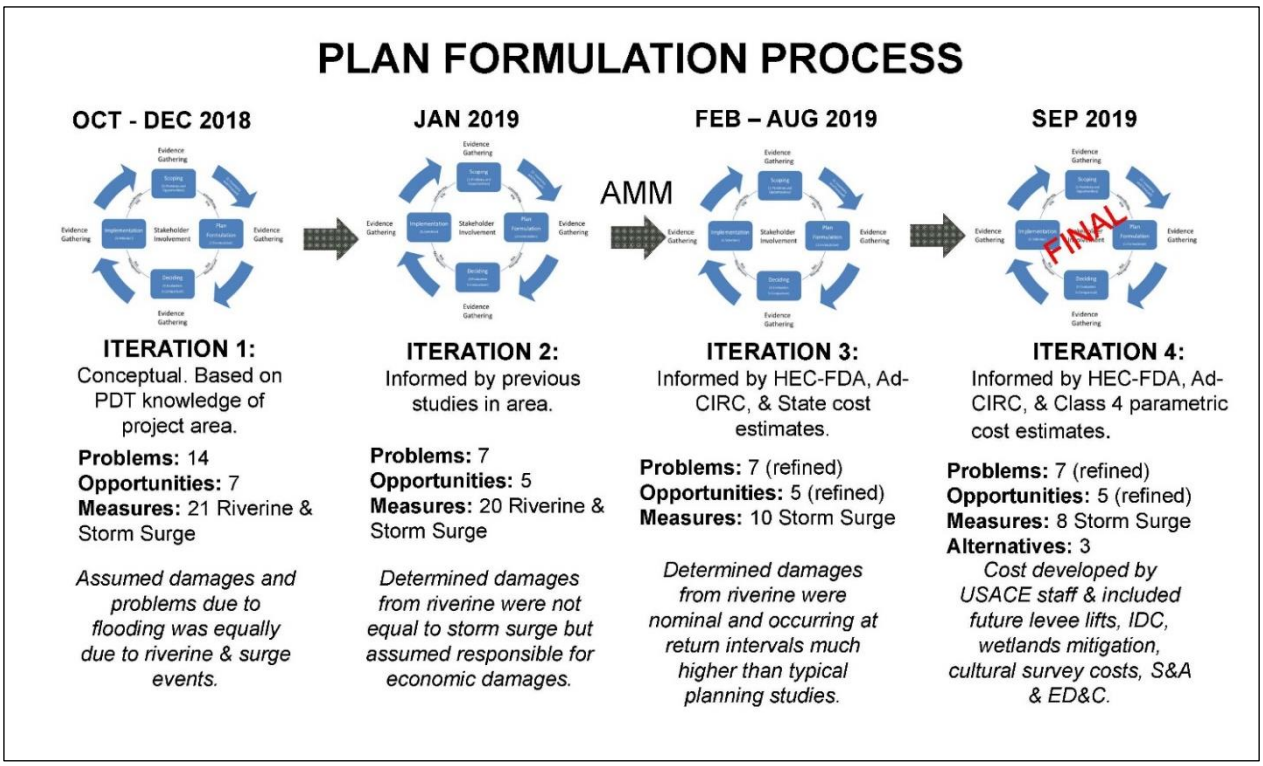


Figure 3-2. South Central Coast Plan Formulation Process

3.2 MANAGEMENT MEASURES

As described in Section 3.1, a variety of input was sought in order to identity a full variety of measure types. Twenty measures were identified. Variations on initial measures occurred upon further refinement and are described under each iteration. The planning team evaluated each independent measure separately to determine if the measure was justified in accordance with ER 1105 2 100 and Water Resource Development (WRDA) Act 1986. Criteria for justification requires a benefit cost ratio of <1. Measures that justify independently would then be combined into alternatives. Section 4 Evaluation and Comparison of Alternatives, describes measures which met ER 1105 2 100 and WRDA 1986 requirements.

3.2.1 Structural Measures

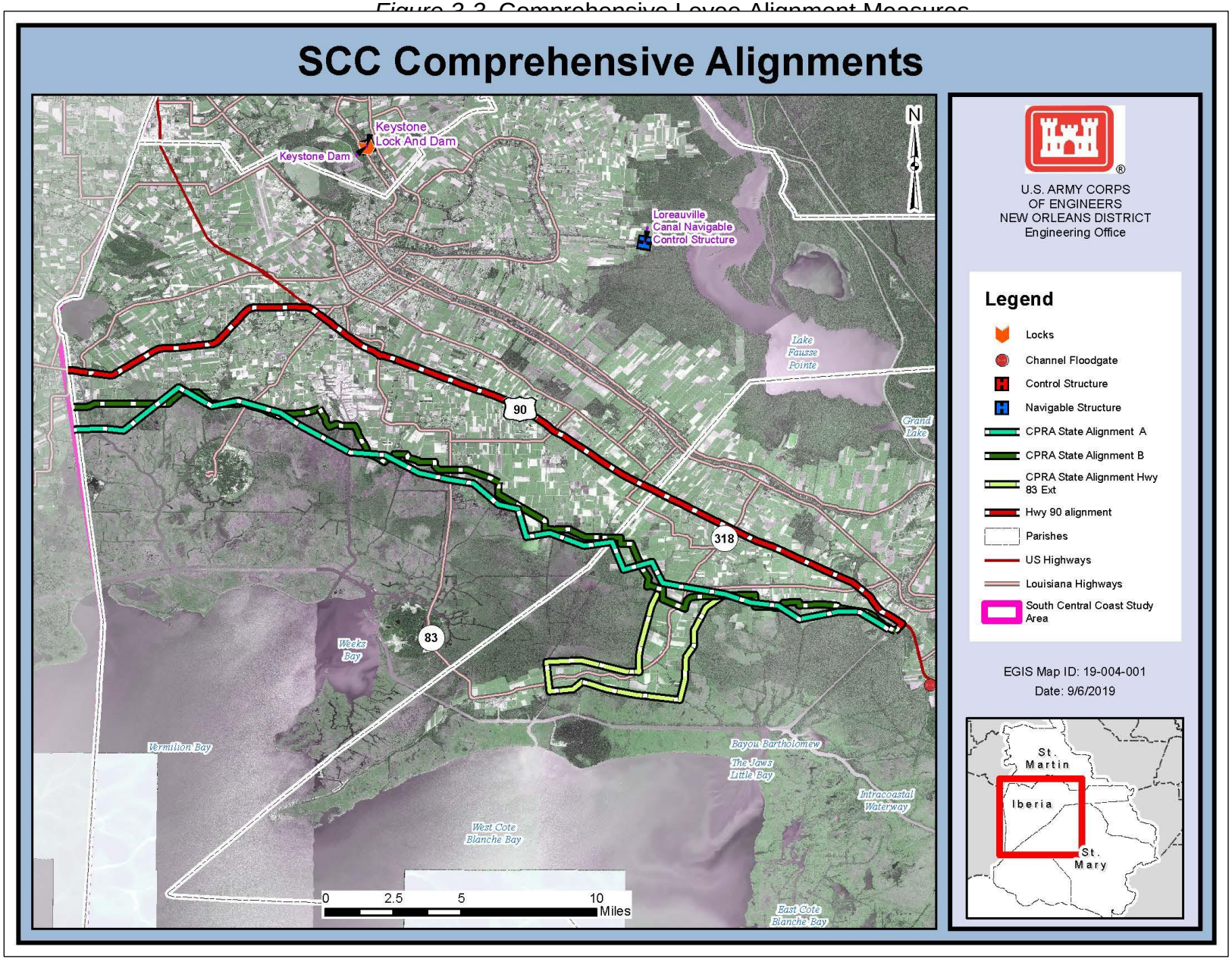
Measure (1, 2, 3, 4)- Build a comprehensive levee system with interior drainage pumps and gates. Three comprehensive levee alignment variations were considered, (Figure 3-3). The three alignments identified and evaluated include the following:

Measure 1 State Alignment A,
Measure 2 State Alignment B, and
Measure 3 Hwy 90 alignment.

The comprehensive levee alignments A and B were developed by a CPRAB contracted study performed by Arcadis. The key difference between State Alignment A and State Alignment B, is that State Alignment A would primarily be constructed on wetland habitat, while State Alignment B is primarily constructed on agricultural lands. State alignments A and B had an additional alignment variation that include a levee extension down Highway 83 (Figure 3-3). The third comprehensive alignment runs parallel to Hwy 90 within the study area and is illustrated in Figure 3-3. USACE PDT identified Hwy 90 comprehensive levee alignment. The intent of the Hwy 90 alignment was to reduce risk to the main evacuation route and because Highway 90 is further inland, design heights were likely to be lower and less costly then alignment A and B.

Measure 4 is interior drainage pumps. Nine interior drainage pumps are included in the comprehensive levee system. Pump locations are expected to be similar across each comprehensive levee system alignment at existing drainage canals. Typical pump design was utilized for planning and engineering assumptions and is illustrated in Figure 3-4. Pumps represent one of the management measures within the total of 20 measures initially identified. Pump locations and channel capacity were identified by CPRAB contractor study performed by Arcadis. The PDT evaluated and validated identified channels and capacity design assumptions.

Figure 2-2 Comprehensive Levee Alignment Measures



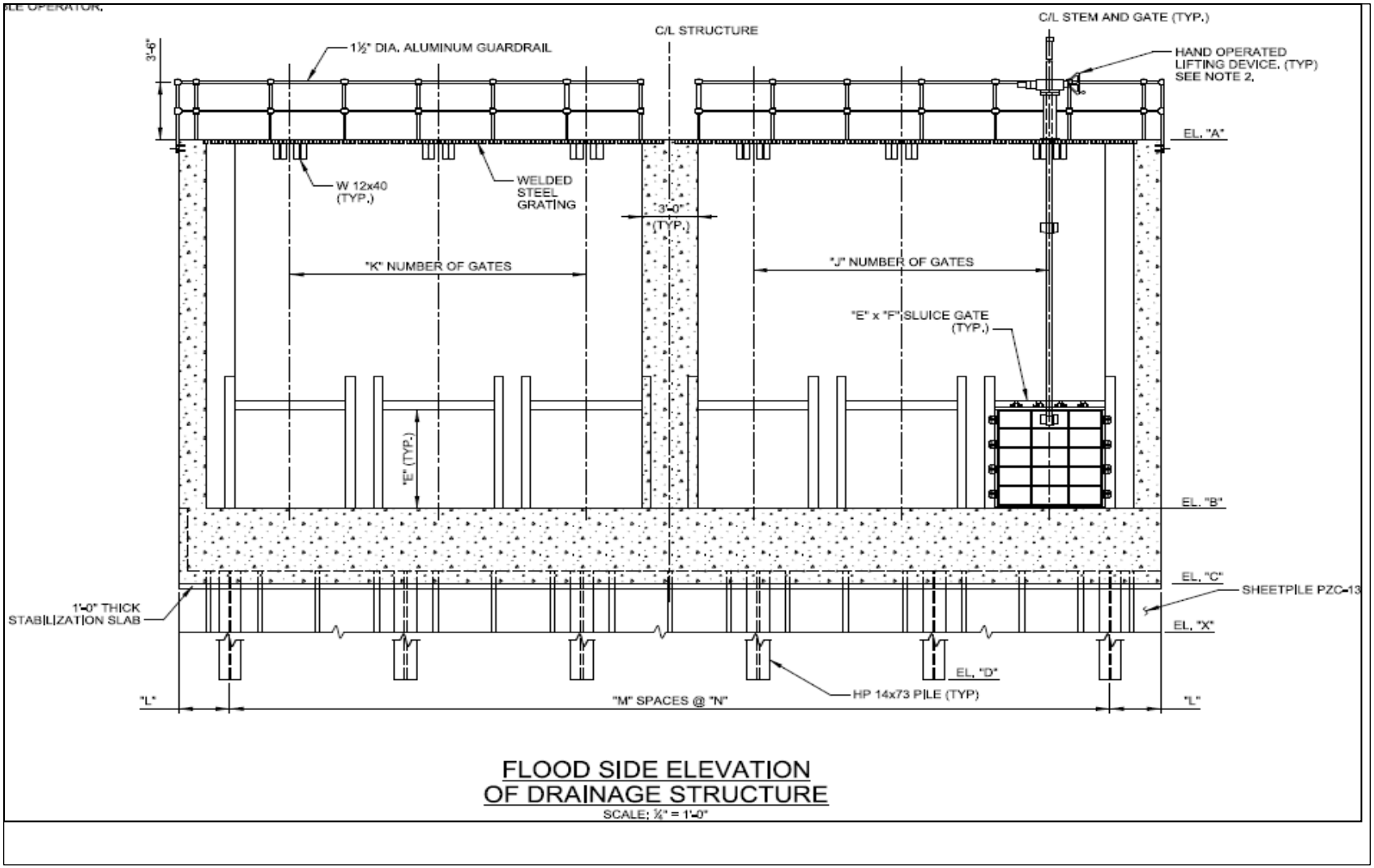


Figure 3-4. Typical Drainage Structure

Measure (5,6)- Raise existing Atchafalaya Riverine Protection levees systems. Elevation of existing levee including (4) Morgan City Back Levee and (5) Levees West of Berwick,to 0.01 Annual Exceedance Probability (AEP) hurricane and storm surge risk reduction. Existing levees, authorized for Atchafalaya River risk reduction, located along the eastern side of SCCL study area, reduce riverine flooding from the Atchafalaya River. The existing levee segments operations and maintenance is mixture of non-Federal Sponsor (NFS) and Federal responsibility. The O&M is performed regularly and there are no known design deficiencies in the existing system. This measure would elevate existing levees to 0.01 AEP hurricane and storm surge risk reduction. Evaluation of levee raises divided levees east and west of Wax lake outlet: Morgan City Back Levees (east, Figure 3-5), Levees West of Berwick (west, Figure 3-6).

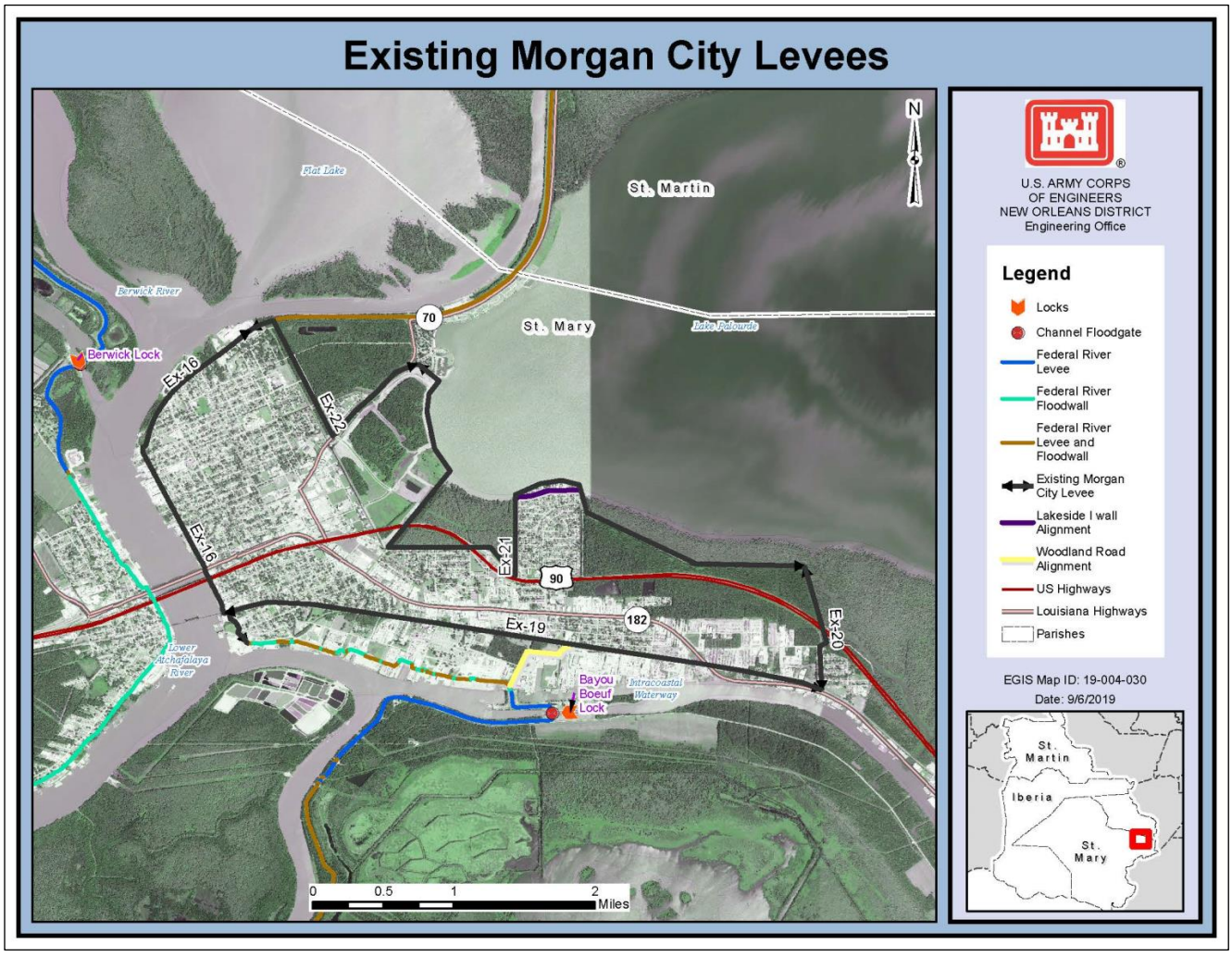


Figure 3-5. Morgan City Levee Raises

Levees West of Berwick are comprised of sub-segments Ex-1- Ex-8. This measure would result in the elevation of all Ex-1 to Ex-8 subsegments to the 0.01 AEP hurricane and storm surge risk reduction. Levee enhancements are expected to require future levee lifts throughout the design life as a result of subsidence and relative sea level rise. Planning and engineering assumptions on levee lifts are provided in Appendix B: Engineering. USACE Cost estimates and benefit cost ratio (BCR) ratio reflect enhancements completed by St. Mary Levee District. See Section 3.4, Measure Evaluation and Screening, for details on results of the assessments.

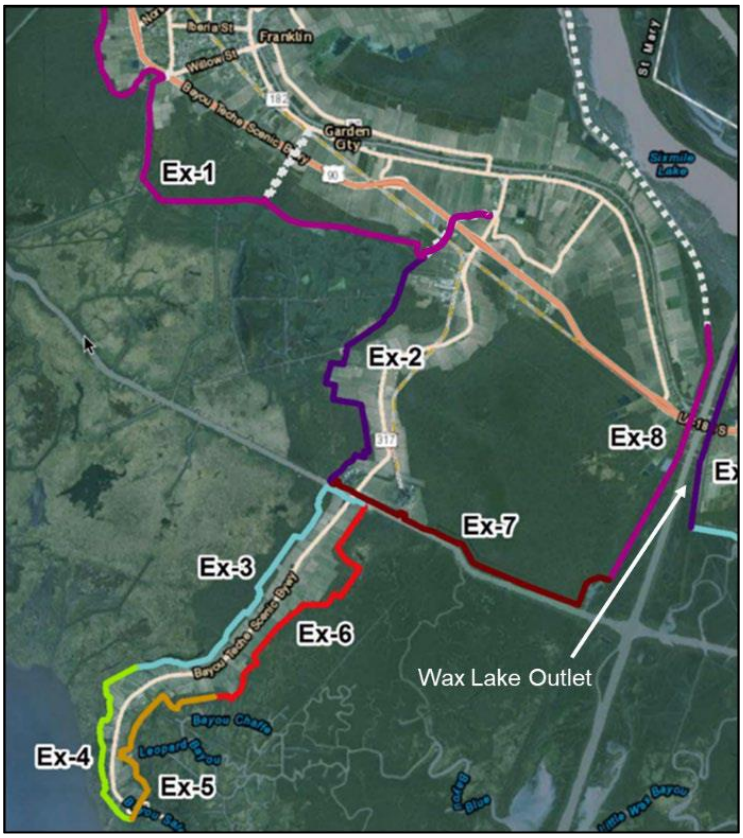


Figure 3-6. Evaluation of Existing Levees West of Berwick with Sub Segment Identified

Measure (7,8,9)- Construct ring levees to protect key population centers and/or key infrastructure. Locations for ring levees and key infrastructure ring levees were identified by assessing recurring damages hot spots and expected annual damage maps (Figure 3-7). The recurring damages within the study area are limited, based on historic data. Three variations of conceptual ring levee alignment were identified south of the City of New Iberia (Figure 3-8).

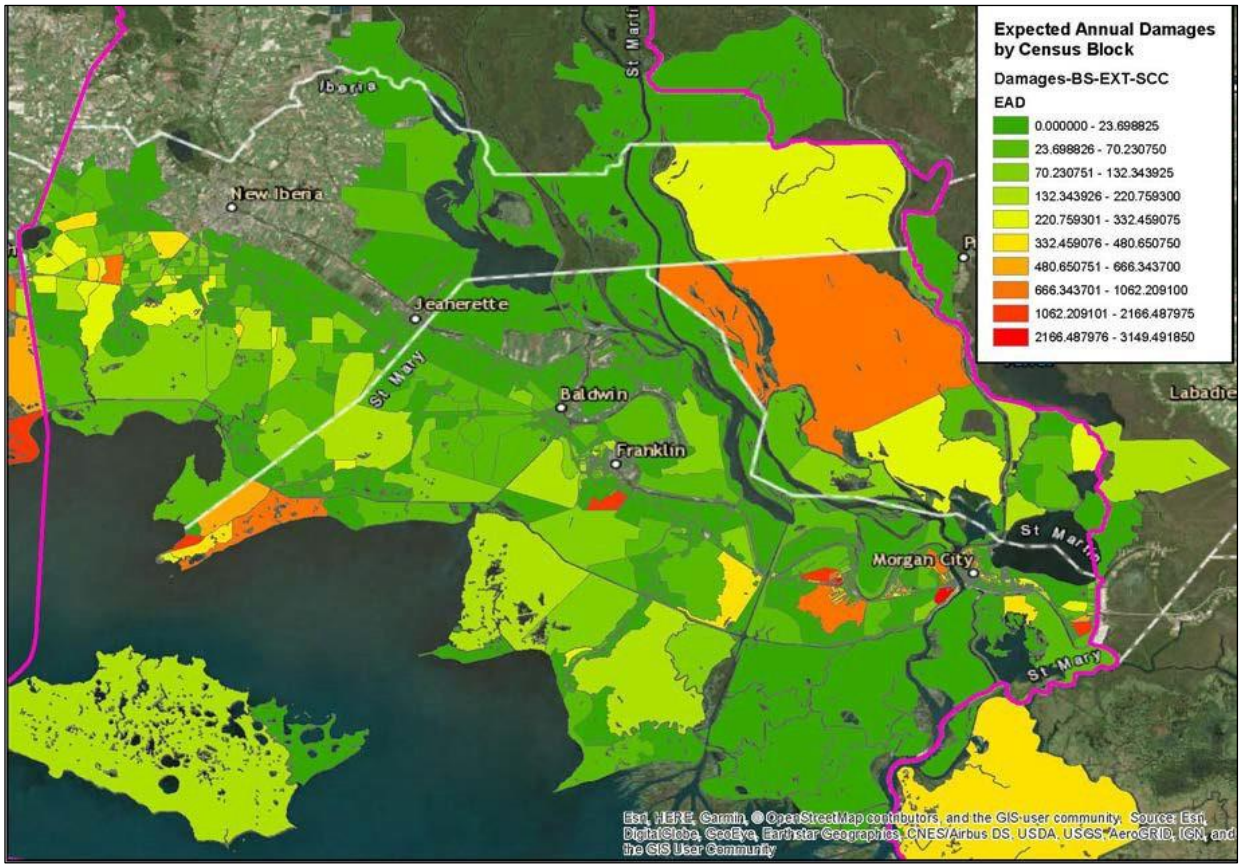


Figure 3-7. Reoccuring Damage Hot Spot by Census Block with Study Area

Measure 7 is ring levee 1 starts on the west side of the study area, east of the City of Delcambre, Louisiana. The City of Delcambre is half in the study area making a comprehensive coastal storm risk reduction solution challenging. Ring levee 1 is 57,448 linear feet. New levee construction is expected to require future levee lifts throughout the design life as a result of subsidence and relative sea level rise. Planning and engineering assumptions on levee lifts are provided in Appendix B: Engineering. Ring levee 1 would include pumping stations and navigation gates at key drainage canals similar to the comprehensive levee.

Measure 8 is a ring levee 2, which starts on the west side of the City of Delcambre and encompasses the City of New Iberia, Louisiana and the Port of Iberia. Ring levee 2 is 50,565 linear feet. New levee construction is expected to require future levee lifts throughout the design life as a result of subsidence and relative sea level rise. Planning and engineering assumptions on levee lifts are provided in Appendix B *Engineering*. Ring levee 2 would include pumping stations and navigation gates at key drainage canals similar to the comprehensive levee.

Measure 9 is ring levee 3 located furthest west of the ring levees, beginning east of Port of Iberia along Weeks Island Road and encompassing the town of Lydia and extending toward City of New Iberia, Louisiana. Ring levee 3 is 35,961 linear feet. New levee construction is expected to require future levee lifts throughout the design life as a result of subsidence and relative sea level rise. Planning and engineering assumptions on levee lifts are provided in Appendix B: Engineering. Ring levee 3 would include pumping stations and navigation gates at key drainage canals similar to the comprehensive levee.

Figure 3-8. Conceptual Ring Levee Measures for the South Central Coast

Ring levee segments were further refined following the third planning iteration. Rationale for refinement is discussed in Section 3.4, Measure Evaluation and Screening. Refinement was based on likelihood of economic justification. The variation resulted in a combination alignment of Ring levees 1 and 2 as shown in Figure 3-9. The alignment provides storm surge damage reduction benefits on the east side of the City of Delcambre, Louisiana, City of New Iberia, and the Port of Iberia. Ring levee 1+2 is 88,272 linear feet. Planning and engineering assumptions on levee lifts are provided in Appendix B: Engineering. Ring levee 1+2 would include pumping stations and navigation gates at key drainage canals similar to the comprehensive levee.

Figure 3-9. Combined Ring Levees Conceptual Alignment 1 +2

It was assumed construction of a comprehensive levee, ring levees, or levee elevations would require future levee lifts due to settling and subsidence within the study area. Engineering assumptions regarding levee lifts is documented in Appendix B: Engineering. A summary of future levee lifts and length is presented in Table 3-1. Costs associated with future levee lifts were included in the cost and benefit analysis.

Table 3-1. Summary Table of the Levee Lift Assumptions

				Lift Elevation (feet)		
Reach	**Width (feet)**	**Length (miles)**	**Area (acres)**	**2.5 ft 5- 7 Yr Post Construction**	**1.5 ft 15-20 Yr Post Construction**	**1 ft 30 Yr Post Construction**
Levees West of Berwick (EX1)	127	18.5	262	13.0	14.5	15.5
Morgan City Back Levee (EX 19)	92	0.6	9	9.0	10.5	11.5
Ring Levee 1	235	10.9	310	23.8	25.3	26.3
Ring Levee 2	223	9.6	259	22.1	23.6	24.6
Ring Levee 3	201	6.8	166	19.5	21.0	22.0

Measure 10- Construct gates at key bridges and/or navigation channels. Sluice and/or Barge gates would be a dependent measure for the comprehensive levee system, ring levee systems, and raising of existing levee segments previously described.

The primary purpose of these gates includes:

- reduce storm surge impacts,
- allow for interior drainage during rainfall and riverine flooding events, and
- avoid impacts to navigation.

Sluice gate locations and estimated costs would occur at nine identified pump locations (Table 3-2 and Figure 3-10). The design flow of the 25-year event was utilized because it represents a conservative estimate for rainfall intensity during a hurricane event. This design flow would ensure gates were appropriately designed to allow for interior drainage during a rainfall event and prevent induced flooding from construction of a levee.

