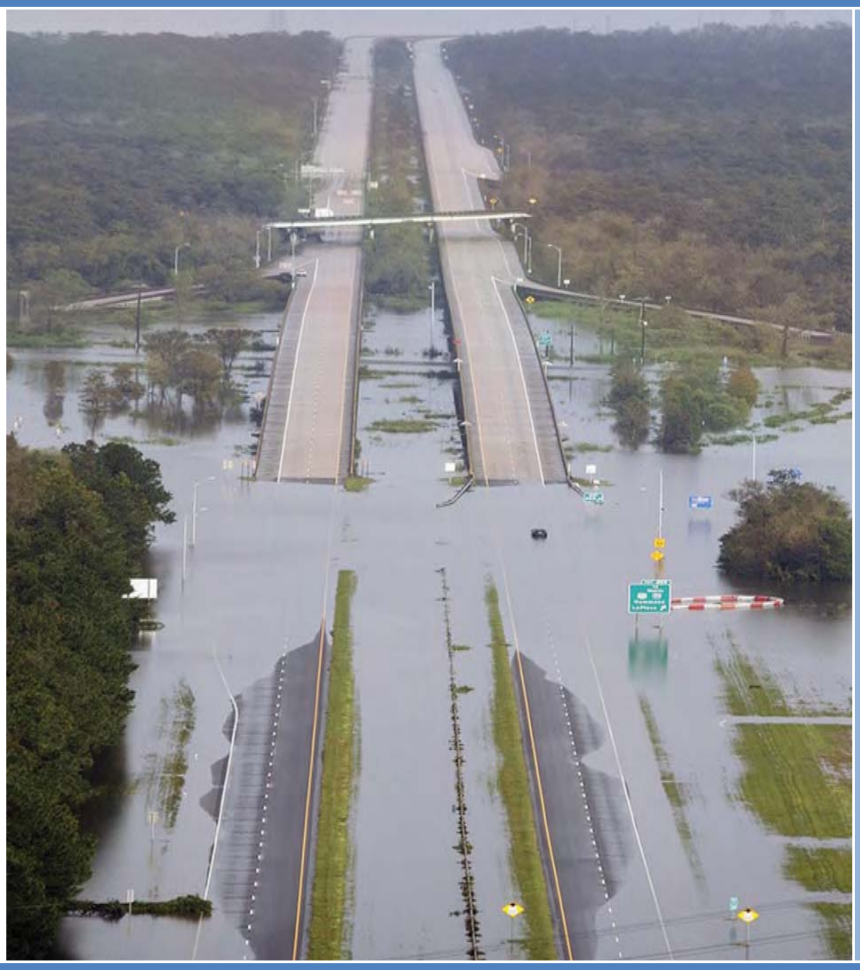
West Shore Lake Pontchartrain Hurricane and Storm Damage Risk Reduction Study



Integrated Draft Feasibility Report and Environmental Impact Statement

US Army Corps of Engineers®

U.S. Army Corps of Engineers
Mississippi Valley Division
New Orleans District

August 2013

Hurricane Isaac flooding in Laplace, Louisiana.

Comments: Please send comments or questions on this Draft Environmental Impact Statement (DEIS) to the U.S. Army Corps of Engineers, New Orleans District, Attention: Dr. William P. Klein, Jr., P.O. Box 60267, New Orleans, Louisiana 70160-0267. Telephone: (504) 862-2540; FAX: (504) 862-2088. **The official closing date for receipt of comments will be 45 days from the date on which the Notice of Availability of the Draft EIS appeared in the Federal Register.**

The U.S. Army Corps of Engineers prepared this feasibility report and Environmental Impact Statement for the West Shore Lake Pontchartrain Hurricane and Storm Damage Risk Reduction study. The Pontchartrain Levee District is the non-Federal Sponsor of the study. The report includes input from the study sponsors, natural resource agencies and the public. It presents potential solutions to reduce damages from hurricane and tropical storm surge for 62,900 residents in St. Charles, St. John the Baptist and St. James Parishes, Louisiana.

The study area offers a bounty of natural resources but it was historically subject to flooding from the Mississippi River and nearby lakes. Colonial settlers built levees along the river starting in the 1700s to combat annual floods. River levees allowed colonists to settle the area, grow crops and harvest natural resources.

The management of Mississippi River flood risks and the development of interior drainage systems in the 20th century, allowed urban and suburban expansion into the region beyond the high ground found adjacent to the river. The study area has no coastal storm levees and remains susceptible to damages from surges resulting from hurricanes and tropical storms. Some natural buffer protection is afforded by a large cypress swamp that separates developed areas from nearby tidal lakes. The swamp has degraded over time and the buffer it provides between the lakes and towns is decreasing.

Population is increasing with suburban and industrial development along the river corridor between Baton Rouge and New Orleans. Residents are attracted to the area's employment opportunities, quality of life and access to recreation. Increasing population and degrading natural buffers combine to create risks of damages from hurricane and tropical storm surge events. Future sea level rise exacerbates the risks of damage from storm hurricane and tropical storm surge events. As a result, hurricane and tropical storm surge damage is a substantial risk today that is expected to increase over time.

In August 2012 Hurricane Isaac struck the region causing extensive rainfall and storm surge flooding in the study area. After the storm President Obama toured the damaged area and met with residents and community leaders. The storm illustrates the risks faced in low-lying study area communities. Thousands of residents and businesses were flooded and continue to work towards community recovery today.

Key industries are located in the river corridor. The Port of South Louisiana is the largest volume port in the Western Hemisphere and the ninth largest in the world. It stretches along the Mississippi River between New Orleans and Baton Rouge and plays a critical role in the export of agricultural commodities from the Nation's heartland. Hurricane Isaac disrupted port logistics. Storm surge blocked facility access closing the port for days. Oil refineries, including the Nation's third largest, were shut down during and after the storm. Gasoline and chemical production stopped impacting an important industrial sector that supports National energy security. Regional and national fuel prices spiked. The storm caused agricultural losses due to an inability to drain flooded fields. Storm surge flooded ground-level parts of Interstate 10 and access to Interstate 55. These are critical transportation routes that support the regional and national economies and that play an important role in emergency evacuation, repopulation and post-storm recovery.

Eleven management measures were crafted to address storm surge. Structural and non-structural features included levees, elevating buildings and restoring cypress swamp. Measures were combined into a dozen alternative plans. A focused array of four alternative plans was evaluated under SMART Planning. Alternatives A and C are comprised of non-structural




measures and levee alignments. A third plan (Alternative D) consists of a levee and flood wall alignment. A no-action plan is the basis to compare benefits and environmental impacts.

Alternative C is the Tentatively Selected Plan. It is an 18.27-mile levee around Montz, Laplace, Reserve and Garyville, reducing risk to over 7,000 structures. Additionally, four miles of I-10 flooded during Hurricane Isaac is within the proposed system. The plan includes non-structural measures for 1,571 structures in Gramercy, Lutcher and Grand Point. The estimated cost is $881,000,000 and annualized net benefits are $23,000,000 with a benefit to cost ratio of 1.63.

Over the next few months a public comment period will be conducted along with technical, peer and policy reviews. Additional feasibility work remains to be completed on engineering, cost estimating, environmental, economic, real estate and construction elements of the plan. Results of the reviews and additional feasibility work will be incorporated into a final report. The final report will be made available for state and agency and public review before the Chief of Engineers makes a final recommendation on the project.

Hurricane Isaac flooding at I-10 and US-51.

Table of Contents

Appendices

List of Tables

List of Figures

1.0 INTRODUCTION

The U.S. Army Corps of Engineers (USACE) Mississippi Valley Division (MVD), New Orleans District (CEMVN) prepared this feasibility report and Environmental Impact Statement (EIS) for the West Shore Lake Pontchartrain (WSLP) Hurricane and Storm Damage Risk Reduction study. It includes input from the non-Federal study sponsor, natural resource agencies, and the public. This report presents potential solutions to reduce hurricane storm surge damages in St. Charles, St. John the Baptist and St. James Parishes, Louisiana. The study website is http://www.mvn.usace.army.mil/About/Projects/WestShoreLakePontchartrain.

1.1 Background

The study area (Figure 1-1) is located in southeast Louisiana between the Mississippi River, and Lakes Maurepas and Pontchartrain. The towns of Montz, Laplace, Reserve, Lutcher, Gramercy, Grand Point, Convent, Garyville and Romeville are area communities. The 184,351 study acre area occupies a portion of one of the oldest delta complexes in the Mississippi River Deltaic Plain. It is located in the lower Mississippi River alluvial plain in the Pontchartrain Basin. The area includes residential and commercial developments south of Interstate 10 (I-10). West of Laplace, a majority of the developed areas are found between U.S. Highway 61 (US-61) and the Mississippi River levee. The area north of I-10 comprises the State of Louisiana's Maurepas Swamp Wildlife Management Area (WMA). The project area includes lands potentially impacted by the proposed action.

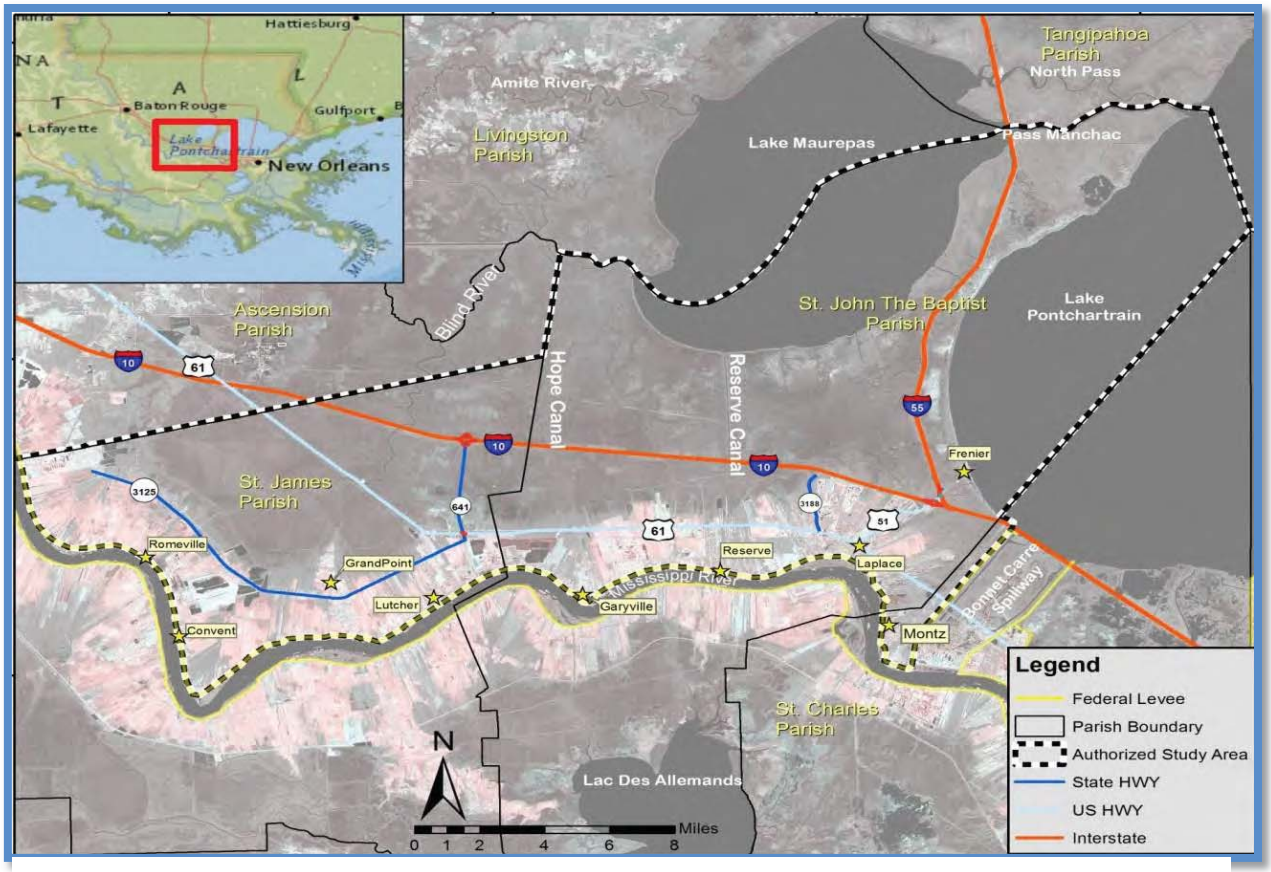


Figure 1-1: West Shore Lake Pontchartrain authorized study area.

Hurricane or tropical storm winds push on the ocean's surface, causing a rise of water over and above the predicted tide. This is called storm surge. Hurricanes and tropical storms are an important part of Louisiana's history and culture. The region experiences tropical waves,




depressions, storms and hurricanes. The study area is highly susceptible to storm surge. The destruction caused by a 1915 hurricane was recounted years later:

> *"… an enormous storm surge advanced with great rapidity upon the western shore of Lake Pontchartrain well ahead of the eye of the hurricane which very nearly struck Frenier head on. As the storm came ashore in the New Orleans area, fifty people drowned as a thirteen foot storm surge swept the Rigolets railroad bridge away. It should also be emphasized that damage and destruction to homes and property were occurring even as the eye of the hurricane was 165 miles from Frenier. Two-hundred seventy-five Louisianians lost their lives as a result of the "Great West Indian Hurricane of 1915."* (Landry 1996)

Recent hurricanes impacting the area include Katrina and Rita in 2005, Gustav and Ike in 2008, and Isaac in 2012. These storms threatened a region that plays a vital national economic role and that serves as a key transportation corridor.

An important swamp buffer separating development from nearby lakes has been impacted over time. The closure of bayous and the construction of levees cut off the annual flooding that historically nourished and maintained the cypress/tupelo habitat in the Maurepas Swamp. The cypress forests of the swamp were logged in the 1890s – 1930s. Canals and railroads were built through the swamp to remove cut timber (Figure 1-2). The swamp is converting to fragmented marsh and open water (USACE 2010a, USACE 2010b). The area may experience up to 2.32-feet of relative sea level rise (RSLR) over the next 50-years under an "intermediate" scenario. The surge buffer benefits of the swamp will continue to diminish as it degrades and disappears and as sea level rises.

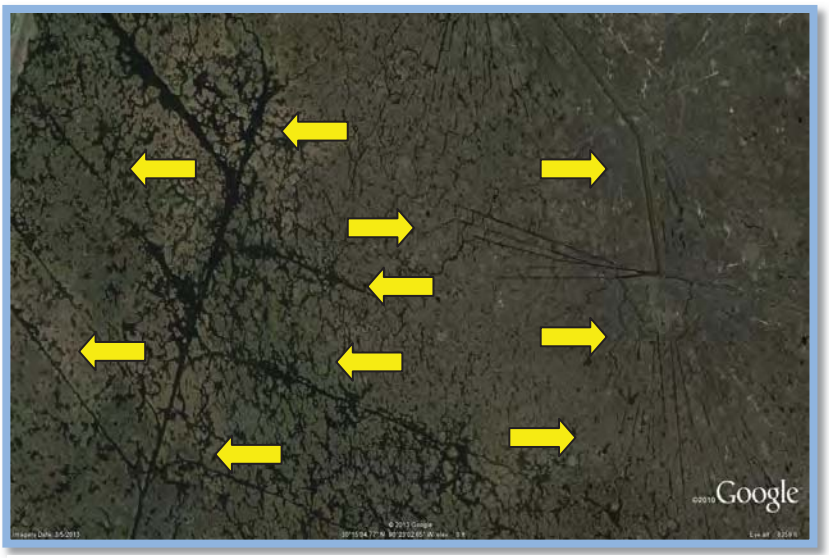


Figure 1-2: Old logging canals in Maurepas Swamp.

1.2 Purpose, Scope, and Need for the Study (*National Environmental Policy Act Required)

The study purpose is to provide a recommendation for Federal participation in hurricane storm damage risk reduction for St. Charles, St. John the Baptist and St. James Parishes that would be economically and environmentally justified. The study addresses flooding caused by storm surge but does not address rainfall flooding. There have been significant changes over the last 40 years, especially since Hurricane Katrina. Population has grown over the past few decades. This report presents a collaboratively-developed plan prepared in accordance with the National Environmental Policy Act (NEPA) and Engineering Regulation 1105-2-100, the USACE Planning Guidance Notebook. It consists of a main report and appendices, and identifies the expected benefits, estimated cost and implementation responsibilities for a tentatively selected plan (TSP). The report provides an overview of the study and summarizes detailed information found in technical appendices. The report is an interim response to the study authority.

1.3 Problems, Needs and Opportunities

Problems in the Study Area

1. Storm surge flooding of approximately 7,698 structures (6-8 feet in areas).
2. Hurricane evacuation routes become impassable and receive damages during storm surges.
3. Agricultural losses resulting from prolonged periods of standing water (e.g., inability to drain saltwater).

Storm surge flooding damages homes, businesses and infrastructure. Surge travels from the Gulf of Mexico into the basin and floods the three study area parishes and beyond (Figure 1-3). Since 1855, 70 hurricanes have made landfall within 65 nautical miles of Laplace (Figure 1-4). Hurricanes Betsy (1965), Camille (1969), Juan (1985), Andrew (1992), Katrina and Rita (2005), Gustav and Ike (2008), and Isaac (2012) caused storm surge flooding. Hurricane Isaac's surge, measured from 6 to 8 feet in the area, threatened lives and damaged more than 7,000 homes, closed roads and disrupted the Nationally-significant energy industry (Figure 1-5).

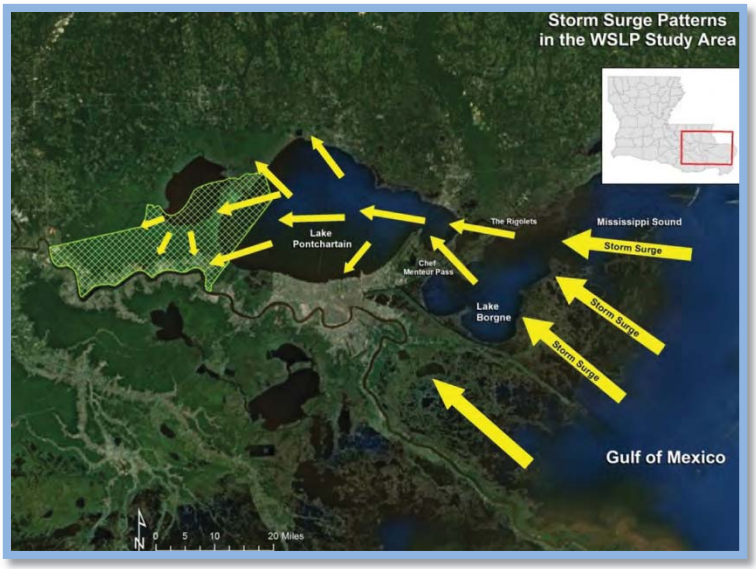


Figure 1-3: Area storm surge patterns.

Businesses and workers serving the Port of South Louisiana are located in the area. The port is the largest volume port in the Western Hemisphere and the ninth largest in the world. It stretches 54 miles on the Mississippi River between New Orleans and Baton Rouge. Hurricane Isaac disrupted port logistics. Its storm surge blocked facility access closing the port. Oil refineries, including the Nation's third largest, were shut down. Gasoline production stopped. Regional and National fuel prices spiked. The storm caused extensive agricultural losses due to an inability to drain storm surge water from fields.

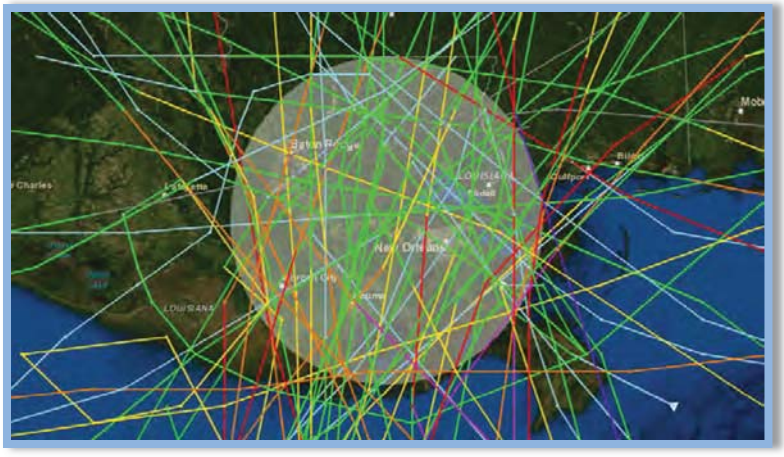


Figure 1-4: Hurricane tracks within 65 nautical miles of Laplace, Louisiana (NOAA 2013).

The study area setting offers a bounty of natural resources but it was historically subject to flooding from the river and nearby lakes. Levees were constructed along the Mississippi River starting in the 1700s to combat annual floods. These levees allowed settlement of the area and agricultural production and the harvesting of natural resources. The area remains susceptible to floods from tropical storms and hurricanes. Some natural protection is afforded by a large cypress swamp that

Figure 1-5: Hurricane Isaac flooding in Laplace, Louisiana.

separates developed areas from nearby tidal lakes. The swamp has degraded over time and the buffer it provides between the lakes and towns is decreasing. As a result, flooding from storm surge (Figure 1-3) remains a risk that is expected to increase over time. The management of Mississippi River flood risk, and the accompanying development of interior drainage systems, allowed urban and suburban expansion in much of the region beyond the natural high-ground near the Mississippi River. Population has increased with suburban development between Baton Rouge and New Orleans. Residents are attracted to the area because of employment opportunities, quality of life, and access to recreation. These factors, increasing population and degrading natural buffers, combine to increase storm surge flooding risks.

1.4 Need for Action

The U.S. Congress recognized the need for a hurricane and storm damage risk reduction project in the area. Two Congressional resolutions authorize this study. The first was adopted on July 29, 1971 by the U.S. House of Representatives Committee on Public Works.

> *"RESOLVED BY THE COMMITTEE ON PUBLIC WORKS OF THE HOUSE OF REPRESENTATIVES, UNITED STATES, that the Board of Engineers for Rivers and Harbors is hereby requested to review the report of the Chief of Engineers on Lake Pontchartrain and Vicinity, Louisiana, published as House Document No. 231, 89th Congress, First Session, and other pertinent reports, with a view to determining whether modifications to the recommendations contained therein are advisable at this time, with particular reference to providing additional levees for hurricane protection and flood control in St. John the Baptist Parish and that part of St. Charles Parish west of the Bonnet Carré Spillway."*

The U.S. Senate Committee on Public Works adopted a resolution on September 20, 1974.