Table 3-2. Proposed Navigational Gate (Steel Barge Gate)

		Design Flow for 25 Yr Event	**Barge Gate Size (Ft)**	**Total Costs**
Iberia Parish	Delcambre/Avery Canal	1530 cfs	110	$30,250,000
	Poufette Canal	3720 cfs	30	$8,250,000
	Petit Anse Canal	5800 cfs	30	$8,250,000
	Commercial/Rodere Canal	5200 cfs	200	$55,000,000
	Delahoussey Canal	2420 cfs	30	$8,250,000
St. Mary Parish	Ivanhoe Canal	90 cfs	N/A	N/A
	Bayou Choupique	2440 cfs	30	$8,250,000
	Bayou Teche/Charenton Canal	4000 cfs	110	$30,250,000

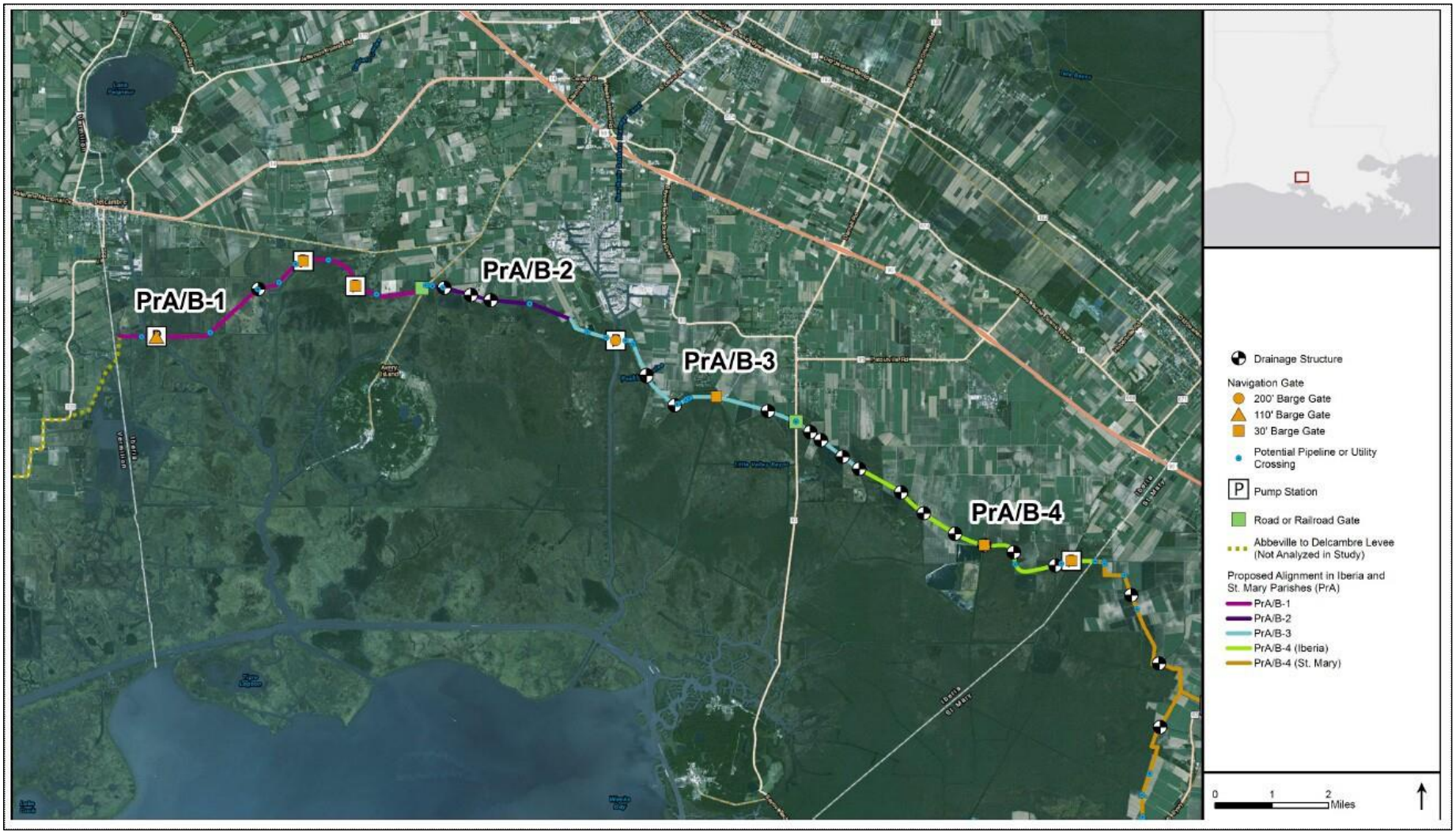


Figure 3-10. Structural Sluice Gate and Pump Station Location Illustrated in the 2017 CPRA Report

3.2.2 Nonstructural Measures

Nonstructural measures are permanent or contingent measures applied to a structure and/or its contents that prevent or provide resistance to damage from flooding. Nonstructural measures differ from structural measures since they focus on reducing consequences of flooding instead of focusing on reducing the probability of flooding. Nonstructural measures identified by the PDT for evaluation include:

Measure 11 Elevate and/or floodproofing (wet or dry). Elevate structures anticipated to have flood depths of 3 to 13 feet. Evacuation planning is part of this measure. Existing trigger points will be compared to updated future without project modeling results following TSP and shared with emergency managers for consideration in evacuation planning decision criteria. Three floodplain aggregations were evaluated as part of this measure. Floodplains evaluated include the 25 year, 50 year, and 100 year storm surge floodplains. Floodplain will be referred to as Measure 11 variation a, b, and c, respectfully.

Measure 12-Create wave /storm surge attenuation structures in front of new or existing levee segments. Wave attenuation structures are dependent upon justified levees. The primary purpose of these measure would be to reduce storm surge wave heights and long term operation and maintenance on justified levees. Wave attenuation structures are dependent upon justified levees. Wave heights can be substantive, 4 to 5 feet have been modeled for the 0.01 AEP storm surge event, in this region. Reguero et al (2014) describes benefits of wetlands in reductions to storm surge and wave attenuation. The existing literature does not directly address quantification of benefits for this type of feature. Best professional judgment to identify reduction in operation and maintenance costs if structural features are determined to be justified in the TSP.

Measure 13-Construct shoreline protection along Vermilion Bay. The purpose of this measure is to prevent erosion and reduce impacts of storm surge and shoreline erosion. Additionally this measure could prevent continued degradation of the marsh habitat that acts as a storm surge barrier.

Measure 14- Construct Water Retention Features on Inside of Levees. This feature is dependent upon a comprehensive levee system or ring levee locations being implemented. The purpose of this measure is to replace or reduce size of pumps needed at key canal locations. This measure is dependent upon a comprehensive levee system or ring levee locations being economically justified. The NFS estimate $1.4 to $1.5 billion for comprehensive levee system, with pumps accounting for 35 percent to 40 percent of the total cost estimate. The PDT identified water retention locations as a potential cost saving measure and assist with a positive benefit to cost ratio. Ancillary environmental benefits may also occur at these retention areas.

Measure 15 - Operational optimization for event scenarios on existing infrastructure. - The primary purpose of this measure is to operate existing infrastructure more effectively to reduce flood risk. The study assessed existing operational manuals and trigger points to determine if hydrologic conditions have changed based on type of storm event and if

systematic changes in operations would reduce damages. Existing pump structures evaluated are illustrated in Figure 1-2. Existing Infrastructure.

Measure 16 - Acquisition and relocation of structures within the 25 year Floodplain. The primary purpose of this measure is to reduce flood damages by removing existing residential and commercial infrastructure from the 25 year storm surge floodplain. The study will assess the feasibility of acquiring residential and commercial infrastructure within a frequently damaged floodplain and verify that removing the structures would provide the highest net benefits over the project planning horizon. The 25 year floodplain was selected based on economic hot spot analysis and reoccurring damages.

3.2.3 Natural and Nature Based Features

Natural and Nature Based measures work with or restore natural processes with the aim of wave attenuation and storm surge reduction.

Measure 17- Restoration of marsh habitat on Marsh Island. Marsh habitat is a natural barrier for storm surge and riverine flooding by retaining water. Marsh Island is expected to be significantly underwater in the moderate and high relative sea level scenarios. This measure would include restoration of marsh habitat on Marsh Island. Measure would require elevation of the existing Marsh Island.

Measure 18 Construct Marsh Island Inlet Closure. An inlet closure structure was identified by public and local municipalities. Locals stated that as the inlet widened over time storm surge and wave heights impacts have increase negative affects on the study area. Purpose of this measure would be to reduce storm surge and wave impacts on study area. Depths to bottom of the inlet are estimated at 50 and 60 feet, with maximum depths up to 100 feet.

Measure 19 Construct Wave Attenuation Structures near Marsh Island. The primary purpose of these features would be to reduce storm surge wave heights, which can be substantive in the study area. These features would be constructed with methods similar to oyster reef restoration. Generally, a slurry of concrete and dead oyster shells are constructed parallel to the coast. Wave heights of 4-5 feet have been modeled for the 0.01 AEP percent event, in this region.

Measure 20 Restore Rabbit and Duck Keys. Barrier island features can reduce storm surge and wave heights. Rabbit and Duck Keys were historically off the coast of south central Louisiana. As a result of erosion, relative sea level rise and subsidence both Rabbit and Duck keys are no longer island features. These features would likely need to be implemented with other natural features to reduce the impacts of storm surge and wave heights.

Measure 21 Cote Blanche Freshwater Sedimentation Introduction. The primary purpose of this measure, as described by the Chitimacha Tribe in a letter of support to the Assistant Secretary of the Army, will be to reduce interior land loss and promote land building, reduce

shoreline erosion rates and protect critical marsh habitat, and maintain lower energy hydrology of the Cote Blanche wetlands.

Table 3-3 and 3-4 illustrate how measures align with project problems, opportunities, and objectives.

3.3 MEASURES DEPENDENCIES

Measures can be classified as independent or dependent measures. Measures that are dependent must be combined with another measure in order to be implemented and therefore cannot be a stand alone alternative. Measures that are independent may be a stand alone alternative or may be combine with other measures. Table 3-5 identifies each measure as in dependent or dependent.

Table 3-3. Goal 1: Reduce Risk, to Communities in the Study Area, from Hurricane and Storm Surge Events

Problems	Opportunities	Objectives	Measures
Flooding from tidal surge and waves associated with tropical storms and hurricanes	Raise or remove buildings out of the floodplain. Block surge with levees and floodgates.	Objective 1a. Reduce economic loss/damages to structures (ie. residential, commercial, agricultural, and industrial from hurricanes and storm surge,.	Structural- Comprehensive levees system, ring levees, floodgates, floodwalls, pumps Non-Structural - Elevate existing structures, acquire existing structures, update evacuation procedures Nature Based Features- Marsh restoration, coastal shoreline protection, barrier island construction
Study area population of approximately 177,000 people are at risk during hurricane, storm surge events.	Reduce life safety risk	Objective 1b. Reduce risk to life safety from hurricanes and storm surge.	Structural- Comprehensive levees system, ring levees, floodgates, floodwalls, pumps Non-Structural Elevate existing structures, acquire existing structures, update evacuation procedures Nature Based Features - Marsh restoration, coastal shoreline protection, barrier island construction
Flooding from riverine and storm surge inundate portions of Hwy 90, the main evacuation route, and slows recovery of area following events.	Protect critical portions of Hwy 90 to allow for safe evacuations and assist in recovery of communities following events	Objective 1c. Reduce risk to primary evacuation route for study area residence and City of New Orleans (Hwy 90).	Structural- Comprehensive levees system, ring levees, floodgates, floodwalls, pumps

Table 3-4. Goal 2: Maintain and Sustain the Natural Ecosystem to Functions that Reduce Flood Severity and Damages

Problems	Opportunities	Objectives	Measures
Flooding from tidal surge and waves associated with tropical storms and hurricanes.	Sustain natural ecosystems whose functions reduce storm surge, riverine, and hurricane impacts.	Objective 2a. Minimize degradation to vulnerable coastal habitat and wetland areas.	Structural- Comprehensive levees system, ring levees, floodgates, floodwalls, pumps Non-Structural Elevate existing structures, acquire existing structures, update evacuation procedures Nature Based Features - Marsh restoration, coastal

Problems	Opportunities	Objectives	Measures
			shoreline protection, barrier island construction

Table 3-5. South Central Coast Measure Dependencies and Combinability

Measure #	Measure Title	Structural Measures															
		Measure 1 Levee A	Measure 2 Levee B	Measure 3 Levee Hwy 90	Measure 4 Interior Pumps	Measure 5 MCBL	Measure 6 LWB	Measure 7 RL 1	Measure 8 RL 2	Measure 9 RL 3	Var. Measure 8 RL 1+2	Measure 10 Gates	Measure 11 Floodproof & Elevation	Measure 12 Wave attenuation	Measure 13 VB Shoreline Protection	Measure 14 Water Retention	Measure 15 Operational Optimization	Measure 16 Acquisition
1	Levee A				D, C	C	C					D, C		D, C	C	D,C		
2	Levee B				D, C	C	C					D, C		D, C	C	D,C		
3	Levee Hwy 90				D, C	C	C					D, C		D, C	C	D,C		
4	Interior Pumps	D, C	D, C	D, C		D, C	D, C	D, C	D, C	D, C	D, C	D, C	C	D, C	C			
5	MCBL	C	C	C	D, C		C	C	C	C	C	D, C	C	D, C	C	D,C	C	C
6	LWB	C	C	C	D, C	C		C	C	C	C	D, C	C	D, C	C	D,C	C	C
7	RL 1				D, C	C	C					D, C	C	D, C	C	D,C	C	C
8	RL 2				D, C	C	C					D, C	C	D, C	C	D,C	C	C
9	RL 3				D, C	C	C					D, C	C	D, C	C	D,C	C	C
*Var. 8	RL 1+2				D, C	C	C					D, C	C	D, C	C	D,C	C	C
10	Gates	D, C	D, C	D, C	D,C	D, C	D, C	D, C	D, C	D, C	D, C		C	D,C	C	D,C	C	C
Nonstructural Measures																		
11	Floodproof Elevation	NA	NA	NA	NA	C	C	C	C	C	C	C		C	C	C	C	
12	Wave attenuation	D, C	D, C	D, C	D, C	D, C	D, C	D, C	D, C	D, C	C	C	C		C	C	C	C
13	VB Shoreline Protection	C	C	C	C	C	C	C	C	C	C	C	C	C		C	C	C
14	Water Retention	D, C	D, C	D, C	D, C	D, C	D, C	D, C	D, C	D, C	C	C	C	C	C		C	C
15	Operational Optimization	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C		C
16	Acquisition	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	

Dependencies = D; Combinability = C; NA = Not Applicable; Grey indicates not combinable or dependent
Natural and Nature Based measures not shown in matrix; all are combinable with both structural and nonstructural measures.
MCBL- Morgan City Back Levees; LWB – Levees West of Berwick; RL- Ring Levee, VB- Vermilion Bay

3.4 MEASURE EVALUATION AND SCREENING

The South Central PDT completed four planning iterations prior to identification of the Tentatively Selected Plan (TSP).

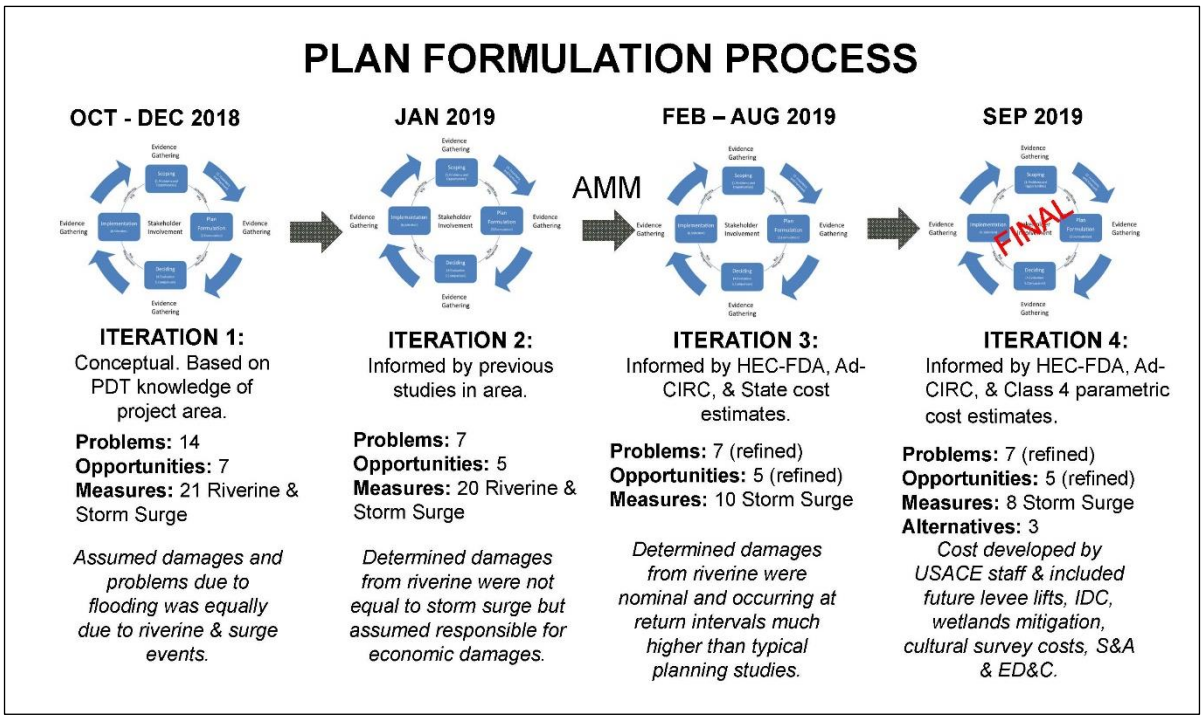


Figure 3-11. South Central Coast Plan Formulation Process

3.4.1 Initial Screening of Measures

Measures were not screened between the first and second iterations. Following the second iteration, measures were screened based on how well they addressed planning objectives and 1983 Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies (U.S. Water Resource Council 1983) criteria. The four Principles and Guidelines criteria are: completeness, effectiveness, efficiency and acceptability. Each measure was rated with a High, Medium, or Low for each criteria. Table 3-6 documents criteria rating for each measure, determination to screen or carry forward to the next iteration, and describes the rationale for screening of measures prior to the third Planning Iteration.

The definitions of these terms are:

- Completeness – The extent to which the alternative plan provides and accounts for all necessary investments or other actions to ensure the realization of the planned effects.
- Effectiveness – The extent to which an alternative plan alleviates the specified problem and achieves the specified objectives.

- Efficiency – The extent to which an alternative plan is the most cost-effective means of alleviating the specified problem and achieving the specified objectives.

Screened measures included:

Measure 2 Build a comprehensive levee system alignment B with interior drainage pumps and gates. This measure was screened because it was determined to be not efficient. The alignment would require extensive wetland survey, mitigation, and monitoring. Additional costs associated with wetland mitigation were determined unlikely to result in an economically justified measure.

Measure 3 Build a comprehensive levee system Hwy 90 alignment with interior drainage pumps and gates. This measure was screened because it was determined to be not efficient. The alignment is directly south of highway 90 and has an increase in number of road intersections giving access to residential and commercial structures south of the alignment. The alignment would require a minimum of twenty highway gates to allow for traffic evacuation south of the alignment. Additional costs associated with crossings and closure gates were determined unlikely to result in an economically justified measure.

Measure 13 Construct shoreline protection along Vermilion Bay. This measure was screened because hydrologic modeling verified that the existing shoreline is not the erosional surface during storm surge events making this measure not effective in reducing storm surge damages to structures.

Measure 14 Construct water retention features inside levees. Land availability sufficient for retention of modeled flow requirements would be extremely costly and land availability sufficient for water retention is limited. This measure was intended to reduce size, and therefore, cost of pumps needed within structural alternatives. Measure would not eliminate the need for pumps completely. Results of economic analysis of structural measures carried through the third iteration provide further evidence that this measure would not provide enough cost savings to make the structural measures economical justified.

Measure 15 Operational Optimization for Event Scenarios. Operational trigger points were reviewed and determined that current operations procedure require pump activation at 0 feet mean sea level. Activation of pumps at a lower trigger point would increase operation and maintenance costs by requiring supervision of pumps earlier in storm readiness procedures. Additionally, running of pumps at lower water conditions may result in pump damage. This measure was deemed to be ineffective and not efficient.

Measure 17. Restoration of marsh habitat on Marsh Island. The distance of Marsh Island to the mainland shoreline is approximately 5 miles. Engineering design considerations suggest 2-3 wavelength in advance of feature intending to protect. Wavelengths vary based on wave height however, within the Gulf of Mexico the average wavelength is 230 feet. This distance is too far to reduce on storm surge or wave heights reduction. Therefore, restoration of Marsh Island would have limited effect on reducing storm surge.

Measure 18 Marsh Island Inlet Closure. The distance of Marsh Island to the mainland shoreline is approximately 5 miles. Engineering design considerations suggest 2-3 wavelength in advance of feature intending to protect. Wavelengths vary based on wave height however, within the Gulf of Mexico the average wavelength is 230 feet. Therefore, construction of an inlet closure near Marsh Island would have limited effect on reducing storm surge. Additionally, the inlet depth is estimated to be an average of 50-60 feet, with maximum depths up to 100 feet. Material to construct the closure would likely be cost prohibitive when compared to effect on reducing storm surge damages.

Measure 19 Wave Attenuation Structures near Marsh Island. The distance of Marsh Island to the mainland shoreline is approximately 5 miles. Engineering design considerations suggest 2-3 wavelength in advance of feature intending to protect. Wavelengths vary based on wave height however, within the Gulf of Mexico the average wavelength is 230 feet. Therefore, construction of an wave attenuation structures near Marsh Island would have limited effect on reducing storm surge.

Measure 20 Restore Rabbit and Duck Keys. The distance of Marsh Island to the mainland shoreline is approximately 5 miles. Engineering design considerations suggest 2-3 wavelength in advance of feature intending to protect. Wavelengths vary based on wave height however, within the Gulf of Mexico the average wavelength is 230 feet. Therefore, construction of an wave attenuation structures near Marsh Island would have limited effect on reducing storm surge.

Measure 21 Cote Blanche Freshwater Sedimentation Project. The Cote Blanche Sedimentation Project area has a very low amount of residential and commercial structures. The low amount of structures results in low reoccurring damages within the proposed project boundary. The measures was determined to be not efficient at addressing South Central Coast project objectives. Additionally, previous USACE project evaluations under other federal programs identified significant pipeline relocations resulting significant cost increase and determination to not implementation the project.

Table 3-6. Iterations 1 and 2 Screening Rationale

	Project Objectives				Criteria					
	1a. Reduce risk to life safety from hurricanes, storm surge, and riverine flooding Areas	**1b. Reduce economic loss/damages, as a result of hurricanes, storm surge, and riverine flooding to structures (i.e. residential, commercial, agricultural, and industrial) within the study area**	**2a. Minimize degradation to vulnerable coastal habitat and wetland areas**	**2b. Increase sustainability of existing natural flood barriers such as wetlands**	**Acceptability[1]**	**Completeness[2]**	**Effectiveness[3]**	**Efficiency[4]**	**Additional Screening Discussion**	**Decision to Move Forward or Screened From Further Consideration**
NO ACTION										
No Action	**Low**	**Low**	**Low**	**Low**	**Low**	**Low**	**Low**	**Low**	Baseline condition – present and future.	Moved Forward
STRUCTURAL MEASURES										
State Levee Alignment A	**High[5]**	**High**	**Medium[6]**	**Low[7]**	**High**	**High**	**High**	**High**	Cropland impacts	Moved Forward
State Levee Alignment B	**High**	**High**	**Low**	**Low**	**Medium**	**High**	**High**	**Low**	Extensive wetland impact and costly mitigation required. Additional cost associated with wetland mitigation was determined to make measure unlikely to economically justify.	Screened From Further Consideration
Hwy 90 Alignment	**High**	**High**	**High**	**Low**	**Medium**	**High**	**High**	**Low**	Alignment is parallel and directly south of Hwy 90. Levee construction would require a minimum of 20 highway crossings and gates to allow for traffic evacuation south of the alignment. Measure determined unlikely to justify due to additional costs of gates.	Screened From Further Consideration
Ring Levees 1, 2, 3	**High**	**High**	**Medium**	**Low**	**Medium- P Low- NFS**	**High**	**High**	**High**	Only protects urban/industrial areas and not rural areas. Medium/Low on Acceptability is based on willingness to NFS cost share. Acceptability is on the low end of medium. Based on Southwest Costal project, public acceptability for ring levees is low.	Moved Forward
Raise Existing Levee Levees West of Berwick and Morgan City Back Levee	**High**	**High**	**Medium**	**Low**	**High**	**Medium**	**High**	**Medium**	Increased height would increase levee base width and need to potential mitigate, majority of impacts would be short term temporary for construction. Wetland Impacts mitigation required. Medium and for completeness and efficiently because does not address full study area.	Moved Forward
Build berm/ridge	**Medium**	**Medium**	**Medium**	**Low**	**Medium**	**Medium**	**Medium**	**Medium**	In combination with additional measures, the effectiveness and efficiency would increase. Not a dependent features. Still benefit for reducing risk but not as much as comprehensive levee. Assumes the same alignment as any of the levee features, but would be a lower cost oy. Ranking is highly dependent on which alignment would be designed with a factor of safety.	Moved forward as a dependent measure.
Sluice/Barge Gates At Key Bridges	**Medium**	**Medium**	**Low**	**Low**	**High**	**Low**	**Medium**	**Low**	Levee alignment; medium for effective and efficiency because it is a dependent measure purpose is to reduce impacts to navigation & to reduce life risk & economic damages.	Moved Forward

	Project Objectives				Criteria					
	1a. Reduce risk to life safety from hurricanes, storm surge, and riverine flooding Areas	**1b. Reduce economic loss/damages, as a result of hurricanes, storm surge, and riverine flooding to structures (i.e. residential, commercial, agricultural, and industrial) within the study area**	**2a. Minimize degradation to vulnerable coastal habitat and wetland areas**	**2b. Increase sustainability of existing natural flood barriers such as wetlands**	**Acceptability[1]**	**Completeness[2]**	**Effectiveness[3]**	**Efficiency[4]**	**Additional Screening Discussion**	**Decision to Move Forward or Screened From Further Consideration**
NON-STRUCTURAL MEASURES										
Shoreline Protection Along Vermilion Bay	**Medium**	**Medium**	**Medium**	**Medium**	**Medium**	**Medium**	**Medium**	**Medium**	Screened due to refined modeling of existing and future without project conditions illustrating the erosional surface during a storm surge event is farther inland. Shoreline protection on the existing shoreline would have minimal benefits for reducing erosion.	Screened From Further Consideration
Marsh Creation (on Marsh Island)	**Low**	**Low**	**High**	**High**	**Low**	**Low**	**Low**	**Low**	Distance from the main shoreline is too far; therefore, storm surge reduction is minimal. Marsh reduction of storm surge waves is not high.	Screened From Further Consideration
Marsh Island Inlet Closure	**Low**	**Low**	**High**	**High**	**Low**	**Low**	**Low**	**Low**	Distance from the main shoreline is too far; therefore, storm surge reduction is minimal. Inlet is 50-60 feet and 100 feet in certain locations would likely be cost prohibitive.	Screened From Further Consideration
Retention features to reduce size of pumps (reduction in size based on State plan recommendation)	**Medium**	**Medium**	**Low**	**Medium**	**Medium**	**Medium**	**Medium**	**Medium**	In combination with additional measures, the effectiveness and efficiency would increase. Measure dependent upon other structural levee measures.Water retention features would be on the inside of levee. NFS would be responsible for LERRDs, NFS would need voluntary buyouts for getting land eminent domain would not be an option.Determined not technically feasibility due to hydraulic flow and design requirements resulting in need of large areas of land. Land availability to accomplish measure is not available within study area.	Screened From Further Consideration
Retention Features (To Replace Pumps)	**Medium**	**Medium**	**Low**	**Low**	**Low- Public and NFS**	**Medium**	**Medium**	**Medium**	In combination with additional measures, the effectiveness and efficiency would increase. Measure dependent upon other structural levee measures.Water retention features would be on the inside of levee. NFS would be responsible for LERRDs, NFS would need voluntary buyouts for getting land eminent domain would not be an option.Determined not technically feasibility due to hydraulic flow and design requirements resulting in need of large areas of land. Land availability to accomplish measure is not available within study area.	Screened From Further Consideration
Wave Attenuation Structures (Marsh Island)	**Low**	**Low**	**High**	**High**	**Low**	**Medium**	**Low**	**Low**	Land may build near the barriers, increasing wetland habitat. Distance from the main shoreline is too far; therefore, storm surge reduction is minimal.	Screened From Further Consideration
Restore Rabbit Key and Duck Key	**Low**	**Low**	**High**	**High**	**Low**	**Medium**	**Low**	**Low**	Land may build near the barriers, increasing wetland habitat. Distance from the main shoreline is too far; therefore, storm surge reduction is minimal.	Screened From Further Consideration
Wave Attenuation Structures (directly off coast)	**Medium**	**Medium**	**Medium**	**Medium**	**Medium**	**Medium**	**Medium**	**Medium**	Construction may impact oyster leases and wetlands. Dependent measure on justified levee measure. Screened following determining no structural plan was justified.	Moved Forward

Operational Optimization for Event Scenarios)	**Medium**	**Medium**	**Low**	**Low**	**Low**	**Low**	**Low**	**Low**	In combination with additional measures, the effectiveness and efficiency would increase. Determined measure would not be effective as reducing impacts of storm surge. Current operations require pumping when water in channels reach 0 feet mean sea level. Changing pumping trigger points would result in higher pump maintenance and repair costs and labor costs with little to no effect on reducing surge impacts.	Screened From Further Consideration
Cote Blanche Freshwater Sedimentation Introduction	**Low**	**Low**	**High**	**High**	**Medium**	**Low**	**Low**	**Low**	The measure is a previous study performed by USACE. It was not implemented due to hazard magnetometer survey showing numerous abandoned pipelines. Features are primarily ecosystem restoration focus and due to low reoccurring economic losses in the area not likely to be cost justified.	Screened From Further Consideration
Elevation and Floodproofing of structures within the 25 or 50, or 100 year floodplain	**High**	**High**	**High**	**Low**	**Medium**	**Medium**	**High**	**High**	Willing participation only.	Moved Forward

[1] Acceptability is the workability and viability of the alternative plan with respect to acceptance by Federal and non-Federal entities and the public and compatibility with existing laws, regulations, and public policies.
[2] Completeness is the extent to which a given alternative plan provides and accounts for all necessary investments or other actions to ensure the realization of the planned effects.
[3] Effectiveness is the extent to which an alternative plan alleviates the specified problems and achieves the specified opportunities.
[4] Efficiency is the extent to which an alternative plan is the most cost-effective means of alleviating the specified problems and realizing the specified opportunities, consistent with protecting the Nation's environment
[5]-A score of "high" signifies the metric was met considerably.
[6]-A score of "medium" denotes the metric was met moderately.
[7]-A score of "low" indicates the metric was minimally met, if at all

3.4.2 Third Planning Iteration Methods-

To assess the benefits of remaining structural or nonstructural measure the preventable physical damages to existing, residential, commercial, industrial, and public buildings and facilities were considered. There are other physical damages, and/or disruptions, associated with broadly dispersed physical infrastructure an natural resources, that may be integral to economic sectors, such as oil and gas production (e.g. pipelines production facilities, etc.) or agriculture (e.g. livestock field crops, etc.) However, because no assurance of reduction in damages loss of productivity can be determined through a dedicated, site specific application of the measures available these damages were not included.

Modeling was performed to determine where hurricane and storm surge damage potential existing in the study area. Figure 3-12 depicts structure locations (red dots) within the structure inventory that are included within the 100-year floodplain and thus, are at risk of hurricane or storm surge-induced flood damages. The structure inventory was not supplemented with additional residential and non-residential properties that are expected to be placed in service in the Future without Project Conditions. Floodplain regulations, mandate by the National Flood Insurance Program (NFIP, managed by FEMA) require that the first floor elevation of any new structures be placed at or above the base flood elevations as indicated by the corresponding FIRM in order to be eligible to purchase national flood insurance. Therefore, while structures that are expected to be placed into service in the future their exposure to the risk of flooding from hurricane and storm surge is significantly less than many structures found under existing conditions.

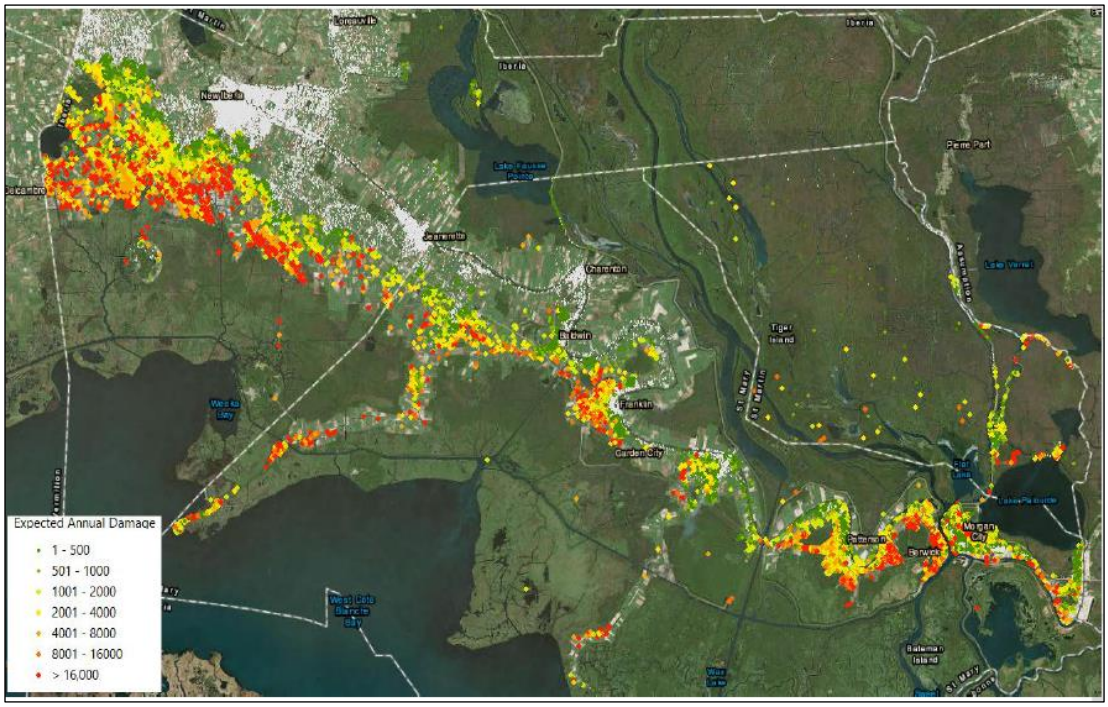


Figure 3 -12. Expected Annual Damages of Residential and Non-Residential Structures in Study Area

The initial screening left ten measures that warranted additional evaluation. A full description of all measures and screening is available in Section 3.

The suite of measures carried through the third iteration include:

Measure 1 Construct Comprehensive Levee System A with associated pumps and gates.
Measure 5 Raise existing Morgan City Back levees (all segments).
Measure 6- Raise existing Levees West of Berwick (all segments).
Measure 7 Construction of new Ring Levee alignment 1 with associated pumps and gates.
Measure 8 Construction of new Ring Levee alignment 2 with associated pumps and gates.
Measure 9 Construction of new Ring Levee alignment 3 with associated pumps and gates.
Measure 16 Acquisition and relocation of structures within the 25 year Floodplain.
Measure 11 variation A Elevate and floodproofing structures within the 25 year storm surge floodplain.
Measure 11 variation B Elevate and floodproofing structures within the 50 year storm surge floodplain.
Measure 11 variation C Elevate and floodproofing structures within the 100 year storm surge floodplain.

3.4.3 Evaluation Refinement of Structural Measures Carried to the 3rd Iteration

Flood frequency curves were used to obtain a flood depth. The Hydrologic Engineering Center Flood Damage Analysis (HEC-FDA) Version 1.4.2 USACE-certified model was used to calculate the damages and benefits for measures based on damage curves. Finally, a maximum project supported was calculated for each of the measures carried through to the third iteration. CPRAB Report (2017) cost estimates were utilized for the comprehensive levee system A. The CPRAB Report cost estimates included total first costs, real estate, and wetland mitigation. Costs not included were future levee lifts, interest during construction, cultural resource surveys, and ED&C and S&A. Ring levee measures, developed by the PDT and not included in the CPRABreport, utilized an average cost per mile of levee presented in the Arcadis Report multiplied by the linear length of levee. If the initial BCR ratio had a value less than 1.0 and further refinements would likely not result in a positive measure was screened from further consideration.

Due to the Port of Iberia being an economic hot spot, the PDT determined evaluation of Ring Levee 1+2 and Ring levee 2 may result in a justified project if benefits were refined. Ring Levee 1+2 and Ring Levee 2 were carried forward for further analysis. The third iteration resulted in the screening of Ring levees 1 and 3 (Table 3-7).

Levees West of Berwick evaluation included all segments. Due to low reoccurring economic damage and structures within the Levees West of Berwick a benefit cost ratio greater than 1 was not reached. The PDT determined Ex-1 segment, if evaluated separately, may produce a benefit cost ratio greater than 1.0. Ex-1 segment of the Levees West of Berwick was carried forward for further evaluation.

Morgan City Levee had a BCR greater than 1.0 and was carried forward for further evaluation.

The comprehensive levee alignment A was analyzed first with and without the Hwy 83 segment, resulting in a BCR below 1.0 threshold. As a result, state alignments A was screened for further analysis.

3.4.4 Evaluation Refinement of Non-Structural Measures Carried to the 3rd Iteration

Nonstructural measure were not evaluated in the third iteration. As a result all of the nonstructural measures were carried forward into the fourth iteration for further analysis. Nonstructural measures include:

Measure 11 var. a- Elevate and floodproofing structures within the 25 year storm surge floodplain,
Measure 11 var. b- Elevate and floodproofing structures within the 50 year storm surge floodplain
Measure 11 var. c- Elevate and floodproofing structures within the 100 year storm surge floodplain
Measure 16 - Acquisition and relocation of structures within the 25 year Floodplain.

Table 3-7. Summary of Third Iteration Structural Measure Benefit Cost Ratio Assessment South Central Coast, LA

Measures	Total Cost	Average Annual Cost	Average Annual Benefits	BCR Ratio	Decision to Move Forward or Screened From Further Consideration
Ring Levee 1	$716,590,000	$26,543,000	$6,038,000	**0.23**	Screened
Ring Levee 2	$778,137,000	$28,823,000	$11,753,000	**0.41**	Carried forward*
Ring Levee 3	$313,000,000	$11,878,000	$2,080,000	**0.18**	Screened
Ring Levee 1+2	$1,494,727,000	$55,366,000	$17,791,000	**0.32**	Carried forward*
Levees West of Berwick	$136,227,000	$5,046,000	$3,247,000	**0.64**	EX-1 Carried forward
Morgan City Levee (Ex 16, 19, 20, 21, 22)	$85,089,000	$3,152,000	$3,002,000	**0.95**	Ex- 19 and 21 Carried forward
Comprehensive Levee A w/ Hwy 83	$1,412,900,000	$53,617,000	$26,990,000	**0.5**	Screened
Comprehensive Levee A w/out Hwy 83	$1,262,300,000	$47,902,000	$21,710,000	**0.45**	Screened

Note-Nonstructural measures (not listed), including elevation and floodproofing of structures, within the 25 year, 50 year or 100 year Floodplain were carried forward to the fourth iteration.
** Measures were carried forward to determine if design adjustments may result in a greater benefit cost ratio. Design adjustment are described in section 3.5.1 Refinement of Structural Measures.*

3.5 MEASURES CARRIED TO FOURTH PLANNING ITERATION

The suite of measures carried through to the fourth iteration include:

Measure 5 Raise existing Morgan City Back levees (Ex 19 and Ex 21).
Measure 6- Raise existing Levees West of Berwick Ex -1.
Measure 8 var.- Construction of new Ring Levee alignment 1+2 with associated pumps and gates.
Measure 8- Construction of new Ring Levee alignment 2 with associated pumps and gates.
Measure 11 var. a- Elevate and floodproofing structures within the 25-year storm surge floodplain.
Measure 11 var. b-Elevate and floodproofing structures within the 50-year storm surge floodplain.
Measure 11 var. c-Elevate and floodproofing structures within the 100-year storm surge floodplain.
Measure 16- Acquisition and relocation of structures within the 25-year storm surge Floodplain.

3.5.1 Refinement of the Structural Measures

The assessment of economic feasibility for four structural measures was completed on measures during the fourth iteration. Measure construction costs and associated assumptions were developed by CEMVN technical leads and are presented in Appendix B Engineering. Results of the third iteration showed potential for justification if variations to structural measures were explored.

Morgan City Back Levees variations occurred after additional coordination confirmed St. Mary Levee and Drainage District completed levee elevations on subsegments resulting in a smaller and more refined locations for levee elevations. As a result, portions of levee segments Ex-19 and Ex-21 (Figure 3-13), known as Lakeside Gap and Youngs Rd, are the only remaining segments within Morgan City back levee not completed to the 0.01 AEP storm surge risk reduction elevation. Youngs Road Levee Gap levee elevation would require raising approximately 3,054 linear feet.

The Lakeside Gap (Ex-21) would require an I-wall with barge gate to the east of Lakeside Subdivision. The I-wall was estimated at 2,143 feet long. An I-wall is a line of steel sheet piling similar to adjacent levee segments. The measure variation also includes replacing an existing barge gate on the eastern edge. Lastly, structural measures were determined to require compliance with higher safety criteria issued under the Hurricane & Storm Damage Reduction system (HSDRRS). Economic evaluations on structural measure under the fourth iteration are presented in Table 3-8 for standard structure safety criteria.Economic assessments of all levee segments within Levees West of Berwick, were not greater than 1.0 BCR during the third planning iteration. However, coordination with the NFS highlighted the importance of these reaches due to presents of critical infrastructure. The PDT refined the Levee West of Berwick measure to include levee subsegment Ex-1 only (Figure 3-14) as it had the highest probability of meeting having a BCR greater than 1.0. The team repeated

the evaluation comparing expected cost of damages over the 50 year planning period to the cost of constructing the levee elevation.

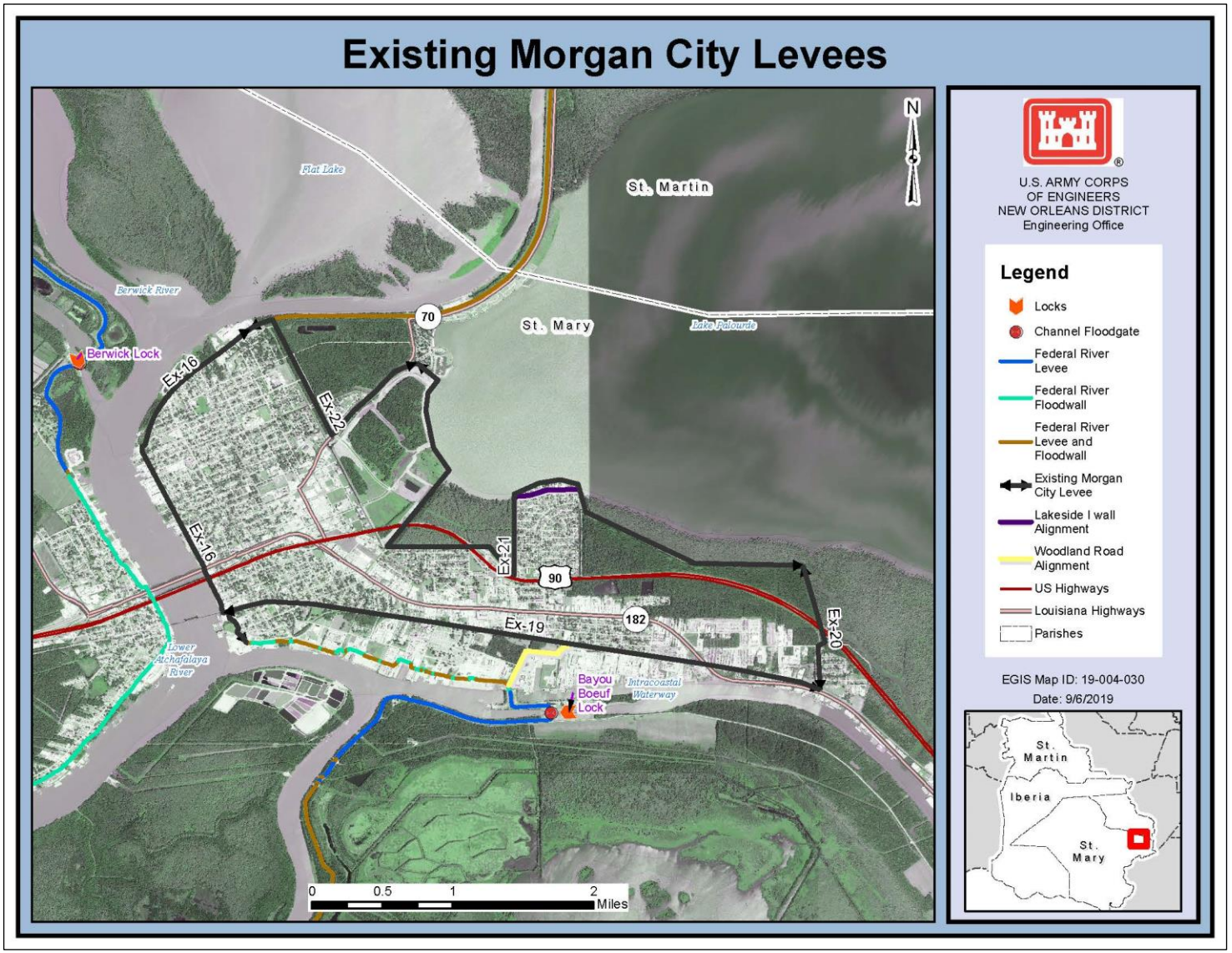


Figure 3-13. Refinement of Structural Alternative- Morgan City Back Levee Sub-segments

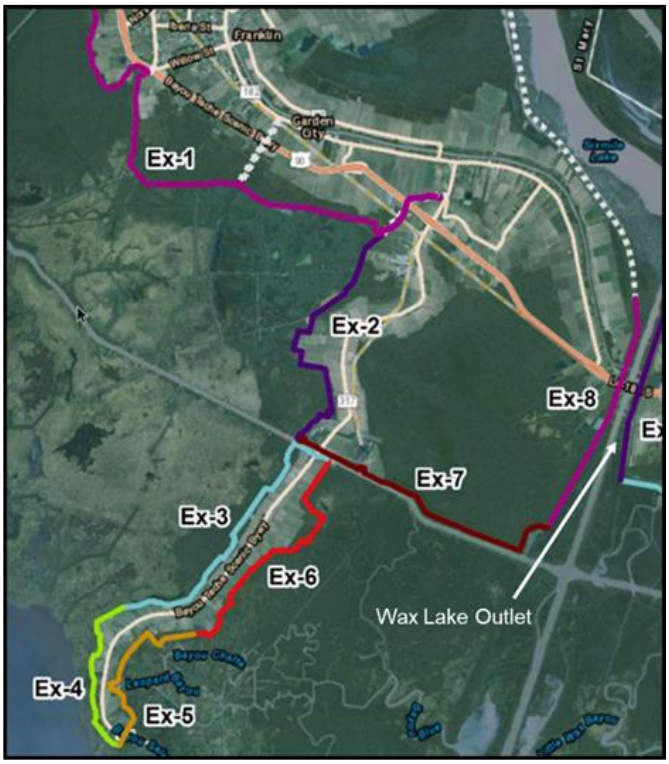


Figure 3-14. Evaluation of Existing Levees West of Berwick with Sub Segment Identified

3.5.2 Economic Analysis of Measures

A BCR analysis was conducted to evaluate the economic feasibility of each of the structural measure. Expected annual benefits for 2025 and 2075 were converted to an equivalent annual value using the previous FY19 Federal interest rate, 2.75 percent, and a 50 year period of analysis. Total cost and estimated annual costs for the project measures included the construction costs, and future levee lifts, estimated labor costs for the two levels of risk reduction. Construction costs, along with the schedule of expenditures, were used to determine the interest during construction and gross investment cost at the end of the construction period. For the purposes of this study, construction was assumed to begin in 2025 and continue through 2027 with additional levee lifts (to maintain levee height due to sinking and subsidence) occur at three times post initial construction 5-7 years, 15-20 years, and 30 years. The first levee lifts would be overbuilt and allowed to settle for several years before the latter levee lift is added for each alternative.

Mitigation costs due to unavoidable habitat impacts were calculated. The USFWS and USACE determined programmatic costs for proposed structural measures based upon visual inspection of habitat types potentially impacted along proposed structural measure alignments, professional judgment, and experience with similar hurricane storm surge risk reduction structural systems, and based on engineering assumptions of right-of-way footprints. Mitigation cost estimate details are described in Appendix A-2.

Benefits were calculated by identification of structural damages within the risk reduction area first floor elevation. Damages were assumed to be reduced to zero as a result of the structural measure resulting in an over estimation of benefits.

Tables 3-8 and 3-9 show the total construction costs, average annual costs, average annual benefits, and BCR, for each measure in the final array. As shown in the tables, the Nonstructural 25-year and 50-year measure were the only measures with a BCR greater than 1.0.The highest net benefits were for the Floodproofing and Elevation of Structures within the the 25-year Floodplain level of risk reduction.

Table 3-8. Economic Analysis of Structural Measures with 0.01 AEP Level Risk Reduction

Structural Measures	Total Costs (in Mil $)	Average Annual Costs (in Mil $)	Average Annual Benefits (in Mil $)	Benefit/Cost Ration	Net Benefits (in Mil $)
Measure 6: Raising Levees West of Berwick Ex -1	$131.79	$4.95	$3.25	0.66	($1.80)
Measure 8 var: Construction of new Ring Levees 1+ 2	$1,311.4	$49.27	$17.79	0.36	($37.58)
Measure 8: Construction of new Ring Levees 2	$738.20	$27.73	$11.75	0.42	($17.07)
Measure 4a: Raising levees surrounding Morgan City (Standard Levee Design)	$81.73	$3.11	$3.00	0.96	($0.15)

3.5.3 Nonstructural Plan Evaluation

Nonstructural measure 11 (a, b, c variations) were evaluated using the 25, 50 and 100 year floodplains within the study area as the aggregation method. Structures were included in the inventory if their FFE fell below the expected 2075, 0.01 AEP floodplain and evaluated for potential damages over the 50 year period of analysis. Benefits and costs were calculated on a floodplain by floodplain basis. Economic justification of each floodplain was determined by a comparison of average annual benefits to average annual costs. The following assumptions were applied when evaluating floodproofing and elevations of structures within the 25, 50, 100 year floodplains:

- Elevation of residential structures to predicted 2075, 0.01 AEP flood elevation (BFE) unless the required elevation is greater than a maximum of 13 feet above ground level*.
- Floodproofing of non-residential and public structures (excluding industrial buildings and warehouses) for flood depths not greater than 3 feet above the adjacent ground.

**- Raising structures greater than 13 feet above ground level introduces damage risk from winds during tropical events as a new condition. This height generally serves as a differentiator for insurance rates for wind/hail coverage as well and is therefore used as the upper limit for elevating structures.*

3.5.4 Economic Analysis of Floodproofing and Elevation Nonstrucutral Measures

The total number of structures inventoried in 2019 (defined by the footprint of the 2075, 0.01 AEP floodplain is approximately 62,000. The number of expected at-risk structures in the 0.01 AEP storm surge floodplain, in the base-year 2025, total approximately 8,875 residential, commercial, and public buildings (but excluding warehouses and industrial buildings). The number of expected at-risk structures in the 0.02 AEP storm surge floodplain, in the base-year 2025, total approximately 15,304 residential, commercial, and public buildings (but excluding warehouses and industrial buildings).

The 25 and 50 year floodplain had a BCR greater than 1.0. Final TSP selection was determined by comparing net benefits. Net benefits were calculated by subtracting the expected annual costs from expected annual benefits. The data extracted from the justified floodplains demonstrates the Federal interest in a 25 year Floodplain nonstructural plan, provides definition of the potential magnitude of the plan, and identified this measure as the TSP for South Central Coast.

The expected annual benefits for the 25 year Floodplain nonstructural plan was estimated at $74.82 million assuming 100% property owner participation, the estimated cost for implementation is approximately $1.41 billion. The corresponding average annual cost is approximately $53.9 million; with net benefits of $20.8 million resulting in a BCR of 1.39. Table 3-8 shows the net benefits for the three nonstructural measures considered.

3.5.5 Economic Analysis of Acquisition and Relocation Measure Evaluation.

The estimate of the cost of acquiring structures was computed once model execution was completed. Acquisition costs are based on the cost of acquiring the parcel of land, the structure(s) built on the land, an architectural survey, and miscellaneous costs associated with the acquisition process. The depreciated replacement value of the structure (excluding any contents) was used to represent the cost of the structure, which was previously described as being sourced from RS Means Square Foot Cost data. The acquisition cost was the cost of performing an architectural survey, which is associated with cultural resources concerns. Finally, the cost of demolition, deed changes, legal fees, and regradding the surface were estimated and included as miscellaneous costs. These miscellaneous costs associated with acquisition were sourced from the 2010 USACE Cedar Rapids, Iowa Feasibility Report. The prices derived from the 2010 report were price indexed to 2019 price levels. Acquisition costs by structure were summed to yield an estimate of total structure acquisition cost.

Relocation. Relocation costs are based on the cost of relocating the occupant, as required per Uniform Relocation Assistance and Real Property Acquisition Act of 1970 (URA), that

has been removed from the acquired parcel. Relocation costs include purchasing a suitably located piece of property commensurate with the acquired parcel and the costs associated with the URA. Costs associated with URA include assisting the occupant with moving costs and incidentals for residential structures and moving costs, searching expenses, and re-establishing costs for non-residential structures. The URA costs amount to $38,000 per residential structure and $50,000 per non-residential structure. Relocation costs by structure were summed to yield an estimate of total structure relocation cost.

The total acquisition and relocation costs were added together and applied on a per structure basis to estimate a cost of acquisition and relocation.

Table 3-9. Economic Analysis of Nonstructural Measureswith 0.01 AEP Level Risk Reduction

Measures	Total Costs (in Mil $)	Average Annual Costs (in Mil $)	Average Annual Benefits (in Mil $)	Benefit/Cost Ratio	Net Benefits (in Mil $)
Measure 11 var. a: Nonstructural at 25 yr Floodplain (elevations and floodproofing)	$1,421.10	$52.63	$74.83	1.42	$22.19
Measure 11 var. b: Nonstructural at 50 yr Floodplain (elevations and floodproofing)	$1916.5	$70.98	$83.89	1.18	$12.91
Measure 11 var. c: Nonstructural at 100 yr Floodplain (elevations and floodproofing)	$3,160.79	$117.07	$94.02	0.80	($23.05)
Measure 16: Acquisitions and Relocations	$3,009.80	$111.48	$103.24	0.93	($8.24)

SECTION 4
Evaluation and Comparison of Alternative Plans

The CEMVN evaluated measures described in Section 3 and screened them based on their ability to meet the project objectives, avoid constraints, and to maximize benefits provided over the 50-year period of analysis from 2025 - 2075. Alternatives were developed with independently justified measures in accordance with ER 1105-2-100 and WRDA 1986. Justification criteria was a BCR of value greater than1.0. Two measures, both nonstructural, met threshold criteria they include:

Alternative 1- Floodproofing or elevation of 3,463 structures located within the 25-year Floodplain to 0.01 AEP future storm surge elevation. Residential structures include 2,629 and nonresidential structures include 834 of the total 3,463.

Alternative 2- Floodproofing or elevation of 5,035 structures located within the 50 year Floodplain to the 0.01 AEP future storm surge elevation. Residential structures include 4,015 and nonresidential structures include 1,020 of the total 5,035.

Risk Reduction- The term 0.01 AP level of risk reduction, refers to a level of reduced risk of hurricane and storm surge wave driven flooding that the project has a 1 percent chance of experiencing each year. The 0.01 AEP chance is based on the combined chances of a storm of a certain size and intensity following a certain track. Different combinations of size, intensity and track could result in a 0.01 probability of a surge event.

4.1 EVALUATION AND COMPARISON USING THE FOUR ACCOUNTS

Plan formulation has been conducted with a focus on achieving the federal objective of water and related land resources project planning, which is to contribute to National Economic Development (NED) consistent with protecting the Nation’s environment, pursuant to national environmental statues, applicable executive orders, and other federal planning requirements. Plan formulation considers all effects, beneficial or adverse, to each of the four evaluation accounts identified in the *1983 Economic and Environmental Principles and Guidelines for Water and Related Land Resource Implementation Studies* (Principles and Guidelines) which are National Economic Development, Environmental Quality, Regional Economic Development, and Other Social Effects.

National Economic Development (NED): The benefits for each alternative plan were evaluated based on damages avoided using HEC-FDA. These benefits were used to compare across the final array of alternatives and select the NED plan. The results of this analysis are shown in Table 4-1. Alternative 1 had an additional $9.73 million worth of net benefits when compared to Alternative 2.

Regional Economic Development (RED): When the economic activity lost in the flooded region can be transferred to another area or region in the national economy, these losses cannot be included in the NED account. However, the impacts on the employment, income, and output of the regional economy are considered part of the RED account. The RED does not influence plan selection, however the results can be useful for the sponsor and local stakeholders. Regional impacts are expected to include and increase in local, state, and national employment statistics as a result of the labor required for project construction. Local and regional sales industries including temporary housing, are expected to increase as a result of temporary laborers coming into the project area for project construction.

Environmental Quality (EQ): A separate EQ analysis was not conducted, as the EQ account did not drive the plan selection for this project. However, the environmental benefits and impacts are discussed in detail as part of the NEPA evaluation in this report. Environmental consequences of alternatives for each key human and natural resource are described in Section 5.

Other Social Effects (OSE): An OSE evaluation was completed on Alternatives 1 and 2 in order to communicate effectiveness of each alternative and ensure that social effects were considered as the alternatives were narrowed. OSE effects are discussed in detail as part of the NEPA evaluation in this report. Environmental consequences of the final alternative for each key human and natural resource are described in Section 5.

Based on economic comparison of action Alternatives 1 and 2, Alternative 2 maximizes annual net benefits and is therefore the NED plan.

Table 4-1. Economic Analysis of Alternatives with 0.01 AEP Level Risk Reduction

Alternatives	Total Costs (in Mil $)	Average Annual Costs (in Mil $)	Average Annual Benefits (in Mil $)	Benefit/Cost Ratio	Net Benefits (in Mil $)
Alternative 1: Nonstructural at 25 year Floodplain (elevations and floodproofing)	$1,421.10	$52.64	$74.83	1.42	$22.19
Alternative 2: Nonstructural at 50 year Floodplain (elevations and floodproofing)	$1916.5	$72.73	$83.89	1.15	$11.16

The EQ analysis described in Section 5 show similar types of environmental impact across action Alternative 1 and 2. Given the change in number of structures across the two areas

the key difference between Alternative 1 and 2 is in residual risk, or risk remaining after complete project implementation.

Based on all the account assessments, the NED Plan is Alternative 1 and the TSP for SCCL.

4.2 EVALUATION AND COMPARISON USING SCCL OBJECTIVES

Action Alternatives 1 and 2 were compared to SCCL objectives, presented and discussed in Section 1 of this report, to validate the selection of the TSP based on net benefit calculations (Table 4-2).