> *"RESOLVED BY THE COMMITTEE ON PUBLIC WORKS OF THE UNITED STATES SENATE, that the Board for Rivers and Harbors is hereby requested to review the report of the Chief of Engineers on Lake Pontchartrain and Vicinity, Louisiana, published as House Document No. 231, 89th Congress, First Session, and other pertinent reports, with a view to determining whether modifications to the recommendations contained therein are advisable at this time, for hurricane protection and flood control in St. James Parish."*

The study was first funded in the 1980s. A 1985 Reconnaissance Report found that there was no justified structural plan suitable for Federal participation. A 1987 reconnaissance report indicated that under Federal criteria a solution could not be found that would be economically justified or environmentally acceptable. Because of increasing population and economic activity,

a 1997 reconnaissance report indicated that the study should proceed into feasibility phase. A Feasibility Cost Share Agreement was executed with the Pontchartrain Levee District (PLD) in 1998. The study stopped in 2002. Following Hurricane Katrina, renewed interest by the levee district led to an amended agreement in 2008. Planning for the project was underway when Hurricane Isaac hit in August 2012. President Obama traveled to Laplace, Louisiana after the storm to view the damage and visit with residents and local leaders (Figure 1-6). The President said, ***"We're getting on the case to figure out what happened here and what we can do to make sure it won't happen again."*** The USACE's post-Isaac damage assessment met the first part of the President's commitment. This study will help deliver the second part.

Figure 1-6: President Obama in Laplace following Hurricane Isaac, September 3, 2012. (Getty Images)

1.5 Objectives of Action

Identifying problems, needs, opportunities, and objectives ensures unity of purpose throughout the planning process. Solving problems and taking advantage of these opportunities provides a basis for effective solutions. **Critical needs** were identified based on the problems.

Critical Needs in the Study Area

1. Keep hurricane evacuation routes open before and after storms.
2. Reduce property damage.
3. Inform public of increased risk of living in flood prone areas.

Opportunities to solve problems were identified based on these needs.

Study Opportunities

1. Reduce hurricane flood risks and damages.
2. Provide smart growth education.
3. Educate local planners and public officials on potential future stages (e.g. 2070).
4. Improve flood warnings for preparation and/or evacuation.
5. Develop measures to reduce damages to evacuation routes due to storm surge.
6. Recommend future modifications to the roadway systems.
7. Develop measures to reduce the flood risk to agricultural areas.
8. Modify connection between lakes and developed areas.

A **study goal** based on the problems, needs and opportunities was developed to help create and evaluate alternative plans. It is the overarching intent of the project.

Study Goal

Reduce the risk of storm surge damages.

A **planning objective** states the intended purposes of the planning process. It is a statement of what solutions should try to achieve. Objectives provide a clear statement of the study purpose.

Planning Objectives

1. Reduce hurricane storm surge related damages through 2070.
2. Reduce risk to residents' life and health by decreasing flooding to the maximum extent practical.
3. Increase public awareness of hurricane risks in developed flood prone areas.
4. Enhance public awareness of the risk to life and property of development in flood prone areas.
5. Reduce the risk of damage and loss of critical infrastructure, specifically the I-10/I-55 hurricane evacuation routes.

1.6 USACE Civil Works Guidance and Initiatives

USACE planning is grounded in the 1983 Economic and Environmental Principles and Guidelines for Water and Related Land Implementation Studies (Principles and Guidelines). The Principles and Guidelines provide for the formulation of reasonable plans responsive to National, state and local concerns. Within the framework of the Principles and Guidelines, the USACE seeks to balance economic development and environmental needs as it addresses water resources problems. The Federal objective of water and related land resources planning is to contribute to National Economic Development (NED) consistent with protecting the Nation's environment, in accordance with National environmental laws, Executive Orders and other Federal planning requirements. The Planning Guidance Notebook provides the overall direction to formulate, evaluate and select projects for implementation. The study conforms to the USACE Campaign Plan goals and the USACE Environmental Operating Principles.

NEPA is the Nation's charter legislation for protecting of the environment. The Federal regulations for implementing NEPA are found in Title 40 Code of Federal Regulations (CFR) Parts 1500-1508. The intent of NEPA is to ensure that information is made available to public officials and citizens regarding major actions taken by Federal agencies, and to identify and consider concerns and issues from the public. "*Any environmental document in compliance with NEPA may be combined with any other agency document to reduce duplication and paperwork*" (40 CFR §1506.4). This document integrates discussions that normally would appear in an EIS into the feasibility report. Sections in this report include NEPA-required discussions marked "*(*NEPA Required)*" in both the Table of Contents and within the body of the document to assist readers. Table 1-1 lists the required EIS information and its location in this document.

1.6.1 NEPA Scoping Process

NEPA provides for an early and open process to determine the scope of issues to be addressed and identify the significant issues related to a proposed action. A Notice of Intent to prepare an EIS was published in the Federal Register (Volume 73, No. 235) on December 5, 2008. The scoping period ended on February 16, 2009. Scoping identified concerns and preferences for levees. People are concerned about construction times, wetlands, hurricane evacuation routes and funding. The scoping report is available upon request.

Table 1-1: NEPA-required information in this report.

EIS Requirement	Location in this Document
Cover sheet	Cover page
Summary	Executive Summary
Table of Contents	Table of Contents
Purpose of and Need for Action	Chapter 1
Alternatives Including Proposed Action	Chapter 3
Affected Environment	Chapter 2
Environmental Consequences	Chapter 4
List of Preparers	Chapter 9
List of Report Recipients	Chapter 7
Index	Appendix F
Appendices	Listed in the Table of Contents

1.7 Non-Federal Sponsors

The Pontchartrain Levee District is the study non-Federal sponsor (NFS). The Louisiana Coastal Protection and Restoration Authority Board (CPRAB) is the NFS for construction, and for operations, maintenance, repair, rehabilitation, and replacement (OMRR&R).

Figure 1-7: Hurricane Isaac flooding at East St. John High School. (Times-Picayune)

2.0 AFFECTED ENVIRONMENT (*NEPA Required)

This chapter describes the affected environment. The historic and existing conditions and a forecast of the "future without-project" conditions provide the basis for plan formulation. The future without-project condition is the No Action Alternative. Important resources, potentially impacted by the proposed action, and their significance are explained in Appendix A. Topics in this chapter mirror Chapter 4, where the "future with-project" conditions are considered.

Water use, water supply and ground (drinking) water were assessed and determined to not be significantly affected by the proposed action. These resources will not be further discussed in this report. Air quality for the three parish area is in attainment of all National Ambient Air Quality Standards. Consistent with the Louisiana Administrative Code, a general conformity determination is not required and therefore air quality will not be discussed further. The cumulative impact analysis follows the 11-step process described in "Considering Cumulative Effects Under the National Environmental Policy Act" (CEQ 1997).

2.1 General Setting

Climate: The climate is subtropical marine with long humid summers and short moderate winters. The seasonal rainy period occurs from mid-December to mid-March with dry periods in May, October and November. Average annual rainfall is 60 inches with a monthly maximum of 20 inches. The heaviest rainfalls usually occur during the summer, with July being the wettest month averaging 6.42 inches. October is usually the driest month, averaging 3.01 inches of rain.

Physical Features: The geology of the lower Mississippi River alluvial valley and the Louisiana coast is summarized in the LCA Ecosystem Restoration Study (USACE 2004). Lakes Maurepas and Pontchartrain occupy a portion of the old Mississippi River pathway known as the St. Bernard Delta. The complex formed in what was then Pontchartrain Bay, enclosing a portion of it to form Lake Pontchartrain. The St. Bernard delta complex was formed by Mississippi River deposits between 3,000 and 4,000 years ago (Frazier 1967). The majority of other landform features include inland swamp, tidal channels, shallow lakes and bays, natural levee ridges along active and abandoned channels, barrier islands and beaches.

Land Use and Land Loss: The 184,351-acre area contains residential and commercial developments south of I-10. West of Laplace the majority of development is between US-61 and the Mississippi River levee. The area north of I-10 is comprised of undeveloped wetlands in the Maurepas Swamp Wildlife Management Area (WMA). Various land cover classifications from the LCA habitat dataset for calendar year 2000 are presented in Figure 2-1 and Table 2-1.

2.2 Water Environment

Water Stage Duration and Frequency: Normal astronomical tides in Louisiana are diurnal (one high tide and one low tide per day) and can have a spring range of as much as 2 feet. The mean tidal range is approximately 0.51 feet (NOAA 2013a). Amplitudes are influenced by tides, but are generally controlled by meteorological events. East winds drive water into the lake.



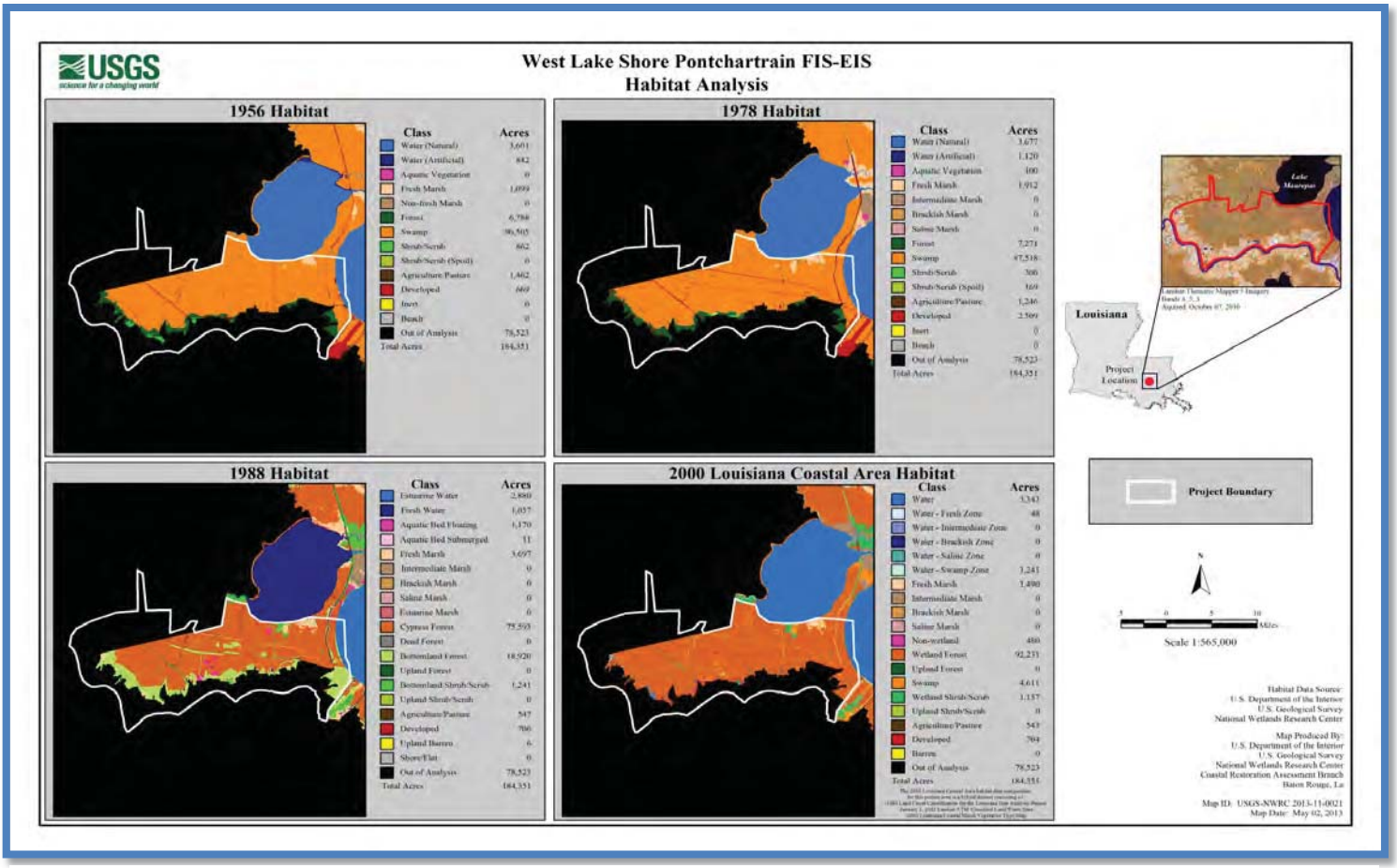



Figure 2-1: Habitats and land loss within the project area.

Table 2-1: Project area land use.

Land Cover Classification	Acres	Percent of Project area
Water	3,343	1.8
Water – Fresh Zone	48	0.02
Water – Swamp Zone	1,241	0.67
Water – Fresh Marsh	1,490	0.80
Non-Wetlands	480	0.26
Wetland Forest	92,231	50.03
Swamp	4,611	2.50
Wetland Shrub/Scrub	1,137	0.62
Agriculture/Pasture	543	0.29
Developed	704	0.38
*Out of Analysis	78,523	42.59
TOTAL	**184,351**	

***Out of analysis: areas not classified in original habitat analysis may contain other land cover classification elements. (NWRC 2013)**

Relative Sea Level Rise: Sea level rise (SLR) conditions were modeled. Mesh and grid elevations were not adjusted for subsidence in this analysis. Rather, the predicted subsidence levels were incorporated in the initial water level parameter to capture the combined effects of subsidence and local SLR into a single relative sea level rise (RSLR) value. For the 2020 and

2070 hydrology simulations, unique RSLR values were added to the 2011 initial water surface elevations (WSE) to calculate the initial WSE appropriate for each year and SLR rate. RSLR values were developed. SLR and RSLR data is listed in Table 2-2 and shown in Figure 2-2.

Table 2-2: Relative sea level rise in the project area.

Year and SLR Scenario	SLR (NAVD88 feet)	RSLR (NAVD88 feet)
2020 Low SLR	0.06	0.30
2020 Intermediate SLR	0.10	0.34
2020 High SLR	0.23	0.47
2070 Low SLR	0.33	1.81
2070 Intermediate SLR	0.85	2.32
2070 High SLR	2.47	3.95

2.2.1 Flow and Water Levels

Historic and Existing Conditions

Changes in the Mississippi River have been responsible for changes in the flow and water levels in the area over several geological periods. Processes involved in the formation of the various deltaic lobes controlled both water levels and flow directions. Seasonal flooding of the Mississippi River has contributed to the historic flow and water level characteristics of the area. Large flood events would bring freshwater, sediment and nutrients to the back swamp areas.

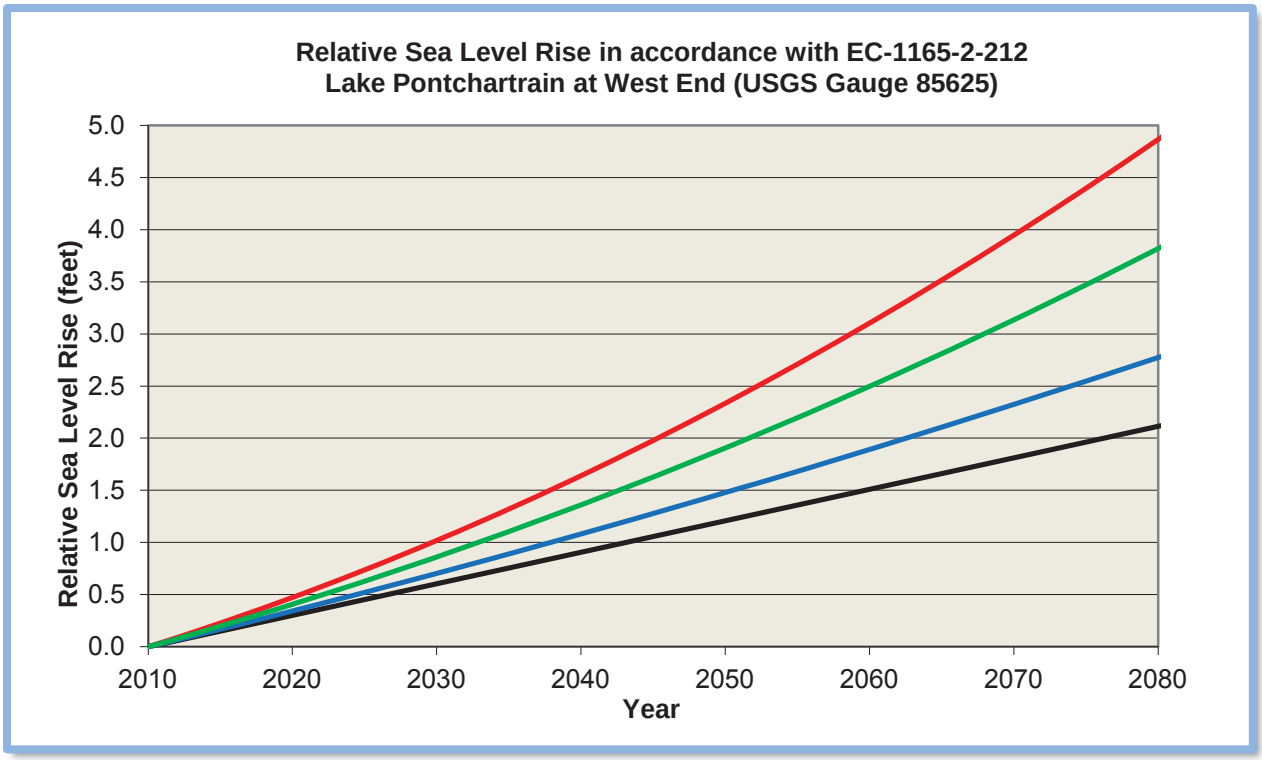


Figure 2-2: Relative sea level rise in the project area. Black = extrapolation of historic rate of RSLR. Blue = low RSLR scenario. Green = intermediate RSLR scenario. Red = high RSLR scenario.

River levees were built in the area beginning in the 1700s by local landowners and governments. Levee building continued through the settlement period and by 1812, the year Louisiana became a state, levees stretched 130 miles upstream from New Orleans to Baton Rouge. The Mississippi River and Tributaries project (MR&T) was authorized by Congress after the Great Mississippi River Flood of 1927. The project provides flood risk reduction for the

Mississippi River and tributaries system from Cape Girardeau, Missouri to the Head of Passes, Louisiana. Levees permanently altered the hydrology of the area by preventing riverine flooding and reducing freshwater inputs to the backwater swamps, Lakes Maurepas and Pontchartrain (USACE 2010). Although the river is no longer directly connected to Lake Maurepas, it is connected to Lake Pontchartrain through the Inner Harbor Navigational Canal and periodic openings of the Bonnet Carré Spillway.

The area's water budget is composed of inflows and outflows through precipitation, evaporation, stream flow, base flow; direct groundwater flow, as well as flows in and out of the estuary. Lake Maurepas is a shallow, fresh to intermediate basin, receiving daily mean freshwater discharge (dmd) primarily from the Amite and Tickfaw Rivers; and to a lesser extent, the Blind River (American Institute of Hydrology, 2006). Lake Pontchartrain is a shallow, brackish basin that receives freshwater discharge from the Tangipahoa, Pearl, and Tchefuncte Rivers, as well as Bayous Lacombe and Liberty, and many smaller creeks.

LCA restoration projects in the study area are closely related and intended to function together to increase freshwater and nutrient inputs to the Maurepas Swamp (USACE 2004). The LCA Convent Blind River Diversion (CBRD) will introduce Mississippi River water to the Maurepas Swamp near Convent, Louisiana (USACE 2010a). The LCA Amite River Diversion Canal (ARDC) would have modified the canal to spread freshwater into the swamp between the Amite River and the Blind River (USACE 2010b). The USACE and State of Louisiana entered into a Design Agreement for Federal implementation of the project. However, in a letter dated August 20, 2012 the State of Louisiana suspended further state participation in Federal design efforts. It is possible that this project would be implemented independently by the State of Louisiana.

The Coastal Wetlands Planning, Protection and Restoration Act (CWPPRA) project (PO-29) "River Reintroduction into Maurepas Swamp" project would divert Mississippi River water to the Maurepas Swamp through Hope Canal. Construction of this project was planned to transition under the LCA program as the "Hope Canal Diversion" project. The project is currently not authorized for construction under either the CWPPRA or LCA programs. It could potentially significantly change area hydrology. As part of the WSLP scoping effort, correspondence from CPRA (formerly the OCPR) requested that the features of the CWPPRA project be incorporated into the WSLP study. CPRA's letter emphasized that any storm damage control structure constructed in the area should allow for the exchange of water in the swamp north and south of I-10. Although the CWPPRA project has been in the engineering and design phase the Environmental Protection Agency, as the lead Federal sponsor for the CWPPRA project, has suspended Federal expenditure on this project as a result of plans by the State of Louisiana to independently implement this project. Recently, the State of Louisiana submitted a permit application to construct the project as an independent effort. If this permit is obtained by the State, the project will not be implemented by the programs.

Because of the uncertainty as to the entity that would implement the ARDC and PO-29 diversion projects in the Maurepas Swamp, further references in this report to the ARDC and PO-29 diversions will be collectively to the "Maurepas Swamp Diversions," and will not reference Federal or State responsibility for implementation.

Future Without-Project Conditions (No Action Alternative)

There would be no direct, indirect or cumulative impacts with the No Action Alternative. Existing conditions and future changes to flow and water levels would not change.

2.2.2 Sedimentation and Erosion

Historic and Existing Conditions

The area has one of the highest land subsidence rates in the country, estimated at 0.4 inch annually. The rate is variable along the coast (Battelle 2005). Coastal Louisiana is more prone than other areas to subsidence and land loss. Human actions have exacerbated the problem.

Shoreline erosion along Lake Maurepas, measured by the USGS Coastal and Marine Geology Program since 1899, shows an average shoreline loss between 1899 and 1995 of approximately 39 inches per year (Zganjar et al. 2002). Shoreline erosion may be attributed to storm surges, lack of sediment entering the area, canal construction, logging operations, and wind and waves. In addition, RSLR and associated saltwater influx has caused increased erosion in coastal wetland areas.

Saucier (1963) calculated Lake Pontchartrain shoreline retreat by comparing aerial photographs from 1931 through 1937, with photographs from the 1950 through 1954. The data shows average annual erosion for one-mile stretches of shoreline. The southwestern shoreline retreats at a mean rate of 8.9 feet per year compared to 3.6 feet per year for the north shore and about 5.6 feet per year for the south shore. Saucier attributed shoreline erosion to subsidence, lack of sediment input, increasing fetch and SLR.

The Maurepas swamp, which includes the 103,263-acre Maurepas Swamp WMA, is isolated from Mississippi River fresh water, sediment, and nutrient inputs by levees (LDWF 2005). The only soil building in the swamp is from organic wetland production (Shaffer et al. 2003). Area subsidence is classified as intermediate. When coupled with minimal soil building, net lowering of ground surface elevation results (Shaffer et al. 2003).