Table 4-2. Alternatives Comparision to SCCL Objectives

SCCL Study Objectives	Alternative 1 Nonstructural- 25 year Floodplain (elevations and floodproofing)	Alternative 2 Nonstructural - 50 year Floodplain (elevations and floodproofing)
Objective 1a. Reduce risk to life safety from hurricanes and storm surge flooding.	Alternative 1 is expected to reduce risk to life safety from storm surge flooding by floodproofing 3,463 structures. Structures include resident homes, buisnesses, critical infrastructure.	Alternative 2 is expected to reduce risk to life safety from storm surge flooding by floodproofing 5,035 structures. Structures include resident homes, buisnesses, critical infrastructure.
Objective 1b. Reduce economic loss/damages, as a result of hurricanes and storm surge flooding to structures (i.e. residential, commercial, agricultural, and industrial) within the study area.	Alternative 1 is expected to reduce risk to life safety from storm surge flooding by prevented an estimated $74 million of annual damages.	Alternative 2 is expected to reduce risk to life safety from storm surge flooding by prevented an estimated $83 million million of annual damages.
Objective 1c. Maintain availability of key evacuation route (Hwy 90) for residence within the study area and city of New Orleans.	Alternative 1 is not directly anticipated to maintain Hwy 90 the key evacuation route. However, through the floodproofing and elevation of critical infrastructure including utilities, parish storage warehouse, police and fire service facilities, Alternative 1 is expected to allow for reduction of hwy closure time following an event. A reduction in closure time will result in less economic losses to the local economy.	Alternative 2 is not directly anticipated to maintain Hwy 90 the key evacuation route. However, through the floodproofing and elevation of critical infrastructure including utilities, parish storage warehouse, police and fire service facilities, Alternative 1 is expected to allow for reduction of hwy closure time following an event. A reduction in closure time will result in

		less economic losses to the local economy.
Objective 2a. Minimize degradation to vulnerable coastal habitat and wetland areas.	Alternative 1 will not degrade coastal habitat and wetlands which provide a natural buffer to storm surge events.	Alternative 2 will not degrade coastal habitat and wetlands which provide a natural buffer to storm surge events.

SECTION 5
Environmental Consequences

5.1 INTRODUCTION

In accordance with the National Environmental Policy Act (NEPA), this section includes the scientific and analytic basis for comparison of the considered alternatives identified in Section 4 – Evaluation and Comparison of Alternative Plans, as well as the No Action Alternative. The discussion includes the environmental impacts of the considered alternatives, any adverse environmental effects which cannot be avoided, the cumulative effects of proposed actions, the relationship between short-term uses and long-term productivity, and any irreversible or irretrievable commitments of resources that would be involved in the proposed actions should one be implemented.

This Section assesses each alternatives's potential environmental impact on those resources identified in Section 2, Affected Environment. The resources described in this Section are those recognized as significant by laws, executive orders (EO), regulations, and other standards of National, state, ore regional agencies and organizations; technical and scientific agencies, groups, or individuals; and the general public.

Definitions Pursuant to NEPA, this Section addresses the impacts in proportion to their significance (40 Code of Federal Regulations [CFR] § 1502[b]). Significance requires consideration of context and intensity (40 CFR § 1508.27). The depth of analysis of the alternatives corresponds to the scope and magnitude of the potential environmental impact. Impacts are considered to be any adverse or beneficial consequences on the human or natural environment caused by the implementation of an action and include any irreversible or irretrievable commitments of resources should the action be implemented.

In addition, impacts on the human and natural environment are direct or indirect. Direct impacts are those caused by the action and occur at the same time and place (40 CFR § 150.8.8(a)). Indirect impacts are those caused by the action and are later in time or further removed in distance, but are still reasonably foreseeable (40 CFR § 1508.8(b)).

The CEMVN uses the terms "adverse" and "significant" in this document to describe potential impacts from the proposed alternatives. These words are defined as:

- Adverse – is a negative impact on the human, natural, and/or physical environment.
- Significant – a substantial, or potentially substantial, adverse change in any of the physical conditions within the area affected by the proposed action, including, land, air, water, minerals, flora, fauna, ambient noise, and/or objects of historic or aesthetic value.

For the purpose of this analysis, the magnitude of impacts are classified as negligible, minor, moderate, or major and defined as:

- Negligible: A resource was not affected or the effects were at or below the level of detection; changes were not of any measurable or perceptible consequence.
- Minor: Effects on a resource were detectable, although the effects were localized, small, and of little consequence to the sustainability of the resource.
- Moderate: Effects on a resource were readily detectable, long-term, localized, and measurable.
- Major: Effects on a resource were obvious, long-term, and had potential consequences on a regional scale.

The duration of the effects in this analysis is defined as follows:

- Short term — when effects last less than one year.
- Long term — effects that last longer than one year.
- No duration — no effect.

Summary of environmental consequences by each alternative. This section describes the environmental consequences associated with implementing the alternatives for the nonstructural hurricane storm surge damage risk reduction NED plan.

The Action Alternatives carried forward, as described in Sections 3 and 4 are nonstructural meeting a positive cost benefit ratio. In Section 4, the CEMVN compares **Alternative 1** 25 year floodplain (the TSP), and **Alternative 2** 50 year floodplain, to **Alternative 3**, the No Acton Alternative.

These alternatives are:

Alternative 1 - Nonstructural Measures within the 25 year floodplain (Alternative 1-25 year Floodplain). Nonstructural measures differ from structural measures since they focus on reducing consequences of flooding instead of focusing on reducing the probability of flooding. Nonstructural measures include elevating (or raising) existing residential structures. This means elevating structures anticipated to have future flood depths of 3 to 13 feet. Additionally, evacuation planning is part of this measure.

At present, there are 3,463 structures within the 25 year floodplain. This includes residential and nonresidential structures. The number of homes actually getting elevated depends on their eligibility and the owners voluntarily electing to raise their home. Therefore, the CEMVN assumes the total number of homes participating in the project would be something lower than 3,463. Nonresidential structure numbers are also anticipated to be less than 100 percent participation.

- Elevation of eligible residential structures. This measure requires lifting the entire structure or the habitable area to the predicted 2075, 0.01 AEP base flood elevation unless the required elevation is greater than a maximum of 13 feet above ground level (structures requiring elevation greater than 13 feet above

ground level would be ineligible to participate due to engineering and risk related factors).

- Dry floodproofing of eligible non-residential structures. Dry floodproofing consists of sealing all areas below the hurricane storm surge risk reduction level of a structure to make it watertight and to ensure that floodwaters cannot get inside by making walls, doors, windows, and other openings resistant to water penetration.

Alternative 2 - Nonstructural Measures within the 50 year floodplain (Alternative 1-50 year Floodplain). The 50 year floodplain includes the 25 year floodplain and expands to a larger area inland. There are 5,035 total structures; 4,015 being residential, and 1,020 nonresidential. The eligibility and nonstructural measures would be the same as the 25 year floodplain alternative, but over a larger area and involve more structures. Likewise, the CEMVN assumed the related environmental impacts would be commensurate to the floodplain's area, resources, land use and human activity.

Alternative 3 - The No Action Alternative. The No Action Alternative, as required by the NEPA, is the baseline to compare the proposed alternatives. Under the No Action Alternative, environmental consequences will still occur because the existing environment is not static. The CEMVN evaluated the difference between the impacts of taking an action and the no-action to establish a benchmark, and enable decision makers to compare the magnitude of the environmental effects of implementing an action alternative.

5.2 STUDY AREA RESOURCES

5.2.1 Water Environment (Hydrology and Hydraulics)

This discussion combines Riverine, Storm Surge, Relative Sea Level Rise, and Floodplain Resources, and includes potential impacts to water stage duration and frequency, and relative sea level rise. Appendix C: Hydraulics, Hydrology, and Climate Preparedness and Resiliency discusses in detail the CEMVN's assumptions for the action alternatives and the No Action Alternative.

Alternative 1 - 25 year Floodplain. The total level of impact would be relatively minor and would be dependent on the combination of nonstructural methods used and the participation rate in the project. Potential direct and indirect impacts to flow and water depend on the method used. For example:

- Raising structures with pilings could increase storage capacity and lower surge elevations for those structures not elevated.
- Localized storm surge risk reduction measures could decrease storage capacity and raise the surge elevations for those nearby structures that would not be elevated.
- Raising structures with a cinderblock chain wall would have similar impacts as existing conditions on storage capacity and surge elevations since it would mimic existing conditions of the structure.

There are no direct or indirect impacts from structure elevation or floodproofing on the natural or regulated floodplains. The nonstructural alternative impact may affect activities and existing structures in the floodplain, but the physical character of the floodplain would not change.

Alternative - 2 50 year Floodplain. The CEMVN anticipates this alternative would have similar impacts to the 25 year alternative, only on a larger scale. There would be minimal impacts to the water stage, duration and relative sea level rise.

Alternative 3 - No Action. The probability and extent of flooding are increasing throughout the floodplains in the study area due to RSLR and changes in precipitation due to climate change. FEMA may change the regulatory floodplains based on changes in flood frequency..

Riverine, storm surge, relative sea level rise, and floodplain resources will be prone to any climate change in temperature. This area's low lying land will be subject to increased flood events, major storms and land loss.

5.2.3 Navigation and Public Infrastructure

This discussion includes potential impacts to:

- Gulf Intracoastal Waterway
- Existing Flood Risk Reduction features (levees, gates, etc.).
- Ports, such as the Port of Iberia and Port of West St. Mary
- Highways, city streets and rural roads (possibly used as evacuation routes)

Alternative 1 - 25 year Floodplain. There would likely be no direct or indirect impacts from structure elevation or floodproofing on existing navigation or flood risk reduction structures.

Alternative 2 - 50 year Floodplain. Impacts would be the same as the 25 year floodplain alternative.

Alternative 3 - No Action. Navigation and public infrastructure features in the study area will continue to provide service throughout the study period. These features will undergo routine maintenance and perhaps major rehabilitation. As the area's population changes, the CEMVN assumes the public infrastructure will change to meet its future demand.

5.2.4 Socio-Economics (The Human Environment)

The CEMVN would implement either nonstructural alternative on an entirely voluntary basis, lessening the potential adverse impacts on the human environment. Please note the **Alternative 3 No Action** description is found at the end the Socioeconomic Section.

5.2.4.1. Population and Housing

Alternative 1 25 year Floodplain. There will be negligible direct impacts to population and housing (number of households) under the nonstructural plan. Indirect impacts may include

temporary housing while a home is being elelvated. Indirect impacts would be short term, with no lasting effects.

Alternative 2 50 year Floodplain. Impacts would be the same as the 25 year floodplain alternative; however, larger in scale because this alternative would cover a larger area and involve more structures.

5.2.4.2. Employment, Business, and Industrial Activity

Alternative 1 - 25 year Floodplain. There would be negligible direct impacts to overall employment, business, and industrial activity associated with the floodproofing of businesses and the construction of localized storm surge risk reduction measures in the nonstructural plan. If and when commercial structures are flood proofed, there may be a temporary impact to businesses as they could potentially either shut down or relocate temporarily while the measure is being applied, leading to a loss of revenue, change in business clients to other more available businesses, as well as a loss of wages to employees. Indirect impacts include additional employment needed to complete any construction. The construction of localized storm surge risk reduction measures around warehouses could temporarily and intermittently impede access to the warehouses during construction and cause drainage issues for adjacent areas and structures.

Alternative 2 - 50 year Floodplain. Impacts would be the same as the 25 year floodplain alternative, however, larger in scale because this alternative would cover a larger area and involve more structures.

5.2.4.3. Public Facilities and Services.

Alternative 1 - 25 year Floodplain. There will be temporary direct impacts associated with floodproofing to public facilities in the area. Potential impacts would be the interruption and temporary unavailability of public services if these facilities are forced to close or are relocated to temporary locations during implementation of the nonstructural risk reduction measures.

The CEMVN anticipates no indirect impacts to public facilities and services.

Alternative 2 - 50 year Floodplain. Impacts would be the same as the 25 year floodplain alternative; however, larger in scale because this alternative would cover a larger area and involve more structures.

5.2.4.4. Transportation

Alternative 1 - 25 year Floodplain. Direct impacts associated with the TSP for transportation would include temporary and intermittent delays, disruption of traffic movement, congestion of roads, and re-routing of vehicles and pedestrians during the construction of the various risk reduction measures. Local parking access to businesses could also be affected by construction vehicles and crews and construction of the localized storm surge risk reduction measures around the warehouses.

Indirect impacts would include the additional wear and tear on roads, especially local roads, caused by large trucks transporting construction materials including borrow material transported for construction of local risk reduction measures at warehouses, as well as reduced parking. There would also be greater noise and dust generated by construction vehicles. However, best construction management practices limit dust emissions and to ensure the safety of construction workers, residents, and employees during construction of the nonstructural measures. There could be minor indirect short term impact to transportation due to construction related activities related to both structural elevations and commercial /warehouse floodproofing measures. These impacts would vary depending on the number and location of structures undergoing improvements at a given time and the timing and duration of the construction-related activities. There would be no long-term impacts to transportation resources.

Alternative 2 - 50 year Floodplain. Impacts would be the same as the 25 year floodplain alternative, however, larger in scale because this alternative would cover a larger area and involve more structures.

5.2.4.5. Airports

Alternative 1 25 year Floodplain. The Harry P. Williams Memorial Airport is the only airport located in the 25 year floodplain. Direct impacts associated with the TSP for this airport and airport operations would include temporary and intermittent delays, disruption of traffic movement, congestion of roads, and re-routing of vehicles and pedestrians during the construction of the various risk reduction measures. Local airport access could also be affected by construction vehicles and crews and construction of the localized storm surge risk reduction measures around the peripheral buildings and accoutrements.

Indirect impacts would include the additional wear and tear on roads, especially local roads, caused by large trucks transporting construction materials including borrow material transported for construction of local risk reduction measures at warehouses, as well as reduced parking. There would also be greater noise and dust generated by construction vehicles. However, best construction management practices limit dust emissions and to ensure the safety of construction workers, residents, and employees during construction of the nonstructural measures. There could be minor indirect short term impact to airports due to construction related activities related to both structural elevations and hanger or other building floodproofing measures. These impacts would vary depending on the number and location of structures undergoing improvements at a given time and the timing and duration of the construction-related activities. There would be no long term impacts to airport resources.

None of the proposed activities would promote additional bird use at or near airports. Therefore, there would be no additional air strike issues with feeding, flying, or loafing wildlife.

Alternative 2 50 year Floodplain. Impacts would be the same as the 25 year floodplain alternative. There are no airports in the 50 year floodplain.

5.2.4.6. Community and Regional Growth (Income)

Alternative 1 - 25 year Floodplain. Direct impacts would include a temporary monetary stimulus to the region due to spending associated with the construction activities in the area. This stimulus would be an increase the region's income for as long as the spending continued. For the study area as a whole, temporary relocations would likely take place within the overall study area during implementation of the nonstructural measures, resulting in little if any change.

Indirect impacts would include reduced risk of hurricane storm surge-related damages for those low-lying structures located in the 25 year floodplain thus reducing overall social vulnerability and preserving growth opportunities for communities in the region and enhancing the potential for long-term growth and sustainability.

Alternative 2 - 50 year Floodplain. Impacts would be the same as the 25 year floodplain alternative, however, larger in scale because this alternative would cover a larger area and involve more structures.

5.2.4.7. Tax Revenue and Property Values

Alternative 1 - 25 year Floodplain. Parish sales tax revenue would likely increase during the implementation of nonstructural measures. Construction activities associated with the TSP would provide jobs and could increase the level of spending, labor, and capital expenditures in the area. Property values should trend upward based on the reduction of flood damge and less dependancey on flood insurance. The CEMVN does not anticipate any indirect impacts to tax revenue or property values.

Alternative 2 - 50 year Floodplain Alternative. Impacts would be the same as the 25 year floodplain alternative, however, larger in scale because this alternative would cover a larger area and involve more structures.

5.2.4.8. Community Cohesion

Alternative 1 - 25 year Floodplain. Direct impacts would disrupt community cohesion, temporarily, include the noise and construction activity dust, the temporary displacement and relocation of residents during construction, and disruption of businesses during construction. Furthermore, non-residential structures serving as meeting places for the community could become temporarily unavailable during project implementation.

Indirect impacts for the nonstructural plan would include reduced risk of hurricane storm surge-related damages for lower-lying structures within communities, thus preserving community cohesion in the region. Other indirect impacts include improvements to pedestrian and handicap access not only to homes, but also to community facilities benefiting from nonstructural measures.

Alternative 2 - 50 year Floodplain. Impacts would be the same as the 25 year floodplain alternative, however, larger in scale because this alternative would cover a larger area and involve more structures.

5.2.4.9. Recreation Resources.

Alternative 1- 25 year Floodplain. The nonstructural features would have no impact to recreational resources depending on the methods used. A direct impact from floodproofing park buildings would be that recreational use would be temporarily unavailable during floodproofing work. An indirect impact of elevating structures would be that on building costs of future recreational camps could result in fewer camps being constructed.

Alternative 2 - 50 year Floodplain. Impacts would be the same as the 25 year floodplain alternative, however, larger in scale because this alternative would cover a larger area and involve more structures.

5.2.4.10. Other Social Effects (OSE)

Alternative 1 - 25 year Floodplain. A summary of OSE is presented in Table 5-1. These include reduction in risks associated with damages from hurricane storm surge events to housing units, public facilities, and commercial structures located within areas where the TSP is implemented, as well as improvement in the health and safety of those residents living within these and surrounding areas. Depending on participation rates, the overall social vulnerability of all three parishes could be reduced, and thus, the potential for long-term growth and sustainability could be enhanced. These areas could be at a reduced risk of incurring costs associated with clean-up, debris removal, and building and infrastructure repair associated with damage from a hurricane storm surge event.

Table 5-1. Other Social Effects Evaluation

Social Factors and Metrics	Nonstructural Measures	No Action
	DL / FE	DL / FE
Physical Health/Safety	1/2	-1/-2
Regional Healthcare	1/2	0/-2
Employment Opportunities	1/3	-1/-3
Community Cohesion	1/2	-1/-1
Vulnerable Groups	1/1	-1/-2
Residents of Study Area	1/1	-1/-2
Recreational Activities	1/2	-1/-2

Impacts are in comparison to the Without Project Condition
DL = impacts to daily life when there is no storm/flooding
FE = impacts during a storm/flood event

Scores range from -3 (significant negative impact) to +3 (significant positive impact)

Under the TSP measures, tenants would be eligible for certain temporary relocation assistance benefits. While structure owners would not be responsible for eligible costs associated with the nonstructural measures, (see Appendix D for a description of eligible costs), they would be responsible for ineligible costs associated with the structure elevation, including temporary relocation costs and any costs for moving out of the eligible structure during construction of the nonstructural measure. (See Section 6 and Appendix D for more information about the benefits of and the eligible and ineligible costs associated with the TSP.) The ability of lower income groups to participate in the project could be impacted by these out of pocket expenses including the costs associated with temporary relocation during structure elevation, and any additional costs that would be required in order to meet the Project eligibility criteria, (i.e., costs associated with any necessary structural repair or asbestos abatement). This could potentially offset, to some degree, the reduction in overall social vulnerability at least in lower income communities.

Alternative 2 - 50 year Floodplain. Impacts would be the same as the 25 year floodplain alternative, however, larger in scale because this alternative would cover a larger area and involve more structures.

Alterntive 3 - No Action The CEMVN assumed the socio economic indicators would remain stable over the study period. Population trends will shift to a more urban setting and occupations would have similar shifts from agriculture to urban jobs. Recreation will remain an important resource and should remain stable in opportunities and participation.

5.2.5 Environmental Justice

Alternative 1 - 25 year Floodplain The voluntary nonstructural plan for SCCLA may directly impact EJ communities but these impacts are not disproportionately high and adverse. All structures within the 25-year flood zone are located in economically justified reaches and would be voluntarily flood-proofed or elevated; therefore, all residents within the reaches, irrespective of race, ethnicity, or income, would be able to choose to participate in the plan. These nonstructural measures may provide this sparsely populated area of minority and low-income populations with hurricane and storm damage, risk reduction equivalent to structural measures, which are not economically justifiable due to the sparse populations scattered over a large area. Despite existing base floor elevations differing among individual structures, structure-raising would provide the same level of risk reduction benefits per structure at year 2075 (end of the period of analysis). Homeowners would be responsible for costs associated with repairs to ensure a structurally-sound home prior to elevation and would be responsible for temporary relocation costs during elevation. All other eligible costs of elevating structures, including the cost to elevate the structure, would not be borne by any single individual or the community; rather, these costs would be part of the proposed project costs.

Indirect impacts include a decrease in risk of damage from 1 percent, 2 percent and 4 percent annual exceedance storm event for minority and/or low-income populations in the study area. Population groups residing or working near elevation sites may experience indirect impacts due to the added traffic congestion and construction noise and dust. Trucks will transport equipment needed to elevate structures, which may increase traffic congestion in the area during construction activities. The environmental indicator (see table in Appendix A-3), “Traffic Proximity and Volume”, shows the area to be at the 28th percentile in the State which does not indicate an existing environmental risk or existing traffic congestion problems. Any additional traffic congestion caused by construction activities should not result in elevating the percentile to above the 80th percentile, which is representative of very poor traffic conditions. Truck traffic and noise along roads, highways and streets during project construction would cease following completion of construction activities. There may also be a degradation of the transportation infrastructure, primarily local roads and highways, as a result of the wear and tear from transporting construction materials. Best management practices will be utilized to avoid, reduce, and contain temporary impacts to human health and safety.

Homeowners choosing to have their home elevated will be required to relocate to other housing until their home is ready for occupancy. The indirect impact of having to find alternative housing will be temporary, but nonetheless a disruption to their current living arrangement.

Positive cumulative impacts from the nonstructural plan includes reduced risk of hurricane storm surge-related damages to minority and/or low-income populations. If this alternative encourages regional economic growth, any additional jobs created may benefit minority and/or low-income groups living within the study area. For those living in structures in the 25 year floodplain that choose not to elevate, flood risk from future storm events, 25 year and greater, will continue.

Alternative 2 - 50 year Floodplain. Impacts would be the same as the 25 year floodplain alternative, but would involve a larger population and more structures.

Alternative 3 - No Action. The No Action Alternative would not provide coastal storm damage risk reduction or reduce storm surge flooding. There would be no direct impacts on minority and/or low-income populations under this alternative. Indirect impacts under the No Action Alterative include a higher potential for temporary displacement of minority and/or low-income populations because residents within the study area would remain vulnerable to flooding and may be forced to relocate to areas with risk reduction features in place. Storm surge increase due to subsidence and sea level rise will exacerbate their vulnerability to flooding. Low-income populations may also find it more difficult to bear the cost of evacuation. This alternative would not contribute to any additional EJ issues when combined with other Federal, state, local, and private risk reduction efforts.

5.2.6 Cultural and Historic Resources and Tribal Trust Resources

Alternative 1 - 25 year Floodplain.

A review of this alternative indicates the proposed action includes the introduction of new visual elements and/or modifications to built-environment resources (i.e., elevation, floodproofing, or demolition) that may directly affect known and undocumented above-ground historic properties (e.g., standing structures and historic districts; see: Section 2.8.6.1) in a manner that may diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association and ground disturbing activities (e.g., access, staging, foundation work, utility relocations and hardening, demolition) within the project footprint that may directly affect known and undocumented archeological resources in a manner that may diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association. The USACE would fulfill its Section 106 procedures, described in Table 6-1 (Environmental Compliance Status) if the proposed action is carried forward byto developing a Programmatic Agreement (PA) in consultation with the NFS, LA SHPO, Advisory Council on Historic Preservation (ACHP), federally-recognized Tribes, and other interested parties, that outlines the steps needed to identify and evaluate cultural resources and make determinations of effects. This PA would be signed and in force prior to the Corps signing the project's Record of Decision. If direct adverse effects to cultural resources are identified and cannot be avoided or minimized, such impacts would be mitigated through the procedures outlined in the PA. The PA would then govern the CEMVN's subsequent NHPA compliance efforts and any additional conditions or requirements will be documented at that time.

The indirect effects to cultural resources within the immediate surrounding viewshed and 25 Year floodplain would be similar to the direct impacts described above for the proposed action but on a larger scale.

Alternative 2 - 50 year Floodplain. The direct, indirect, and cumulative impacts to cultural resources for the considered action would be proportionally similar to the impacts specified for *Alternative 1-25 year Floodplain* described above.

Cultural Resources Cumulative Impacts Cumulative impacts to cultural resources would be the additive combination of impacts by this and other federal, state, local, and private, hurricane storm surge damage risk reduction and other structural and nonstructural projects existing and/or authorized for construction along the coast including South West Coastal Louisiana, Morganza to the Gulf of Mexico, Larose to Golden Meadow, and others (see: Table 1-1). Activities associated with these projects have the potential to directly and/or indirectly effect existing and previously undocumented cultural resources within the project footprints, surrounding viewsheds, and communities they occur in. Potential negative cumulative effects may include direct damage to, or destruction of, built-environment and archaeological resources significant at the state, local, and national level and/or of significance to Tribes. Furthermore, in consideration of potential effects to built-environment resources, the CEMVN acknowledges that non-structural elevation and/or flood-proofing

measures may result in modifications to historic buildings or other built-environment resources potentially not meeting the Secretary of the Interior's Standards. However, the overarching goal of this effort is to reduce risk from future flood events through elevation and flood-proofing, and to preserve the physical integrity and character of historic buildings. Therefore, the proposed action may also have positive cumulative effects towards preserving unique architectural and design characteristics that many of Louisiana's historic communities strive to maintain and enhance. As is applicable, one significant cumulative positive outcome that could come out of this effort would be to limit the total height of elevation for historic buildings and maintain character defining features when applying floodproofing measures so these structures retain their historic character in relation to other historic buildings within a historic district, thus; protecting the architectural qualities of historic districts as a whole. Otherwise, damage to, or loss of, cultural resources within the present study area in conjunction with other large-scale flood risk and coastal storm surge risk reduction projects in the region could lead to the loss of connection to place causing a net loss of cultural diversity within southern coastal Louisiana. If direct, indirect, and/or cumulative adverse effects to cultural resources are identified and cannot be avoided or minimized, such impacts would be mitigated through the programmatic approach outlined in *Alternative 1-25 year Floodplain* described above. The PA would then govern the CEMVN's subsequent NHPA compliance efforts and any additional conditions or requirements will be documented at that time.

Impacts to cultural and historic resources in southern Louisiana have resulted from both natural processes, (e.g., erosion) and human activities (e.g., land development, dredging, agriculture, and vandalism). Coastal environments are dynamic, and impacts to cultural and historic resources in the area would continue at current trend because of both natural processes including anthropogenic modifications of the landscape as well as human alterations.

Alternative 3 - No Action. Impacts to cultural and historic resources in southern Louisiana have resulted from both natural processes, (e.g., erosion) and human activities (e.g., land development, dredging, agriculture, and vandalism). Coastal environments are dynamic, and impacts to cultural and historic resources in the area would continue at current trend because of both natural processes including anthropogenic modifications of the landscape as well as human alterations.

5.2.7 Land Use

Alternative 1 - 25 year Floodplain. The SCCL study area consists of a mixture of private and public lands. The proposed TSP measures would not significantly impact current land use patterns. Natural, agriculture, and urban land uses should continue to evolve over the life of the project in a stable setting with reduced storm surge impacts. The CEMVN did not identify any indirect impacts to land use planning efforts.

The nonstructural alternatives would not impair the implementation of any land use plans currently in place. See Section 6.8 for additional information.

Alternative 2 - 50 year Floodplain. Impacts would be the same as the 25 year floodplain alternative.

Alternative 3 - No Action. The study area should continue to be rural and predominately agricultural land use; however, urbanization and non-permeable surfaces should continue to expand at their current rate. This should continue with or without project. This may increase flash flooding and increased run-off. Local CSRM measures may result from the urban growth. Land under current parish, state, and Federal management should continue as public lands. These lands' missions are expected to remain as CSRM, fish and wildlife management, and recreation.

The study area communities will continually follow and update their planning documents in accordance with policy changes, land use trends, public opinion, and coordinated land use and emergency operating procedures.

5.2.8 Aesthetics and Visual Resources

Alternative 1 - 25 year Floodplain. The TSP would have minimal impacts on visual resources. Elevating homes would not impact view sheds into any surrounding areas. In areas where there is public access from a street or roadway, these nonstructural elements would not change the view shed. Houses being raised are currently present, their elevation would change, but the site is still occupied either way. There may be some new visual limitations for residents living near elevated structures. These impacts should be minor since homes in a neighborhood may all be eleveated commensurate with local flood conditions.

Alternative 2 - 50 year Floodplain. Impacts would be the same as the 25 year floodplain alternative, however, larger in scale because this alternative would cover a larger area and involve more structures.

Alternative 3 - No Action. Visual resources would continue to evolve from existing conditions because of both land use trends and natural processes over the course of time. The loss/conversion of swamps into marsh/open-water areas would continue, as would the accretion of land at the mouth of the Atchafalaya River and Wax Lake Outlet. The pleasing landscape would remain ephemeral, and visual resources would continue to be rich with biodiversity.

5.2.9 Water Quality and Salinity

Alternative 1 - 25 year Floodplain Indirect impacts would include the continuation of existing water quality trends as described in Section 2. The TSP would reduce the risk of damages resulting from flooding of structures within the study area, with drainage of floodwaters containing elevated nutrients, metals, and organics into water bodies connected to the Atchafalaya River and Bayou Teche basins. Into the future the area would be affected by existing and proposed, development (in particular, oil and gas development, agriculture, and climate patterns (Mousavi et al., 2011).

Direct impacts of the nonstructural alternative would stem from construction for raising of structures.

Construction impacts to runoff would be minimized through implementation of a Stormwater Pollution Prevention Plan (SWPPP) (USEPA 2012). Any structure modification would adhere to applicable regulations pertaining to surface water quality, such as Louisiana Permitted Discharge Elimination System (LPDES) permitting. Structures not either raised or demolished/removed face the risk of flooding and are capable of releasing constituents associated with structure and housed materials; for a local example of water quality impacts of flooded structures please (Skrobialowski et al. 2007).

Alternative 2 - 50 year Floodplain. Impacts would be the same as the 25 year floodplain alternative, however, larger in scale because this alternative would cover a larger area and involve more structures.

Alternative 3 - No Action. Water quality trends would continue in a similar fashion as the current conditions. Without implementing an action alternative there would be an increased risk of damages resulting from flooding of structures within the study area, with drainage of floodwaters containing elevated salinity, nutrients, metals, and organics into water bodies connected to the Bayou Teche and Atchafalaya River Basins. In the future, existing and proposed restoration measures, natural geomorphologic processes, development and agriculture), and climate patterns may exacerbate salinity level increases in the study area. (Mousavi, et al., 2011).

5.2.10 Aquatic Resources

Alternative 1 - 25 year Floodplain. The CEMVN would implement the TSP in developed/disturbed areas. This alternative would not impact any aquatic resources or wetlands in the study area. The TSP would not impact any Louisiana Natural Heritage Program designated rare, unique, and imperiled communities. The with project conditions would be the continuation of existing conditions with coastal shoreline recession, and subsidence and land loss continuing at similar or increasing rates of change.

Because the proposed project is not located in wetlands nor would it disturb wetlands, the proposed project would not introduce or promote the spread of any aquatic invasive plant species.

Alternative 2 - 50 year Floodplain. Impacts would be the same as the 25 year floodplain alternative.

Alternative 3 - No Action. The FWOP conditions would be the continuation of existing conditions with coastal shoreline recession, and subsidence and land loss continuing at similar or increasing rates of change. The loss of these coastal shorelines would adversely affect the extraordinary scenic, scientific, recreational, natural, historical, archeological, cultural, and economic importance of the coastal shorelines. The continued loss of coastal shorelines would result in the reduction and eventual loss of the natural protective storm buffering. Without the protective buffer provided by the coastal shorelines, interior estuarine

wetlands would be at an increased risk to severe damage from hurricane storm events. Figure 2-6 . Illustrates the land area changes in coastal Louisiana that have occurred.

Without, large-scale restoration efforts, coastal land loss crisis will only worsen. Strategic prioritization and efficient implementation of projects may prevent Louisiana from losing an additional 2,250 square miles of land over the next 50 years.

The lack of sediment input in the areas outside of the Atchafalaya Basin, among other factors, will continue to lead to disintegration of the productive and protective wetlands, leaving coastal communities, industry and vital infrastructure increasingly vulnerable to storms.

The continued loss of coastal shorelines would result in the reduction and eventual loss of the natural protective storm buffering. Without the protective buffer provided by the coastal shorelines, interior estuarine wetlands would be at an increased risk to severe damage from hurricane storm events.

The Coastal Protection and Restoration Authority (CPRAB) has plans to construct the Atchafalaya River the Atchafalaya River Sediment Diversion. This project would provide basin-wide benefits to marshes in southwest Terrebonne Parish. Sediment and fresh water diverted into the marshes would help build land and sustain other nearby projects planned for construction, like Mauvais Bois Ridge Restoration. This project will have the greatest benefits to freshwater habitats, such as forested areas, flotant and fresh and intermediate marsh, which are threatened by saltwater intrusion and sediment starvation (*Restore the Mississippi River Delta*, 2018).

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 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 deeper water and precluding marsh regeneration. Significant accretion of sediments is then required in order for marsh habitat to reestablish. Table 2-10 shows the predicted loss of marsh through 2050.

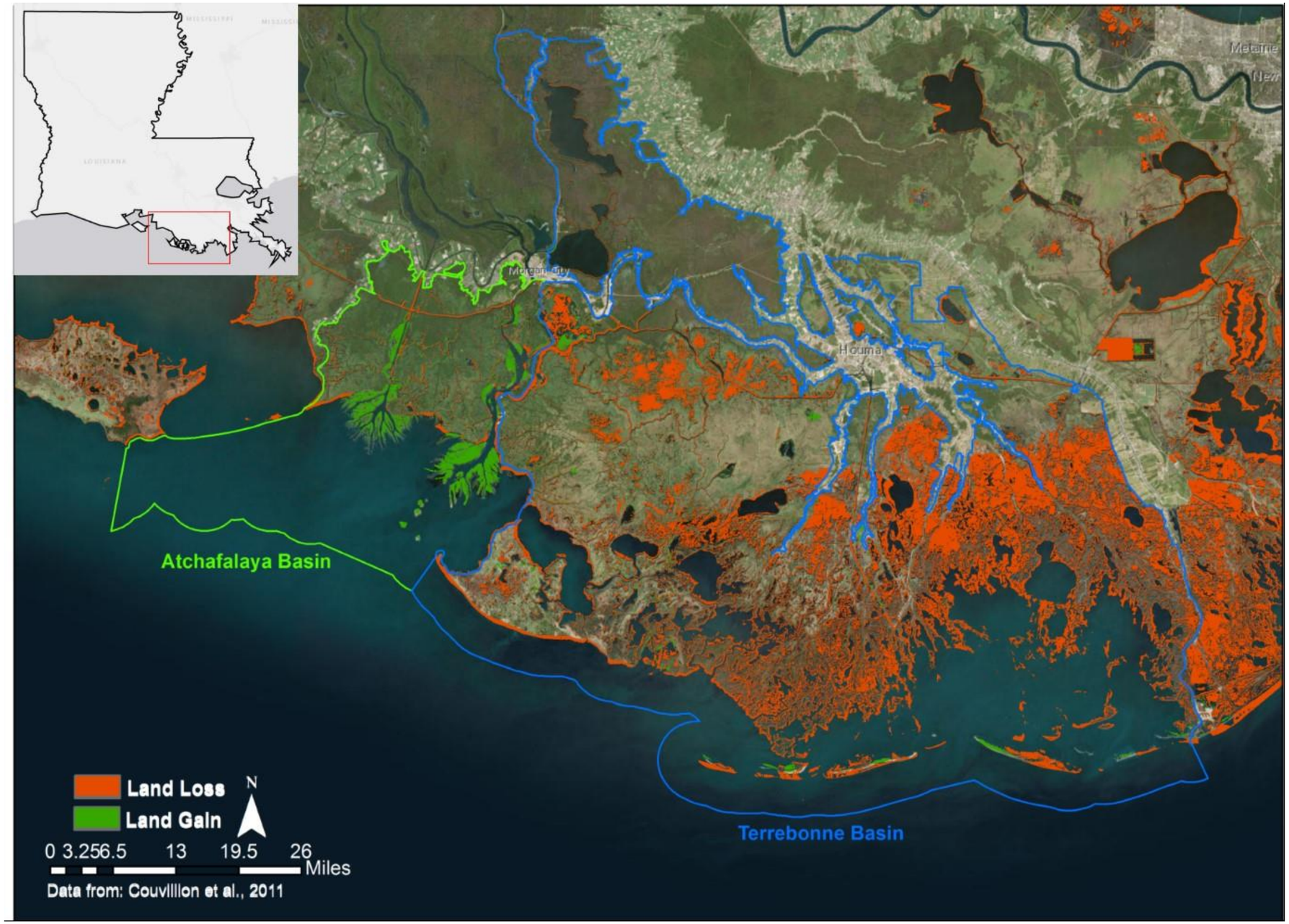


Figure 2-6 . Land Area Change in Coastal Louisiana (Photo courtesy of USGS)

Coastal Zone Federal Consistency

Alternative 1 - 25 year Floodplain. The CEMVN determined the proposed project would not have an effect on any coastal use or resource. This means any reasonably foreseeable effect on any coastal use or resource resulting from this action. This also includes effects on coastal uses. Effects include both direct effects resulting from the activity and occur at the same time and place as the activity, and indirect (cumulative and secondary) effects resulting from the activity and are later in time or farther removed in distance, but are still reasonably foreseeable (indirect effects).

In a letter dated October 1, 2019 the CEMVN submitted an initial Coastal Zone Consistency Determination (per 15 C.F.R. § 930.35) to the Louisiana Department of Natural Resources. Prior to the USACE signing the Record of Decision, the CEMVN would continue coordination with the LDNR concerning coastal resource protection if the LDNR disagrees with this Determination. In a letter dated October 23, 2019, the Louisiana Department of Wildlife and Fisheries (LDWF) provided preliminary comments (Appendix A-8). The CEMVN intends to implement all the LDWF recommended wildlife monitoring and avoidance measures if this alternative is implemented.

Alternative 2 - 50 year Floodplain. Impacts would be the same as proportionally similar to 25 year floodplain alternative, and as such, would not be expected to have an effect on any coastal use or resource.

Alternative 3 - No Action. The current coastal zone boundary in the study area should remain the same as the current condition throughout the study period.

Vegetation and Estuary Resources

Alternative 1 - 25 year Floodplain Since the nonstructural measures in this alternative would not take place in any aquatic habitat, vegetation and estuary resources should not be impacted.

Alternative 2 - 50 year Floodplain. Impacts would be the same as the 25 year floodplain alternative.

Alternative 3 - No Action. The current wetland gain/loss trends as well as a change in wetland composition would continue within vegetation zones in the study area. Both human-induced impacts and natural processes would contribute to the continued loss of vegetated habitats, including continued shoreline erosion and subsidence, increased saltwater intrusion, increased water velocities, and increased herbivory (Reed and Wilson, 2004). Relative sea level rise, land subsidence, development, and climate change may negatively impact all vegetation habitats over the study period. These factors may reduce the land coverage of native species, and alter the species community. The CEMVN expects the land loss trend to continue over time resulting in the loss of these valuable vegetative communities. For example, without action, saltwater intrusion and drainage problems would continue, resulting in the conversion of freshwater marsh to intermediate and brackish marsh

and eventual open water. These conditions will deteriorate the habitat diversity by reducing species (plant and animal) abundance and overall quantity of habitat. Invasive species abundance and diversity should increase throughout the study period.

Net marsh loss by 2050 is expected to be 97,505 acres (Louisiana Coastal Wetlands Conservation and Restoration Task Force and the Wetlands Conservation and Restoration Authority, 1999).

Wetland losses are predicted to result in:

- Some unknown extent of existing riverine bottomland hardwood (BLH) and associated swamp habitats would be converted to more efficient water conveyance channels as human populations and development increase.
- Some unknown extent of existing pasture and rangelands would be converted to rural, suburban and urban human habitats, generally in the order presented, as human populations and development increase.

Habitat switching would occur due to increasing sea level rise, subsidence, shoreline erosion and other land loss drivers.

Invasive species will continue to proliferate. New species will become problematic in the future. This will add additional pressures to native animals and natural ecosystems. Invasive species management would likely continue to use money that could be used for managing natural systems.

5.2.11 Fish and Wildlife Resources

Aquatic and Fisheries Resources

Alternative 1 - 25 year Floodplain. Because the nonstructural measures in this alternative would not take place in any aquatic habitat, the TSP would have no direct, indirect, or cumulative impacts to aquatic and fisheries resources.

Alternative 2 - 50 year Floodplain. Impacts would be the same as the 25 year floodplain alternative.

Alternative 3 - No Action. Existing conditions and associated changes due to ecosystem drivers, would persist into the future. Increases in RSLR would increase saltwater intrusion and exacerbate ongoing conversion of estuarine wetlands to shallow open water and loss of existing estuarine fish habitats. Increases in RSLR could exacerbate ongoing conversion of existing aquatic organism distributions from an estuarine-dependent to more marine-dependent distribution. As habitat loss continues, there would be a corresponding reduction in overall species diversity and abundance as well as loss of estuarine nursery, foraging, refugia, and other estuarine aquatic habitats. Subject to the above-described limitations of the Coastal Wetlands Planning, Protection and Restoration Act (CWPPRA) and LCA programs, aquatic and fisheries would benefit from restoration activities implemented by

other programs such as CIAP, CWPPRA, beneficial use of dredged material; however, these activities are not enough to keep up with the current trends in habitat loss and RSLR.

Essential Fish Habitat (EFH)

Alternative 1 - 25 year Floodplain. Since the nonstructural measures in this alternative would not take place in any aquatic habitat classified as EFH, the TSP would have no direct, indirect, or cumulative impacts to EFH from implementation of this action.

Alternative 2 - 50 year Floodplain. Impacts would be the same as the 25 year floodplain alternative.

Alternative 3- No Action. Existing trends and continued shoreline erosion, subsidence, and land loss, would continue to convert existing estuarine EFH to marine and open water EFH types resulting in the loss of existing estuarine EFH but an increase in the open water and marine EFH.

5.1.12 Wildlife Resources

Alternative 1 - 25 year Floodplain. The TSP would have no direct significant impacts on most wildlife resources except for human commensal wildlife (e.g., rats, mice, pigeons, etc.) that thrive in association with human habitations typically disrupting the natural habitats..

Depending on final designs of the TSP, there could be a potential for minimal indirect impacts to colonial nesting water birds if there are residential or nonresidential structures near a colony of nesting birds. These impacts could include the temporary displacement of any birds that may be present due to construction activity and noise. The CEMVN assumes the birds would relocate to adjacent foraging/roosting grounds. Nesting birds would not be impacted as no work would take place within a rookery. In accordance with the LDWF, the CEMVN would follow survey, monitoring and avoidance measures outlined in their letter, dated October 23, 2019 (Appendix A-8).

There would likely be no impacts to the bald eagle as no known nests are located near any project features. If an eagle's nest is found within the study area, the CEMVN would coordinate any potential disturbance activates with the US Fish and Wildlife Service.

Alternative 2 - 50 year Floodplain. Impacts and the CEMVN's avoidance measures would be the same as the 25 year floodplain alternative, however, larger in scale because this alternative would cover a larger area and involve more structures.

Alternative 3 - No Action. Existing conditions and changes caused by ecosystem drivers would persist. The RSLR, human encroachment and development, and other factors would result in loss of existing wildlife estuarine, riverine, and bottomland hardwood forest habitats. Increases in RSLR would increase saltwater intrusion and exacerbate ongoing conversion of estuarine wetlands to shallow open water. As habitat loss continues, migratory Neotropical avian species would have less suitable stopover habitat forcing them to fly further to suitable habitat. Flying longer distances to find suitable stopover habitat could result in an increase in

mortality resulting in a corresponding reduction in overall species diversity and abundance. Most mammalian, amphibian, and reptilian species would migrate to habitats that are more suitable. Wildlife would benefit from restoration activities implemented by other programs such as CIAP, CWPPRA, LCA and the beneficial use of dredged material; however, these activities are not enough to keep up with the current trends in habitat loss and RSLR.

5.2.13 Threatened/Endangered Species and Other Protected Species of Concern

Alternative 1 - 25 year Floodplain. Nonstructural measures would have No Effect on any listed species or critical habitat. In letters dated, September 30, 2019, the CEMVN coordinated this determination with the US Fish and Wildlife Service and National Marine Fisheries Service (Appendix A-5, & Appendix A-6).

The CEMVN would implement recommendations from USFWS and the National Marine Fisheries Service (NMFS) and utilize the best available practical techniques and BMPs during construction to avoid, minimize, and reduce potential adverse impacts to threatened and endangered species. This is in accordance with the Bald and Golden Eagle Protection Act (BGEPA), and MBTA,

Alternative 2 - 50 year Floodplain. The CEMVN's avoidance measures would be the same as the 25 year floodplain alternative.

Alternative 3 - No Action. With or with out the proposed project, land loss would directly reduce the availability of habitat for threatened and endangered species. Piping plover would lose access to some forage and roosting habitat as it shifts to shallow open water. As interior marshes are lost, shoreline retreat rates increase. Coastal habitat, utilized by sea turtles, shoreline retreat rate will continue. The continued erosion of the Gulf coast shoreline would result in additional salt water intrusion into the interior wetlands area resulting in additional marsh loss. Conversely, the recently delisted brown pelicans would gain access to more shallow water foraging areas, resulting from the shoreline retreat. Indirect effects would be the continued reduction of piping plover critical wintering habitat due to coastal erosion.

Without action, there would be the continued degradation and loss of emergent wetland habitats used by many different fish and wildlife species for shelter, nesting, feeding, roosting, cover, nursery, and other life requirements. The loss and deterioration of transitional wetland habitats over time could continue to indirectly affect, to an undetermined degree, all listed species that may potentially utilize the area including: Gulf sturgeon, piping plovers, red knots, green sea turtles, Kemp's Ridley sea turtles, loggerhead sea turtles, hawksbill sea turtles, leatherback sea turtles, and the West Indian manatee. If habitat loss goes unabated, the recovery of some sensitive/delisted species such as brown pelican, bald eagle, and colonial nesting birds could be indirectly impacted.

5.2.14 Air Quality

Alternative 1 - 25 year Floodplain. No aspect of the proposed project, neither short-term nor long-term, has been identified resulting in violations to air quality standards. The environment would not be exposed to contaminants/pollutants in such quantities and

duration injurious to human, plant, or animal life, or property, or which unreasonably interferes with the comfortable enjoyment of life, or property, or the conduct of business. Fugutive dust levels may increase at construction sites, but should be short term in nature.

Alternative 2 - 50 year Floodplain. The CEMVN's avoidance measures would be the same as the 25 year floodplain alternative.

Alternative 3 - No Action. The study area would continue to be subject to air pollutants from mobile sources including vehicles traveling on city roads near and immediately adjacent to the existing levee systems. The CEMVN does not anticipate there Due to dissipation by wind, pollutants from these sources do not attain high enough concentrations to warrant measurement or to result in degradation to sensitive resources.

5.2.15 Noise

Alternative 1 - 25 year Floodplain. Overall, heavy machinery would generate an increase in noise levels throughout the project areas during construction hours and temporarily disturb residents and businesses. Noise levels would return to their current state after construction. The project would not likely to incease noise levels in the study area.

Once the project is completed, noise levels would return to existing conditions and no significant long-term noise impacts are anticipated.

Alternative 2 - 50 year Floodplain. The CEMVN's avoidance measures would be the same as the 25 year floodplain alternative.

Alternative 3 - No Action. Future ambient noise levels within the study area would continue to be influenced by land uses including industrial, commercial, residential and agricultural areas. Noise sources include primarily vehicular traffic trains, and large transport vehicles travelling in the project area. Secondary noise sources include industrial activities and construction. and along county and township roads. Noise levels would not increase during the study period.

5.2.16 Hazardous, Toxic, and Radioactive Waste

Alternative 1 - 25 year Floodplain. The CEMVN would conduct Phase 1 HTRW assessments on a case-by-case basis depending on each property subject to modification and acceptance into the project. Compliance with this Act would be achieved prior to land certification (free of any HTRW). If any items regulated under these laws were discovered, the CEMVN and the non-Federal sponsor would comply with applicable requirements. At this time, the CEMVN does not expect any impacts arising from any HTRW issues with this project.

For each residential structure, the CEMVN would conduct an ASTM Phase I HTRW/Asbestos investigation (and if warranted, may be accompanied by additional HTRW investigations), inspections, surveys, and boundary monumentations. The land and the structure must be certified as "clean" by the appropriate State office before any Project funds

may be expended. All asbestos must be abated and disposed of properly. Asbestos impacted by floodproofing would be removed at Project cost, while HTRW impacted by floodproofing must be remediated by the property owner prior to the initiation of the floodproofing work.

The CEMVN's preliminary HTRW records review indicated the majority of the study area is either clean, or remediated and closed. Based on the Phase I environmental site assessment, the proposed activities would likely result in the "capping" of any potentially impacted areas through the placement of overlying materials that may include sand, sediment, rocks, and placement of reinforced structures. The CEMVN would utilize the best available practical techniques and BMPs during construction to avoid and minimize potential adverse impacts or discharges of pathogens or toxic substances into coastal waters.

Alternative 2 - 50 year Floodplain. Impacts would be the same as the 25 year floodplain alternative, however, larger in scale because this alternative would cover a larger area and involve more structures.

Alternative 3 - No Action. There is no anticipated change to HTRW risks over the study period.

5.2.17 Soils

This discussion includes potential impacts to:

- Sedimentation and Erosion
- Prime and Unique Farmlands

Alternative 1 25 year Floodplain. The TSP would have no direct impacts on soils, prime and unique farmlands, or water bottoms.

Alternative 2 50 year Floodplain. Impacts would be the same as the 25 year floodplain alternative, however, larger in scale because this alternative would cover a larger area and involve more structures.

Alternative 3 No Action. The FWOP conditions would include persistence of current sedimentation and erosion patterns. Existing hydrologic alterations would continue to affect water levels and salinities and continue influencing land loss at similar or increased rates. The RSLR would expose additional shoreline areas to erosive forces into the near future. Couvillion et al. (2011) predict coastal Louisiana is potentially at risk of losing between 2,118 and 4,677 km^2 of land over the next 50 years. This would be a potential loss of between 14.6 percent and 32.3 percent of the remaining coastal wetlands in the state over the next 50 years (exclude Atchafalaya Basin). The uncertainty range for wetland change projections represents anywhere from a 32.2 percent reduction to a 49.6 percent increase in the average wetland loss rates experienced from 1932–2010 (Couvillion et al., 2011). These results suggest that a net wetland loss in coastal Louisiana over the next 50 years would likely occur regardless of uncertainties in parameters that influence coastal wetland loss.

The FWOP conditions would be the continuation of existing conditions with coastal shoreline recession, subsidence and land loss continuing at similar or increasing rates of change with concomitant increase in shallow open waterbottoms. As RSLR increases and areas become inundated by salt water, prime farmlands could be lost. As human populations and development increase, prime farmlands could be converted to suburban, urban, and industrial uses and areas available for agricultural use would decrease. Gulf shoreline recession rates, varying between +8 feet to -52.9 feet per year, would result in Gulf shoreline rollover onto interior marshes, and change in land use patterns from forested areas to agriculture and grazing pasture. Soils identified as prime farmlands would also be susceptible to flooding events and subsidence and could be lost as RSLR increases.

5.2.18 Sustainability, Greening and Climate Change

Alternative 1 - 25 year Floodplain. Although the magnitude of the effects of climate change, including rising sea levels, temperature changes, and changing rainfall patterns, is uncertain, it is generally acknowledged that climate change would affect both natural system and human environmental conditions in south Louisiana during the next century. Scientists and agency water managers agree that implementation of the TSP would provide an important adaptation response for both the natural system and the human environment. The CEMVN would analyze the effects of sea level change on the benefits predicted for the TSP per ER 1100-2-8162, “Incorporating Sea Level Change in Civil Works Programs” (31 December 2013). For more information, refer to Appendix C *Hydraulics, Hydrology, and Climate Preparedness and Resiliency*.

The TSP would boost the resiliency to potential climate change effects by increasing flood risk management abilities and buffering the effects of sea level rise and land subsidence.

The potential project features would not contribute to long-term climate change patterns.

Alternative 2 - 50 year Floodplain. Impacts would be the same as the 25 year floodplain alternative, however, larger in scale because this alternative would cover a larger area and involve more structures.

Alternative 3 - No Action. In the next few decades, the CEMVN expects longer growing seasons and rising CO_2 levels would increase yields of some crops, though such benefits will be progressively offset by extreme weather events. Though adaptation options can reduce some of the detrimental effects, in the long-term, the combined stresses associated with climate change may decrease agricultural productivity.

The climate change assessment tools, utilized in the study are consistent with USACE Engineering and Construction Bulletin (ECB) 2016-25, Guidance for Incorporating Climate Chance Impacts to Inland Hydrology in Civil Works Studies, Designs, and Projects to provide an indication of the potential for non-stationary and impact to flood risk. Appendix C, *Hydraulics, Hydrology, and Climate Preparedness and Resiliency*, has additional discussion on climate change.

The USACE projects, programs, missions, and operations have generally proven to be robust enough to accommodate the range of natural climate variability over their operating life spans. However, recent scientific evidence shows in some places and for some impacts relevant to USACE operations, climate change is shifting the climatological baseline natural climate variability occurs, and may be changing the range of variability as well. This is relevant to the CEMVN because the assumptions of stationary climatic baselines and fixed range of natural variability, as captured in the historic hydrologic record may no longer be appropriate for long-term projections of flood risk.

The CEMVN considered climate change impacts on the hydrology of the study area in accordance with ECB 2016-25, Guidance for Incorporating Climate Change Impacts to Inland Hydrology in Civil Works Studies, Designs and Projects, as well as USACE Engineering Technical Letter 1100-2-3, Guidance for Detection of Nonstationarities in Annual Maximum Discharges.

SECTION 6
Environmental Compliance

6.1 ENVIRONMENTAL OPERATING PRINCIPLES

The U.S. Army Corps of Engineers developed Environmental Operating Principles (EOPs) to ensure USACE missions include totally integrated sustainable environmental practices. The EOPs provided corporate direction to ensure the workforce recognized the USACE' role in, and responsibility for, sustainable use, stewardship, and restoration of natural resources across the Nation and, through the international reach of its support missions.

Since the Environmental Operating Principles were introduced in 2002 they have instilled environmental stewardship across business practices from recycling and reduced energy use at USACE and customer facilities to a fuller consideration of the environmental impacts of USACE actions and meaningful collaboration within the larger environmental community.

The re-energized Environmental Operating Principles are:

- Foster sustainability as a way of life throughout the organization.
- Proactively consider environmental consequences of all USACE activities and act accordingly.
- Create mutually supporting economic and environmentally sustainable solutions.
- Continue to meet our corporate responsibility and accountability under the law for activities undertaken by the USACE, which may impact human and natural environments.
- Consider the environment in employing a risk management and systems approach throughout the life cycles of projects and programs.
- Leverage scientific, economic and social knowledge to understand the environmental context and effects of USACE actions in a collaborative manner.
- Employ an open, transparent process that respects views of individuals and groups interested in USACE activities.

The CEMVN incorporated environmental sustainability into this study planning. This should result in an efficient, “green” project while reducing flood risk. The plan is consistent with all applicable laws and policies. The CEMVN and its non-Federal sponsor continue to meet their corporate responsibility and accountability for the project in accordance with those laws and policies. The study team is using appropriate ways and means to assess cumulative impacts to the environment through the National Environmental Policy Act (NEPA) and the use of engineering models, environmental surveys and coordination with natural resource agencies. As a result of employing a risk management and systems approach throughout the life cycle of the project, the project design would address as many concerns as possible with no mitigation required to address adverse impacts.

6.2 ENVIRONMENTAL COMPLIANCE

The National Environmental Policy Act (NEPA) requires a summary of public participation, detailed in this section. In addition to NEPA, the CEMVN is in ongoing coordination with the resource agencies as required by other federal laws, statutes, and Executive Orders (EOs), and is detailed in this section as well.

6.2.1 Scoping

The CEMVN held five project kickoff meetings at the start of the SCCL planning process. These included one resource agency meeting, two community and levee CEMVN leaders meetings and two public meetings (Appendix J).

The CEMVN issued a Notice of Intent (NOI) to prepare an EIS for the SCCL project in the Federal Register (Vol. 84, No. 63 on April 2, 2019. The NOI included a 45-day public comment period, ending on May 17, 2019. On April 10, 2019 the CEMVN sent cooperating agency letters to the US Fish and Wildlife Service and National Oceanic Atmosphere Administration (National Marine Fisheries Service). The CEMVN sent a cooperating letter to the Federal Emergency Management Agency on May 22, 2019 (Appendix A-9). The CEMVN held two public scoping meetings on May 14 and 15, 2019. Appendix J, details these meetings.

6.2.2 Agency Coordination and Public Involvement

In accordance with 33 C.F.R § 385.26(a), required consultation, as defined in 33 CFR § 385.3, continues with all required agencies, including:

- Department of Interior
- Environmental Protection Agency
- Department of Commerce
- Federal Emergency Management Agency
- Chitimacha Tribe of Louisiana
- Louisiana Coastal Protection and Restoration Authority
- Other federal, state, and local agencies as designated in 33 CFR § 385.26(a).

In accordance with 33 C.F.R § 385.26(e)(3), required coordination, as defined in 33 CFR § 385.3, occurred with all required agencies, including:

- U.S. Fish and Wildlife Service (USFWS)
- National Marine Fisheries Service (NMFS)
- US Geological Service (USGS)
- Louisiana Department of Natural Resources
- Other appropriate agencies as required by applicable law.

The project delivery team consists of those individuals designated by the CEMVN and CPRAB, the implementing agencies, and representatives designated by other government agencies or tribes. Inter-agency participation is encouraged to gain technical skills and

knowledge of other agencies. Several federal, tribal, and state agencies are active members of the CEMVN. Participants include the USEPA, USFWS, USGS, and LDGF. Representatives from St. Martin, St. Mary, and Iberia parishes, as well as levee districts, and community representatives are also active participants.

Agencies including the NOAA, USFWS, FEMA, and the tribes were asked at the beginning of the planning process to become cooperating agencies under NEPA. In a letter dated May 17, 2019, NOAA agreed. Due to the robust interagency process planned for this project, the other agencies and tribes did not wish to enter into a cooperating agency agreement; however, these agencies were fully involved in all phases of the SCCL planning process.

The CEMVN used periodic resource agency webinars at key phases of the SCC planning process during the formulation of project objectives, management measures, and evaluation of alternatives.

In a letter dated October 2, 2019, NOAA indicated they were stepping down as a cooperating agency (Appendix A-9). Their reasoning was based on the TSP's lack of potential impacts on NOAA trust resources, such as marine mammals, endangered species and essential fish habitat.

Public outreach efforts for the SCCL study began early in the planning process and was done in compliance with 33 CFR § 385.18. Due to intense public, political, and media interest in flood risk management in southern Louisiana, public participation is a critical component of the development of this feasibility report. Appendix K details the CEMVN's public involvement activities.

The CEMVN held monthly stakeholder briefs to provide study updates and encourage participation with project activities needed for selection of the TSP. The attendees include congressional delegation, non-Federal sponsor, and stakeholders. Communication is key to project success and keeping the study partners apprised of the latest progress. The CEMVN initiated the meetings in June of 2019 and would continue throughout the study duration. Some of the topics included takeaways from public meetings, schedule, review, and screening of the alternatives.