The CBRD and the Maurepas Swamp Diversions are intended to sustain this unique swamp system (USACE 2004, 2010a and 2010b). The diversion(s) would increase flow through the southwestern portions of the area, which is intended to provide a constant source of oxygen- and nutrient-rich waters to the swamp. Benefits would include measurable increases in productivity, which could help build swamp substrate and balance subsidence, reduce mortality, and increase soil bulk density. As accretion improves, there could be an increase in recruitment of new cypress and tupelo. Anticipated sediment benefits could include direct contribution to accretion, as well as contribution to biological productivity through the introduction of sediment-associated nutrients, which also could contribute to production of substrate.

Future Without-Project Conditions (No Action Alternative)

There would be no direct, indirect or cumulative impacts. Existing conditions and future changes to sedimentation and erosion in the area would persist as would potential offsets to those losses by restoration impacts from the CBRD and the Maurepas Swamp Diversions. Soil erosion and land loss would continue at the same or increased rates. Natural and man-made levees would continue to subside and organic soils would not be able to maintain their elevations due to subsidence, decreased plant productivity, and wave erosion (USACE 2004). Sediments would continue to be transported from terrestrial areas into Lakes Maurepas and Pontchartrain.

2.2.3 Water Quality and Salinity

Historic and Existing Conditions

Water Quality Influences: Area water quality is influenced by basin elevations, surface water budget, land cover and use, coastal deltaic processes, and regional weather. The study area is in the western portion of the Pontchartrain Basin. The basin is influenced by several rivers which provide freshwater to estuarine lakes connected to each other and, ultimately, to the Gulf of

Mexico via several major passes. The estuary has experienced hydro-modification via the construction of canals and embankments such as road and railroad beds and hurricane storm damage risk reduction features (Keddy et al. 2007, Sikora and Kjerive 1985, Tate et al. 2002). The basin includes upland forest and agricultural land north of the estuary, wetlands and open water in the estuary, development and agriculture along the Mississippi River corridor and in nearby urban areas (Demcheck et al. 2004, Brown et al. 2010, Wu and Xu 2007, Turner et al. 2002, Patil and Deng 2008). Chemical transformations occurring in the estuary can be biologically mediated by wetlands (Mitsch and Gosselink 2000). A diversity of wetland types exist in the estuary which are affected by coastal deltaic processes and anthropogenic factors (Gosselink 1984, Keddy et al. 2007). Weather patterns can affect estuary 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, Keddy et al. 2007).

Literature Review: Development in the basin in the 20th century led to degradation of estuary waters (Hastings 2009). Historical pollution sources include sewage discharges, increased urbanization and farming, mining of water bottoms, and oil and gas activities. While recently many of these sources are curtailed or eliminated, urbanization and farming are increasing (Patil and Deng 2008, Brown et al. 2010, Turner et al. 2002, Wu and Xu 2007). Garrison (1999) provides a water quality summary for data collected in Lake Maurepas from 1943-1995. Sikora and Kjerve (1985) and Tate et al (2002) both compared pre-/post-MRGO salinity trends, finding a 0.2-0.4 PPT increase at Pass Manchac. Patil and Deng (2008) investigated water quality of the Amite River; dissolved oxygen (DO) levels in the river decreased by 1 mg/L between 1975-1990 and 1991-2005. Findings of the study implicate continued mining in the river and increased urbanization of the watershed. Recently, a total maximum daily load (TMDL) for the river for DO was developed (LDEQ 2011). Studies were conducted in support of the diversion of Mississippi River water into the Maurepas Swamps (e.g., Lee Wilson and Associates 2001, Shaffer et al. 2003, Hoeppner et al. 2008, Lane et al. 2003, Shaffer et al. 2009), and discuss water quality, and suggest that diversions may be beneficial during droughts.

Louisiana Water Quality Inventory: Historical (1998-2012) Clean Water Act Section 305(b) assessments of study area sub-segments were evaluated. For each sub-segment, an average designated use support value was calculated (0=always impaired, 1=unimpaired; see Appendix A for methodology and details). Long-term average support values reveal that impairments are commonplace in sub-segments west of the Maurepas land bridge. The most commonly suspected causes included in the 305(b) assessments were non-native aquatic plants; low DO, mercury, fecal coliform, total phosphorus, sedimentation/siltation, and elevated turbidity, while the most commonly suspected sources were unknown sources such as, atmospheric deposition, introduction of non-native organisms, on-site treatment systems, wetland habitat modification, and site clearance for land development/redevelopment. In the current (2012) 305(b) assessment, the most frequently cited suspected causes of impairment include non-native aquatic plants, low DO, mercury, elevated turbidity, and fecal coliform, while most frequently cited suspected sources of impairment include wetland habitat modification, introduction of non-native organisms, atmospheric deposition, unknown sources, on-site treatment systems, natural sources, and agriculture.

Water Quality Monitoring: See Appendix A for water quality details. For each monitoring station in the study area, data for selected parameters was summarized by means of box plots (overall and seasonal), quantile plots, and trend analysis. Findings suggest differences in water quality based on habitat, salinity, and season. Low DO is common in the Maurepas Swamp. Pass Manchac is experiencing increased marine influence.

Future Without-Project Conditions (No Action Alternative)

Direct and Indirect Impacts: There would be no direct impacts. DO and salinity gradient trends are expected to continue. Without a project there would be an increased risk of damage from storm surge resulting from hurricane and tropical storm events in the area. Drainage of storm waters containing elevated nutrients, metals, and organics into water bodies connected to the Maurepas Swamp and Lake Maurepas is a possibility (Farris et al. 2007). Without the proposed project, the area would still be affected by the following:

- Restoration and Other Efforts – the LCA CBRD project (USACE 2010a) has the potential to locally reduce salinity stress and improve DO. Multiple diversion projects throughout the Pontchartrain Basin may concurrently have the potential to generate significant changes in wetlands biogeochemistry, some of which may negatively affect wetland plant community resiliency (Swarzenski et al. 2005).
- Federal and state water quality programs – may address land use practices in the Mississippi River basin and could impact the area water quality (Broussard 2008).
- Coastal processes – the Maurepas Swamp is anticipated to continue to decline and convert to marsh and open water, in turn affecting local water quality conditions.
- Development – development in watersheds affecting the study area.
- Climate change, sea-level and hurricane/tropical storm surge frequency may impact water quality through increased frequency of saltwater intrusion (Mousavi et al. 2011).

2.3 Human Environment (Socioeconomics)

2.3.1 Population and Housing

Historic and Existing Conditions

Table 2-3 shows the population trend in the three-parish area. Population increases between 2000 and 2010 are likely the result of population influx after Hurricane Katrina (2005). The three parish total population in 2010 was 120,806 residents. The 2012 population in the three parishes declined to 119,161 (U.S. Census 2013) due mainly to Hurricane Isaac impacts.

Table 2-3: Parish-wide populations (in 1000s). (U.S. Census 2013)

Parish	1970	1980	1990	2000	2010
St. Charles	29.5	37.5	42.5	48.2	52.8
St. James	19.7	21.6	20.8	21.4	22.1
St. John the Baptist	23.8	32.3	40.1	43.1	45.9
Total	**73.0**	**91.4**	**103.4**	**112.7**	**120.8**

The 2012 study area population totaled 62,900 residents. Housing trends (Table 2-4) parallel population growth. Almost all residential and non-residential development is on the higher ground adjacent to the Mississippi River. Major area communities include: Laplace, the largest urban area in the study; Reserve and Garyville in St. John the Baptist Parish; Gramercy and Lutcher in St. James Parish; and Montz in St. Charles Parish. The area was most recently flooded by Hurricane Isaac (2012) storm surge (Figure 2-3 and Figure 2-4).

Table 2-4: Number of households in study area (in 1000s). (U.S. Census 2013)

Parish	1970	1980	1990	2000	2010
St. Charles	7.59	11.6	14.4	16.5	17.2
St. James	4.63	6.1	6.4	7.0	6.9
St. John the Baptist	5.77	9.4	12.7	14.3	15.1
Total	**17.99**	**27.1**	**33.5**	**37.8**	**39.2**

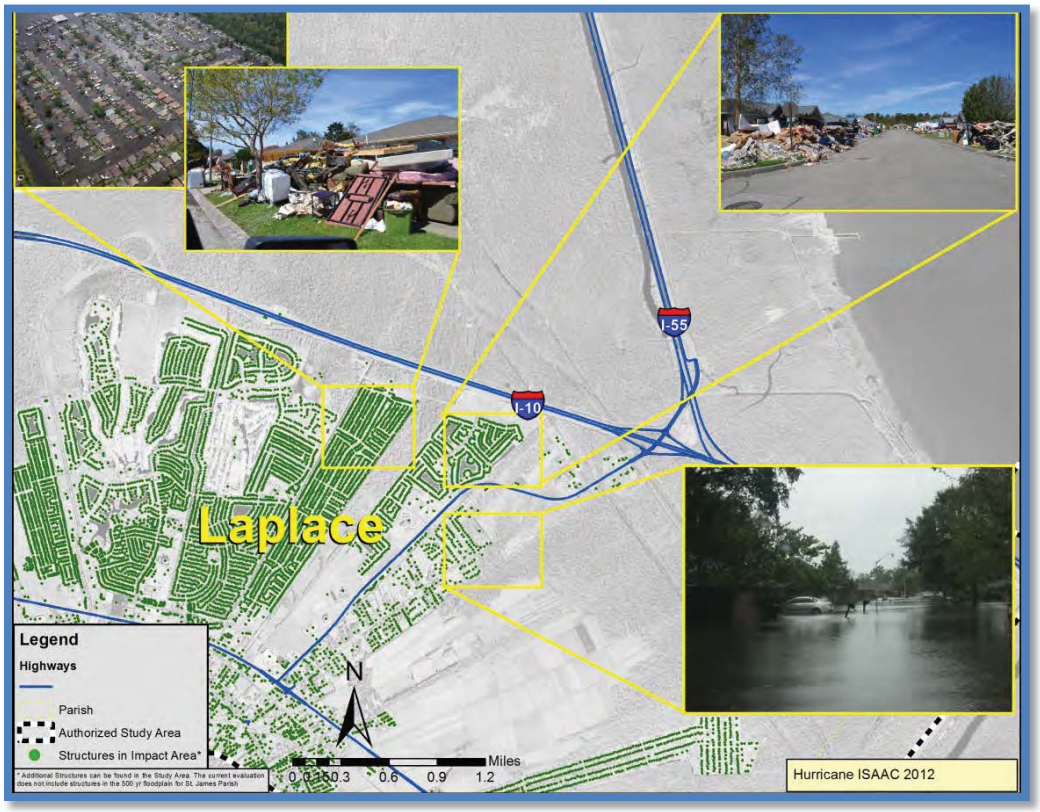


Figure 2-3: Hurricane Isaac storm surge flooding in Laplace.

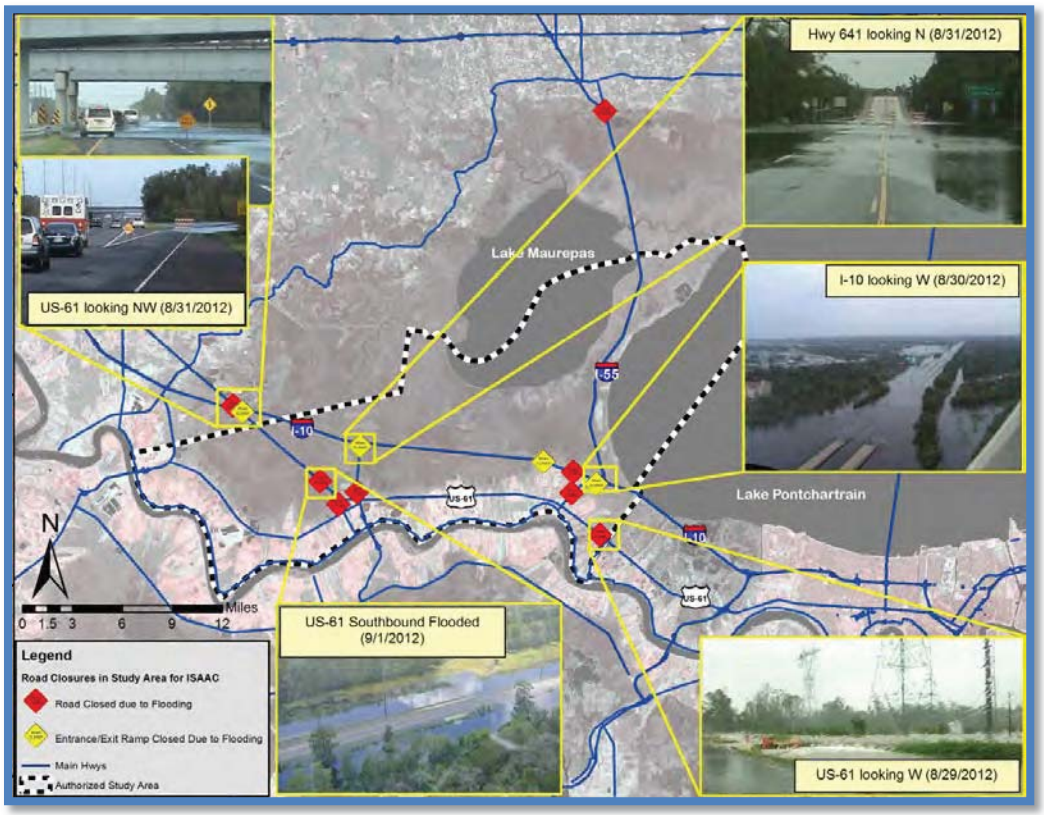


Figure 2-4: Hurricane Isaac storm surge flooding of important transportation routes.

Approximately 20,000 residential structures were inventoried in the study area. Federal Emergency Management Agency (FEMA) data indicates storm surge and rainfall flood claims for the three parishes were paid between 1978 and 2012 totaling $338,000,000 (Table 2-5). Evaluations conducted for the study showed that under the modeled 100-year storm surge conditions approximately 7,689 structures' first floors would potentially be inundated under the existing conditions. First floor elevations were determined via field approximations (Figure 2-5).

Table 2-5: Summary of parish-wide storm damage insurance payments 1978 through 2012. (FEMA 2013)

Parish	# of Claims	Total Nominal Dollar Amount (in millions)	Average Dollar Amount per Claim
St. Charles	5907	$100.13	$16,950
St. James	135	$1.74	$12,870
St. John the Baptist	4851	$236.18	$48,690
Total	**10898**	**$338.05**	**$31,030**

Future Without-Project Conditions (No Action Alternative)

Population and housing are expected to follow economic trends in the local, regional, and National economies. An increase of 33,000 residents and approximately 11,000 residential structures are projected. In the absence of hurricane/tropical storm surge damage risk management measures population and housing could be adversely affected.

Evaluations of the future without-project conditions showed that under the modeled 100-year storm surge conditions 14,486 structures' first floors would potentially be inundated under the 2070 intermediate sea level rise conditions (Figure 2-6). One or a series of catastrophic hurricane/tropical storm surge events would result in severe negative impacts to residents and cause significant damage to structures. Additionally, residents in these communities could potentially incur higher insurance premiums offered by the National Flood Insurance Program (NFIP) should insurance rate maps (FIRM) be updated to reflect an increase in storm damage risk over time.

Direct and Indirect Impacts: The No Action Alternative would have no direct impacts. Indirect impacts would include a higher potential for permanent displacement of population compared to the proposed alternative as residents relocate to areas with less risk.

2.3.2 Employment, Business, and Industrial Activity (including Agriculture)

Historic and Existing Conditions

Table 2-6 shows the growth of non-farm employment in the three-parish-wide area. Increase in employment is likely the result of the influx of population and businesses after Hurricane Katrina (2005). Leading employment sectors include education, health care and social assistance, manufacturing, and retail. Approximately 1,900 non-residential structures are in the area including: petroleum services and river services companies, Zapp's Potato Chip Factory and the Marathon refinery. Approximately 10 percent of the area (23,800 acres) is devoted to agriculture, and about half of these acres are sugar cane crops. This percentage differs from land use percentages described in Table 2-1, which indicates only 543 acres are in agriculture. This apparent discrepancy is because the data was developed for land loss comparisons in the LCA (2004) study; land uses in over 40 percent of the study area were not included.

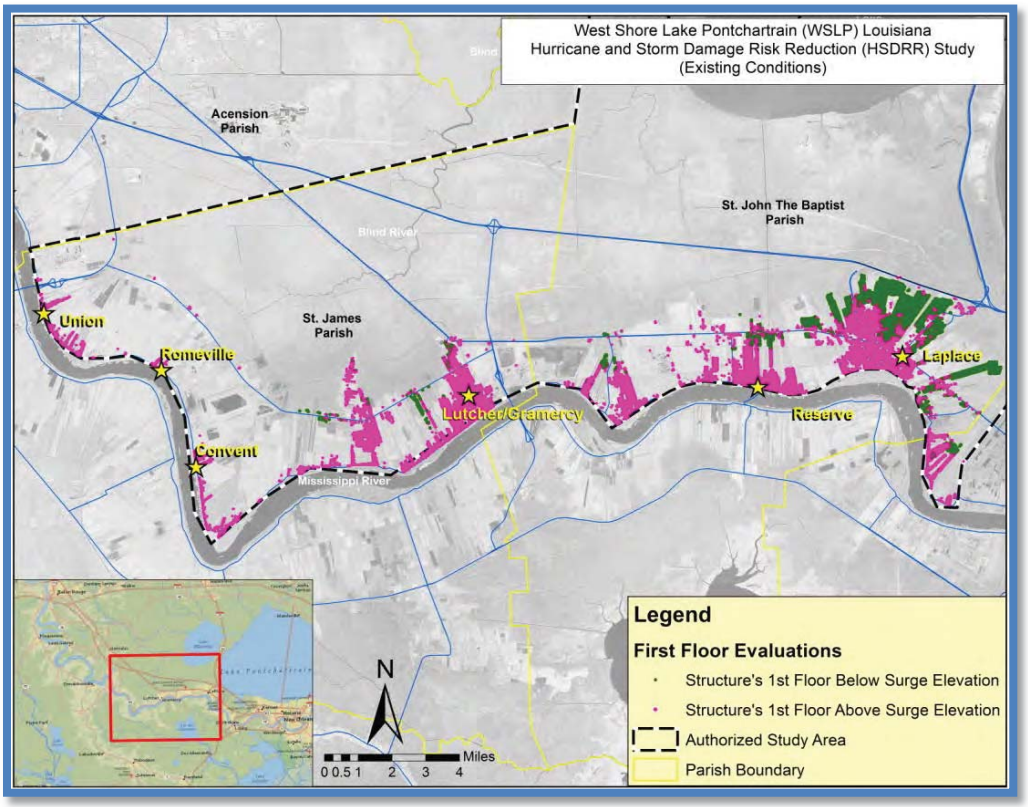


Figure 2-5: First floor evaluations (existing conditions).

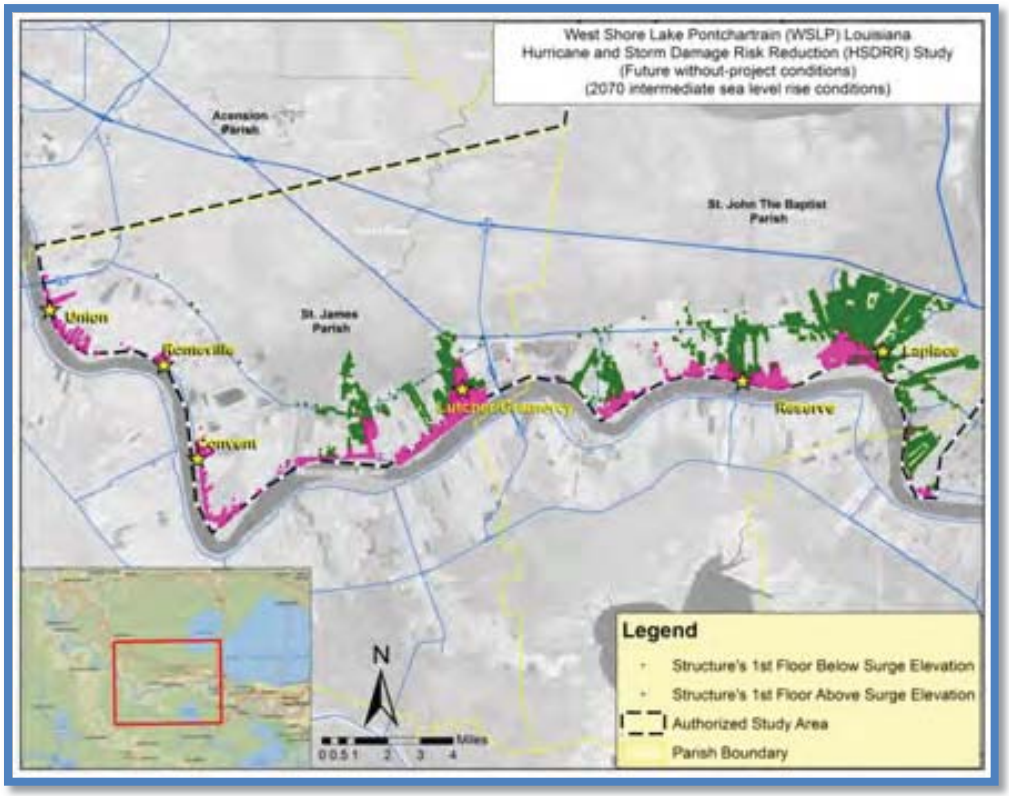


Figure 2-6: First floor evaluations (future without-project conditions).

Table 2-6: Historical parish-wide non-farm employment (in 1000s). (Moody's 2013)

Parish	1970	1980	1990	2000	2010
St. Charles	9.0	18.1	18.5	20.1	24.3
St. John the Baptist	5.4	9.8	9.4	7.6	8.1
St. James	4.2	9.4	11.0	13.4	15.0
Total	**18.5**	**37.2**	**39.0**	**41.1**	**47.4**

Future Without-Project Conditions (No Action Alternative)
Growth in employment, business and industrial activity is expected to follow economic trends in the local, regional, and National economies. An additional 22,790 jobs are projected by the year 2080. However, without flood risk management alternatives, the stability of employment, business and industrial activity could be adversely affected. One or more catastrophic hurricane/tropical storm surge events could result in severe negative impacts to employment and business activity and cause significant damage to non-residential structures. Additionally, business owners in these communities could potentially incur higher flood insurance premiums should the FIRMs be updated to reflect an increase in flood risk over time.

Direct and Indirect Impacts: The No Action Alternative would have no direct impacts. Indirect impacts would include a higher potential for temporary interruption or permanent displacement of employment, business, and industrial activity as businesses temporarily or permanently relocate to areas with less storm damage risk.