The USFWS provided their Draft Coordination Act Report on October 4, 2019 (Appendix A-7). These comments were provided in accordance with the Fish and Wildlife Coordination Act of 1958, as amended. They provided the following recommendation to avoid and minimize possible impacts associated with implementation of non-structural measures:

1. Should construction of earthen berms around a structure result in impacts to adjacent wetlands, a sheetpile barrier shall be constructed in lieu of earthen berms to avoid or minimize those wetland impacts.

CEMVN Response: The CEMVN is not considering earthen berms as part of nonstructural measures in their TSP. Further, the CEMVN does not anticipate impacting any wetlands for any of the nonstructural measures.

The USFWS add two additional recommendations should project plans change and construction of flood protection features be added to avoid and/or minimize project impacts on fish and wildlife resources, and for mitigating unavoidable impacts to those resources:

2. The Corps should coordinate closely with the Service and other fish and wildlife conservation agencies throughout the planning, engineering and design of project features to ensure that those features are located and designed to avoid and minimize wetland impacts and associated fish and wildlife resources.

CEMVN Response: The CEMVN will continue to coordinate this project through the planning, design, and construction phases. If the project changes, the CEMVN would coordinate these changes with the state and federal resource agencies prior to finalizing any phase. The CEMVN would integrate any recommendations, requirement, and/or statutory mitigation if required based upon the agencies' comments and authority.

3. The Corps should obtain a right-of-way from the Service prior to conducting any work on Bayou Teche National Wildlife Refuge, in conformance with Section 29.21-1, Title 50, Right-of-Way Regulations. Issuance of a right-of-way will be contingent on a determination by the Service's Regional Director that the proposed work will be compatible with the purposes for which the Refuge was established.

CEMVN Response: If the CEMVN's TSP does change and would require any right-of-way needs on USFWS fee title-managed lands including the Bayou Teche National Wildlife Refuge, the CEMVN would obtain all the necessary real estate agreement documentation in accordance with Section 29.21-1, Title 50, Right-of-Way Regulations. The CEMVN would work closely with refuge and other USFWS staff to ensure any project needs would be compatible with the refuge's land management and protection of its natural and recreational resources.

In a letter dated October 31, 2019, the Louisiana Department of Natural Resources, Office of Coastal Management, provided several Louisiana Department of Wildlife and Fisheries recommendations in accordance with the Coastal Zone Management Act of 1972 (Appendix A-8). These recommendations focused on state listed species, bald eagle nests, colonial nesting bird colonies, and critically imperiled forest stand protection.

CEMVN Response: The CEMVN concurs with the LDRN and LDWFs' concerns and warnings concerning T &E species and colonial nesting birds, and sensitive habitats. The Disrtict acknowledges the LDWF warnings and bird nesting colony instructions and endorse these statements. If after the CEMVN's planning efforts and the project is carried forward for developing plans and specifications, the CEMVN would add any limitations in the appropriate contract documents set out by the LDWF's October 21, 2019 letter. Further, during construction, the CEMVN would carry out any survey, monitoring and reporting requirements associated with impact avoidance to any LDWF trust resources.

6.2.3 Draft Project Implementation Report and Environmental Impact Statement

The SCCL Notice of Availability (NOA) for the Draft PIR/EIS was published in the Federal Register on November 22, 2019 and mailed to interested stakeholders to begin the 45-day review period. The review period ends on January 6, 2020 (subject to anticipated publish date in the Federal Register). The Draft PIR/EIS was filed in accordance with ER-FRL-8994-7, Amended Environmental Impact Statement Filing System Guidance for Implementing 40 CFR 1506.9 and 1506.10 of the Council on Environmental Quality's Regulations Implementing the NEPA (14 January 2011), and made available for public and agency review.

6.2.4 Comments and Responses

Appendix K: Public Involvement and Scoping will contain a comment response matrix detailing the comments received during the NEPA review process for this November 2019 Draft FR/EIS, along with CEMVN responses.

6.2.5 Statement Recipients

A copy of the Draft FR/EIS is posted on the CEMVN website at the following address:

https://www.mvn.usace.army.mil/South-Central-Coast/

Notice of its availability was emailed to federal, state, and local agencies; affected Native American tribes; congressional offices, media outlets, municipalities, levee districts, and interested private organizations and individuals (Appendix K).

6.2.6 Compliance with Environmental Laws, Statutes and Executive Orders

Table 6-1 identifies the status of coordination with other Federal agencies and compliance with major environmental statutes.

Table 6-1. Environmental Compliance Status

Law, Policy and Regulations	Status	Comments
Anadromous Fish Conservation Act	Fully Compliant	Proposed action would not adversely affect anadromous fish species.
Archaeological Resources Protection Act of 1979	Fully Compliant. The SCCL complies with this Act and would continue to comply throughout construction and operation and would obtain any required permits.	A Federal Permit under the Archaeological Resources Protection Act (ARPA), Approved October 31, 1979 (Public Law 96-95; 93 Stat. 721; 16 U.S.C 470aa-II; 32 CFR 229) will be obtained from the appropriate Federal land manager for all archaeological work occurring within federal and Indian lands in the United States, and the removal and disposition of archaeological collections from those sites.
American Indian Religious Freedom Act	Fully Compliant	The policy of the U.S. is to protect and preserve for American Indians, Alaska Native Groups, and Native Hawaiians inherent rights of freedom to believe, express, and exercise traditional religions. These rights include, but are not limited to, access to sites, use and possession of sacred objects, and the freedom to worship through ceremony and traditional rites.
Bald and Golden Eagle Protection Act	Fully Compliant	Proposed action would not adversely affect the bald eagle. No permits for takes are required.
Clean Air Act	Fully Compliant. SCCL would comply with this Act as applicable based on detailed design; would obtain any required permits.	Potential for permanent sources of air emissions. Air emissions permits may be required for temporary construction events.
Clean Water Act of 1972	Fully Compliant. The SCCL complies with this Act. Would obtain Water Quality Certification (WQC) from the State of Louisiana and any required National Pollutant Discharge Elimination System (NPDES) permits and update 404(b) analysis prior to construction.	The CEMVN does not anticipate any impacts to the Waters of the United States. Any short-term construction activities may require NPDES permits. The project does not have any wetland fill activities
Coastal Barrier Resources Act and Coastal Barrier Improvement Act of 1990	These Acts are not applicable to this project.	The project would not affect any designated coastal barrier resources.
Coastal Zone Management Act of 1972	Fully Compliant. The SCCL complies with this Act and obtaining concurrence by the State of Louisiana	In a letter dated September 24, 2019 the CEMVN prepared a Louisiana Coastal Zone Consistency Determination (Negative Determination) in accordance with the provisions of 15 CFR Part 930 (Appendix A). The CEMVN determined the proposed action is consistent to the maximum extent practicable with the enforceable policies of Louisiana's approved Coastal

		Zone Management Program.
Endangered Species Act of 1973	Fully Compliant. The CEMVN is compling with this Act and consulting with NMFS and USFWS as appropriate.	In a letter dated September 30, 2019, the CEMVN provided it's No Effect determination and reasoning to the USFWS (Appendix A-5). The USFWS replied to the CEMVN's determination on TBD 2019. In a letter dated September 30, 2019, the CEMVN provided it's No Effect determination and reasoning to the NMFS (Appendix A-6).
Estuary Protection Act of 1968	Fully Compliant	The project would not affect any estuary resources.
Farmland Protection Policy Act of 1981	Fully Compliant	The project would not affect any prime or unique soils.
Federal Water Project Recreation Act/Land and Water Conservation Fund Act	Fully Compliant	The CEMVN evaluated the proposed action's effects on outdoor recreation. The proposed action would not adversely affect existing recreational opportunities.
Fish and Wildlife Coordination Act of 1958, as amended.	Fully Compliant	The CEMVN coordinated the proposed action with the USFWS and NMFS. The USFWS and NMFS are active participants on the SCCL team and provided information on fish and wildlife elements for the project. The USFWS provided a Planning Aid Letter on November 18, 2018. The Draft Fish and Wildlife Coordination Act Report (CAR) was received on October 4, 2019 (Appendix A-7). Prior to final feasibility report approval, the CEMVN would receive a USFWS Final CAR.
Magnuson-Stevens Fishery Conservation and Management Act	Fully Compliant	No elements of the proposed project would be in any Essential Fish Habitat. Therefore, the project would not affect any Essential Fish Habitat.
Marine Mammal Protection Act of 1972	Fully Compliant	No elements of the proposed project would be in any marine mammal habitat.
Marine Protection, Research and Sanctuaries Act	This Act is not applicable.	Ocean disposal is not a component of this project; therefore, this Act is not applicable.
Migratory Bird Treaty Act of 1918	Fully Compliant. The CEMVN is in compliance now, and would be in full compliance with the Act at the time of construction.	The proposed action would not significantly adversely affect migratory bird species. The CEMVN is in compliance and would be in full compliance with the Act at the time of construction.
National Environmental Policy Act of 1969	Fully Compliant	On April 2, 2019 a Notice of Intent (NOI) to prepare an EIS was published in the Federal Register (81 Fed. Reg. 137). The CEMVN held public scoping meetings

		on May 14 and 15, 2019 in St. Martinsville and Morgan City, LA. A NOA of the Draft EIS was published in the Federal Register (83 Fed. Reg. 130; 83 FR 31535) on November 22, 2019 and mailed to interested stakeholders to begin the 45-day review period. The review period closes on January 6, 2020. All comments received during the public meetings and the review periods, along with responses, will beincluded in Appendix K. Upon public and agency review, and comment on the Draft EIS, and public and agency review of the subsequent Final EIS, and the signing of the Record of Decision, this project would be in full compliance with this Act.
National Historic Preservation Act of 1966 (NHPA)	Partially Compliant. The CEMVN is engaged in developing a Programmatic Agreement (PA) establishing procedures to satisfy the CEMVN's Section 106 responsibilities pursuant to 36 CFR Part 800.14(b) with regard to the programmatic review of this feasibility study and allows the CEMVN to coordinate Section 106 reviews with its evaluation of the proposed action's potential for significant impacts to the human and natural environment required by NEPA, as amended (42 U.S.C. § 4321 et seq.). The PA will address the potential to effect historic properties that are eligible for or listed on the National Register of Historic Places (NRHP), including archaeological sites, districts, buildings, structures, and objects that are significant in American history, architecture, archaeology, engineering, and/or sites of religious and cultural significance on or off Tribal Lands (as defined in 36 CFR § 800.16(x)) that may be affected by this undertaking. USACE will continue to develop a project-specific PA in furtherance of the CEMVN's Section 106 responsibilities for this undertaking. The PA would then govern the CEMVN's subsequent NHPA compliance efforts. Following the execution of the PA, the CEMVN may proceed with issuing a ROD in compliance with Section 106 and NEPA.	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 ACHP an opportunity to comment. Historic properties are identified by qualified agency representatives in consultation with interested parties. The CEMVN 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 the CEMVN's Section 106 responsibilities, on June 10, 2019, the USACE submitted a NOI to develop a project-specific PA to the LA SHPO, ACHP, NFS (Louisiana Office of Coastal Protection and Restoration Authority) and appropriate federally recognized tribes (the Alabama-Coushatta Tribe of Texas (ACTT), the Choctaw Nation of Oklahoma (CNO), the Coushatta Tribe of Louisiana (CT), the Chitimacha Tribe of Louisiana (CTL), the Jena Band of Choctaw Indians (JBCI), the Mississippi Band of Choctaw Indians (MBCI), the Muscogee (Creek) Nation (MCN), the Seminole Nation of Oklahoma (SNO), the Seminole Tribe of Florida (STF), and the Tunica-Biloxi Tribe of Louisiana (TBTL). On July 17, 2019, the CNO submitted written correspondence stating that "This project lies outside of our area of historic interest. The Choctaw Nation Historic Preservation Department respectfully defers to the other Tribes that have been contacted." On June 24, 2019, the CEMVN 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. No other responses to this letter were received from any of the other potential stakeholders consulted (SHPO/Tribal/NFS). Additionally, on June 14, 2019, the CEMVN posted a NHPA/NEPA Public Notice to the designated project website https://www.mvn.usace.army.mil/South-Central-Coast/) 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 the CEMVN's proposal to develop a project-specific PA pursuant to 36 CFR § 800.14(b). No comments were received.
Native American Graves Protection and Repatriation Act	Fully Compliant	This Act applies to federally owned lands, including reservation lands.
Resource Conservation and Recovery Act, as Amended by the Hazardous and Solid Waste Amendments of 1984; CERCLA, as Amended by the Superfund Amendments and Reauthorization Act of 1986; Toxic Substances Control Act of 1976.	Fully Compliant	The CEMVN would conduct Phase 1 HTRW assessments on a case-by-case basis depending on each property subject to modification and acceptance into the project. Compliance with this Act would be achieved prior to land certification. If any items regulated under these laws were discovered, the CEMVN and the Nonfederal Sponsor would comply with applicable requirements.
Rivers and Harbors Act of 1899	Fully Compliant	The proposed action would not obstruct navigable waters of the United States.
Submerged Lands Act of 1953	Fully Compliant	The proposed action does not occur on submerged lands and no construction is expected on submerged lands.
Wild and Scenic River Act of 1968	This Act is not applicable.	No designated wild and scenic rivers are located within study area.
EO 11514, Protection and Enhancement of	Fully Compliant	The objectives of the proposed action are focused on

Environmental Quality		environmental protection.
EO 11593, Protection and Enhancement of the Cultural Environment	Fully Compliant	The SCCL study is in compliance for this E.O.
EO 11988, Floodplain Management	Fully Compliant	The purpose of this E.O. is to discourage federally induced development of floodplains. This project would essentially elevate structures above the floodplain, thereby improving floodplain management.
EO 11990, Protection of Wetlands	Fully Compliant	The proposed project would not take place in any wetlands.
EO 12962, Recreational Fisheries	Fully Compliant	The proposed action is not expected to have any impact to recreational fisheries in or near the study area.
EO 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations	Fully Compliant	A full environmental justice analysis was completed (Appendix B) and the project would not disproportionately adversely affect any minority or low-income population.
EO 13007, Indian Sacred Sites	This Act is not applicable.	This EO is directed toward executive branch agencies with statutory or administrative responsibility for the management of federal lands. The proposed action would not affect Department of Defense-owned or USACE- managed lands.
E.O. 13045, Protection of Children from Environmental Health Risks and Safety Risks	Fully Compliant	The proposed action is not expected to have environmental or safety risks that may disproportionately affect children.
E.O. 13089, Coral Reef Protection	Fully Compliant	Coral reefs are not affected.
EO 13122, Invasive Species	Fully Compliant	A nuisance and exotic vegetation control plan has been prepared to prevent or reduce establishment of invasive and non-native species within the study area. The control plan is located in Appendix A.
EO 13175, Consultation and Coordination with Indian Tribal Governments	Fully Compliant	In meeting its Federal trust responsibility, the CEMVN engaged in government-to-government consultation with Tribes via letter on June 10, 2019, to consult on this Undertaking in anticipation of developing a PA. Consultation with Tribes would continue throughout PED.
EO 13186, Responsibilities of Federal Agencies to Protect Migratory Birds	Fully Compliant	The proposed action would not adversely affect migratory bird species. The proposed action is expected to benefit species by improving habitat and increasing availability of foraging opportunities.
Advisory Circular 150/5200-33A – Hazardous	Fully Compliant	The closest airport, the Harry P. Williams Memorial Airport is approximately 7 miles from the closest

Wildlife Attractants on Near Airports		proposed project feature. SCCL project would not impact any airports or promote increased wildlife, especially bird use, near or on any airports.
Executive Order 13807, Establishing Discipline and Accountability in the Environmental Review and Permitting Process for Infrastructure Projects, 15 August 2017.	Fully compliant. The CEMVN will continue to comply with this EO, also referred to as One Federal Decision (OFD) throughout the planning process.	The CEMVN determined the project is a major infrastructure project and is eligible for inclusion on the OFD dashboard. The CEMVN uploaded the dashboard with project milestone dates. The CEMVN and other federal agency partners have not missed any established milestones and therefore are in full compliance with this EO (Appendix A-9).

6.2.7 Compliance with Louisiana Statutes

Permits, Entitlements, and Certifications

National Pollutant Discharge Elimination System, Section 402 (NPDES) permits required under the Clean Water Act may be necessary for the construction (non-point source runoff) of project features, depending on means and methods of construction. The USEPA has delegated this program to the Louisiana Department of Environmental Quality (LADEQ) for implementation. Nonstructural improvements would need to be authorized by NPDES permits. At this time, a NPDES permit would not be required for the operation of the other SCCL features, as the project does not involve the discharge of pollutants. All required permits, including underground injection control permits, and/or modifications to existing permits would be acquired prior to construction activities.

6.2.8 Compliance with Applicable Water Quality Standards and Permitting Requirements

The SCCL is not expected to significantly affect the compliance of watercourses, lakes, or wetlands with applicable water quality criteria. If potentially adverse effects are observed or predicted, longer-term impacts to water quality associated with the operation of project features would be addressed through operational monitoring and adaptive management actions.

6.2.9 Coastal Zone Management Act of 1972

The Coastal Zone Management Act (“CZMA”) requires "each federal agency conducting or supporting activities directly affecting the coastal zone shall conduct or support those activities in a manner to the maximum extent practicable, consistent with approved state management programs." In a letter dated October 1, 2019, the CEMVN submitted a preliminary Coastal Zone Consistency Determination (per 15 C.F.R. § 930.35) to the Louisiana Department of Natural Resources. Prior to the USACE signing the Record of Decision, the CEMVN would continue coordination with the LDNR concerning coastal resource protection. The LDNR provided initial comments by letter dated October 23, 2019. (Appendix A-8).

6.2.10 Other Environmental Compliance Requirements

Advisory Circular 150/5200-33A – Hazardous Wildlife Attractants on Near Airports

The advisory circular provides guidance on locating certain land uses having the potential to attract hazardous wildlife to or in the vicinity of public-use airports. The circular provides guidance on wetlands in and around airports and establishes notification procedures if reasonably foreseeable projects either attract or may attract wildlife.

In response to the advisory circular, the U.S. Army as well as other federal agencies, signed a Memorandum of Agreement (MOA) with the FAA to address aircraft-wildlife strikes. The MOA establishes procedures necessary to coordinate their missions to more effectively

address existing and future environmental conditions contributing to aircraft-wildlife strikes throughout the U.S.

The closest airport, the Harry P. Williams Memorial Airport is approximately 7 miles from the closest proposed project feature. The proposed project would not impact any airports or promote increased wildlife, especially bird use, near or on any airports.

Engineer Regulation 1105-2-100

In addition to the resources listed in Table 6-2, the USACE planning guidance (ER 1105-2-100, 1983) identifies other resources needed to take in to account in their project planning (Table 6-2).

Table 6-2. ER 1105-2-100 Resources

Resource	Possible Project Effects	Reasons
Life	Positive effect	Added flood risk reduction
Health	Positive effect	Added flood risk reduction
Safety	Positive effect	Added flood risk reduction
Long term productivity	Positive effect	Added confidence with additional flood risk reduction
Energy requirements	Short term minor effect; no long term effect	Localized, temporary construction fuel needs
Energy conservation	Positive effect	Less energies required for future flood fight requirements

6.3 RELATIONSHIP TO SHORT-TERM USES AND LONG-TERM PRODUCTIVITY (ON ALL RESOURCES)

Construction activities would temporarily disrupt, wildlife, and human recreational use in the immediate vicinity of a given construction site. Construction activities would likely provide positive, short-term economic opportunities and a few jobs for the surrounding communities. Overall, the long-term health and productivity of the ecosystem is anticipated to remain stable with implementation of the proposed project. Flood risk reduction would increase under the preferred alternative (TSP); therefore, short-term human use impacts would be offset by long-term increases in productivity.

6.4 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT TO RESOURCES (ON ALL RESOURCES)

Irreversible commitments are those that cannot be reversed, except perhaps in the extreme long run (Shipley, 2010). Simply stated, once the resource is removed it can never be replaced. This study is in the planning stage. Money has been expended to complete this planning document and pre-project monitoring. No construction dollars, considered irreversible, have been expended for the study.

Irretrievable commitments are those lost for a period of time (Shipley 2010). Construction activities of any of the considered action alternatives would temporarily disrupt natural resource productivity. The construction activities signal an irretrievable loss in exchange for the benefits of the habitat improvements.

6.5 RELATIONSHIP TO PLANS AND MASTER PLANS

Table 6-3 shows the relationship of the SCCL study and study area land use plans.

Table 6-3. Project Relationship with Local Land Use Plans

Title	Owner	Date	Purpose	Project Relationship
St. Mary Levee District Master Plan	St. Mary Parish	2010	The Plan identifies parish hurricane protection, backwater flooding, and related needs such as saltwater intrusion prevention.	The proposed project supports this plan with flood impact resiliency and floodplain management. The TSP proposes elevating residential structures and floodproofing nonresidential strucures. These features support this mater plan.
Breaux Bridge Comprehensive Long-Range Resiliency Plan	Breaux Bridge, LA	2012	A plan to use infill development in targeted areas to manage growth and ensure long-term resilience.	The proposed project supports this plan with flood impact resiliency and floodplain management. The TSP proposes elevating residential structures and floodproofing nonresidential strucures. These features support increased resiliency this master plan.
Iberia Parish Hurricane Protection Master Plan	Iberia Parish	2012	Comprehensive plan to provide protection from flooding, saltwater intrusion, tidal and storm surges associated with tropical storms and hurricanes for the lands and residents of Iberia parish.	The proposed project supports this plan with flood impact resiliency and floodplain management. The TSP proposes elevating residential structures and floodproofing nonresidential strucures. These features support this mater plan.
Louisiana's Comprehensive Master Plan	Coastal Protection and Restoration Authority of Louisiana.	2017	Following Hurricanes Katrina and Rita in 2005, the Louisiana Legislature created the CPRAB and tasked it with coordinating the local, state, and Federal efforts to achieve comprehensive coastal protection and restoration. To accomplish these goals, CPRAB was charged with developing a master plan to guide our work toward a sustainable coast.	The proposed project supports this plan with coastal resiliency and floodplain management. The TSP proposes elevating residential structures and floodproofing nonresidential strucures. These features support this mater plan.
Restoring the Mississippi River Delta	Restore the Mississippi River Delta	2018	Recommendations for Coastal Restoration Projects and Programs in Louisiana	While the proposed project does not include ecosystem restoration, it would not impact local or regional restoration efforts or existing habitats.

6.6 INDIRECT EFFECTS

Indirect effects, as defined by the Council On Environmental Quality regulations, are "caused by the proposed action and occur later in time or farther removed in distance, but are still reasonably foreseeable. Indirect effects may include growth inducing effects and other effects related to induced changes in the pattern of land use, population density, or growth

rate, and related effects on air and water and other natural systems, including ecosystem" (40 CFR 1508.8). Indirect effects differ from direct impacts associated with the construction and operation of the proposed project and are caused by an action or actions having an established relationship or connection to the proposed project. Indirect effects can be linked to direct effects in a causal chain, and extended as indirect effects producing further consequences.

This document identified in previous sections the proposed action effects and issues associated with implementing the proposed action by documenting the direct and indirect effects of the proposed action on environmental resources. The CEMVN did not identify any significant impacts. The following indirect effects the CEMVN assumed may occur:

- Flood resiliency may slow or reverse a regional population decline.
- Moving structures above the floodplain may reduce damages normally resulting in hazardous spills, pollution, and expensive clean-up costs.
- There may be short-term impacts to tax revenue throughout the region during construction.

6.7 CUMULATIVE IMPACTS

Cumulative impacts are defined as those impacts resulting from the incremental impact of an action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (Federal or non-Federal) or person undertakes the actions. Representative past, present, and future regional projects were utilized in the cumulative impacts analysis.

Cumulative effects result from the proposed action when added to other past, present and reasonably foreseeable projects or actions. 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).

Figure 6-1. Approach to Cumulative Effects

Scoping

1. Identify resources
2. Define the study area for each resource
3. Define time frame for analysis

Describing the Affected Environment

4. Identify other actions affecting the resources
5. Characterize resources in terms of its response to change and capacity to withstand stress
6. Characterize stresses in relation to thresholds
7. Define baseline conditions

Determining the Environmental Consequences

8. Identify cause-and-effect relationships
9. Determine magnitude and significance of cumulative effects
10. Assess the need for mitigation of significant cumulative effects
11. Monitor and adaptive management, accordingly

The Council of Environmental Quality (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 for the SCCL project followed these 11 steps, shown in Figure 6-1. 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*.[1]

Bounding Cumulative Effects Analysis

Cumulative effects analysis requires expanding the geographic boundaries and extending the timeframe to include additional effects on the resources, ecosystems, and human communities of concern.

The CEMVN's determined geographic boundaries for each resource by the distribution of the resource itself, and the area within that distribution where the resource could be affected by considered action alternatives in combination with other past, present and reasonably foreseeable actions. The primary area considered in the cumulative effects analysis is limited to the study area and an area of influence depending on the resource.

The timeframe for the cumulative effects analysis for each considered resource begins when past actions began to change the status of the resource from its original condition, setting the long-term trend currently evident and likely to continue into the reasonably foreseeable future. The timeframe for this analysis began in the early 1800s when the region began to be altered by non-indigenous settlers and ends in 2075 (end of 50 year period of analysis for the study).

Reasonably Foreseeable Future Actions and Conditions

Cumulative impacts would be the incremental direct and indirect effects of not taking action to address hurricane storm surge damage risk reduction on the human, water and natural environmental resources, in addition to the direct and indirect impacts of other past, present and reasonably foreseeable future actions (40 CFR § 1508.7) on these important resources. In the FWOP conditions, the following human, water and natural environmental important resources would continue to be at risk.

[1] Cumulatively considerable means that the incremental effects of an individual action are significant when viewed in connection with the effects of past, present, and probable future actions.

Human Environment

- Population is declining in the area and households are holding steady in the future without project.
- People, households and other structures in the study area in the year 2075 would remain at risk of hurricane storm surge damage.
- Transportation infrastructure would be more susceptible to damages resulting from hurricane storm surge events due to expected RSLR and loss of coastal wetlands.
- Infrastructure would remain at risk and continue to experience reduced access due to hurricane storm surge damage and loss of coastal wetlands.
- Community and regional growth would remain at risk of continued hurricane storm surge damage.
- Tax revenues and property values would remain at risk due to continued hurricane storm surge damage.
- Continued erosion, fragmentation and eventual loss of coastal wetlands.
- Expected higher flood insurance premiums would be expected to increase the cost of property ownership and result in correspondingly lower market values.
- Continued or increased risk of damage to residential and non-residential structures resulting in temporary and/or permanent relocation of populations would negatively affect the community cohesion in many communities.
- Continued temporary displacement of minority and/or low-income populations because residents within the area would remain vulnerable to flooding from hurricane storm surge and may be forced to relocate to areas with risk reduction measures in place.
- Continued higher risks of damage from hurricane storm surge would manifest itself in higher premiums for flood insurance under the NFIP.
- Continued shoreline recession, subsidence, and land loss would result in the movement of unstable sediments and would undermine man-made structures, especially the extensive oil and gas pipelines and related structures in this “working coastline”

Water Environment

- Existing hydrologic alterations would continue to impact water levels and salinities and continue influencing land loss at similar or increased rates.
- As sea levels rise, natural drainage pattern flow paths would remain unchanged but drainage times would increase.
- Continued salt water intrusion and inundation during hurricane storm surge events.
- Continued erosion by wave and current action resulting in continued shoreline erosion of most channels, lakes, and the Gulf.

Natural Environment

- Degradation, fragmentation and continued loss of soil resources, especially coastal wetlands would continue into the FWOP condition. The Louisiana Coastal Study (USACE, 2004) estimated coastal Louisiana would continue to lose land at a rate of approximately 6,600 acres per year over the next 50 years. It is estimated an additional net loss of 328,000 acres may occur by 2050, which is almost 10 percent of Louisiana's remaining coastal wetlands. More recently, Couvillion et al (2013) estimated that between 2010 and 2060, coastal Louisiana would show a net change of -519,119 acres the Teche/Vermilion basin with a net change of -16,556 acres. However, wetland soil losses would be offset to some extent by restoration projects implemented through other programs.
- Continued increases in RSLR could increase saltwater intrusion and exacerbate ongoing conversion of existing estuarine wetlands to shallow open water.
- Impacts to cultural and historic resources in coastal Louisiana would continue as a result of both natural processes and cultural modifications of the landscape.
- Recreational infrastructure and consumptive recreational opportunities would remain vulnerable to damage from hurricane storm surges.
- Continued conversion of existing vegetated wetlands used as foraging, nesting, and over-wintering habitat to open water habitats.
- Reduction in overall species diversity and abundance as well as loss of estuarine nursery, foraging, refugia, and other estuarine aquatic habitats.
- Continued bankline erosion with sloughing, fragmentation and continued degradation of shorelines.
- Continued encroachment of salinity into fresher areas of brackish and freshwaters.
- Continued habitat switching by organisms due to continued fragmentation, degradation and loss of transitional estuarine habitats due to increasing RSLR, subsidence, shoreline erosion, and other land loss drivers.
- Loss of existing transitional estuarine habitats would further stress species that are dependent on these habitats for all or a part of their life cycle.

The future without project risks to the important resources in the human, water and natural environment could be offset, to some undetermined degree, by other hurricane storm damage risk reduction projects and ecosystem restoration efforts. The CEMVN used other assumptions key to the formulation and recommendation, including those related to analytic models used in the study.