2.3.3 Public Facilities and Services

Historic and Existing Conditions
Public facilities and services have historically grown to meet population demands. The area includes a mixture of community centers, schools, hospitals, police, and fire protection. An airport, technical college, and facilities associated with the Port of South Louisiana are located in the area. During the threat of hurricanes and severe storms public buildings are occasionally used for shelter. A total of 402 public and quasi-public buildings were inventoried to calculate damages in the three-parish area in 2012.

Future Without-Project Conditions (No Action Alternative)
Public facilities and services are expected to grow with the needs of the population and would follow growth trends. In addition to the 402 public and quasi-public buildings, an additional 165 such facilities are projected by 2070. These facilities would be more susceptible to damages resulting from hurricane/tropical storm surge events. The increased risk of damage to public facilities and the resulting temporary and/or permanent relocation of these facilities would have a negative impact on services.

Direct and Indirect Impacts: There would be no direct impacts. Indirect impacts would include a greater potential for permanent displacement of public facilities and services due to hurricane/tropical storm surge events.

2.3.4 Transportation

Historic and Existing Conditions
Transportation infrastructure includes major roads and navigable waterways that have developed historically to meet the needs of the public. I-10, an east-west route connecting New Orleans and Baton Rouge, crosses the northern part of the area and is a primary hurricane evacuation route. US-61, another evacuation route through the project area, is located south of I-10 and is the northern boundary of the local industrial sector in the area. Most of I-10 and US-61 are either just below or just above the 100-year floodplain. Other major highways in the

project area include I-55, which runs north-south and intersects I-10 in the northeastern portion of Laplace; US-44, which is located in the southern portion of the project area and runs parallel to the Mississippi River; and US-51, which runs north-south through Laplace and parallels I-55.

Other modes of transportation in the project area include water transport along the Mississippi River via vessels and barges, rail, and aviation via the St. John the Baptist Parish airport. Of the three railroads in the project area, two are owned by Canadian National Railroad and one is owned by Kansas City Southern Railroad.

During Hurricanes Ike and Isaac portions of US-61, I-10, and the I-10/I-55 interchange were inundated by a combination of storm surge and rainfall (Table 2-7). This interfered with emergency service access and prevented local and regional residents from returning to their primary residence. This delay in re-population equates to higher emergency costs during storm events, due to the longer time periods required for sheltering residents until the area is made safe to return. There is also the added travel time and cost for taking alternative routes during re-population following tropical storm events.

Travel from Baton Rouge to New Orleans typical takes approximately 1.5 hours without traffic delays. If access routes are congested this extends to two hours (Table 2-8). Most of the alternative routes are on local roads. Traffic congestion on local roads could extend travel time.

Table 2-7: Mean height (elevation) of major hurricane evacuation routes.

Highway Reach	Mean Height (ft. NAVD 88)	Length (miles)	Type
I-10 Laplace Area	**5.42**	**3.76**	**4 lanes divided**
I-10 Reserve Canal Underpass to Mississippi Bayou	7.58	0.88	4 lanes divided
I-10 Mississippi Bayou to Hope Canal	7.91	3.39	4 lanes divided
I-10 Hope Canal to Gramercy Exit	8.28	2.30	4 lanes divided
I-10 Gramercy to Blind River	7.66	1.80	4 lanes divided
I-10 Blind River to Bayou Conway	7.64	2.53	4 lanes divided
US-61 Last Reach	**5.65**	**0.65**	**4 lanes divided**
US-61 Last Reach to Pipeline	5.78	1.55	4 lanes divided
US-61 Pipeline to Boatclub	5.72	1.84	4 lanes divided
US-61 Boatclub to Canal	6.14	0.98	4 lanes divided
US-61 Low area	**5.51**	**1.12**	**4 lanes divided**
US-61 Low area to Gramercy	6.15	0.21	4 lanes divided
US-61 Gramercy Exit	**6.28**	**3.21**	**2 lanes**

*Reaches shown in **bold** flooded during Hurricane Isaac.

Future Without-Project Conditions (No Action Alternative)

Transportation infrastructure would be more susceptible to damages resulting from hurricane/tropical storm surge events. There would be an increased risk that access to infrastructure would be reduced due to storm surge.

Direct and Indirect Impacts: With no action there would be no direct impacts. Indirect impacts would include a higher potential for damages to transportation infrastructure in the area as a result of hurricane/tropical storm surge events, coupled with the interruption of use by emergency responders and residents.

Table 2-8: Potential transportation impacts.

Scenario	Typical Travel Distance between BR and NOLA	Average Travel Time* between BR and NOLA	Additional Travel Distance from Scenario # 1	Average Additional Travel Time from Scenario # 1	Comments
Scenario #1: No Impacts	83.90 miles	1.43 hours	-	-	-
No access to I-10	96.30 miles	1.70 hours	12.40 miles	16 mins	No exit to Laplace Area
I-10 impacted between Laplace and Belle Terre exits	87.50 miles	1.60 hours	3.60 miles	10 mins	4 lane local highway ~ 13 stop lights
I-10 impacted between Gramercy/Lutcher and Belle Terre exits	88.60 miles	1.67 hours	4.70 miles	14 mins	4 lane local highway ~ 19 stop lights
I-10 impacted between Sorrento and Gramercy/Lutcher exits	89.90 miles	1.63 hours	6.00 miles	12 mins	4 lane local highway ~ 20 stop lights
I-10 and US-61 impacted thru Maurepas Swamp	91.70 miles	1.83 hours	7.80 miles	24 mins	2 lane local roadway >20 stop lights

*__BR__ = Baton Rouge. __NOLA__ = New Orleans; travel times are based on number of lanes, distances and speed limits. Road conditions (e.g. traffic density) were not factored into calculations.

2.3.5 Community and Regional Growth

Historic and Existing Conditions

Community and regional growth are influenced by National trends, but depend significantly upon local attributes. Table 2-9 shows per capita income growth since 2000 in the area. Growth has been aided by the flood risk reduction provided by the MR&T levee system.

Table 2-9: Parish-wide per capita income. (U.S. Census 2013 and Moody's 2013)

Parish	1990	2000	2010	2012
St. Charles	$17,297	$24,228	$32,599	$34,992
St. John the Baptist	$14,231	$18,327	$29,663	$31,492
St. James	$14,440	$19,720	$29,351	$31,349

Future Without-Project Conditions (No Action Alternative)

Risk reduction from hurricane/tropical storm surges would not be provided for communities in the project area. Property owners in these communities could potentially incur higher flood insurance premiums should FIRMs be updated to reflect an increase over time in the risk of damage from hurricane/tropical storm surge events. While community and regional growth is expected to follow National and local economic trends, increased insurance premiums associated with damage resulting from hurricane/tropical storm surge events could have a negative impact on community and regional growth relative to areas with lower flood insurance premiums.

Direct and Indirect Impacts: With no action there would be no direct impact. Indirect impacts under the No Action Alternative would include a higher potential for less community and regional growth due to increasing risk of damage from hurricane/tropical storm surge events.

2.3.6 Tax Revenues and Property Values

Historic and Existing Conditions

Damages from hurricane/tropical storm surge events can significantly impact business, industries, farms, property values, local employment and income, which then negatively impacts the tax base created by these activities. Reduction in the risk of damages from hurricane/tropical storm surge events can have a commensurate positive impact on tax revenues and property values. Conversely, the lack of reduction of risk of damages from hurricane/tropical storm surge events in areas highly susceptible to these damages could limit the growth of tax revenues and property values.

Residential (19,958) and non-residential (1,882) structures were inventoried to calculate potential storm-related damages. The median value of owner-occupied housing units are $175,200 in St. Charles Parish, $114,000 in St. James Parish, and $148,800 in St. John the Baptist Parish. Future losses to these properties will tend to reduce tax revenues.

Future Without-Project Conditions (No Action Alternative)

Growth in tax revenues and property values are expected to follow local, regional and National economic trends. However, without storm surge damage risk reduction management measures, the economic stability, tax revenues and property values could be adversely affected. Community residents could incur higher storm damage flood insurance premiums should FIRMs be updated to reflect an increase over time in the risk of damage from hurricane/tropical storm surge events. Higher insurance premiums could negatively affect property values.

Direct and Indirect Impacts: There would be no direct impacts under the No Action Alternative. Indirect impacts could include lower tax revenues as property values decline due to high risk of damage from storm surge events and residents and businesses relocate to lower-risk areas.

2.3.7 Community Cohesion

Historic and Existing Conditions

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 project area, which was originally settled in the 1700s, is comprised of communities with established public and social institutions including places of worship, schools, and community interaction.

The construction of water resource projects can impact community cohesion in different ways. For example, prior to the Great Flood of 1927, the area was subject to periodic riverine flood damage events from the Mississippi River. However, with the construction of the MR&T levee system, the risk of inundation from the river has been greatly reduced and the community cohesion of the area was positively impacted.

The area remains highly susceptible to storm surge damage. In August 2012, communities in St. John the Baptist Parish, including the town of Laplace, were inundated by the storm surge from Hurricane Isaac. The study area does not currently have a hurricane or storm surge damage risk reduction system in place. Hence, following Hurricane Isaac, local populations where temporarily forced to relocate thereby disrupting community cohesion.

Future Without-Project Conditions (No Action Alternative)

The area will become more susceptible to damage caused by hurricane/tropical storm surge events that is projected to increase over the period of analysis. The increased risk of damage to

residential and non-residential structures and the resulting temporary and/or permanent relocation of populations would negatively affect the community cohesion in many communities.

Direct and Indirect Impacts: There would be no direct impacts. Indirect impacts would include a higher potential for a reduction in community cohesion if the civic infrastructure in the area continues to be damaged as a result of hurricane/tropical storm surge events. Community cohesion may be reduced if residents and businesses relocate to lower-risk areas.

2.3.8 Environmental Justice

Analysis of Environmental Justice (EJ) used census tracts and block groups to obtain a more accurate estimate of the demographics in the study area, which primarily falls on the East bank of the Mississippi River. St. James, a portion of St. Charles, and St. John the Baptist Parishes are considered the reference communities of comparison. Overall parish reference demographics were compared to the census tracts and block groups demographics for the following: the towns of Gramercy, Lutcher, Grand Point and Convent in St. James Parish; the town of Montz in St. Charles Parish; and the towns of Laplace, Reserve and Garyville in St. John the Baptist Parish. The potential for EJ concerns arise in instances where the percent minority (50 percent) and/or low-income (20 percent) population in a census tract or block group is greater than those in the reference community (the entire parish). To analyze communities in the project area, the team used 2010 U.S. Census records. Community outreach activities included conducting small neighborhood meetings and circulation of informational flyers. This methodology is consistent with E.O. 12898.

Historic and Existing Conditions: The study area includes residential, commercial, industrial and undeveloped land. The above referenced towns include predominantly minority and/or low-income populations which have received additional outreach efforts per the requirements of E.O. 12898. Tables 2-10, 2-11 and 2-12 show the percent minority and low-income for communities that could be potentially impacted by the proposed action.

Table 2-10: St. James Parish communities percent minority and low income.

	St. James Parish*	Gramercy	Lutcher	Grand Point	Convent
Total Population	22,102	3,613	3,559	2,473	711
% Minority	53%	49%	54%	27%	69%
% Low Income	15%	13%	21%	8%	10%
Census Tract	N/A	N/A	LA093040200	N/A	N/A
Census Block Group(s)	N/A	LA0930401001	LA0930402001 LA0930402002 LA0930402003 LA0930402004	N/A	N/A

***Includes total parish population demographics.**

Table 2-11: St. Charles Parish communities percent minority and low income.

	St. Charles Parish*	Montz
Total Population	52,880	1,918
% Minority	35%	22%
% Low Income	13%	0%
Census Tract	N/A	N/A
Census Block Group(s)	N/A	N/A

***Includes total parish percent minority and low income.**

Table 2-12: St. John the Baptist Parish communities percent minority and low income.

	St. John the Baptist Parish*	Laplace	Reserve	Garyville
Total Population	45,824	29,872	9,766	2,811
% Minority	61%	59%	65%	
% Low Income	15%	9%	20%	
Census Tract	N/A	LA095070400 LA095070500 LA09507900 LA095071000	LA095070500 LA095070700 LA095070800	LA095070600
Census Block Group(s)	N/A	LA0950703003 LA0950709001	LA0950705001 LA0950707001 LA0950707002 LA0950707003 LA0950707005 LA0950708001 LA0950708002	LA0950706001 LA0950706002

***Includes total parish percent minority and income.**

The communities of Lutcher, Convent, Laplace and Reserve have minority populations of 54 percent, 69 percent, 59 percent and 65 percent, respectively. These communities include a greater percentage of minorities relative to the State and Parish levels. However, they also represent a majority of the population in the study area. Hence, these communities would not be disproportionately impacted by the proposed action. Communities that have low-income populations at or above 20 percent include: Lutcher (54 percent minority) and Reserve (65 percent minority). Because these communities have high minority and low-income populations, they have been identified for further outreach efforts per E.O. 12898.

Future Without-Project Conditions (No Action Alternative)

Direct and Indirect Impacts: There would be no direct impacts. Indirect impacts include continued degradation, under a low RSLR scenario, of wetlands between Lakes Maurepas and Pontchartrain and communities on the east bank of the Mississippi River. These wetlands provide a buffer from hurricane and storm surge risk to minority and low-income residents in the area. Under the no action alternative, residents would continue to incur costs associated with damages to structures, utilities and the local economy following major storm events.

While the area includes a predominantly minority and/or low-income population, there are non-minority and non-low income populations dispersed throughout. People living and working in the area, irrespective of race or income, would be impacted by storm surge events in the future without project condition. There would likely be disproportionate impacts on low-income residents in a mandatory evacuation due to the lack of financial resources. Federal, state, parish and local programs are available to assist all residents in the rebuilding process after storms.

2.4 Natural Environment

2.4.1 Soils, Water Bottoms and Prime and Unique Farmlands

Historic and Existing Conditions: Soils are hydric and non-hydric. Most of the undeveloped area is forested wetlands/swamp habitat comprised of the Barbary-Sharkey soil association. The Convent-Silty alluvial land association is found immediately along the Mississippi River. The Commerce-Sharkey soil association is primarily found on agricultural and undeveloped lands. Convent-Commerce-Sharkey soil association and Convent-Barbary soil association are typically found in undeveloped and rural/suburban/urban developed areas, respectively (USDA 2013).

Water bottoms include Lakes Maurepas and Pontchartrain; the Mississippi and Blind Rivers; Mississippi Bayou and Bayou Fusil; parish canals, such as the Reserve Relief Canal, Hope Canal, and Godchaux Canal; and shallow swamp, ponds and sloughs. Lakes Pontchartrain and Maurepas, and the Mississippi River are state water bottoms. Because of the typical stagnant swamp conditions, the loss of sediment inputs, reduced primary productivity, and limited consolidation, net phosphorus and organic matter export from the swamp is likely low. Therefore, support for dependent systems downstream (e.g., Lake Maurepas) is likely limited and substantially reduced from historic levels (USACE 2010b).

Historically, forested wetlands, swamps and associated water bottoms were typically subjected to flooding and drying events. Water bottoms provided an outwelling of organic matter (Odum 1980) and a sink for phosphorus and nitrogen that supported the health of downstream ecosystems in Lake Maurepas (Lane et al. 2003). However, cessation of near annual Mississippi River floods has limited the capacity of these functions and services.

Approximately 44,672 acres, or 24.2 percent, of the study area meet the soil requirements for prime farmland (NRCS 2013). Not all of these soils are presently utilized for agricultural purposes. In addition, these acres and percentage differ from agricultural land use acres and percentage described in Table 2-1 which indicates only 543 acres are in agriculture. This apparent discrepancy is because Table 2-1 was developed for land loss comparisons in the LCA (2004) study. Nevertheless, this is the only readily available land use information for the area. As such the analysis does not include land uses in over 40 percent of the study area, as indicated in Table 2-1. Unique farmland is not located in the study area. Prime farmland is limited to natural ridge tops and consists of the following soil associations: Cancienne silt loam, Cancienne silty clay loam, Carville silt loam, Gramercy silty clay, Schriever clay, and Vacherie very fine sandy loam. Not all of prime farmlands in the study area are used for agriculture. Crops include mainly common bermudagrass, improved bermudagrass, soybeans, wheat, sugar cane, bahiagrass, and corn. Hydrologic conditions and regulations may prevent some of these areas from functioning to prime capacity. Coordination with the Natural Resources Conservation Service regarding prime farmlands has been completed (Appendix A).

Borrow material for this project could come from the Bonnet Carré Spillway area between the Mississippi River and Airline Highway or alternative borrow sources not yet identified. The Bonnet Carré Spillway area has been used as a Government Furnished borrow source since 1985. The area has been disturbed by sand haulers maintaining the Spillway, and existing borrow pits are scattered throughout the area. Use of the Bonnet Carré potential borrow site is documented in the 2007 “Final Phase I Environmental Site Assessment, Bonnet Carré Borrow Area, North of Airline Highway, St. Charles Parish, Louisiana.”

Future Without-Project Conditions (No Action Alternative)

Direct and Indirect Impacts: There would be no direct impacts. Existing conditions and changes in the future would persist. The area and the known proposed borrow site would continue to experience changes in RSLR that could potentially affect the spatial limits, depths and frequency of inundation to existing wet (hydric) and non-wet (non-hydric) soils in low lying areas. Existing non-hydric soils could be converted to hydric type soils, and existing hydric soils could become permanent water bottoms as swamp habitats are converted to open water. Portions of the area and the Maurepas Swamp could be permanently inundated under both the intermediate and high RSLR scenarios (Table 2-2). Prime farmlands could be converted to other uses.

Under both the intermediate and high RSLR scenarios (Table 2-2), soils would likely remain

nutrient poor, exhibit atypically low bulk densities for forested wetlands due to insufficient sediment content, and exhibit a corresponding loss in soil bearing capacity. There would be continued degradation and conversion of forested wetland and swamp habitats to marsh and open water. Saltwater intrusion from Lakes Maurepas and Pontchartrain during storms would continue. Degradation and conversion of existing swamp habitats (hydric soils) to water bottoms would likely continue resulting in less accretion and continued subsidence. Decomposition of swamp vegetation would initially increase the availability of nutrients and detritus. However, the continued conversion of fresh swamp to marsh and eventually to shallow open water would ultimately decrease available nutrients and detritus for the Maurepas Swamp system.

2.4.2 Vegetation Resources

Historic and Existing Conditions

The area includes forested wetlands, swamps, estuarine emergent wetlands, and submerged aquatic vegetation (SAV). Land cover and habitat analysis is displayed in Figure 2-1. These quantities are based upon the USGS land loss data analysis from the LCA Study (2004) and do not represent land cover or habitats for the entire study area. Hence, the 543 acres (0.29 percent) of agricultural/pasture grassland is not representative of the entire study area. Wetlands in the area provide protection from wave action, erosion, and storm damage and offer various consumptive and non-consumptive recreational opportunities.

Vast virgin stands of bald cypress-tupelo swamp habitat once stretched from the bottomlands of north Louisiana to the Gulf of Mexico (Conner and Day 1976). The Maurepas Swamp was vegetated by an expanse of old growth, freshwater forested swamp that extended as far as 26 miles north from the Mississippi River to the Baton Rouge-Denham Springs fault line. The area was subjected to extensive logging through the 1930s. Remnant logging railroad embankments and canal system used to extract the harvested timber has resulted in increased land loss. Consequently, existing forested wetlands and swamp habitats in the area are rapidly converting to fresh marsh and shallow open water habitats due to impounding, saltwater intrusion, and a lack of nutrient and sediment inputs. This habitat shift has caused a significant loss of wetland functions, including loss of forested wetlands/swamp habitats for wildlife and aquatic species, recreational opportunities, aesthetics, and storm surge protection. To address these forested wetland losses the CBRD and the Maurepas Swamp diversion studies were authorized for study or construction and have made restoration of the most severely degraded portions of the swamp a National priority.

Forested wetlands/swamp and bottomland hardwood forest (BLH) typical dominant and co-dominant species include bald cypress, water tupelo, green ash, swamp red maple, blackgum, diamond oak, black willow, southern wax myrtle buttonbush and Chinese tallow. BLH species in the project area include: swamp red maple, green ash, swamp tupelo, and various oak species. Swamp red maple and green ash typically comprise the sub-dominant mid-story (Beyer et al. 1906, Conner and Day 1976). Scrub species, including black willow, wax myrtle, and buttonbush are sporadically present in areas with diminished canopy cover. Detailed descriptions of common area plants are presented in LCA (USACE 2004, 2010a and 2010b).

SAV communities were historically dominated by native species such as fanwort, coontail, small pondweed, bladderwort, water nymph, widgeon grass, and wild celery. Native SAV communities are largely confined to areas of higher flows, including natural waterways and natural cuts into the swamp interior. Shallow water habitats with insufficient flow may be choked with floating vegetation, greatly limiting light penetration into the water column. SAV are an important food source and habitat for both aquatic organisms and terrestrial wildlife. SAV provides structure and habitat for many invertebrates that are food for various life stages of fish. SAV also provides

food for waterfowl and feeding habitat for fish-eating birds such as herons and egrets.

Invasive plants include water hyacinth, alligatorweed, hydrilla, common salvinia, giant salvinia, Chinese tallow, and Chinese privet. 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. This impacts 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.

The Louisiana Natural Heritage Program database identifies the following threatened and endangered species and rare, unique or imperiled vegetative communities in the area: cypress-tupelo swamp rare or unique habitats, the bald eagle, alligator snapping turtles, osprey, paddlefish, manatee, swamp milkweed, floating antler fern and rooted spike-rush (LDWF 2013).

Future Without-Project Conditions (No Action Alternative)
Direct and Indirect Impacts: There would be no direct impacts. Existing conditions and trajectories of ecological change to area vegetation would persist. Undeveloped vegetated lands, including wetlands, would continue to be lost to development. Wetlands along major highways would continue to be lost to development as seen along Belle Terre Boulevard in Laplace, and areas north of US-61. Forested wetlands/swamp, BLH and associated sub-canopy species that would be enclosed by the proposed action would continue to be subjected to saltwater intrusion and subsidence, but to a lesser degree. Forested wetlands/swamps would continue to convert to marsh and open water (USACE 2010a and 2010b).

Much of the area, as well as portions of the Maurepas Swamp could be permanently inundated under the intermediate and high RSLR scenarios likely further changing existing habitats. The area would continue to be subjected to increases in RSLR which could increase the geographic extent of saltwater intrusion, potentially convert vast areas of existing forested wetlands and swamp habitats to marsh and eventually open water. There could also be a shift from fresh water dominant species to species that can tolerate higher salinity.

Degradation and loss of forested wetland and swamp habitats will accelerate the decline in interdependent processes of plant production and habitats used by various biota necessary for a stable ecosystem. The moderation of storm surge provided by cypress-tupelo swamp and the contribution of vertical accretion to offset subsidence would be lost.

2.4.3 Wildlife Resources

Historic and Existing Conditions: Table 2-13 shows the status, functions of interest, trends, and projections from 1985 through 2050 for avifauna, furbearers, game mammals, and reptiles in the area (adapted from LCWCRTF & WCRA 1999).

Birds: Area wetlands have historically supported an abundance of neotropical and other migratory and non-migratory birds. Diving ducks, seabirds, rails, coots, and gallinules have preferred the open water habitats of Lake Maurepas and the West Manchac Land Bridge, while wading birds typically utilize fresh swamp habitats in the area. The area also supports the recently de-listed (Endangered Species) bald eagle and colonial nesting waterbird (e.g., herons, egrets, ibis, night-herons, and roseate spoonbills) rookeries. Since 1985, most bird species and species groups in the area have exhibited either increasing or stable populations in the area.

Area forested wetlands, swamp, BLH, and other wetlands provide birds and wildlife with shelter,

nesting, feeding, roosting, cover, nursery, and other life requirements. Wetlands provide neotropical migrants with essential stopover habitat on annual migrations (Stouffer and Zoller 2004, Zoller 2004). The greatest threat is habitat loss (American Bird Conservancy 2009). Bottomland hardwood forests provide critical bird breeding habitat (Wekeley and Roberts 1996).

Mammals: Since 1985, furbearer populations have typically remained stable across the Upper Pontchartrain Basin (LCWCRTF & WCRA 1999). Rabbits have experienced declines in the Amite/Blind and West Manchac Land Bridge mapping units, as have squirrels in the West Manchac Land Bridge mapping unit. However, squirrels have remained steady throughout the remainder of the area, whereas deer populations have increased. The West Indian manatee, federally-listed as an endangered species, is known to occur or occasionally enter the area.

Reptiles: Due to the ecological and economic importance of the American alligator, historical and current figures on population numbers are available. In contrast, data on other reptiles in the area is unavailable. LDWF survey data from 1996 to 2000 shows alligator nest densities in the area are classified as medium (approximately 1 nest per 250 acres). Alligator spotlight surveys in the Maurepas Swamp from June to August 2006 found that alligator density, and especially the density of large alligators, appeared to increase with proximity to Lake Maurepas (Fox et al. 2007). There are at least four lizard species, 16 snake species, and 9 turtle species documented in bald cypress-tupelo swamps of southern Louisiana (Dundee and Rossman 1989). The lack of recorded evidence obscures accurate historic and existing conditions for other reptile species that are known or are likely to have inhabited the Maurepas Swamp.

Amphibians: The bald cypress-tupelo ecosystem supports a wide variety of frogs, toads, and salamanders. Abundant water, shelter, and food resources enable several species to thrive. At least 13 frog and toad species and six salamander species inhabit this community type in south Louisiana. Amphibians are often exceptional indicators of wetland ecosystem health. Limited information exists on historic and existing population trends of area amphibians. In a study on similar habitat located in close to the area, Tinkle (1954) observed numerous amphibian species over the course of a year. Literature accounts and museum specimens suggest the presence of pig frogs (Dundee and Rossman 1989) in Ascension and St. James parishes.

Invasive Wildlife Species: Prior to the introduction of nutria to Louisiana in 1930s (USGS 2000, Baroch et al. 2002), no invasive wildlife species were known to be present. A substantial population increase of nutria is attributed to the decline in the price of pelts in 1989 (USGS 2000, Baroch et al. 2002). Areas of extensive nutria damage, or “eat outs,” alter the composition and habitat type of wetland communities (USGS, 2000). Aerial surveys estimated 80,000 acres of marsh in the State of Louisiana were damaged by nutria (Keddy et al. 2007). Throughout the Maurepas Swamp, nutria eat seedling cypress and other forested wetland and swamp tree species preventing regeneration (USACE 2010a).

Future Without-Project Conditions (No Action Alternative)

Direct and Indirect Impacts: There would be no direct impacts. Existing conditions and associated changes into the future would persist. Continued human encroachment and development would result in loss of existing wildlife wetland habitats. The area would be subjected to increases in RSLR which could increase saltwater intrusion and exacerbate ongoing conversion of existing forested wetland and swamp habitats to marsh and open water (USACE 2010a, USACE 2010b). The area and the Maurepas Swamp could be inundated to some unknown extent, under both the intermediate and high RSLR scenarios, thereby potentially reducing available forested wetland and swamp wildlife habitat.

Table 2-13: Status, functions of interest, trends, and projections from 1985 through 2050 for avifauna, furbearers, game mammals, and reptiles with the study area. (LCWCRTF & WCRA 1999)

Mapping Unit	1988 Habitat Type	% of	Avifauna: Bald Eagle Func.	Status	Trend	Proj.	Wading Birds Func.	Status	Trend	Proj.	Dabbling Ducks Func.	Status	Trend	Proj.	Diving Ducks Func.	Status	Trend	Proj.	Raptors Func.	Status	Trend	Proj.	Rails, Coots, and Gallinules Func.	Status	Trend	Proj.
Amite/Blind	FS	73	Ne	Hi	I	I	Ne	Hi	I	Sy	Mu	Lo	Sy	Sy		NH				NH				NH		
	HF	21		NH				NH			Mu	Lo	Sy	Sy		NH				NH				NH		
West Manchac Land Bridge	OW	6		NH				NH			W	Lo	Sy	Sy	W	Lo	Sy	Sy		NH			W	Lo	Sy	Sy
	FM	22		NH			Mu	Hi	I	Sy	W	Lo	D	D	W	Lo	D	D	Mu	Lo	Sy	Sy	Mu	Lo	D	D
	FS	61		NH			Ne	Hi	I	Sy	W	Lo	Sy	Sy		NH			Mu	Mo	I	Sy		NH		
	HF	11		NH				NH			W	Lo	Sy	Sy		NH			Mu	Hi	I	D		NH		
East Manchac Land Bridge	OW	7		NH				NH			W	Lo	Sy	Sy	W	Lo	Sy	Sy		NH			W	Lo	Sy	Sy
	IM	41		NH			Mu	Hi	I	Sy	W	Lo	D	D	W	Lo	D	D	Mu	Lo	Sy	Sy	Mu	Lo	D	D
	FS	15		NH			Ne	Hi	I	Sy	W	Lo	Sy	Sy		NH				NH				NH		
	HF	34		NH				NH			W	Lo	Sy	Sy		NH				NH				NH		

Mapping Unit	1988 Habitat Type	% of	Avifauna (cont.): Other Marsh/OW Func.	Status	Trend	Proj.	Other Woodland Func.	Status	Trend	Proj.	Other Marsh/OW Func.	Status	Trend	Proj.	Other Woodland Func.	Status	Trend	Proj.	Furbearers: Nutria Func.	Status	Trend	Proj.	Muskrat Func.	Status	Trend	Proj.
Amite/Blind	FS	73	Ne	Lo	Sy	Sy	Ne	Mo	I	Sy	Mu	Lo	Sy	Sy	Mu	Mo	Sy	Sy	Mu	Mo	Sy	Sy	Mu	Lo	Sy	Sy
	HF	21		NH			Ne	Hi	I	D		NH			Mu	Mu	Sy	D	Mu	Lo	Sy	Sy	Mu	Lo	Sy	Sy
West Manchac Land Bridge	OW	6	Mu	Mo	Sy	Sy		NH			Mu	Mo	Sy	Sy		NH			Mu	Mo	Sy	Sy	Mu	Lo	Sy	Sy
	FM	22	Ne	Hi	Sy	Sy		NH			Mu	Hi	Sy	Sy		NH			Mu	Mo	Sy	Sy	Mu	Lo	Sy	Sy
	FS	61	Ne	Lo	Sy	Sy	Ne	Mo	I	Sy	Mu	Lo	Sy	Sy	Mu	Mo	Sy	Sy	Mu	Mo	Sy	Sy	Mu	Lo	Sy	Sy
	HF	11		NH			Ne	Hi	I	D		NH			Mu	Hi	Sy	D	Mu	Lo	Sy	Sy	Mu	Lo	Sy	Sy
East Manchac Land Bridge	OW	7	Mu	Mo	Sy	Sy		NH			Mu	Mo	Sy	Sy		NH			Mu	Mo	Sy	Sy	Mu	Lo	Sy	Sy
	IM	41	Ne	Hi	Sy	Sy		NH			Mu	Hi	Sy	Sy		NH			Mu	Mo	Sy	Sy	Mu	Lo	Sy	Sy
	FS	15	Ne	Lo	Sy	Sy	Ne	Mo	I	Sy	Mu	Lo	Sy	Sy	Mu	Mo	Sy	Sy	Mu	Mo	Sy	Sy	Mu	Lo	Sy	Sy
	HF	34		NH			Ne	Hi	I	D		NH			Mu	Hi	Sy	D	Mu	Lo	Sy	Sy	Mu	Lo	Sy	Sy

Mapping Unit	1988 Habitat Type	% of	Furbearers (cont.): Mink, Otter, and Raccoon Func.	Status	Trend	Proj.	Game Mammals: Rabbits Func.	Status	Trend	Proj.	Squirrels Func.	Status	Trend	Proj.	Deer Func.	Status	Trend	Proj.	Reptiles: American Alligator Func.	Status	Trend	Proj.
Amite/Blind	FS	73	Mu	Lo	Sy	Sy	Mu	Lo	D	D	Mu	Lo	Sy	D	Mu	Mo	I	D	Mu	Mo	I	I
	HF	21	Mu	Lo	Sy	Sy	Mu	Lo	Sy	Sy	Mu	Mo	Sy	D	Mu	Mo	I	Sy	Mu	Lo	Sy	Sy
West Manchac Land Bridge	OW	6	Mu	Lo	Sy	Sy		NH				NH				NH			Mu	Mo	I	I
	FM	22	Mu	Lo	Sy	Sy	Mu	Lo	D	D		NH			Mu	Lo	Sy	D	Mu	Mo	I	I
	FS	61	Mu	Lo	Sy	Sy	Mu	Lo	D	D	Mu	Lo	D	D	Mu	Mo	Sy	D	Mu	Mo	I	I
	HF	11	Mu	Lo	Sy	Sy	Mu	Lo	D	D	Mu	Mo	D	D	Mu	Mo	Sy	D	Mu	Lo	Sy	Sy
East Manchac Land Bridge	OW	7	Mu	Lo	Sy	Sy		NH				NH				NH			Mu	Mo	I	I
	IM	41	Mu	Lo	Sy	Sy	Mu	Lo	D	D		NH			Mu	Lo	Sy	D	Mu	Mo	I	I
	FS	15	Mu	Lo	Sy	Sy	Mu	Lo	D	D	Mu	Lo	D	D	Mu	Lo	Sy	D	Mu	Mo	I	I
	HF	34	Mu	Lo	Sy	Sy	Mu	Lo	D	D	Mu	Mo	D	D	Mu	Lo	Sy	D	Mu	Lo	Sy	Sy

Habitat Types: FS = Fresh Swamp; HF = Hardwood Forest; OW = Open Water, FM = Fresh Marsh, IM = Intermediate Marsh. Habitat types comprising less than 5% of unit are shown only if habitat type is particularly rare or important to wildlife.

Status: NH = Not Historically Present; NL = No Longer Present; Lo = Low Numbers; Mo = Moderate Numbers; Hi = High Numbers.

Functions of Particular Interest: Ne = Nesting; St = Stopover Habitat; W = Wintering Area; Hi = High Numbers; Mu = Multiple Functions.

Trends (since 1985) /**Projections** (through 2050): Sy = Steady; D = Decrease; I = Increase; U = Unknown.

Migratory neotropic avian species currently utilize the area as migratory stopover habitat. As forested wetlands and swamp habitats are lost, there would be a corresponding reduction in overall species diversity and abundance.Most mammalian, amphibian and reptilian species would be required to relocate to more suitable swamp habitats. There could be an increase in the population and distribution of nutria due to the conversion of swamp into open water and marsh which are the preferred habitats by nutria.

Future Without-Project Conditions (No Action Alternative)
Direct and Indirect Impacts: There would be no direct impacts. Existing conditions and associated changes into the future would persist. Continued human encroachment and development would result in loss of existing wildlife wetland habitats. The area would be subjected to increases in RSLR which could increase saltwater intrusion and exacerbate ongoing conversion of existing forested wetland and swamp habitats to marsh and open water (USACE 2010a, USACE 2010b). The area and the Maurepas Swamp could be inundated to some unknown extent, under both the intermediate and high RSLR scenarios, thereby potentially reducing available forested wetland and swamp wildlife habitat. Migratory neotropic avian species currently utilize the area as migratory stopover habitat. As forested wetlands and swamp habitats are lost, there would be a corresponding reduction in overall species diversity and abundance. Most mammalian, amphibian and reptilian species would be required to relocate to more suitable swamp habitats. There could be an increase in the population and distribution of nutria due to the conversion of swamp into open water and marsh which are the preferred habitats by nutria.

2.4.4 Aquatic and Fisheries Resources

Historic and Existing Conditions: Plankton and benthic organisms serve as the lowest food resource level for many species of fish and shellfish. Plankton can often be used as an indicator of benthic, nutrient, and water quality health (Stone et al. 1980). Like plankton, benthic invertebrate communities are also good indicators of ecological health. Because many benthic organisms are sessile or have limited mobility, they cannot move away from environmental stressors and therefore community profiles reveal information about the environment's health (Porrier et al. 2009). There is little information available on plankton communities in Lake Maurepas and the upstream Maurepas Swamp waterbodies. Data available for Lake Maurepas suggests the dominance of Anabena, dinoflagellates, diatoms, and cyanobacteria with occasional strong presence of chlorophytes (Atilla et al. 2007).

Benthic macroinvertebrates tend to dominate deepwater swamp invertebrate communities. Characteristic species include crayfish, clams, oligochaete worms, snails, freshwater shrimp, midges, amphipods, and various immature insects (Mitsch and Gosselink 1993). One of the main functions of a benthic community is secondary production, the conversion of plant material by benthic detritivores and herbivores to animal tissue, thereby forming major links in the aquatic food web between plants and predators. Compared to other habitat types, bald cypress-tupelo wetlands may support higher invertebrate densities.

Limited data exists on benthic communities in the area. Species present are likely typical of deepwater forested wetlands and slow-flowing rivers in the region. However, the increased duration of inundation and the low flow and exchange due to impoundment have promoted a system characterized by low DO levels and limited drawdown of water levels to below surface elevations. These conditions likely have resulted in reduced diversity of benthic organisms. Species composition has likely shifted towards species more tolerant of low DO levels, such as oligochaetes and midges. Reduced soil bulk densities and changes in average particle size, texture, and organic content due to low sediment input may further influence habitat suitability

and species presence (Day et al. 1989). Within Blind River, woody debris introduced from the adjacent swamp may provide suitable substrate for invertebrates to colonize and thus support benthic community diversity.

The Maurepas Swamp benthic community is seasonally abundant. Typically, winter months have higher DO concentrations when water temperatures are cooler. Organisms found in winter include a variety of segmented and flatworms, snails, crustaceans, and insects. During summer, when lower DO is present, the benthic community is sparse. Air-breathing insects and crustaceans; a few tubificid oligochaetes and dipterans, which can tolerate lower oxygen conditions; and crawfish, especially burrowing crawfish, may be found. During periods when the swamp floor dries, these organisms survive through the resistance stages (eggs, cocoons, etc.) and repopulate the area when water returns to the swamp (Loden 1978).

Salinity strongly influences species composition of invertebrate communities. Higher abundance of benthic organisms has been associated with decreasing salinity from saline to freshwater sites in Louisiana (Philomena 1983). Invertebrate species vary in the range of salinity within which they can survive and their tolerance to fluxes (Day et al. 1989). The Maurepas Swamp, Blind River, and the bayous and canals in the area are primarily freshwater, but salinity intrusion can occur. Throughout the area higher salinity occurs during drought years (Shaffer et al. 2003). The relatively low salinity of these waters provides transitional habitat for freshwater fish and provides nursery and foraging habitat for marine fish and shellfish. Freshwater fish, such as largemouth bass, sunfish, catfish, and crappie are taken by recreational fishermen (LDWF 2009, Hastings 2001). Crawfish and crabs may be harvested from the swamp (Fox et al. 2007).

A survey from January 1976 to August 1977, (Watson et al. 1981) sampled fish species at six locations along Blind River from south of US-61 to Lake Maurepas. The 57 species of finfish collected included 12 estuarine, 43 freshwater, one catadromous and one anadramous species. Freshwater species were dominant both spatially and temporally. Finfish diversity appeared to be higher at the lower stretches of Blind River, below the Amite River Diversion Canal and closer to Lake Maurepas. Multiple studies have been conducted on diversion projects in the area. Data from these studies show an overall decrease in the number of taxa collected. However, different sampling gear and sample locations could explain the trends. Additionally, an overall a trend toward less freshwater species collected is evident (Fox et al. 2007).

Fox et al. (2007) sampled fish at 20 locations in the Maurepas Swamp. There were 26 taxa collected with a total of 1,425 individuals. Spotted gar and striped mullet were dominant species making up 76.5 percent of all fish. Physiochemical data was collected as well, study (Fox et al. 2007) ranged from 1.52 to 6.25, and species richness ranged from 2 to 12 species, indicating a very variable community. Lower diversity, evenness and richness were observed in the interior, in areas of low flow, low DO and low pH. Most of the species specific analyses were consistent with known habitat preferences. For example, spotted gar was negatively correlated with high surface DO levels. This species can breathe air, and it is usually found in hypoxic areas.

Future Without-Project Conditions (No Action Alternative)

Direct and Indirect Impacts: There would be no direct impacts. Existing conditions and associated changes into the future would persist. The area would be subjected to increases in RSLR which could increase saltwater intrusion and lead to increases in and the potential conversion of vast areas of forested wetlands and swamp habitats to marsh and open water. Much of the area, as well as the Maurepas Swamp could be permanently inundated under both the intermediate and high RSLR scenarios. There could be a shift from fresh water dominate species to those species that can tolerate higher salinity.

2.4.5 Essential Fish Habitat (EFH)

Historic and Existing Conditions: Table 2-14 and Figure 2-7 show two EFH species and their likely occurrence in the area by life stage. Blind River and various bayous and canals in the Maurepas Swamp provide EFH, including nursery, foraging, and spawning and breeding grounds. Aquatic and wetland habitats in the area include estuarine emergent wetlands, submerged aquatic vegetation, mud substrates, and estuarine water column. These provide EFH for white shrimp and red drum. Waterbodies and wetlands provide nursery and foraging habitats for a variety of fish, some of which may serve as prey for other fish species designated as EFH species (e.g., mackerel, snapper, and grouper) and highly migratory fishes (e.g., billfish and sharks). The area also provides foraging and nursery habitat for economically important marine fishery resources including striped mullet, Atlantic croaker, blue crab, and Gulf menhaden. The area is important for Federal and state-managed species. It provides foraging and nursery areas for prey species (gulf menhaden and bay anchovy) (Penland et al. 2002) eaten by predators, such as sand seatrout, spotted seatrout, catfish and crappie (LDWF 2009, Hastings 2001), and highly migratory species.

Table 2-14: Essential Fish Habitat for life stages of species in Lake Pontchartrain.

Species	Life Stage (occurrence in project area)	Essential Fish Habitat Zone and Habitat Type
White Shrimp (*Litopenaeus setiferus*)	Adult (rare)	Near shore and offshore sand/shell, and soft bottoms.
	Juvenile (common to abundant)	Estuarine emergent marshes and soft bottoms.
Red Drum (*Sciaenops ocellatus*)	Adult (common to rare)	Estuarine SAV, soft bottoms, sand/shell and emergent marshes. Near shore pelagic and sand/shell, and hard bottom habitat (used for spawning. Offshore sand/shell and hard bottom).
	Juvenile (common to rare)	Estuarine SAV, soft bottoms and near shore sand/shell, and hard bottom.

(GMFMC 2004, NMFS 2013b, USACE 2008, NMFS 2009)

Future Without-Project Conditions (No Action Alternative)

Direct and Indirect Impacts: There would be no direct impacts. Existing conditions and associated changes into the future would persist. The area and the Maurepas Swamp could be inundated to some unknown extent, under both the intermediate and high RSLR scenarios, thereby potentially increasing the extent of saltwater intrusion that could potentially convert existing EFH nursery swamp habitats to marsh and open water EFH.

2.4.6 Threatened and Endangered Species

Historic and Existing Conditions

A complete list of threatened and endangered species and critical habitats in the project area is presented in USACE (2010a) and (USACE 2010b). Two threatened and endangered species, the Gulf sturgeon (*Acipenser oxyrhynchus desotoi*) and the West Indian manatee (*Trichechus manatus*), and one delisted species, the bald eagle (*Haliaeetus leucocephalus*), are known to occur or occasionally enter the area. There are no threatened or endangered plants in the area. The area is also known to support colonial nesting waterbirds (e.g., herons, egrets, and others). The USFWS (personal communication, USFWS January 9, 2009) provided recommendations for minimizing disturbance to colonies containing nesting wading birds during construction. The USFWS recommended that on-site contract personnel be informed of the need to identify

colonial nesting birds and their nests, and to avoid affecting them during the breeding season. The recommendations will be followed to the maximum extent practicable.

Figure 2-7: EFH for white shrimp (green) and red drum (red).

West Indian Manatee: Substantial food sources (submerged or floating aquatic vegetation) have not been observed in the area. Given the extensive areas of relatively undisturbed wetlands in the region and the paucity of food sources in the project area, it is considered unlikely for the manatee to frequent and utilize the inshore waters of Lake Maurepas and Pontchartrain as habitat, although manatees could pass through this area while transiting the lake.

Gulf Sturgeon: The area is not Gulf sturgeon critical habitat.

Bald Eagle: The bald eagle was delisted as a federally threatened species for most of the United States; however, it is protected under the Bald and Golden Eagle Protection Act, and the Migratory Bird Treaty Act. Habitats suitable for use by the bald eagle are present in St. Charles, St. John the Baptist and St. James Parishes, and occurrences of the bald eagle have been recorded there. The bald eagle is known to nest and forage in the Maurepas WMA (personal communication, Ms. Brigette Firmin, USFWS on May 10, 2013). According to USFWS maps depicting active and inactive eagle nests, all active nests are beyond 1,500 feet from the proposed project construction sites. The USFWS considers this sufficient distance not to be of concern for potential impacts by construction activities.