"Reasonably foreseeable actions" were defined as actions or projects with a reasonable expectation of actually happening, as opposed to potential developments expected only on the basis of speculation. In addition, the following proposed present actions were considered for this cumulative impacts analysis:

- Lake Pontchartrain and Vicinity - Lake Pontchartrain and Vicinity, LA - General Reevaluation Report. The Lake Ponchartrain and Vicinity project is located between the Mississippi River on the south, Lake Ponchartrain on the north and

Lake Borgne on the east. The project includes features in four parishes (St. Charles, Jefferson, Orleans, and St. Bernard) and provides 1% risk reduction for hurricane and storm risk to a portion of the greater New Orleans area. Due to the combined effects of subsidence, settlement, consolidation, and potential sea level rise, the levee system will not provide the designed level of risk reduction in the future, resulting in increased risk to life safety, flood damages and human health safety. The study investigates potential measures to restore the authorized level of protection.

- The Amite River and Tributaries –Comprehensive Study East of the Mississippi River Louisiana. The study area, includes the Amite River Basin, encompasses an area of approximately 3,450 square miles consisting of eight Louisiana parishes (East Feleciana, St. Helena, East Baton Rouge, Livingston, Iberville, Ascension, St. James, and St. John the Baptist), Maurepas Lake, and four Mississippi counties (Amite, Wilkinson, Franklin, and Lincoln). Over three-fourths of the study area lies in the parishes of southeastern Louisiana, located east of the Mississippi River and north of Lake Maurepas. The upper one-fourth of the study area's drainage area lies in the southwestern Mississippi counties and is home to over 500,000 residents. Due to the August 2016 flooding, the entire study area is being reevaluated to determine whether additional improvements for flood control are recommended with particular reference to the Amite River, Bayou Manchac, Comite River, and their tributaries.
- Upper Barataria, Louisiana Feasibility Study - The Study Area includes communities in the following seven southeast Louisiana parishes: Ascension, Assumption, Jefferson, Lafourche, St Charles, St. James, and St. John the Baptist Parishes. The Study Area is bounded on the north and east by the Mississippi River and Tributaries Project, Mississippi River Levee, on the west by Bayou Lafourche, and on the south Study Area extends slightly past U.S. Highway 90. The Upper Barataria Basin is part of the larger Barataria Basin watershed covering approximately 760 square miles and characterized by low, flat terrain with numerous navigation channels, drainage canals, and natural bayous that drain into Lake Salvador and eventually the Gulf of Mexico. The entire study area has been declared a federal disaster area nine times in the past 30 years due to flood damages from storms. The feasibility study is reevaluating measures to reduce rainfall, tidal, and hurricane flooding to protect residential and commercial structures, major transportation routes, and many other commercially and culturally significant places and activities vital to the economy of the region.
- The West Shore Lake Pontchartrain project is located in southeast Louisiana on the east-bank of the Mississippi River in St. Charles, St. John the Baptist, and St. James Parishes in Southeast LA. The West Shore Lake Pontchartrain Chief's report was published in June 2016 and the project has been included in the Bipartisan Budget Act of 2018. The $760 million project is approximately 18.5 miles in length and includes 17.5 miles of levee, 1 mile of T-wall, 4 pumping stations, 2 drainage structures, and approximately 35 utility relocations. The project would also provide localized risk reduction measures focused in St. James

Parish. The project would include mitigation to offset unavoidable environmental impacts.

- The Southwest Coastal Louisiana project would provide non-structural hurricane and storm surge damage risk reduction measures in the 4,700 square mile study area located in Calcasieu, Cameron, and Vermilion Parishes in southwest Louisiana.

The TSP proposes implementing nonstructural measures across the study area to reduce coastal storm surge damages to 3,463 residential structures, commercial structures, public buildings, and warehouses through the combined voluntary elevation of residential structures, dry floodproofing of non-residential structures. To assess the cumulative impacts for the TSP, the incremental direct and indirect impacts of implementing the TSP, as detailed in Section 4 above, are considered together with other past, present and reasonably foreseeable future nonstructural risk reduction projects identified and described below. Table 6-4 summarizes the cumulative impacts[2].

Reasonably Foreseeable Ongoing Programs

It is reasonably foreseeable that the FEMA Hazard Mitigation Assistance (HMA) (http://www.fema.gov/hazard-mitigation-assistance) grants programs would continue to provide funding for eligible mitigation activities that reduce disaster losses and protect life and property from future disaster damages. Currently, FEMA administers the following HMA grant programs:

- Hazard Mitigation Grant Program (HMGP) assists in implementing long-term hazard mitigation measures following Presidential disaster declarations. Funding is available to implement projects in accordance with State, Tribal, and local priorities.

[2] The cumulative impacts of the Nonstructural 50 year Floodplain Alternative are similar to, but greater in scale, to the cumulative impacts identified in connection with the Nonstructural 25 year Floodplain Alternative because of the larger numbers of structures included in the50 year Floodplain Alternative . Hence a discussion of the cumulative impacts associated with the 50 year Floodplain Alternative will not be further detailed.

- Pre-Disaster Mitigation (PDM) provides funds for hazard mitigation planning and to implement mitigation projects before disasters. The program goal is to reduce overall risk to the population and structures, while at the same time, also reducing reliance on Federal funding from disaster declarations.
- Flood Mitigation Assistance (FMA) provides annual funds so that measures can be taken to reduce or eliminate risk of flood damage to buildings insured under the NFIP.

Nonstructural Risk Reduction Measures throughout Louisiana

The 2017 State Master Plan recommends a comprehensive nonstructural program as part of its strategy to reduce the flood risk for Louisiana citizens. The 2017 State Master Plan's Appendix E3 Nonstructural Implementation Strategy includes the following nonstructural strategies:

- floodproofing of residential and commercial properties, and
- elevation of residential properties.

In addition, programmatic measures such as land use planning, building codes, and education that can reduce risk to future buildings within communities would be integral to the nonstructural program (source: http://coastal.la.gov/our-plan/2017-coastal-master-plan/ accessed October 24, 2019).

Following Hurricanes Katrina, Lili, Rita, Gustav, Ike, and Issac many residents were required to meet certain building requirements to meet floodplain management ordinances. Some individuals met these building requirements at personal expense. Many others utilized the FEMA Hazard Mitigation Assistance (HMA) (http://www.fema.gov/hazard-mitigation-assistance) grants programs (including: HMGP, PDM and FMA programs) to provide funding for eligible mitigation activities that reduce disaster losses and protect life and property from past, present and future disaster damages in Louisiana.

Nonstructural Risk Reduction Measures throughout the Study Area:

Past and Present Actions

Section 2 discusses the existing condition of each resource by describing the present condition and providing historical context (e.g., the past condition) for how the resource was altered to the current conditions. The CEMVN used information from field surveys, discussions with project sponsor and subject matter experts, scoping comments, and literature searches to assess the past and existing conditions of the resource and to identify present and reasonably foreseeable future actions.

Ongoing commerce such as tourism, fisheries, petroleum extraction and processing, and shipping would continue to be major activities in the study area. Development and ongoing improvements to these industries are taking place and would continue into the future.

Within the study area the only known Federal program addressing reduction in damages from hurricane storm surge events is FEMA's Hazard Mitigation Assistance (HMA), as expressed in the FEMA Federal Insurance and Mitigation Administration (FIMA) policy guidance. The key purpose of Hazard Mitigation Grant Program (HMGP) is to ensure that the opportunity to take critical mitigation measures to reduce the risk of loss of life and property from future disasters is not lost during the reconstruction process following a disaster. The HMGP funding is available, when authorized under a Presidential major disaster declaration, in the areas of the State requested by the Governor. Federally-recognized tribes may also submit a request for a Presidential major disaster declaration within their impacted areas (see http://www.fema.gov/medialibrary/assets/documents/85146). The amount of HMGP funding available to the Applicant is based on the estimated total Federal assistance, subject to the sliding scale formula outlined in Title 44 of the Code of Federal Regulations (CFR) Section 206.432(b) that FEMA provides for disaster recovery under Presidential major disaster declarations. As described in greater detail at the above referenced website, the following project types are eligible under the HMA programs:

- Property Acquisition and Structure Demolition;
- Property Acquisition and Structure Relocation;
- Structure Elevation;
- Mitigation Reconstruction; and
- Dry Floodproofing.

A total of 3,496 structures are within the study area. Of these, 2,629 residential structures, 597commercial, 71 public, and 166 industrial are within the 25 year floodplain. Many of these structures are located on naturally higher elevations. It is reasonably foreseeable many of these self-reliant residents would continue to stay in the area and raise their structures or take other measures to reduce hurricane storm surge damages.

50 year Cumulative Effects by Resource

This analysis considers known past, present, and reasonably foreseeable future nonstructural hurricane storm damage risk reduction projects over a 50 year period of analysis from 2025 to 2075. Table 6-4 provides the cumulative effects analysis including the past, present and reasonably foreseeable actions that might impact each resource category identified to have an incremental cumulative effect. If a resource was not identified to have a cumulative effect then this resource was not discussed in detail. The cumulative effects analysis discusses future conditions of the No Action (without project) and with the project (discussed in whole, as an alternative, unless otherwise noted.

Table 6-4. Summary of Cumulative Impacts

Resource	Past Actions (Historic Conditions)	Present Actions (Existing Conditions)	The No-Action Alternative (Future Without Project condition)	Cumulative Impacts Nonstructural 0-25 year Floodplain Plan*
Water	US & LA & SA: Flows and water levels respond to and are impacted by natural conditions such as hurricane storm surge and man-made conditions. Subsidence and eustatic sea level rise cause landward movement of marine conditions into estuaries, wetlands and fringing uplands.	US & LA: Increased flows and water levels associated with increased runoff due to increasing urbanization and wetland loss. Rate of RSLR increasing over historic conditions. SA: Water control structures operated both passively and actively. Virtually all hydrologic management focuses on controlling salinity and minimizing tidal fluctuations by constructing and operating levees, weirs, and a variety of gated structures. 1990 inventory identified 174 individual water control structures in the study area.	US & LA & SA: Increased hurricane storm surges; increased flows and water levels associated with increase urbanization and associated runoff and increased wetland loss. Rate of RSLR increasing over historic conditions. Existing and authorized structural and nonstructural hurricane storm surge damage risk reduction projects provide risk reduction. SA: Continued disjointed and uncoordinated operation of water control structures. There are no identified existing or authorized for construction risk structural or nonstructural risk reduction measures in SA.	US & LA: Increased hurricane storm surges; increased flows and water levels associated with increased urbanization and associated runoff and increased wetland loss. Rate of RSLR increasing over historic conditions. Existing and authorized structural and nonstructural hurricane storm surge damage risk reduction projects provide risk reduction. SA: Total level of project-induced impact would be relatively minor and in addition to other existing and authorized for construction structural and nonstructural hurricane storm surge damage risk reduction projects.
Water Quality and Salinity	LA & SA: Clean Water Act of 1977, NEPA of 1969, Coastal Zone Management Act, and Estuary Protection Act and institutional recognition to restore and protect water bodies, especially with respect to point sources. Non-point sources still unregulated. LA & SA: Increasing human development adversely impacts water quality. Salinity levels increase inland due to salt	US & LA & SA: Continued institutional recognition. Increasing human development, agriculture and oil & gas exploration and industrialization result in increased potential for water quality problems and saltwater intrusion. SA: coastal wetland loss results in loss of water purification by wetlands. Channels and oil & gas exploration canal continue to provide conduit for saltwater	US & LA & SA: Continued institutional recognition. Increasing human development, agriculture and oil & gas exploration and industrialization result in increased potential for water quality problems and saltwater intrusion. These water quality impacts offset by existing and authorized for construction ecosystem restoration projects. SA: coastal wetland loss results in loss of	US & LA: Continued institutional recognition. Increasing human development, agriculture, channelization and oil & gas exploration and industrialization continue to result in increased potential for water quality problems and saltwater intrusion. These water quality impacts offset by existing and authorized for construction ecosystem restoration projects. SA: The TSP would reduce

	water intrusion, due in part to wetland loss, channelization, and oil and gas exploration canals.	intrusion and coastal land loss.	water purification by wetlands. Channels and oil & gas exploration canal continue to provide conduit for saltwater intrusion and coastal land loss.	water quality impacts associated with flooding from storm surge events. These impacts would be in addition to other national, state and local existing and authorized for construction structural and nonstructural hurricane storm surge damage risk reduction projects.
Coastal Shorelines	US: Institutional recognition of coastal barrier resources. Beach shorelines continue to erode as sea level rises and in many instances subsidence continues. Losses offset by federal, state, and local beach nourishment and restoration projects. LA: Gulf shoreline and interior waterbody shoreline losses continue as sea level rises and subsidence continues. Losses offset by beach nourishment and restoration projects such as CWPPRA, LCA, NOAA Fisheries and other state and local efforts SA: Gulf coastal shorelines and interior waterbody shorelines continue to erode due to natural and man-induced causes.	US: Institutional recognition of coastal barrier resources continues. Beach shorelines continue to erode as sea level rises and subsidence continues. Losses offset by federal, state, and local beach nourishment and restoration projects. LA: Gulf shoreline and interior waterbody shoreline losses continue as sea level rises and subsidence continues. These impacts offset by beach nourishment and restoration projects such as CWPPRA, LCA, NOAA Fisheries and their state and local efforts LA: beach shorelines continue to erode as sea level rises and subsidence continues. Losses offset by federal, state, and local beach nourishment and restoration projects. LA: Gulf shoreline and interior waterbody shoreline losses continue as sea level rises and subsidence continues. Losses offset by beach nourishment and restoration projects such as CWPPRA, LCA, NOAA Fisheries and other state and local efforts.	US: Institutional recognition of coastal barrier resources continues. Losses offset by federal, state, and local beach nourishment and restoration projects. LA: Gulf shoreline and interior waterbody shoreline losses continue as sea level rises and subsidence continues. These impacts offset by beach nourishment and restoration projects such as CWPPRA, LCA, NOAA Fisheries and other state and local efforts SA: Gulf shoreline and interior waterbody shoreline losses continue as sea level rises and subsidence continues. Losses offset by beach nourishment and restoration projects such as CWPPRA, LCA, NOAA Fisheries and other state and local efforts	US: Institutional recognition of coastal barrier resources continues. Beach shorelines continue to erode as sea level rises in many instances subsidence continues. These impacts offset by federal, state and local beach nourishment and restoration projects. LA: Gulf shoreline and interior waterbody shoreline losses continue as sea level rises and subsidence continues. Losses offset by beach nourishment and restoration projects such as CWPPRA, LCA, NOAA Fisheries and other state and local efforts SA: TSP has no significant direct, indirect or cumulative impacts on coastal shorelines.
Population and Housing	Risks of hurricane storm surge impacts continue to those not	Risks of hurricane storm surge impacts continue to those not	Risks of hurricane storm surge impacts continue to those not	US: Population and households increasing. LA: Increasing

	provided risk reduction by structural or nonstructural risk reduction measures. United States (US): Population and households increasing. Louisiana (LA): population in 1970 estimated at 3.645 million. Risks of hurricane storm surge impacts to those not provided risk reduction by structural or nonstructural risk reduction measures. SA: 1970 populations and number of households in St Mary, St, Martin, & Iberia Parishes is 196,680 with 57.2 thousand households.	provided risk reduction by structural or nonstructural risk reduction measures. US: Population and households increasing. LA: 2015 populations increasing to 4,605 million. Continued coastal land loss and conversion to open water and loss of forested wetlands. St Mary, St, Martin, & Iberia Parishes 2019 population 259,918 with 96.2 thousand households.	provided risk reduction by structural or nonstructural risk reduction measures. US: Population and households increasing. LA: Increasing population and households in Louisiana. Continued coastal land loss and conversion to open water and loss of forested wetlands. SA: Increases population and households in Mary, St, Martin, & Iberia Parishes. Households likely continue. Risk of hurricane storm surge damages continue. Continued loss of brackish and saline marsh habitats.	populations and households. Risks of hurricane storm surge impacts continue to those not provided risk reduction by structural or nonstructural risk reduction measures. SA: Hurricane storm surge related risks reduced for individual households and people located in the 25 year floodplain and in structures that volunteer to participate in nonstructural risk reduction measures. People and households associated with those structures not included in the proposed voluntary nonstructural risk reduction measures would continue to be at risk from hurricane storm surge risk reduction.
Employment, Business, and Industrial Activity	The leading employment sectors are education, healthcare, petroleum production, and petrochemical refining. Other significant employment sectors include education, manufacturing, accommodations and social services, and retail trade. Employment for the region as a whole grew from 1970 through 2000.	Employment growth was steady, and is reflected in the population estimates previously described.	Employment is expected to continue to follow the same trend in the study area. However, businesses would face a higher risk of closing periodically due to damages sustained from hurricane storm-surge.	Would lower the risk that hurricane storm-surge damage would cause the businesses included in the recommended plan. This lower risk could shorten the amount of time businesses would need to close following a hurricane.
Public Facilities and Services	The Ports of Morgan City and Iberia are key centers for international trade, and is among the top busiest ports in the nation.	The Ports of Morgan City and Iberia are key centers for international trade, and is among the top busiest ports in the nation.	FWOP conditions would include a greater potential for permanent displacement of public facilities and services due to hurricane storm surge events. Public facilities and services are expected to grow with the needs of the population and would follow population growth trends.	Would reduce risk of hurricane storm surge-related damages for public facilities and services in the area thereby reducing the number of days a structure is unavailable for use and minimizing the inconvenience to the general public.

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, an east-west thoroughfare that crosses the central part of the area and is a primary route for hurricane evacuation and post-storm emergency response.	The transportation infrastructure includes major roads, highways, railroads, and navigable waterways that have developed historically to meet the needs of the public. Highway 90, an east-west thoroughfare that crosses the central part of the area and is a primary route for hurricane evacuation and post-storm emergency response.	Portions of Highway 90 and other highways and local roads would continue to be periodically damaged by hurricane storm surge.	Portions of Highway 90 and other highways and local roads would continue to be periodically damaged by hurricane storm surge.
Tax Revenue and Property Values	Tax revenues from property taxes tend to rise over time with the increase in property values.	Property values in the low-lying areas are likely not rising in value at the same rate as comparable properties facing a lower risk of sustaining hurricane storm-surge damage.	FWOP conditions would include lower tax revenues as property values decline due to higher risk of damage from hurricane storm surge events over time. Higher risk of damage from hurricane storm surge would manifest itself in higher premiums for flood insurance under the NFIP: higher premiums are expected to increase the cost of property ownership and result in correspondingly lower market values	For the properties included in the recommended plan, property values would stabilize as the higher risk of damage from hurricane storm surge is arrested and reduced.
Community Cohesion	US, LA and SA: 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. Many areas across the country, state and in the study area are comprised of communities with a long history and long-established public and social institutions including places of worship, schools, and community associations. In 2005 with Hurricane Rita, and again in 2008 with Hurricane	US, LA and SA: Due to the absence of hurricane storm surge risk reduction measures, and the resulting direct impacts to existing structures, local populations are often forced to evacuate and/or relocate for significant time periods, thereby significantly disrupting temporarily, and in some instances, permanently, community cohesion.	US, LA and SA: Due to the absence of hurricane storm surge risk reduction measures, and the resulting direct impacts to existing structures, local coastal populations, projected to increase in the future, are often forced to evacuate and/or relocate for significant time periods, thereby significantly disrupting temporarily, and in some instances, permanently, community cohesion. These impacts would be in addition to other national, state and local existing and authorized for construction structural and nonstructural hurricane and	US, LA and SA: Storm surge risk reduction measures could temporarily affect community cohesion due to the noise and fugitive dust from construction activities, the temporary displacement and relocation of residents during construction, and disruption of businesses during construction. Furthermore, non-residential structures that serve as meeting places for the community could become temporarily unavailable during Project implementation. The nonstructural plan would provide positive benefits to the community and it's

	Ike, communities in study area were inundated by storm surge and social institutions were impacted and affected community cohesion.		storm surge damage risk reduction projects.	cohesiveness by reducing the risk of storm surge damage resulting in fewer evacuations or permanent displacement. These impacts would be in addition to other national, state and local existing and authorized for construction structural and nonstructural hurricane and storm surge damage risk reduction projects.
Community and Regional Growth	Growth in the study area has been largely steady and follows population trends	Residents currently living in low lying areas face the prospect of relocating due to the high risk of hurricane storm surge damage.	Income growth and associated community and regional growth are expected to follow trends in national income, local employment, household formation, and the demand for public facilities and services. There would also be a higher potential for unstable or disrupted community and regional growth due to increasing risk of damage from storm surge events.	Would include reduced risk of hurricane storm surge-related damages for those low-lying structures located in the 25 year floodplain thus reducing overall social vulnerability and preserving growth opportunities for communities in the region and enhancing the potential for long-term growth and sustainability.
Recreation Resources	US, LA and SA: Recreational features and opportunities vary throughout the coastal zone, habitat and culture playing significant roles in the diversity of activities. From the games and competitions of Native Americans, to the influence of diverse immigrant cultures, traditional recreation in Louisiana has been a product of its people.	US, LA and SA: Federal and State agencies are major providers of recreational opportunities throughout the country and State of Louisiana. There are one Wildlife Refuges and Conservation Areas in the Study Area, and two State parks. In addition to the high quality recreational fishing and hunting in the parks in the region, several lakes and inland marshes offer opportunities for birding, hunting and catching both freshwater and saltwater species.	US, LA and SA: The continued loss of wetlands/marshes and habitat diversity affects recreational opportunities. Storm surge and saltwater could have a negative impact on freshwater forests and habitats and could reduce recreational resources (e.g., fishing, hunting, bird watching, and other). In general, further degradation of area marshes will continue and its associated negative impacts on recreation activities will increase. Additionally, recreational infrastructure would remain	US, LA and SA: By elevating residential recreational structures, such as camps, damage from storm surge is less likely to occur. Additionally, elevated structures should create less debris that must be removed following a storm surge event. These impacts would be in addition to other national, state and local existing and authorized for construction structural and nonstructural hurricane storm surge damage risk reduction projects.

			vulnerable to surges. These impacts would be in addition to other national, state and local existing and authorized for construction structural and nonstructural hurricane storm surge damage risk reduction projects.	
Other Social Effects	US: Severe storm surge events threaten the health and safety of residents living in coastal areas. Loss of life, injury, and post flood health hazards may occur in the event of catastrophic flooding. LA and SA: The study area was severely impacted by Hurricane Rita in 2006 and Hurricane Ike in 2008. When facilities that provide critical care or emergency services are impacted by storm surge events, residents are at an even greater risk for experiencing negative health outcomes. Hurricanes Rita and Ike reduced the accessibility and availability of health facilities and services and required additional first responder (fire and police) protection.	US, LA and SA: Other Social Effects that storm surge has on communities include impacts to health and safety, economic vitality, social connectedness, vulnerability and resiliency and leisure and recreation. Many communities along the eastern seaboard and the gulf coast remain vulnerable to these social effects.	US, LA and SA: Social vulnerability is expected to increase over time if subsidence and sea level rise continue to occur, and the population of coastal communities increases as it is projected to do. The absolute number of socially vulnerable people (e.g., low income, minority, less-educated, and over the age of 65) at risk for storm surge events will increase. This, in turn, may lead to an increased burden placed on local, state, and federal agencies to ensure that the most socially vulnerable populations have access to resources before, during, and after flood events. These impacts would be in addition to other national, state and local existing and authorized for construction structural and nonstructural hurricane and storm surge damage risk reduction projects as described in more detail in Sections 1.8 and 2.4.2, & 3.7.2.	US, LA and SA: Cumulative impacts include reducing the risks associated with damages to housing units, public facilities, and commercial structures during storm events as well as improving the health and safety of residents living within the study area. The study area's social vulnerability would be reduced under this alternative with the possible exception of populations unwilling to participate or unable to participate in the Project due to ineligible Project costs. Reduced social vulnerability leads to the potential for enhanced long-term growth and sustainability. Also, the area would be at a reduced risk of incurring the costs associated with clean-up, debris removal, and building and infrastructure repair as a result of storm surge events. These impacts would be in addition to other national, state and local existing and authorized for construction structural and nonstructural hurricane and storm surge damage risk reduction projects as described in more detail in Sections 1.8 and 2.4.2, & 3.7.2
Environmental Justice	US, LA & SA: Institutional	US, LA: High poverty rates	US, LA & SA: Institutional	US, LA: High poverty rates

	recognition of Environmental Justice because of Executive Order 12898 of 1994 (E.O. 12898) and the Department of Defense's Strategy on Environmental Justice of 1995, directing 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.	negatively impact the social welfare of residents and undermine the community's ability to provide assistance to residents in times of need.	recognition of Environmental Justice because of Executive Order 12898 of 1994 (E.O. 12898) and the Department of Defense's Strategy on Environmental Justice of 1995, directing 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.	negatively impact the social welfare of residents and undermine the community's ability to provide assistance to residents in times of need.
Cultural and Historic Resources and Tribal Trust Resources	US, LA, & SA: Institutional recognition via the National Historic Preservation Act (and others). Historic and cultural resources subjected to natural processes and man-made actions.	US, LA, & SA: Continued institutional recognition. Human activities as well as natural processes can potentially destroy historic and natural resources. The loss of land threatens the existence and integrity of these resources.	US, LA, & SA: Continued institutional recognition via the National Historic Preservation Act (and others). Potential loss of historic and cultural resources due to natural and human causes. SA: The continued adverse impacts associated with hurricane storm surge and land loss within the SA threatens the existence and integrity of historic and cultural resources that may exist within the SA.	US & LA: Continued institutional recognition via the National Historic Preservation Act (and others). Potential loss of historic and cultural resources due to natural and human causes. SA: Implementing the TSP could directly and indirectly affect any recorded or unrecorded cultural resource that may exist within the footprint of the project, the project's borrow source, or within any area identified as an area of potential effects (APE). A programmatic agreement (PA) would be in place to govern future investigations and activities. In accordance with the PA, to the extent any adverse effect to identified cultural resources cannot be avoided, such impacts would be mitigated. These impacts would be in addition to other national, state and local existing and authorized for construction structural and nonstructural hurricane storm surge damage risk reduction projects

Aesthetics and Visual Resources	US, LA, & SA: Technical recognition via 1988 USACE Visual Resources Assessment Procedure. Institutional recognition via Wild and Scenic Rivers Act, Louisiana Scenic Rivers Act, Scenic Byways and others. LA & SA: Aesthetic resources negatively impacted by hurricanes Katrina, Rita, Gustav, and Ike	US, LA, & SA: Continued institutional recognition. Visual resources have been destroyed, enhanced, or preserved by human activities and natural processes. LA & SA: Continued wetland loss may have an adverse effect on the visual complexity of the bayous and swamps.	US, LA, & SA: Continued institutional recognition. Continued human population growth and development and other human activities have the potential to destroy, enhance or preserve visual resources. SA: Erosion and land loss could result in the loss of vegetation that may provide a visually complex environment and desirable views and reduce opportunities for viewing wildlife.	US, LA, & SA: Generally, there would be no significant effects on the natural environment. Most effects would be on the human environment. This includes incremental risk reduction achieved by elevating 3,463 residential structures, floodproofing 597 non-residential structures.These impacts would be in addition to other national, state and local existing and authorized for construction structural and nonstructural hurricane storm surge damage risk reduction projects
Water Quality and Salinity	LA & SA: Clean Water Act of 1977, NEPA of 1969, Coastal Zone Management Act, and Estuary Protection Act and institutional recognition to restore and protect water bodies, especially with respect to point sources. Non-point sources still unregulated. LA & SA: Increasing human development adversely impacts water quality. Salinity levels increase inland due to salt water intrusion, due in part to wetland loss, channelization, and oil and gas exploration canals.	US & LA & SA: Continued institutional recognition. Increasing human development, agriculture and oil & gas exploration and industrialization result in increased potential for water quality problems and saltwater intrusion. SA: coastal wetland loss results in loss of water purification by wetlands. Channels and oil & gas exploration canal continue to provide conduit for saltwater intrusion and coastal land loss.	US & LA & SA: Continued institutional recognition. Increasing human development, agriculture and oil & gas exploration and industrialization result in increased potential for water quality problems and saltwater intrusion. These water quality impacts offset for construction ecosystem restoration projects. SA: coastal wetland loss results in loss of water purification by wetlands. Channels and oil & gas exploration canal continue to provide conduit for saltwater intrusion and coastal land loss.	US & LA: Continued institutional recognition. Increasing human development, agriculture, channelization and oil & gas exploration and industrialization continue to result in increased potential for water quality problems and saltwater intrusion. These water quality impacts offset by existing and authorized for construction ecosystem restoration projects. SA: The TSP would reduce water quality impacts associated with flooding from storm surge events. These impacts would be in addition to other national, state and local existing and authorized for construction structural and nonstructural hurricane storm surge damage risk reduction projects.
Aquatic Resources	US: Institutional recognition of Natural Resources. Wetlands resources continue to be lost to	US: Institutional recognition of Natural Resources continues. Wetlands resources continue to	US: Institutional recognition of Natural Resources continues. Wetlands resources continue to	US: Institutional recognition of Natural Resources continues. Wetlands resources continue to

	human encroachment and development LA: from 1985 to 2010 increasing coastal land loss of -16.57 mile2 per year SA: from 1985 to 2010 increasing coastal land loss of – 0.97 square miles per year Calcasieu Basin; -1.30 mile2 in Mermentau Basin; -0.45 mile2 in Teche-Vermilion Basin	be lost to human encroachment and development LA: from 1985 to 2010 increasing coastal land loss of -16.57 square miles per year SA: from 1985 to 2010 increasing coastal land loss of – 0.97 mile2 per year Calcasieu Basin; -1.30 mile2 in Mermentau Basin; -0.45 mile2 per year in Teche-Vermilion Basin	be lost to human encroachment and development. These impacts would be offset by existing and authorized for construction ecosystem restoration projects. LA: estimated net change between 2010-2060 under moderate sea level rise scenario is - 2100 km2. These impacts offset by restoration projects such as CWPPRA, LCA, NOAA Fisheries and other state and local efforts SA: estimated net change between 2010-2060 under moderate sea level rise scenario in Calcasieu/Sabine basin is -146.5 km2; in Mermentau Basin -208 km2; and in Teche- Vermilion Basin -67 km2	be lost to human encroachment and development. These impacts would be offset by existing and authorized for construction ecosystem restoration projects LA: estimated net change between 2010- 2060 under moderate sea level rise scenario is -2100 km2. These impacts offset by restoration projects such as CWPPRA, LCA, NOAA Fisheries and other state and local efforts. SA: TSP has no significant direct, indirect or cumulative impacts on wetlands resources.
Fish and Wildlife Resources	US & LA & SA: Institutional recognition of natural resources and fish and aquatic resources and its habitats. Reduction in fisheries habitat, increased catches, gear improvement, catch regulations, Magnuson-Stevens Fishery Conservation and Management Act and amendments, formation of NMFS and LDWF. About 90% of the world's seafood resources have been depleted in the past century; 38% of the depleted species have declined by more than 90%; 7% of the species of fish studied by researchers have become extinct.	US & LA & SA: Institutional recognition of natural resources and fish and aquatic resources and its habitats. LA: from 1985 to 2010 increasing coastal land loss of -16.57 square miles per year results in loss of coastal estuaries used as fish and aquatic organisms nursery and foraging habitat. SA: from 1985 to 2010 increasing coastal land loss of – 0.97 mile2 per year Calcasieu Basin; -1.30 mile2 in Mermentau Basin; -0.45 mile2 per year in Teche-Vermilion Basin	US: Institutional recognition of natural resources and fish and aquatic resources and its habitats continues. Fisheries and aquatic resources continue to be adversely impacted due to reduction in fisheries habitat, increased catches, gear improvement, catch regulations. These impacts would be offset by existing and authorized for construction ecosystem restoration projects LA: continued fish and aquatic organisms estuarine habitats lost with estimated net change between 2010-2060 under moderate sea level rise scenario is -2100 km2. These impacts offset by restoration projects such as CWPPRA, LCA, NOAA Fisheries and other	US: Institutional recognition of natural resources and fish and wildlife resources and its habitats continues. Fisheries and aquatic resources continue to be adversely impacted due to reduction in fisheries habitat, increased catches, gear improvement, catch regulations. These impacts would be offset by existing and authorized for construction ecosystem restoration projects LA: continued fish and aquatic organisms estuarine habitats lost with estimated net change between 2010-2060 under moderate sea level rise scenario is -2100 km2. These impacts offset by restoration projects such as CWPPRA, LCA, NOAA Fisheries and other

			state and local efforts SA: estimated net change between 2010-2060 under moderate sea level rise scenario in Calcasieu/Sabine basin is -146.5 km2; in Mermentau Basin -208 km2; and in Teche-Vermilion Basin -67 km2	state and local efforts SA: TSP has no significant direct, indirect or cumulative impacts on fisheries or.
Essential Fish Habitat (EFH)	US & LA & SA: Institutional recognition of decline in EFH quality; passage of Magnuson-Stevens Fishery Conservation and Management Act, as amended, formation of NMFS and LDWF.	US & LA & SA: Institutional recognition of EFH continues. LA: from 1985 to 2010 increasing coastal land loss of -16.57 square miles per year results in loss of coastal estuaries used as transitional estuarine EFH nursery and foraging habitats. SA: from 1985 to 2010 increasing coastal land loss of – 0.97 mile2 per year Calcasieu Basin; -1.30 mile2 in Mermentau Basin; -0.45 mile2 per year in Teche-Vermilion Basin results in loss of coastal estuaries used as EFH nursery and foraging habitats.	US: Institutional recognition of EFH continues. LA: continued transitional estuarine EFH lost with estimated net change between 2010-2060 under moderate sea level rise scenario is - 2100 km2. These impacts offset by restoration projects such as CWPPRA, LCA, NOAA Fisheries and other state and local efforts SA: continued transitional estuarine EFH lost with estimated net change estimated net change between 2010-2060 under moderate sea level rise scenario in Calcasieu/Sabine basin is -146.5 km2; in Mermentau Basin -208 km2; and in Teche-Vermilion Basin -67 km2	US: Institutional recognition of EFH continues. LA: continued transitional estuarine EFH lost with estimated net change with estimated net change between 2010-2060 under moderate sea level rise scenario is - 2100 km2. These impacts offset by restoration projects such as CWPPRA, LCA, NOAA Fisheries and other state and local efforts SA: TSP has no significant direct, indirect or cumulative impacts on fisheries or aquatic resources. These impacts would be in addition to other national, state and local existing and authorized for construction structural and nonstructural hurricane storm surge damage risk reduction projects
Wildlife Resources	US: Institutional recognition of natural resources and fish and wildlife resources and its habitats. Wetland dependent wildlife populations respond primarily to natural population-regulating mechanisms. Institutional recognition of wildlife and its habitats. Wildlife resources continue to be adversely impacted and lost due to human encroachment and development	US: Institutional recognition of natural resources and fish and wildlife resources and its habitats continues. Continued institutional recognition of wildlife and its habitats. Wildlife resources continue to be adversely impacted and lost due to human encroachment and development of wildlife habitats. LA: wildlife habitats lost from 1985 to 2010 due to increasing coastal land loss of -	US: Institutional recognition of natural resources and fish and wildlife resources and its habitats continues. Wildlife resources continue to be adversely impacted and lost due to human encroachment and development of wildlife habitats. These impacts would be offset by existing and authorized for construction ecosystem restoration projects LA: continued wildlife habitats	US: Institutional recognition of natural resources and fish and wildlife resources and its habitats continues. Wildlife resources continue to be adversely impacted and lost due to human encroachment and development of wildlife habitats. These impacts would be offset by existing and authorized for construction ecosystem restoration Projects LA: continued wildlife habitats

	of wildlife habitats LA: wildlife habitats lost from 1985 to 2010 due to increasing coastal land loss of -16.57 mile2 per year SA: wildlife habitat losses from 1985 to 2010 increasing coastal land loss of – 0.97 square miles per year Calcasieu Basin; -1.30 mile2 in Mermentau Basin; -0.45 mile2 in Teche-Vermilion Basin	16.57 square miles per year SA: from 1985 to 2010 increasing coastal land loss of – 0.97 mile2 per year Calcasieu Basin; -1.30 mile2 in Mermentau Basin; -0.45 mile 2 per year in Teche-Vermilion Basin	lost with estimated net change between 2010-2060 under moderate sea level rise scenario is - 2100 km2. These impacts offset by restoration projects such as CWPPRA, LCA, NOAA Fisheries and other state and local efforts SA: estimated net change between 2010-2060 under moderate sea level rise scenario in Calcasieu/Sabine basin is -146.5 km2; in Mermentau Basin -208 km2; and in Teche-Vermilion Basin -67 km2	lost with estimated net change between 2010-2060 under moderate sea level rise scenario is - 2100 km2. These impacts offset by restoration projects such as CWPPRA, LCA, NOAA Fisheries and other state and local efforts SA: TSP has no significant direct, indirect or cumulative impacts on wildlife resources.
Threatened/Endangered Species and Other Protected Species of Concern	US, LA & SA: The Endangered Species Act of 1973 (ESA), Migratory Bird Treaty Act of 1918 as amended (MBTA), Bald and Golden Eagle Protection Act (BGEPA) and Marine Mammal Protection Act of 1972 (MMPA) help protect the existence of certain species listed under each Act. Listed and protected species habitat is impacted by natural conditions such as hurricane storm surge, saltwater intrusion and subsidence, and man-made conditions such as agriculture, human development and industrialization.	US, LA & SA: continued impacts to listed and protected species habitat by natural conditions such as hurricane storm surge, saltwater intrusion and subsidence, and manmade conditions such as agriculture, human development and industrialization.	US, LA & SA: continued impacts to listed and protected species habitat impacts by natural conditions such as hurricane storm surge, saltwater intrusion and subsidence, and man-made conditions such as agriculture, human development and industrialization.	US & LA: continued impacts to listed and protected species habitat impacts associated with agriculture, human development and industrialization. SA: minimum and temporary project induced impacts such as temporary avoidance of nearby habitat due to noise and construction activity. These impacts would be in addition to other national, state and local existing and authorized for construction structural and nonstructural hurricane storm surge damage risk reduction projects.
Soils	US: Institutional recognition of soil and water resources conservation. Prime agricultural land decreases from 1997 to 2012 LA: land area decreases from 1932 to 2010; SA: land area decreases from 1932 to 2010 with concomitant increase in shallow open water area.	US: Institutional recognition of soil and water resources conservation. Prime agricultural land decreases from 1997 to 2012 LA: land area decreases from 1932 to 2010 SA consists primarily of wetland type soils and shorelines prone to frequent flooding and not	US: Institutional recognition of soil and water resources conservation. Prime agricultural land decreases from 1997 to 2012 LA: land area continues to decrease with concomitant increase in shallow open water resulting in greater potential for hurricane storm surge damages	US: Institutional recognition of soil and water resources conservation. Prime agricultural land decreases from 1997 to 2012 LA: land area continues to decrease with concomitant increase in shallow open water resulting in greater potential for hurricane storm surge damages

		suitable for agricultural use. Prime farmland consist of 941,196 acres, or 34.3 percent of the soils in SA	to human habitations and loss of estuarine marsh habitats. These impacts offset by beach nourishment and restoration projects such as CWPPRA, LCA, NOAA Fisheries and other state and local efforts SA: land area continues to decrease with concomitant increase in shallow open water resulting in greater potential for hurricane storm surge damages and loss of estuarine marsh habitats	to human habitations and loss of estuarine marsh habitats. These impacts offset by beach nourishment and restoration projects such as CWPPRA, LCA, NOAA Fisheries and other state and local efforts SA: no significant impacts of the TSP on soils, water bottoms or prime and unique wetlands.
Sedimentation and Erosion	US & LA & SA: Flood Control Act of 1928 helps reduce sedimentation of rivers and other water bodies caused by erosion associated with agriculture, human development, industrialization and storms. SA: Sediment delivery by Atchafalaya River and other rivers throughout SA.	US & LA: continued sedimentation and erosion associated with agriculture, human development, industrialization, storms, navigation channels and oil and gas canals. LA: 350 miles of sandy barrier shoreline and gulf beaches lost. SA: White Lake average shoreline erosion rate of 15 feet per year; Grand Lake shoreline erosion rate of 11 feet per year to 32 feet per year; and Sabine Lake about 10 feet per year.	US & LA: continued sedimentation and erosion associated with agriculture, human development, industrialization, storms, navigation channels and oil and gas canals. These impacts would be offset by existing and authorized for construction ecosystem restoration projects. SA: continued shoreline erosion and sedimentation.	US & LA: continued sedimentation and erosion associated with agriculture, human development, industrialization, storms, navigation channels and oil and gas canals. These impacts would be offset by existing and authorized for construction ecosystem restoration projects SA: No project-induced impacts of the TSP.

(*Alternative 6b– Nonstructural 50 year Floodplain cumulative impacts would be similar in nature but greater in scale compared to Alternative 6a)

US= United States, LA = Louisiana, SA= Study Area

6.8 MITIGATION AND MONITORING PLANS

The Council on Environmental Quality's regulations (40 CFR 1508.20) implementing the procedural provisions of NEPA of 1969, as amended (42 U.S.C. 4321 et seq.) define "mitigation" as including

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; and,
e) compensating for the impact by replacing or providing substitute resources or environments.

Because the CEMVN anticipates there would be no wetland, endangered species, marine mammals, or essential fish habitat impacts, it is not preparing a mitigation and monitoring plan.

If the TSP changes, the CEMVN would work with USFWS, NMFS, EPA, and other interested agencies to develop a final mitigation plan that is fully consistent with the Clean Water Act Section 404(b)(1) Guidelines, particularly with respect to the April 10, 2008, mitigation rule. The CEMVN would issue a special public notice describing the details of this mitigation plan.

SECTION 7
Tentatively Selected Plan Recommendations

7.1 DESCRIPTION OF THE TENTATIVELY SELECTED PLAN (TSP)

Alternative 1 Floodproofing 25 year Floodplain Plan proposes implementing nonstructural measures across the 86,073 square miles representing the 25 year floodplain to reduce coastal storm damages to 3,462 residential structures, 597 commercial structures, 71 public buildings, and 166 warehouses. This will be achieved by elevating residential structures, and dry floodproofing non-residential structures. Residential structures will be elevated to the BFE predicted to occur in the year 2075. Non-residential structures will have floodproofing measures applied generally up to 3 ft above ground level. The NED TSP is 100 percent voluntary. The expected average annual net benefits are approximated at $20.89 million dollars, with a fully funded cost of approximately $1.42 billion.

The NFS is required to prepare a Floodplain Management Plan in coordination with the USACE to maintain the integrity of the project. However, the NFS should work with the governing bodies within the three parishes to ensure consistency with local development plans and regulations.

Although communities within the study area cannot change the minimum National Flood Insurance Program standards, the NFS should work with the local governments to adopt local standards that achieve higher levels of flood risk reduction, such as replacing elevation requirements based on the 100-year to the 500-year level of risk reduction; implementing a zero rise floodway; and adopting cumulative damages as the trigger for substantial damage determination. Local governments within the floodplain should be encouraged to adopt and implement and enforce stricter building and housing code requirements, and land use and zoning regulations and other developmental controls aimed at reducing flood risk and flood damage.

No mitigation is required for the NED TSP.

By and large, flood risk management projects positively contribute to public safety. This is particularly true for structural plans where for the most frequent flood events, the incidence of inundation are reduced for communities and other developed areas. However, for less frequent and more severe flood events in coastal areas that are characteristic of the study area, structural plans could have a negative effect on public safety. This may arise from some among the public who do not abide by mandatory evacuation orders in advance of an approaching storm, but who otherwise would, believing that the structural levee may provide greater protection from storm surge than may be warranted. Thus, the total population exposed to flooding in the event of overtopping or breach could be greater under with-project conditions. However, for nonstructural plans, no change is expected in evacuation behavior

because the potential exaggerated expectations of performance afforded to structural measures is not present, and awareness of flood risk is not abated. Similarly, residual risk to critical infrastructure (i.e. hospitals, evacuation routes, public buildings) is not expected to be different from without-project conditions since much of this infrastructure is already built and designed to operate in dire situations, especially those of greater frequency such as tropical systems and flood potential.

7.2 RISK AND UNCERTAINTY

Risk is the probability or likelihood for an outcome. Uncertainty refers to the likelihood an outcome results from a lack of knowledge about critical elements or processes contributing to risk or natural variability in the same elements or processes. Throughout project planning, the CEMVN identified risk and uncertainty using collaboration with stakeholders and a risk register. Risk informed decisions were made regarding the reliability of estimated benefits and the costs of alternative plans.

Measures were developed to manage risk, expanding on and referencing successful similar work completed by previous projects along the Louisiana coast as well as nationwide. Experience from previous projects helped in the identification of possible risks and decrease uncertainty in plan formulation. No measure or alternative in the recommended plan is burdened by significant risk or uncertainty regarding its eventual success. Significant risks were avoided by using proper design, appropriate selection, and correct seasonal timing of applications. Risks were also managed through extensive coordination with other agencies and USACE experts. The dynamic and complex nature of coastal environmental processes is a principal source of uncertainty. The CEMVN would use post-construction monitoring to address uncertain outcomes in all the plan's components.

Separating neighborhoods was identified as a low risk. The team was able to lower the risk by determining the most efficient, yet less obtrusive location for levee placement. Impacts to wetlands and cultural resources (known and unknown) was also a risk. The CEMVN would continue to coordinate resource impacts during the planning process and PED phase to reduce this impact risk.

Environmental Factors

Appendix A-1 includes a table outlining the CEMVN's environmental planning risks, importance, and each risk's resolution status.

Relative Sea Level Rise: There is uncertainty about how much sea level change would occur in the region. The evaluation of RSLR is documented in the Appendix C *Hydraulics, Hydrology, and Climate Preparedness and Resiliency*. Calculations based on Engineering Regulation 1100-2-8162 determined the low, intermediate, and high rates of RSLR at 2075 would be 1.4 feet, 2.3 feet, and 3.2 feet higher than current levels respectively (Table 5-5). The intermediate rate was used for models and screening alternatives, with the low and high rates then used in a sensitivity analysis on the TSP to ensure that no superior alternatives

had been accidentally eliminated due to the reliance on a single scenario. This analysis is detailed in Appendix C: Hydraulics, Hydrology, and Climate Preparedness and Resiliency.

The RSLR could impact the benefits achieved by the TSP. Because the TSP was developed using the intermediate RSLR rate, the TSP would provide fewer benefits than anticipated should the low RSLR rate result and more benefits with the high RSLR rate. With the high RSLR rate, the nonstructural component would be less effective because structures would have to be raised to a height that would increase their risk from wind damage during a storm. This could ultimately lead to a shift in project strategy from elevations to relocations if future sea level is higher than anticipated. Such a shift would occur only after careful consideration of not only sea level, but also community cohesion and the viability of supporting infrastructure such as transportation, water supply, and wastewater. For those structures already raised in a previous round of elevation, actual economic benefits could be lower than anticipated if community cohesion and supporting infrastructure are not maintained. These factors would be considered during the implementation phase of the Project. The CEMVN would continue to monitor local conditions and determine if the intermediate scenario of RSLR is occurring. If observed conditions deviate from intermediate to high sea level forecasts during design or construction, reevaluation of the NED.

Storms: Uncertainty with regard to the size and frequency of hurricanes resulting from global 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 Rita or a slow moving storm such as Hurricane 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 were included in the modeling. By using a long-term record of different storm scenarios, the effects of such storms were incorporated into the modeling to reduce the uncertainty in the determination of Project benefits (see Appendix C *Hydraulics, Hydrology, and Climate Preparedness and Resiliency*).

If indicated by monitoring of RLSR and/or climate non-stationarity, the nonstructural Project can be adaptive and make adjustments to design criteria and structures preliminarily recommended for inclusion in the Project. This is achievable because the implementation of a broad regional nonstructural project, as well as evidence of a greater-than-predicted rate of RSLR and/or coastal storm damages, would be distributed over time. As sea level changes and is updated over time, the floodplain definitions would change, design criteria can be adapted, and the predicted 2075 0.01 APE BFE could be adjusted upward. This could require raising structures deemed eligible in the TSP to a higher elevation than identified at this time. Conversely, some structures that were already elevated would return to the risk pool earlier than forecasted. However, this would also be a time distributed effect and identification of greater than expected RSLR would correspond to a potential reduction of forecast benefits.

Modeling Factors

The ADCIRC and HEC-RAS models appear to provide a specific response on the TSP in any given scenario; however it is only a representative point of reference in a complex

system. While the analysis is enhanced by the models, application of the models can introduce error and uncertainty. Calibration and verification efforts are employed so 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 such as boundary conditions, which are limited by the data available, especially during storm events and the time period selected for analysis. Another model parameter assumption is model geometry. Survey data/LiDAR has good coverage in some areas; other areas require assumptions, interpolations, extrapolations, or known elevation points to get coverage. Another uncertainty is that a limited number of storm scenarios are modeled. The CEMVN assumed various storm scenarios over a number of years would represent a much higher indicator of the ability for nonstructural measures to appropriately avoid or minimize surge related damages from major storm events. Models use available historic data to extrapolate future storm conditions and frequency. The size and frequency of storms included are based on statistical analysis but do not account for meteorological changes that can increase or decrease storms over a period of several years. The models do not account for the potential of increased frequency and intensity of storms due to climate change.

Economic Factors

The CEMVN used an economic model to analyze the existing condition and with project measures (Appendix C: Hydraulics, Hydrology, and Climate Preparedness and Resiliency). The with-project alternatives were run to the point of producing the structure detail and therefore do not include any risk and uncertainty in the results.

The flood risk that remains in the floodplain after the proposed alternatives are implemented is known as the residual flood risk. For SCCL, the residual risk illustrated in Appendix D. Alternative 1 25 year nonstructural plan reduced expected annual damages in every reach with the exception of Reach 150 and Reach 70. However, the amount of expected annual damages reduced in the reaches where the recommended plan was effective is limited. The 25 year aggregated floodplain reduces expected annual damages by an estimated $75,000,000 meaning there is an estimated $145,000,000 of residual expected annual damages over the 50 year period of analysis in the with-project condition.

7.3 FEDERAL AND NON-FEDERAL COST-SHARING

The State of Louisiana acting through the CPRAB will be the NFS for design, construction, operation, maintenance, repair, rehabilitation and replacement. It is anticipated the cost share for the design and construction of the project will be 65 percent Federal and 35 percent non-Federal. However, Public Law 115-123 provides that a project that is studied using Supplemental Investigations funds is eligible for implementation using Construction funds provided in that Act if the Secretary determines that the project is technically feasible, economically justified, and environmentally acceptable. Final, specific cost share requirements would be identified in the Project Partnership Agreement. Among other responsibilities, the CPRAB must provide all project LERRDs required for the project. The OMRR&R cost is a 100 percent NFS responsibility. The estimated total project cost for the NED TSP is $1,421,315,000 at a FY 2019 price level.

7.4 FEDERAL RESPONSIBILITIES

The Federal government will be responsible for 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.

7.5 NON-FEDERAL RESPONSIBILITIES FOR THE NED TSP

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

a. Provide 35 percent of total project costs as further specified below:

1. Provide the non-Federal share of design costs allocated by the Government in accordance with the terms of a design agreement entered into prior to commencement of design work for the project;

2. Provide, during the first year of construction, any additional funds necessary to pay the full non-Federal share of design costs;

3. Provide all lands, easements, and rights-of-way, including those required for relocations, the borrowing of material, and the disposal of dredged or excavated material; perform or ensure the performance of all relocations; and construct all improvements required on lands, easements, and rights-of-way to enable the disposal of dredged or excavated material all as determined by the Government to be required or to be necessary for the construction, operation, and maintenance of the project;

4. Provide, during construction, any additional funds necessary to make its total contribution equal to 35 percent of total project costs;

b. Do not use funds provided by a Federal agency under any other Federal program, to satisfy, in whole or in part, the non-Federal share of the cost of the project unless the Federal agency that provides the funds determines that the funds are authorized to be used to carry out the project;

c. Comply with all 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. 4601-4655), and the Uniform Regulations contained in 49 CFR Part 24, in acquiring lands, easements, and rights-of-way required for construction, operation, and maintenance of the project, including those necessary for relocations, the borrowing of materials, or the disposal of dredged or excavated material; and inform all affected persons of applicable benefits, policies, and procedures in connection with said Act;

d. For so long as the project remains authorized, operate, maintain, repair, rehabilitate, and replace the project, or functional portions of the project, including any mitigation features, at no cost to the Federal Government, in a manner compatible with the project‘s authorized purposes and in accordance with applicable Federal and State 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 for the purpose of completing, inspecting, operating, maintaining, repairing, rehabilitating, or replacing the project;

f. Hold and save the United States free from all damages arising from the construction, operation, maintenance, repair, rehabilitation, and replacement of the project and any betterments, except for damages due to the fault or negligence of the United States or its contractors;

g. Keep and maintain books, records, documents, or other evidence pertaining to costs and expenses incurred pursuant to the project, for a minimum of 3 years after completion of the accounting for which such books, records, documents, or other evidence are required, to the extent and in such detail as will properly reflect total project costs, and in accordance with the standards for financial management systems set forth in the Uniform Administrative Requirements for Grants and Cooperative Agreements to State and Local Governments at 32 Code of Federal Regulations (CFR) Section 33.20;

h. Comply with Section 221 of Public Law 91-611, Flood Control Act of 1970, as amended (42 U.S.C. 1962d-5), and Section 103 of the Water Resources Development Act of 1986, Public Law 99-662, as amended (33 U.S.C. 2213), which provides that the Secretary of the Army shall not commence the construction of any water resources project or separable

element thereof, until the non-Federal sponsor has entered into a written agreement to furnish its required cooperation for the project or separable element;

i. Comply with all applicable Federal and State laws and regulations, including, but not limited to: Section 601 of the Civil Rights Act of 1964, Public Law 88-352 (42 U.S.C. 2000d) and Department of Defense Directive 5500.11 issued pursuant thereto; Army Regulation 600-7, entitled "Nondiscrimination on the Basis of Handicap in Programs and Activities Assisted or Conducted by the Department of the Army" and all applicable Federal labor standards requirements including, but not limited to, 40 U.S.C. 3141- 3148 and 40 U.S.C. 3701 – 3708 (revising, codifying and enacting without substantial change the provisions of the Davis-Bacon Act (formerly 40 U.S.C. 276a et seq.), the Contract Work Hours and Safety Standards Act (formerly 40 U.S.C. 327 et seq.), and the Copeland Anti-Kickback Act (formerly 40 U.S.C. 276c et seq.);

j. Perform, or ensure performance of, any investigations for hazardous substances that are determined necessary to identify the existence and extent of any hazardous substances regulated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Public Law 96-510, as amended (42 U.S.C. 9601-9675), that may exist in, on, or under lands, easements, or rights-of-way that the Federal Government determines to be required for construction, operation, and maintenance of the project. However, for lands that the Federal Government determines to be subject to the navigation servitude, only the Federal Government shall perform such investigations unless the Federal Government provides the non-Federal sponsor with prior specific written direction, in which case the non-Federal sponsor shall perform such investigations in accordance with such written direction;

k. Assume, as between the Federal Government and the non-Federal sponsor, complete financial responsibility for all necessary cleanup and response costs of any hazardous substances regulated under CERCLA that are located in, on, or under lands, easements, or rights-of-way that the Federal Government determines to be required for construction, operation, and maintenance of the project;

l. Agree, as between the Federal Government and the non-Federal sponsor, that the non-Federal sponsor shall be considered the operator of the project for the purpose of CERCLA liability, and to the maximum extent practicable, operate, maintain, repair, rehabilitate, and replace the project in a manner that will not cause liability to arise under CERCLA.

m. Prevent obstructions or encroachments on the project (including prescribing and enforcing regulations to prevent such obstructions or encroachments) such as any new developments on project lands, easements, and rights-of-way or the addition of facilities which might reduce the level of protection the project affords, hinder operation and maintenance of the project, or interfere with the project's proper function;

n. Not less than once each year, inform affected interests of the extent of protection afforded by the project;

o. Agree to participate in and comply with applicable Federal floodplain management and flood insurance programs;

p. Comply with Section 402 of the Water Resources Development Act of 1986, as amended (33 U.S.C. 701b-12), which requires a non-Federal sponsor to prepare a floodplain management plan within one year after the date of signing a project partnership agreement, and to implement such plan not later than one year after completion of construction of the project;

q. 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 protection levels provided by the project;

r. Shall not use any project features or lands, easements, and rights-of-way required for such features as a wetlands bank or mitigation credit for any other project;

s. Pay all costs due to any project betterments or any additional work requested by the sponsor, subject to the sponsor's identification and request that the Government accomplish such betterments or additional work, and acknowledgement that if the Government in its sole discretion elects to accomplish the requires to so notify the non-Federal sponsor in writing that sets forth any applicable terms and conditions.

7.6 PATH FORWARD

At this phase of the study, prior to concurrent review of the draft document, the CEMVN identified the 25 year floodplain Nonstructural Plan, including elevation and floodproofing TSP for future recommendation for authorization as a Federal project, with such modifications thereof as in the discretion of the Commander, Headquarters, U.S. Army Corps of Engineers, may be advisable. The USACE recognizes that the non-Federal sponsor, CPRAB, supports the current identification of the TSP, but support is also subject to concurrent review of the Draft Report. The CEMVN will continue to coordinate with the NFS, CPRAB to complete feasibility level of design on the TSP. An implementation plan for the TSP will further developed and documented in the revised final decision document.

Concurrent review of this draft report includes public, technical, legal, and policy reviews, as well as a Type I IEPR. The PDT, the CEMVN management, and USACE vertical team representatives throughout the agency will consider comments provided during the review period prior to providing feedback to a USACE Headquarters Senior Leaders Panel. This panel will consider the evaluation of the significant public, technical, legal, policy and IEPR comments on the TSP and other alternatives to determine the endorsement of a recommended plan and proposed way forward to complete feasibility-level design and the final report.

The final feasibility report is anticipated to be submitted in Fall of 2020 to USACE headquarters. After the final feasibility report is submitted to headquarters, a Chief's Report

will be developed. On the Chief of Engineers signs the report, the Chief of Staff signs the notification letters forwarding the Report to the chairpersons of the Senate Committee on Environmental and Public Works and the House of Representatives Committee on Transportation and Infrastructure. The signed Chief's Report is also supplied to the Office of the Assistant Secretary of the Army for Civil Works for review by the Administration.

While the TSP recommended herein, provides a significant suite of measures to reduce coastal storm risk in South Central Louisiana, the plan will not solve all of St. Mary, Iberia, and St. Martin Parishes flooding problems. Under the TSP, there remains residual risk from flooding beyond the design limitations, there are locations within the study area that are outside of the 25 year floodplain that will continue to see impacts to roadways, utilities, and the natural environment as a result of flooding. The USACE recognizes that the USACE authority and formulation methodology is limited in what it can provide. It is recommended that additional actions by the sponsor and other entities be considered in a holistic approach to further mitigate coastal storm damages and increase overall resiliency.