Future Without-Project Conditions (No Action Alternative)
Direct and Indirect Impacts: There would be no direct impacts on threatened or endangered species, or their designated critical habitats, bald eagles or colonial nesting waterbirds. The Gulf sturgeon and the West Indian manatee, along with the bald eagle, would continue to

occasionally enter the project area. The West Indian Manatee has been infrequently sited near the project area. Continued conversion of forested wetlands and swamp habitat to marsh and open water would provide more favorable conditions for the Gulf Sturgeon and the West Indian Manatee, but would provide only foraging habit for the bald eagle and colonial nesting waterbirds. As forested wetlands and swamp habitats are lost, there would be a corresponding reduction in overall species diversity and abundance.

2.4.7 Cultural and Historic Resources

Historic and Existing Conditions**:** Eight cultural units are used to characterize the prehistoric cultural sequence in southeast Louisiana: Paleo-Indian (10000–8000 B.C.), Archaic (8000–1000 B.C.), Poverty Point (1700–500 B.C.), Tchefuncte (500 B.C.–A.D. 100), Marksville (A.D. 100–500), Baytown (A.D. 400–700), Coles Creek (A.D. 700–1200) and Mississippian/Plaquemine (A.D. 1200–1700). Historic perspectives generally cover the colonial period to approximately 1764, Acadian migration to the area, end of the Colonial period, the Antebellum period, the Civil War, late 19th century reconstruction, and the early 20th century.

The majority of the area contains few cultural resources, although not all areas have been adequately examined for that possibility, especially along natural waterways. The area contains natural levee of the Mississippi River, where numerous historic cultural resources, such as plantation buildings, have been recorded. Although cultural resources surveys have crossed many portions of the project area, undiscovered cultural resources may still exist.

Plantation properties that overlap the area include 16AN30 (Tezcuco Plantation) and 16AN31 (Monroe Plantation), 16SJB8 (Belle Point Plantation), 16SJB10 (Laplace Plantation), 16SJB12 (Sunnyside Plantation), 16SJ11 (Hester Plantation), 16SJ12 (St. Elmo Plantation), 16SJ20 (Wilton Plantation), 16SJ21 (Helvetia Plantation), 16SJ30 (Colomb Plantation), 16SJ34 (St. Rose Plantation), 16SJ49 (Rapidan Plantation), 16SJ37 (Welham Plantation). These often contain outbuildings or components to a plantation operation, and may cover several acres.

Less definable cultural resources located within lands protected by the artificial Mississippi River Levee include 16SC54, 16SC79, 16SJB8, 16SJB66, 16SJ19, 16SJ29, 16SJ64. The site identified as 16SJ1 is a National Register of Historic Places (NRHP) prehistoric site located in agricultural lands, and 16SJ50 and 16SJ51 are additional prehistoric sites that may be contemporaneous and related to site 16SJ1. Further sites include 16SJ5, 16SJ7, 16SJ9, 16SJ15, 16SJ16, 16SJ18, and 16SJ57 that have been determined as ineligible for the NRHP.

Cultural sites on the Mississippi River batture includes 16SJ13, 16SJ31, 16SJ39, and sites 16SJ41 – 16SJ48 that are ineligible for the NRHP. Site 16SJ38 has remnants of the Bourbon Plantation sugar house. Cultural resources in the Maurepas Swamp include parts of rail lines and water crossings used for logging (16SJ71, 16SJ72, 16SJ73). Other recorded resources includes two historic coffins (16SJ58, 16SJ61) eroded from a cemetery probably associated with 19th-20th century Blind River hunting camps. Recorded resources along the shores of Lake Maurepas, Lake Pontchartrain, or waterways include 16SJB4, 16SJB33, NRHP site 16SJB2, the Schloesser Cemetery (16SJB3), and remnant civil war fortifications (16SJB7).

Future Without-Project Conditions (No Action Alternative)

Direct and Indirect Impacts: No direct impacts to cultural and historic resources would occur. Indirect impacts would be the continuation of existing conditions. Changes in RSLR could affect the spatial limits, depths and frequency of inundation to existing cultural and historic resources.

2.4.8 Aesthetics and Visual Resources

Historic and Existing Conditions**:** Aerial photography between 1992 and 2010 shows visual conditions of the area changed over 20 years. The landscape along with view sheds has changed due to development, the conversion of swamps into marsh and open water. Photographs show that the same public thoroughfares that are in place today were in place in 1992; however, the scenery has changed from natural to a more developed state with residential, commercial and industrial development dominating US-61, Louisiana Highway 51 (LA-51) and LA-44, and other corridors. The only major exception is I-10, which traverses the area, giving near unobstructed views of a native landscape that remains aesthetically pleasing. Primary view sheds then, as they are today, were best taken from the local road system, and, in some instances, the Mississippi River levee.

There are two Scenic Streams in or near the area. Blind River stretches south 25 miles from Lake Maurepas, crossing under I-10 and ending near US-61 on the west side of the area. Bayous LaBranche and Trepagnier are located to the east outside of the study area sourcing from Lake Pontchartrain and stretching south, crossing under I-10 and US-61 and ending near the Norco (Bayou Tepagnier) and Good Hope (Bayou LaBranche). Other water resources include the Mississippi River, and numerous canals, streams and creeks that crisscross the native habitat between I-10 and the developed areas along the river (LDWF 2013).

> *"Blind River's surrounding habitat is composed almost entirely of deep, wooded swamp with Spanish moss draped bald cypress and water tupelo being the dominant plant species. The habitat exhibits moderate plant species diversity and moderately high animal diversity. Natural levees and spoil banks provide the only upland habitat available near the river."*

Scenic Byways include the Great River Road traversing US-61. This is but one segment to an overall scenic byway that stretches on multiple thoroughfares from Canada to the Gulf of Mexico. It is state and Federally designated and also has an "All American Road" status, making it significant in culture, history, recreation, archeology, aesthetics and tourism.

Future Without-Project Conditions (No Action Alternative)

Direct and Indirect Impacts: There would be limited to no direct impacts to visual resources. Visual resources would most likely evolve from existing conditions in a natural process, or change as dictated by future land use maintenance practices and policies.

2.4.9 Recreation Resources

Historic and Existing Conditions

The area includes the 103,263-acre Maurepas Swamp WMA. There are a few private camps in the WMA. The LDWF estimates that there were 22,673 WMA recreation users in 2012. Access into the WMA area is generally by boat; however, several locations provide foot access. Consumptive recreation includes hunting deer, squirrels, rabbits and raccoons; fishing for bass, sunfish and crappie; and trapping alligators and nutria. Non-consumptive recreation includes bird watching, sightseeing, and boating. There is a 0.5 mile nature trail and two tent-only camping areas. There is one private recreational camp in the alternative levee alignments.

Many canals and bayous traverse the area, including Pipeline, Hope, Grand Point, and Reserve Relief Canals; and Mississippi and Manchac Bayous. Blind River is one of the most used waterways in the WMA. Recreation includes boating, fishing, hunting, and crawfishing. There is a public boat launch (Hope Canal) in the WMA. There are boat launches near the WMA boundary providing access into the WMA, including Tchakenhou Bayou, Ruddock Canal, Reserve Relief, and St. James Boat Club launch. Additionally, the St. James Boat Club boat

launch, funded by the Land and Water Conservation Fund, provides access to Blind River. It includes playground facilities and is used as the Choupique Rodeo Site. Three launches access the I-55 canal. There are no designated parking lots; parking occurs along the highway. The canal provides access to Lake Maurepas. A launch is located at the end of Peavine Road to access Lake Pontchartrain. Three launches are located off US-61, I-55, and I-10. The US-61 launch provides access to Conway Canal and Old New River. The I-55 and I-10 boat launches provide access to adjacent canals and Lake Maurepas.

Cajun Pride Swamp Tours is located off Frenier Road near US-51. This commercial operation provides boat tours in their private refuge and in the Manchac Swamp. Belle Terre Country Club and Golf Course is located in the area. This provides various recreational facilities including a golf course, outdoor swimming pool, and tennis courts. There are local recreational parks including Regala Park, Montz Park, Bethune Park, and Laplace Recreation and Youth Organization (Larayo) Youth Park. Regala Park facilities include an outdoor swimming pool, softball/baseball fields, picnic pavilions, tennis courts, playground, racquetball courts, 1 mile walking path, and soccer field. Montz Park provides a 1,561-foot walking path, baseball fields, basketball courts, playground, and picnic pavilions. Bethune Park provides baseball fields and as does Larayo Youth Park which also provides tennis courts and a swimming pool.

Future Without-Project Conditions (No Action Alternative)
Direct and Indirect Impacts: There would be no direct impacts. Recreational infrastructure would remain vulnerable to surges. Parks, boat launches, and golf courses could be damaged. Storm surge and salt water could have a negative impact on freshwater forests and habitats and could reduce recreational resources (e.g., fishing, hunting, bird watching, and other).

2.4.10 Noise

Historic and Existing Conditions**:** Noise, or unwanted sound, may be objectionable in terms of the nuisance, health, or well-being effects it may have upon humans and the human environment, as well as upon animals and ecological systems (Kryter 1994). Generally, noise is a localized phenomenon. The regulations for Occupational Noise Exposure (29 CFR §1910.95) under the Occupational Safety and Health Act of 1970, as amended, establishes a means for effective coordination of Federal activities in noise control and to provide information to the public regarding noise emissions. There are many different noise sources throughout the area including commercial and recreational boats, and other recreational vehicles; automobiles and trucks, and all terrain vehicles; aircraft; machinery and motors; and industry-related noise.

Future Without-Project Conditions (No Action Alternative)
There would be no direct, indirect or cumulative impacts.

2.5 Cumulative Impacts for the Future Without Project Condition

Cumulative impacts would be the incremental direct and indirect impacts of not implementing a storm risk reduction system for each of the significant resources described above in addition to the direct and indirect impacts attributable to other storm damage risk reduction systems which have not and would not be implemented in the Pontchartrain Basin, Louisiana and the Nation. There is little, if any, published data with which to provide a quantitative comparison regarding proposed hurricane/tropical storm damage risk reduction projects which have not been implemented. Primary cumulative impacts would include the incremental effects of not providing hurricane/tropical storm damage risk reduction. These would be localized and would affect different parts of the area:

- an estimated 62,900 residents and 20,000 residential structures in the area;
- an estimated 70,190 non-farm jobs; 1,900 non-residential structures; 23,800 farm acres;

- projected 165 public and quasi-public facilities;
- transportation infrastructure;
- effects community and regional growth;
- the effects on tax revenues and property values;
- community cohesion effects, especially during hurricane and storm surge events;
- potential effects of not providing risk reduction to minority and low income populations;
- potential degradation and or loss of cultural and historic resources;
- the continued loss of wetland habitats due to human development and conversion of existing forested wetlands and swamp habitats to marsh and open water; and
- potential salt water intrusion and inundation during hurricane and storm surge events.

Figure 2-8: Hurricane Isaac flooding in the River Forest subdivision in Laplace, Louisiana.

3.0 PLAN FORMULATION

Plan formulation is the key to supporting the USACE Civil Works water resources development mission. It is a process requiring experience, analysis, intuition and inspiration. To ensure that sound decisions are made, the process requires a systematic and repeatable approach. The Principles and Guidelines describe the study process for Federal water resource projects. It requires the systematic formulation of alternative plans that contribute to the Federal objective.

3.1 Prior Studies

This study builds upon prior reports and plans. Area problems and opportunities are documented in these reports. Table 3-1 lists relevant reports and studies.

Table 3-1: Relevant prior reports and studies.		Relevance to WSLP Study				
	Comprehensive Planning Studies	Data Source	Consistency	Structural Measures	Non-Structural Measures	FWOP Conditions
1980	LA Coastal Resources Program	X	X	X	X	X
1999	Coast 2050: Toward a Sustainable Coastal LA	X	X	X	X	X
2004	LA Coastal Area (LCA), LA Ecosystem Restoration Study	X	X	X	X	X
2012	LA's Comprehensive Master Plan for a Sustainable Coast	X	X	X	X	X
	Related Hurricane and Flood Damage Risk Reduction Projects and Reports					
1927	"Flood Control, Mississippi River and Tributaries" Published as House Document 90, 70th Congress 1st Session	X	X	X	X	X
1965	Chief of Engineers Report on Lake Pontchartrain and Vicinity, LA Hurricane Protection Project	X	X	X		X
1967	Amite River and Tributaries, Comite River Basin, LA	X	X	X		X
1984	Chief of Engineers Report on Lake Pontchartrain and Vicinity, LA Hurricane Protection Project	X	X	X		X
1990	LA Coastal Area Mississippi River Delta Study	X	X	X		X
1994	LA Coastal Wetlands Restoration Plan	X	X	X	X	X
1994	Southeast LA Hurricane Preparedness Study	X	X	X	X	X
2010	LCA Ecosystem Restoration Study, Volume II of VI, Final Integrated Feasibility Study and Supplemental Environmental Impact Statement for the Amite River Diversion Canal Modification Ascension and Livingston Parishes, LA	X	X	X	X	X
2010	LCA Ecosystem Restoration Study, Volume IV of VI , Final Integrated Feasibility Study and Supplemental Environmental Impact Statement for the LCA Small Diversion at Convent/Blind River St. James Parish, LA	X	X	X	X	X
	Previous West Shore Lake Pontchartrain Reports					
1985	West Shore Lake Pontchartrain Initial Evaluation Report	X	X	X		X
1987	Lake Pontchartrain West Shore, LA Hurricane Protection Reconnaissance Report	X	X	X		X
1997	West Shore Lake Pontchartrain, LA Hurricane Protection Project, Reconnaissance Report	X	X	X		X
2003	St. John the Baptist Parish, LA East Bank Urban Flood Control Reconnaissance Report	X	X	X		X




3.2 Planning Constraints

Plans are formulated to achieve objectives. **Objectives** and **constraints** are linked to problems and opportunities. Constraints are restrictions that limit the extent of the planning process.

Planning Constraints

1. Minimize impacts to wetlands.
2. Minimize impacts to the Small Diversion at Convent/Blind River project and River Reintroduction into Maurepas Swamp project.
3. No loss of flood protection from existing flood damage reduction projects.
4. Minimize impacts to the Maurepas Swamp Wildlife Management Area and surrounding wetlands.
5. Minimize infrastructure impacts (pipelines, highways, hospitals, schools, fire stations, and police stations).

3.3 Management Measures Considered and Screened (*NEPA required)

A **management measure** is a feature (a *structural element* that requires construction or assembly on-site) or an activity (a *non-structural action*) that can be implemented at a specific geographic site to address one or more planning objectives. They can be used individually or combined with other management measures to form alternative plans. Measures were developed to address problems and to capitalize upon opportunities. They were derived from a variety of sources including prior studies, the public scoping process, and the team.

This study considered structural measures and non-structural measures to provide risk reduction and maximize project benefits. All measures were screened for capability to meet objectives and avoid constraints, for engineering and economic feasibility, and for the level of risk reduction provided over the period of analysis (2020 to 2070). Measures that warranted continued consideration were assembled into **alternative plans**. Below are the structural and non-structural measures that were considered. Those measures carried forward for further consideration are shown in blue boxes. Figure 3-1 illustrates some of these measures. Detailed information about the measures and screening process can be found in Appendix E.

Non-Structural Measures

- **Full Acquisition/Buy-out**: This measure would involve the relocation of residents outside of the floodplain by physically moving structures or by purchasing replacement structures. An acquisition program would reduce flood vulnerability and decrease future flood damages. *Carried forward for further consideration.*
- **Limited Acquisition/Buy-out**: This measure would remove structures that receive repetitive damages from high frequency storm events (1 year, 5 year, 10 year, and 25 year frequencies). *Carried forward for further consideration.*
- **Flood-proofing and Elevation**: This measure would raise residential structures above the 2070 floodplain and flood-proof other structures, such as public facilities, to reduce damages. *Carried forward for further consideration.*
- **Floodplain Management Measure**: This measure would update local floodplain zoning rules based on changes due to RSLR. *Carried forward for further consideration.*
- **Cypress Reforestation**: This measure would enhance and/or restore forest on the Maurepas Landbridge and in the Maurepas Swamp to reduce surge heights. *Eliminated from consideration because it would be ineffective in reducing the level of risk reduction.*
- **Flood Forecast and Warning Measures**: This measure would involve more robust flood forecasting and warning systems. *Eliminated from consideration because the area has an ample forecast/warning system provided by local government. NOAA, FEMA,*

and the USACE already take the responsibility of producing storm surge maps under existing floodplain management authorization.

Structural Measures

- **Levees/Floodwall**: This measure would reduce storm surge damages. *Carried forward for further consideration.*
- **Control Structures on Canals and Bayous**: This measure involves the placement of control structures on canals and bayous to reduce the risk of flood damages. *Carried forward for further consideration.*
- **Seawall**: This measure would construct a seawall along the rim of Lakes Maurepas and Pontchartrain. *Eliminated because it would have adverse environmental impacts by enclosing swamp, and would stop drainage systems by preventing water exchange with Lake Maurepas. Mitigation features for this measure would not be cost effective.*
- **Floodgates on Tidal Passes**: This measure would place a large tide control structure on Pass Manchac, and potentially North Pass, to prevent storm surge from entering the area. *Eliminated from consideration because it would have adverse impacts on the environment and drainage systems by restricting tides and limiting the ability of the upper basin to drain during storms. The mitigation features would be cost prohibitive. Additionally, it would be ineffective due to surge flanking.*
- **Highway/Levee**: This measure would raise the I-10 roadbed to serve as a levee to reduce risk of surge damage. *Eliminated from consideration because it would require massive changes to the highway system, and would require replacement of the highway during scheduled levee lifts.*

3.4 Initial Array of Alternatives (*NEPA required)

Structural Measures were combined into an **initial array of 12 alternative plans**. These plans started in the eastern portion of the study area, and were incrementally expanded to the west. Maps and detailed descriptions of each of the alternative plans can be found in Appendix E.

- **Plan 1**: Levees/floodwalls from the Bonnet Carré Spillway to Reserve Canal.
- **Plan 2**: Levees/floodwalls from the Bonnet Carré Spillway to East St. John High School.
- **Plan 3**: Levees/floodwalls from the Bonnet Carré Spillway to East St. John High School following the wetland/non-wetland interface.
- **Plan 4**: Levees/floodwalls from the Bonnet Carré Spillway to East St. John High School offset from I-10.
- **Plan 5**: Levees/floodwalls from the Bonnet Carré Spillway to Marathon.
- **Plan 6**: Levees/floodwalls from the Bonnet Carré Spillway to Reserve enclosing US-51.
- **Plan 7**: Levees/floodwalls from the Bonnet Carré Spillway to Marathon following the wetland/non-wetland interface.
- **Plan 8**: Levees/floodwalls from the Bonnet Carré Spillway to Ascension Parish/Mississippi River.
- **Plan 9**: Levees/floodwalls from Bonnet Carré Spillway to Hope Canal/Mississippi River.
- **Plan 10**: Levees/floodwalls from the Bonnet Carré Spillway to the Hope Canal/Mississippi River enclosing I-10.
- **Plan 11**: Levees/floodwalls from the Bonnet Carré Spillway to the Hope Canal/Mississippi River with pipeline avoidance.
- **Plan 12**: Levees/floodwalls from the Bonnet Carré Spillway to Ascension Parish enclosing I-10.

Figure 3-1: Typical levee, floodwall (T-wall) and control structure.

To determine if the plans were viable for further evaluation each plan was scored from 5 (high performing) to 1 (low performing) based on how well it met objectives and avoided constraints. The scores were totaled and the plans were compared, evaluated and screened.

After reviewing the aggregate scores, Plans 1 - 6 were eliminated from further consideration because they did not maximize the planning objectives. Plans that could induce flooding to communities outside of the risk reduction system or divided communities were eliminated from consideration because they were considered unacceptable.

Plan 7 and Plan 9 alignments followed the wetland/non-wetland interface through St. John the Baptist Parish. However, Plan 7 would not provide risk reduction to the town of Garyville. By increasing the length of the levee by 500 feet, Plan 9 provided risk reduction to Garyville while only minimally increasing costs. Plan 7 was thus eliminated. Plan 8 and Plan 12 would provide risk reduction to the same area. The difference between the two Plans was the tie-in points at the two closest high ground areas to prevent storm surge from flanking the levee. Plan 12 would extend into Ascension Parish and tie into the Marvin Braud pump station. Plan 8 would tie into LA-70 in St. James Parish adding 4 miles to the alignment. Plan 12 was carried forward instead of Plan 8 because it was less costly and the direct environmental impacts were less than Plan 8.

The four remaining structural plans were carried forward: Plan 9, Plan 10, Plan 11 and Plan 12.

Structural and non-structural measures were combined to form additional plans. A plan was developed to evaluate a stand-alone non-structural plan which would acquire or elevate 14,486 structures in the flood plain. The non-structural plan cost $3,260,000,000 far exceeding estimated benefits and the cost of other alternatives. The stand-alone non-structural plan was eliminated from further evaluation, but it was determined that portions of this plan could be carried forward to complement the remaining structural alignments. After screening the structural plans, the remaining plans (Plan 9, Plan 10, Plan 11 and Plan 12) were evaluated to identify if there was a risk of storm surge-related damage that was not addressed by the structural alignments. While Plan 12 would provide risk reduction to most of the developed study area, Plans 9, 10, and 11 would not provide risk reduction to St. James Parish. Additionally, two communities within St. James Parish, Lutcher and Convent, could be considered Environmental Justice communities per Executive Order 12898.

Non-structural measures were added to complement Plans 9, 10, and 11 to address the risk of potential storm surge-related damages to areas west of Hope Canal. With the inclusion of the non-structural measures, Plans 9, 10, and 11 would provide benefits commensurate with Plan 12 (Figure 3-2).

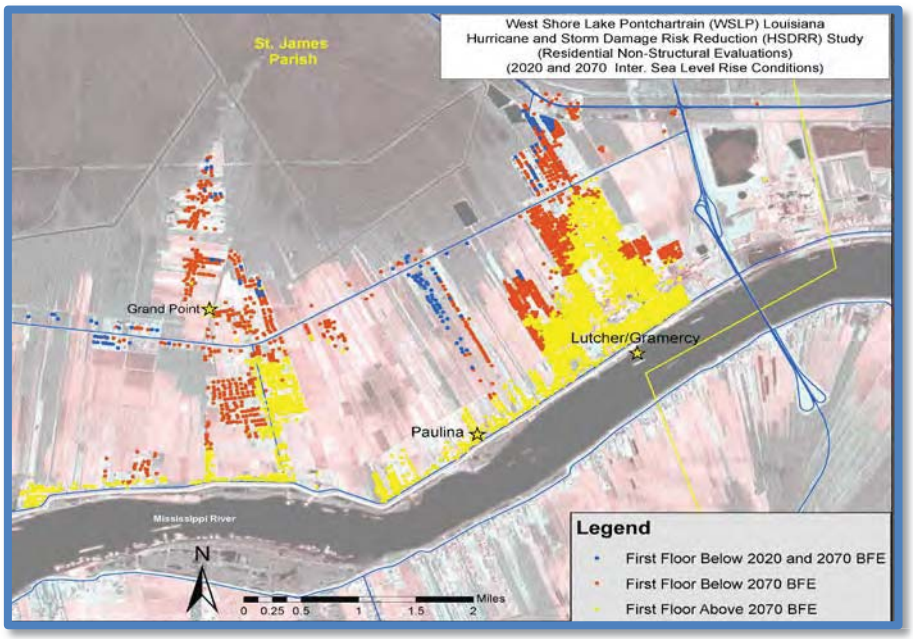


Figure 3-2: Supplemental non-structural plan area in St. James Parish.

The number of structures expected to be impacted by storm surge is highly influenced by RSLR. Under the base condition (year 2020) damages in St. James Parish resulting from a 1% annual exceedance probability (AEP) storm event would impact approximately 219 structures. This is expected to increase with the effects of RSLR over the 50-year period of analysis to 1,571 structures out of a total of 4,921 structures. Due to the uncertain impacts of RSLR, a range of costs were developed based on a minimum expected number of structures based on the 2020 floodplain and a maximum number of structures based on the 2070 floodplain. During feasibility level design, further analysis on the non-structural features will be conducted by economic reach to determine the economic feasibility of the non-structural features (Figure 3-3).

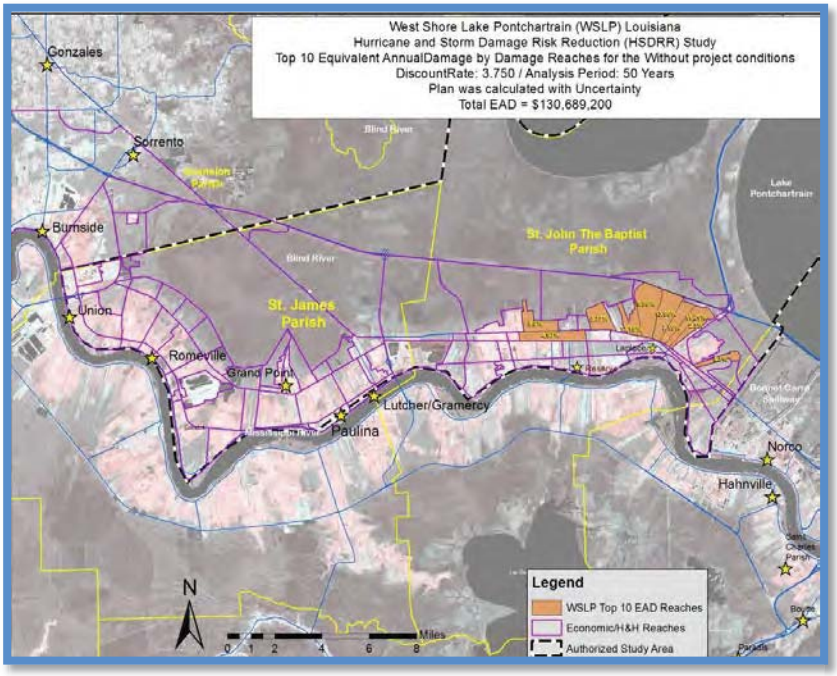


Figure 3-3: Economic reaches, FWOP condition.

Four plans with non-structural measures were carried forward and identified as follows:

Plan 9 + non-structural → **Alternative A**
Plan 10 + non-structural → **Alternative B**
Plan 11+ non-structural → **Alternative C**
Plan 12 → **Alternative D**

These alternatives were further evaluated considering alignments with respect to the I-10 corridor. Alternative B would not provide greater risk reduction for the evacuation routes than any of the other plans. Alternative B would reduce risk to the same number of structures as Alternative C but would enclose approximately 4,000 more acres of wetlands. Based on this, Alternative B was eliminated.

3.5 Final Array of Alternatives (*NEPA required)

The final array of alternatives carried forward for consideration included **the No Action Alternative**, **Alternative A**, **Alternative C**, and **Alternative D** (Figure 3-4). Engineering details on each can be found in Appendix B. Comparative details are shown in Table 3-2. The team assumed that Alternatives A, C, and D would provide equal levels of risk reduction. The least costly plan would have the highest net benefits. Analysis is based on a 1% AEP storm event.

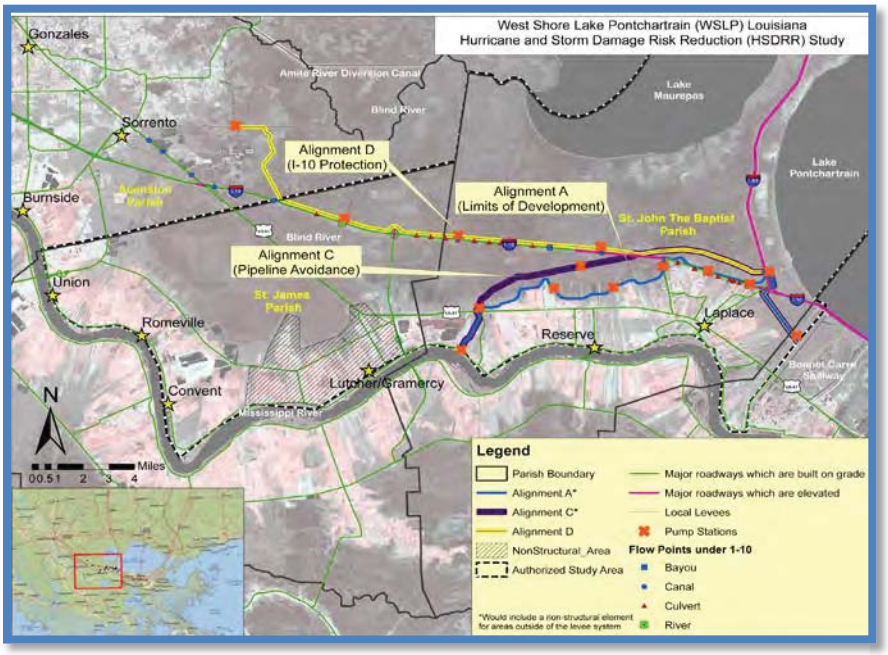


Figure 3-4: Final array of alternative plans.

No Action Alternative (Future without-project condition)

Under the No Action Alternative no risk reduction would occur. The area would continue to experience storm surge damage. This would be exacerbated by RSLR and increased impacts to wetlands due to salinity. As wetlands erode and subside, they would provide less risk reduction.

Table 3-2: Comparative details for final array of alternative plans.

Alternative	Length of Alternative	Size of Study Area Behind Alternative	Number of Structures Behind Alternative	Communities Behind Alternative	Miles of I-10 Behind Alternative	Wetlands Behind Alternative	Number of Pipeline Crossings
A	20 miles	38 sq miles	16,919	Montz, Laplace, Reserve, Garyville	4 miles	~5 sq miles	70
C	18 miles	47 sq miles	16,919	Montz, Laplace, Reserve, Garyville	4 miles	~16 sq miles	36
D	28 miles	160 sq miles	21,840	Montz, Laplace, Reserve, Garyville, Lutcher, Gramercy, Grandpoint	15 miles	~79 sq miles	14

Alternative A: Bonnet Carré Spillway to the Hope Canal to Mississippi River

Alternative A (Figure 3-5) would provide risk reduction to St. Charles, St. John the Baptist and St. James Parishes. The approximately 20.41-mile levee and floodwall alignment begins at the West Guide levee of the Bonnet Carré Spillway, north of transmission line and pipeline corridors and extends west around the interstate interchange and along the wetland/non-wetland interface. The alignment turns south near Hope Canal, until it reaches the Mississippi River Levee (MRL). Elevation and/or acquisition of structures outside of the alignment would reduce risk of storm surge-related damage in areas west of the Hope Canal.

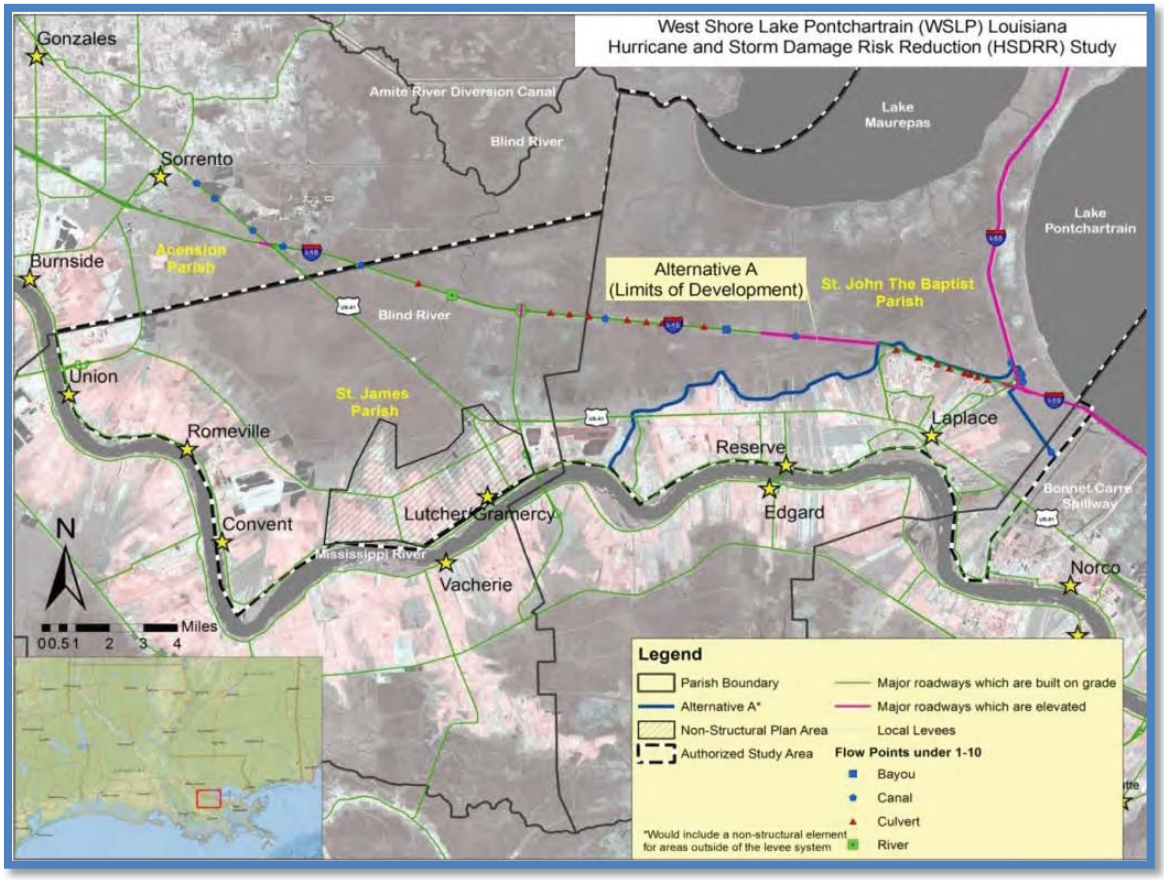


Figure 3-5: Alignment and features of Alternative A.

Construction would require roughly 3,100,000 cubic yards of earthen borrow material; 3,700,000 yards of geotextile fabric; 30,000 cubic yards of aggregate limestone road; nearly 5,000 linear feet of T-walls to cross under the interstate, or as frontal risk reduction for pump stations; 1,200 linear feet of flood gates; 240 linear feet of drainage gates; and 2 railroad gates. Eight pump stations on the alignment would require 25,000 cubic yards of concrete, 230,000 square feet of sheet pile, nearly 7,000 tons of riprap, and 151,000 linear feet of concrete piles. Multiple culverts with flap gates would be constructed. Because the alternative hugs the wetland/non-wetland interface, Alternative A has the least adverse wetland impacts. However, the plan has the greatest residual risk (the risks left after all construction and safety measures have been assessed) because overtopping of the levee by surge would cause immediate inundation of populated areas. It also has the most pump stations which results in more maintenance and greater risk of system failure. It is the least adaptable because expansion of the levee would require the purchase and/or relocation of existing structures. The plan does not reduce risk to infrastructure in St. James Parish.

Alternative C: Bonnet Carré Spillway to the Hope Canal to Mississippi River

Alternative C (Figure 3-6) evaluates the feasibility of avoiding multiple pipeline and utility crossings. It follows the Alternative A alignment between the West Guide levee of the Bonnet Carré Spillway to the US-51 interchange, where it then tracks north across US-51 and along a pipeline transmission corridor. The approximately 18.27-mile alignment crosses I-10 and follows the pipeline corridor through wetlands near the Belle Terre exit until it reaches Hope Canal. The alignment then turns south and extends to the MRL. Elevation and/or acquisition of structures outside the alignment would reduce risk of storm surge-related damage to structures in areas west of the Hope Canal.

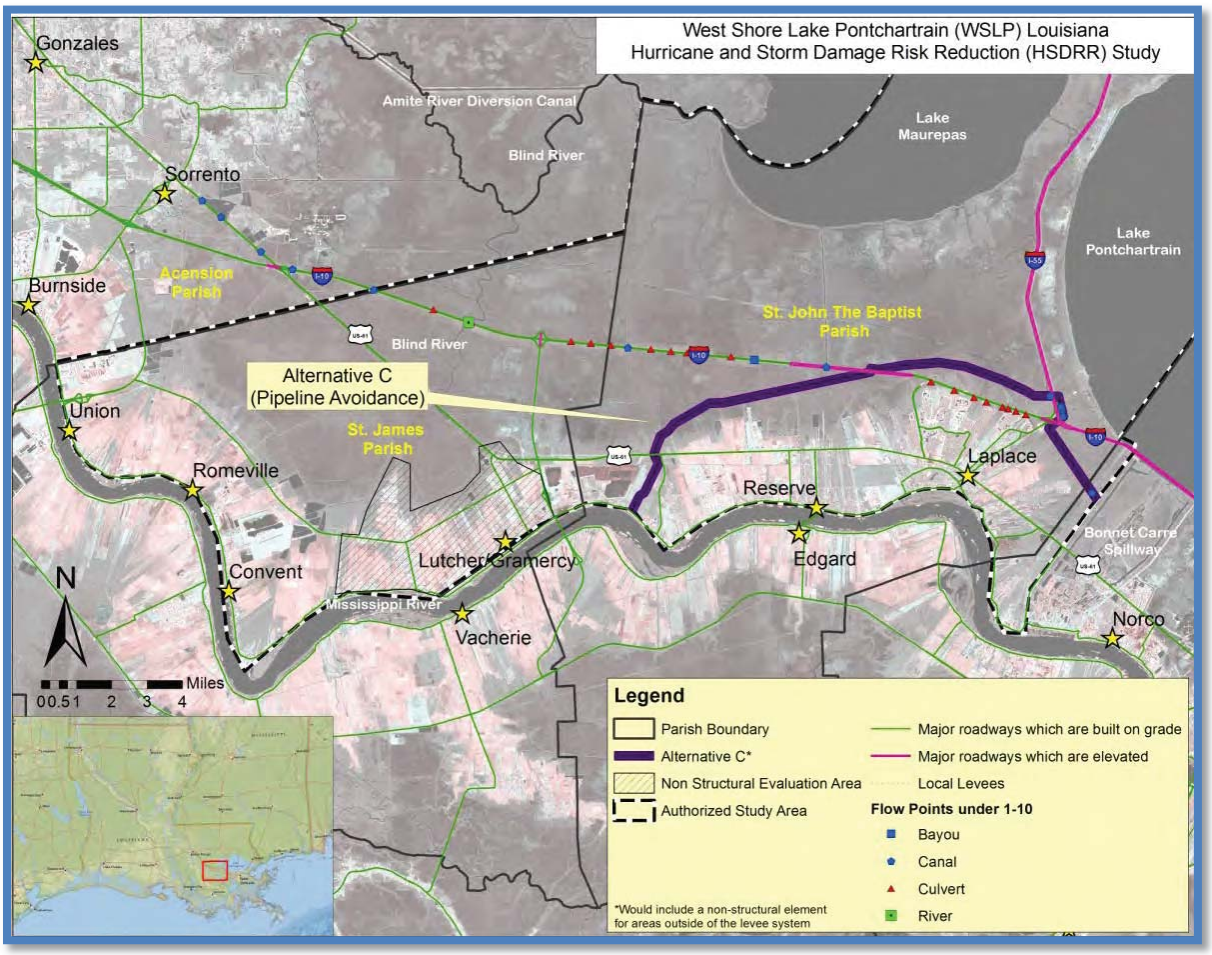


Figure 3-6: Alignment and features of Alternative C.

Construction of the alternative would require roughly the same amount of borrow material as Alternative A. It would require 3,365,000 cubic yards of geotextile fabric; nearly 26,000 cubic yards aggregate limestone road; 5,300 linear feet of T-walls; 300 linear feet of flood gates; 200 linear feet of drainage gates; 4 pump stations; and 2 railroad gates. Environmental structures similar to those identified for Alternative A would be built. This alternative encloses more wetlands than Alternative A, and would require more environmental structures, but has less residual risk because levee overtopping would not immediately inundate populated areas. It is more adaptable should changing conditions require modifications to the structures because the alignment does not abut existing structures. However, the plan does not reduce risk to infrastructure in St. James Parish.

Alternative D: Bonnet Carré Spillway to Ascension Parish

Alternative D (Figure 3-7) is a westward extension of the Alternative C alignment along the I-10 corridor into Ascension Parish. It continues west at the St. James Parish line slightly north of I-10 until it reaches the Old New River, where it proceeds north to the non-Federal Laurel Ridge levee in Ascension Parish. Measures to maintain water flow and to reduce impacts to enclosed wetlands would be built. Alternative D reduces risk to communities in St. Charles, St. John and St. James Parishes and provides a level of risk reduction to a segment of the I-10 hurricane evacuation route.

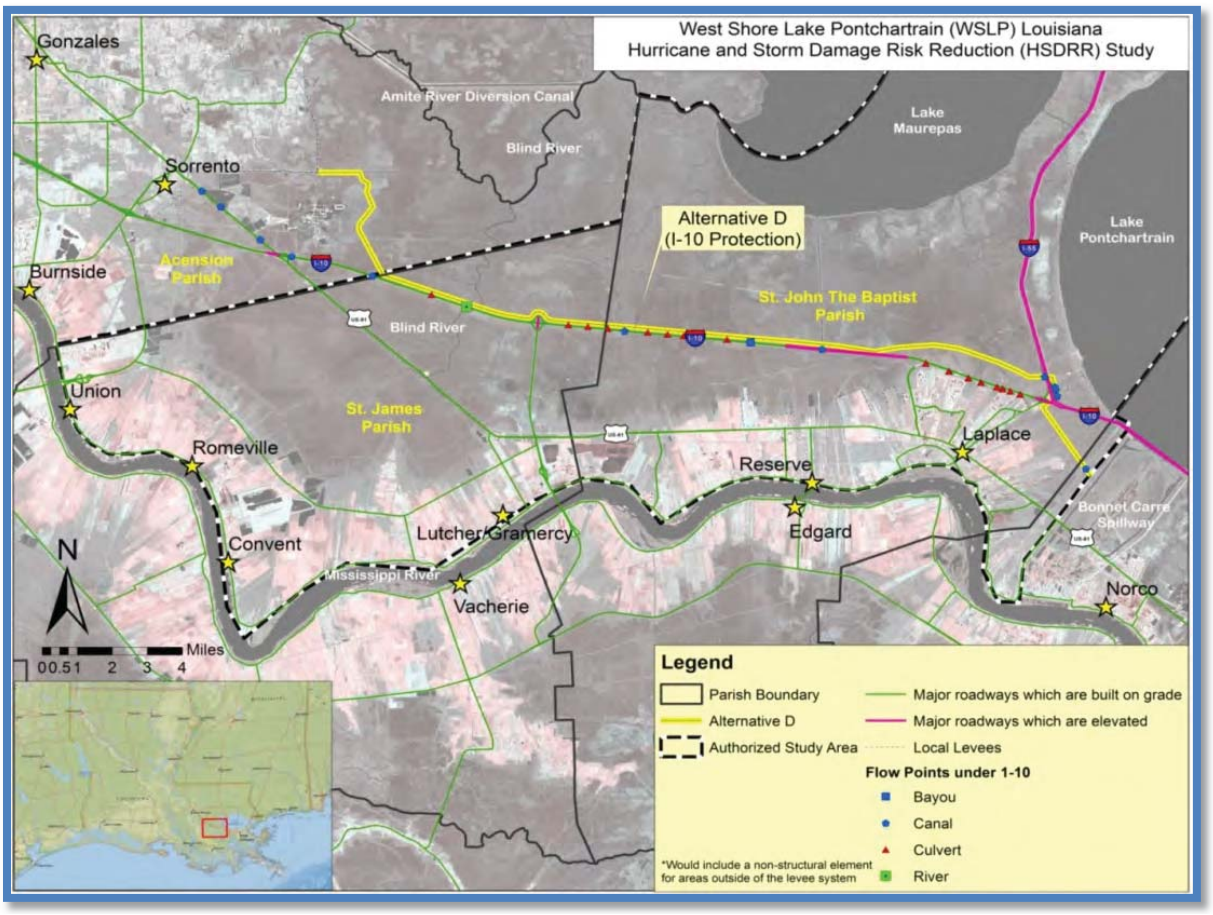


Figure 3-7: Alignment and features of Alternative D.

Construction of the approximately 28-mile alternative would require 3,700,000 cubic yards of borrow material, 3,037,000 square yards of geotextile fabric; approximately 37,000 cubic yards of aggregate limestone road; just over 4,000 linear feet of T-walls; 300 feet of flood gates; 400 feet of drainage gates; approximately 6 pump stations; nearly 24,000 cubic yards of concrete; almost 200,000 square feet of sheet pile; approximately 5,900 tons of rip rap; 154,000 linear feet of concrete piles; and environmental structures, most notably at Blind River, a Louisiana Scenic River. It encloses the most acres of wetlands requiring more environmental structures than any of the other alternatives. Each of these structures would require maintenance because failure of the environmental structures could increase adverse environmental impacts. The greater number of structures results in more maintenance and a greater risk of failure. There is concern about potential impounding of large areas of wetlands under this alternative, especially if the river diversion projects are constructed. Alternative D provides the greatest structural risk reduction and would reduce risks to roads and other infrastructure in St. James Parish.

3.6 Cost Estimates

Estimated costs for levees, floodwalls, and pump stations; real estate costs; operation and maintenance, repair, rehabilitation and replacement (OMRR&R); environmental mitigation; and non-structural features were totaled for each alternative and compared to each other to help identify a TSP. Costs for the non-structural features of Alternative A and Alternative C, and costs associated with mitigation for indirect impacts are uncertain. For this reason, a range of costs was developed for each feature.

Non-structural Cost: Non-structural costs were based on a 100% structure survey of area improvements. The cost of raising and/or acquiring structures located in the 2020 and 2070 100-year floodplains was evaluated by comparing the cost of elevating the structure to the cost of acquiring the structure. The lesser cost was used to determine the cost of the non-structural feature. RSLR greatly impacts the number of structures to be raised, resulting in uncertainty as to how many structures would have to be raised by any given date. A minimum cost of the non-structural feature of $53,143,789 was developed based on the cost of reducing risk to structures in the 2020 100-year floodplain. A maximum cost of $305,256,794 was developed based on the cost of reducing risk to structures in the 2070 100-year floodplain. The maximum cost was used for comparison.

Indirect Impact Cost: At this stage, mitigation costs for indirect impacts remain uncertain due to limited hydrologic information and lack of a full wetland value assessment (WVA). To reduce the uncertainty of costs associated with mitigating for indirect impacts, a maximum cost based on Morganza to the Gulf and Lake Pontchartrain and Vicinity project estimates, and a minimum cost based on local mitigation bank costs were developed. These costs were averaged. In place of WVA analysis, habitat reduction values from 5 - 75 percent were calculated. Using these values, the average estimated mitigation cost associated with indirect impacts ranged from $871,000,000 to $980,000,000 for Alternative A, $844,000,000 to $1,000,000,000 for Alternative C, and $672,000,000 to $2,200,000,000 for Alternative D.

Based on available information, the habitat reduction value impacts are estimated to be approximately 15 percent of the total enclosed wetlands, as shown in Table 3-3. The risk reduction features will be designed to maintain existing hydrologic flows to the extent practicable. If this can be achieved, indirect impacts would be limited to those that occur during closure of structures for storm surge events – an estimated 8.5 days per year. A WVA analysis based on hydrologic modeling will be conducted on the TSP during feasibility design.

Table 3-3: Estimated first costs for final array of alternative plans.

	Alternative A	Alternative C	Alternative D
Levees & Floodwalls	$335,898,670	$334,156,997	$339,508,346
Pump Stations	$132,162,500	$112,687,500	$166,437,500
Pipeline Relocations	$70,300,000	$35,100,000	$11,693,750
Real Estate	$3,849,000	$3,283,000	$2,434,000
Direct Habitat Impacts	$17,000,791	$35,710,811	$43,323,364
Indirect Mitigation Cost (15%)	$23,123,679	$54,655,968	$327,687,626
Non-Structural 2070*	$305,256,794	$305,256,794	$0
Total Cost	**$887,591,434**	**$880,851,070**	**$891,084,586**

***Some non-structural costs will be LERRD costs that are the responsibility of the NFS. The non-structural costs will be spread over the entire period of analysis and will be heavily discounted and result in less than 17% of the total average annual costs.**

OMRR&R Cost: Table 3-4 provides preliminary OMRR&R cost estimates for each alternative. Annual costs will be refined during feasibility level design and analysis. Upon notice of

completion of construction of the project, or a functional portion of the project, the CPRAB shall commence OMRR&R responsibilities for the project (Chapter 8).

Table 3-4: Comparison of annual OMRR&R cost for final array of alternative plans.

Alternative	Levee Grass Cutting		Structure OMRR&R ($)	Total OMRR&R ($)
	(acres)	($)		
Alternative A	390	$234,000	$7,277,050	$7,511,050
Alternative C	868	$520,800	$3,607,275	$4,128,075
Alternative D	1269	$761,400	$5,421,538	$6,182,938

NOTE: Based on levee right-of-way acreage, 2012 dollars, and includes a 25% contingency. OMRR&R costs for mitigation are not included. Cost include grass cutting; pump station and flood gate replacement; and other planned OMRR&R activities.

3.7 Summary of Accounts and Comparison of Alternatives

Plans in the final array are assumed to provide equal levels of risk reduction. To facilitate evaluation and comparison of the alternatives, four Federal Accounts were used to assess the effects of alternatives. The accounts are National Economic Development (NED), Environmental Quality (EQ), Other Social Effects (OSE), and Regional Economic Development (RED).

No Action Alternative: No NED benefits would be associated with the No Action Alternative. There would continue to be adverse impacts to the EQ as salinity levels increase in the area, affecting wetlands and eventually causing impacts to residents (OSE) in the immediate vicinity of the study by reducing the natural swamp buffer. Reducing the natural buffer could also cause uncertainty to RED by impacting major oil refineries in the region and the overall economy.

Alternative A: Alternative A provides NED benefits, but provides less net benefits than Alternative C. It encloses the fewest acres of wetlands, resulting in the least adverse impacts to EQ. However, it risks immediate inundation of developed areas in an overtopping event; thus reducing safety to residents (OSE) in the area. It limits future modification or reinforcement of the system due to its proximity to existing structures. It would also risk disruptions to the local drainage patterns northward if design parameters are exceeded. (Figure 3-8). While Alternatives C and D would disrupt existing drainage if design parameters are exceeded, the damage resulting would be greatest for Alternative A due to

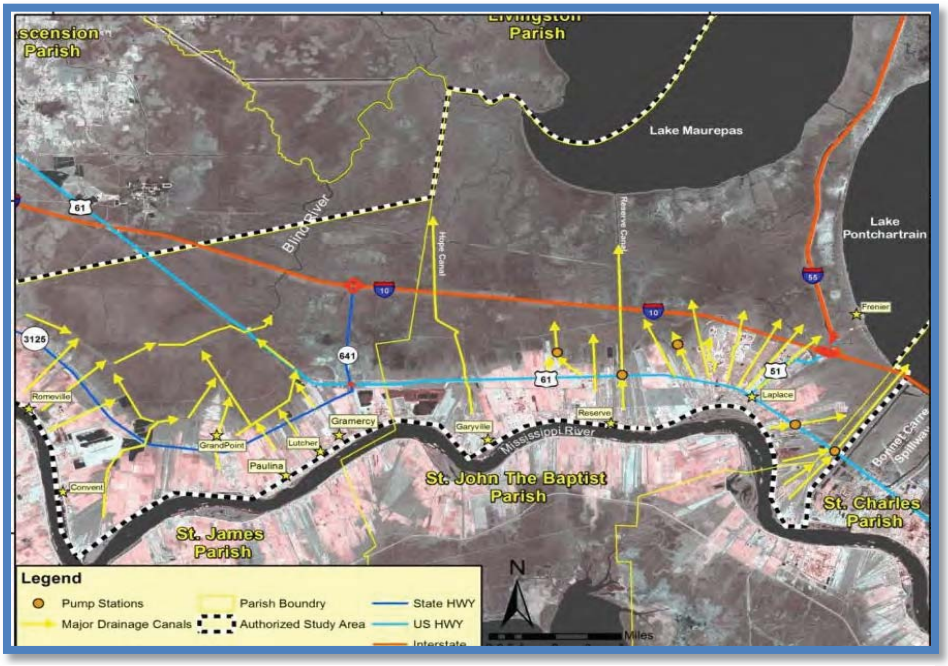


Figure 3-8: Study area drainage patterns.

the close proximity of the levee to existing structures. There is no risk reduction to roads in St. James Parish which could flood, preventing employees from accessing vital industries.

Alternative C: Alternative C maximizes benefits. It has more adverse impacts on EQ than Alternative A but reduces impacts to wetlands compared to Alternative D. In case of a major storm surge event that exceeds the federally authorized project design, Alternative C could reduce the risk to OSE because storm surge would, over time, first fill in the wetlands before potentially inundating developed areas. Because this alternative addresses an uncertain yet reasonably foreseeable need to modify the system, it could provide stability to RED in developed areas. The alignment can be enlarged should RSLR be greater than anticipated without displacing area residents. There is no risk reduction to roads in St. James Parish.

Alternative D: Alternative D provides NED benefits, but does not maximize those benefits. It provides risk reduction to a larger area thus reducing risk to more area residents. Structural risk reduction is provided to roads in St. James Parish, reducing the risk that employees would be unable to access critical infrastructure and places of employment. Additionally, because the levee is not located in close proximity to existing structures, the threat of flooding due to exceedence of design parameters is lessened. Alternative D poses potential uncertainties concerning the impoundment of large areas of wetlands, especially if the river diversion projects are constructed. While it would prevent saltwater intrusion, it would risk impacting hydrology by enclosing approximately 54,800 acres of swamp and would impact the EQ of the Maurepas WMA as well as Blind River, a Louisiana Scenic River. Per the Wild and Scenic River Act, construction within 100 feet of a scenic stream requires a permit.

Economic Costs Comparison: The parametric implementation costs were annualized using the current interest rate (3.75%) and a 50 year period of analysis (2020-2070) as shown in Table 3-5. In 2020, only 5% of the benefits are derived from St. James Parish and only 219 structures are located within the 100-year floodplain. The cost of the non-structural feature for Alternatives A and C increases from approximately $53,000,000 (in year 1) to over $305,000,000 (in year 50) due to RSLR. Most of the structures would not reside in the 100-year floodplain until the later years of the period of analysis. Because of this, the non-structural costs were spread evenly over a 53-year period beginning in 2017 and ending in 2069; and then compounded or discounted to the 2020 base year. The annual benefits were compared to the cost assuming a 100-year level of risk reduction. The total annual benefits were then compared to the total annual costs.

Table 3-5: Economic comparison of final array of alternative plans.

Alternative	Implementation Costs ($ millions)	Annual OMRR&R ($ millions)	Equivalent Annual Benefits ($ millions)	Annual Costs ($ millions)	Benefit-to-Cost Ratio	Annualized Net Benefits ($ millions)
A	887.6	7.5	59.9	40.5	1.48	19.4
C	881.0	4.1	59.9	36.8	1.63	23.0
D	891.1	6.2	59.9	46.7	1.28	13.2

Alternative C has the lowest cost and the highest net benefits followed by Alternative A and Alternative D. The preliminary benefit to cost ratio (BCR) for Alternative C is equal to 1.63 to 1 with annualized net benefits of approximately $23,000,000. For Alternative A the BCR is 1.48 and for Alternative D it is 1.28 with net benefits of $19,400,000 and $13,200,000, respectively.

Hydrologic information is limited, so estimates were not developed to evaluate the number of environmental structures that would be required for the alternatives. The inclusion of environmental structures could greatly increase the cost of Alternative D, which encloses 79 square miles of wetlands, in comparison to Alternative A (5 square miles) and Alternative C (15 square miles). Benefits such as reductions in emergency costs and damage to roadways have not been calculated and would expect to be greatest for Alternative D and the least for Alternative A. These benefits are usually minimal and would not impact the selection of the TSP.

Alternative A tracks the wetland-non-wetland interface in Laplace to its termination at the Hope Canal in western St. John the Baptist Parish. It requires the largest number of pump stations (8 pump stations) compared to Alternative C (4 pump stations) and would require approximately $7,500,000 in OMRR&R cost to maintain the fully constructed alternative compared to $4,100,000 in OMRR&R for Alternative C. If overtopped, Alternative A would allow immediate inundation at developed areas and I-10, resulting in the greatest residual risk.

3.8 Identifying the Tentatively Selected Plan

Alternative C is the tentatively selected plan (TSP) and the NED plan as determined by the evaluation criteria. It fulfills the planning objectives stated in Section 1.5. It reasonably maximizes net benefits, consistent with protecting the Nation's environment in accordance with national environmental statutes, applicable Executive Orders, and other Federal planning requirements.

4.0 ENVIRONMENTAL CONSEQUENCES (*NEPA Required)

This chapter describes the direct, indirect and cumulative environmental consequences of implementing the proposed hurricane and storm damage risk reduction plans considered in this study. Topics in this chapter mirror the topics in Chapter 2. The potential impacts (effects) of the alternatives in the Final Alternative Array to significant resources are compared to the No Action Alternative (i.e., future without-project conditions).

4.1 Water Environment

4.1.1 Flow and Water Levels

Alternative C

Direct and Indirect Impacts: Structural measures would provide storm damage risk reduction for those areas with the greatest human development, including: Laplace and the immediately surrounding area of St. John the Baptist Parish; and the town of Montz, in St. Charles Parish. This alternative would reduce the risk of flow and water levels in the interior of the protected levee and pump system during a storm surge. During such an event the levee system would be closed thereby causing interior (protected side) water stages and flows to decrease, while being similar for rainfall events. For the exterior (unprotected side), water stages during storm events along the east bank of St. James Parish and east bank of Ascension Parish could, to some unknown extent, potentially increase when the levee system is closed. Furthermore, the length of storm surge inundation to the exterior wetlands adjoining the proposed structurally protected areas could be less than under the No Action Alternative, as there could be less storm surge to drain from the interior with the proposed levee and associated features in place. Additional modeling will be conducted during the feasibility phase to determine if any such potential exists.

Of the 14,486 existing residential structures located in St. James Parish, an estimated 1,571 residential structures could be potentially elevated. However, there would likely be no effects to flows or water levels attributable to this measure in the St. James Parish area. The buy-out non-structural measure would also not significantly impact flows or water levels in the St. James Parish area. Although the green space created from structures removed following buy-outs, may have some minor effects to water flows.

Major indirect impacts of the structural measures would be a decrease in tidal interchange between the interior (protected side) and exterior (unprotected side) areas of the proposed levee alignment. Proposed modifications to the interior drainage system, required to mitigate for project-induced interior storm damage, would operate by gravity drainage, with pumps operating only during storm events resulting in high exterior water levels. It was estimated the pumps would be operated, on average, for 1.7 storm events per year which equates to closure of gate structures on average 8.5 days per year. Consequently, hydrologic connectivity would be generally maintained between the wetlands within the 47 square mile levee-enclosed area and the surrounding swamps and Lakes Maurepas and Pontchartrain except during the closing of the system for storm events. Preliminary hydrologic modeling (that does not include rainfall) indicates that future without-project daily water stages on the protected side would be similar to future with-project conditions except during storm events as described above.

Figure 4-1 displays the with and without project water elevations for both the exterior and interior sides of the levee system. Flows into and out of the system (not including rainfall) would also be similar to future without-project conditions, but there could be a brief time lag under the future with-project conditions. Figure 4-2 displays modeling simulation flows during the month of May for Area 5 near the Bonnet Carré. For this area, there was roughly ¾ the amount of interchange for with-project versus without-project. In addition, on average, there was a 10-minute delay in the timing of the tidal flows. Should the trend of increased precipitation and

climate warming continue, there could be continued increases in runoff associated with increased rainfall events which may affect the total volume of freshwater in the area as well as during storm damage peaks (USACE 2004). Non-structural measures would have little, if any, significant indirect impacts on flows or water levels.

Figure 4-1: Model results of with and without proposed levee alignment affects on tidal circulation.

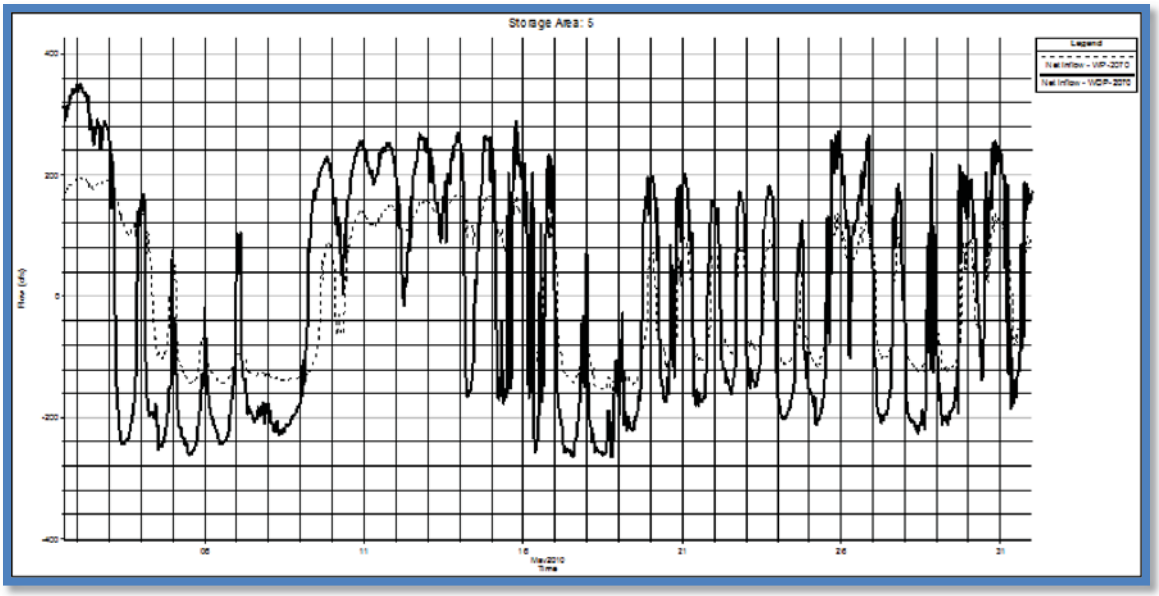


Figure 4-2: Modeling simulation flows during month of May for Area 5 (near Bonnet Carré guide levee).

Alternative C has the potential to increase stages to the areas exterior to the levee. These areas include the east bank of St. James Parish and the Gonzales and French Settlement areas in

Ascension Parish. Concern over induced flooding due to the Greater New Orleans Hurricane and Storm Damage Risk Reduction System (HSDRRS) caused similar concern after Hurricane Isaac to the Laplace area. However, based on ADCIRC studies after Hurricane Isaac induced flooding in Ascension Parish is not anticipated.

Cumulative Impacts: Impacts would be the incremental direct (856 acres) and indirect effects (up to 8,424 acres) on flows and water levels attributable to the proposed action in addition to the direct and indirect impacts to flow and water levels attributable of other previous, existing and authorized levee systems in the Pontchartrain Basin, the State and the Nation.

Impacts in the Pontchartrain Basin levee systems, consistent with the USACE November 2012 preliminary report titled "Hurricane Isaac With and Without 100-year HSDRRS Evaluation" and the "Comprehensive Environmental Document, Phase I, Greater New Orleans HSDRRS", (USACE 2013) include: approximately 217 miles of levees systems within the existing New Orleans HSDRRS; approximately 1,115 acres of recently constructed portions of the West Bank and Vicinity HSDRRS system; additionally the 142-mile long MR&T levee system and the 18-mile long non-Federal levee from Caernarvon to White Ditch; as well as potential impacts of projects approved for construction. The State levee systems include approximately 3,122 miles of levee. Approximately 100,000 miles of levees exist throughout the Nation (ASCE 2013).

Alternative A

Direct, Indirect and Cumulative Impacts: Impacts for structural measures would be similar to Alternative C, except they would occur over a smaller area (38 square miles enclosed area). Moreover, Alternative A has the potential to increase flood stages in the immediate areas exterior to the levee. However the affected area would be of a smaller footprint than the influence area of Alternative C. Direct, indirect and cumulative impacts of non-structural measures would be similar to those identified for Alternative C.

Alternative D

Direct Impacts: Impacts would be similar to Alternative C except over a much larger area (160 square miles) including the areas with the greatest human development within St. Charles and St. James and St. John the Baptist Parishes. The western-most portion of the Alternative D levee alignment would extend outside of the authorized project area into Ascension Parish to tie into an existing non-Federal levee. This alternative would directly impact flow and water levels in the interior (protected side) and exterior during rainfall and hurricane events. Interior water stages and flows would likely decrease for hurricane events, while being similar for rainfall events (assuming that the drainage structures or pumps are operating).

Indirect and Cumulative Impacts: Impacts would be similar to Alternative C, except over a larger area (160 square mile enclosed area) and the following exception: Alternative D would also have the potential to increase stages to the areas exterior to the proposed levee alignment. The probable affected area would be much larger than the influence area of Alternative C.

4.1.2 Sedimentation and Erosion

Alternative C

Direct and Indirect Impacts: Implementing the proposed action would require approximately 3,100,000 cubic yards of borrow sediments. However, best management practices would be used to avoid, minimize and reduce potential sedimentation and erosion impacts during borrow excavation. Construction of levees earthwork fill, placement of geotextile, T-walls, storm damage gates, drainage gates, sheetpile, riprap, gates and pumping stations would also utilize best construction management practices to avoid, minimize and reduce potential erosion and

sedimentation into adjacent wetlands. These impacts would generally be minor and short-term, lasting only during construction of the proposed project features. Indirect impacts would include significant reduction of erosion and sedimentation associated with storm events.

The placement of structures within waterways intersecting the levee alignment has the potential to create a sedimentation/erosion maintenance issue directly upstream and downstream of the structure. However, these structures would be designed and scour protection would be placed to minimize sedimentation/erosion issues. Several pumping stations would also be placed along the waterways that would intersect the levee alignment. These pump stations have the potential to cause severe erosion in the vicinity of the suction and discharge areas. The pump stations would be designed and scour protection would be placed to minimize sedimentation/erosion issues. Even as such, these issues may still exist. The proposed action has the potential to decrease tidal interchange velocities throughout the area resulting in increased sedimentation within waterways of both the interior and exterior of the proposed levee alignment.

Cumulative Impacts: Consist of the incremental direct and indirect impacts of implementing and operating the proposed hurricane and storm damage risk reduction system in addition to the direct and indirect impacts to sediment and erosion attributable to other existing and authorized levee systems in the Pontchartrain Basin, the State and the Nation.

Alternative A
Direct, Indirect and Cumulative Impacts: Impacts would be similar to Alternative C except over a smaller area.

Alternative D
Direct, Indirect and Cumulative Impacts: Impacts would be similar to Alternative C except over a larger area.

4.1.3 Water Quality and Salinity

Alternative C
Direct and Indirect Impacts: Some wetland and open water areas would be converted into upland habitat for construction of hurricane protection features and would no longer provide water quality benefits. Because fill and construction materials are anticipated to be free of contaminants, discharge of these materials into existing adjacent waters is not expected to result in adverse effects to aquatic organisms. Construction impacts to runoff would be minimized through implementation of a Stormwater Pollution Prevention Plan (SWPPP) (USEPA 2012). Indirect impacts include water exchange between the flood and protected side of the levee system. This could lead to localized areas of stagnation and reduced salinity on the protected side of the levee and local areas of increased salinity on the flood side of the levee system. Additional development in areas behind the levee alignment could lead to additional point and nonpoint discharges within these areas. Structures operation is expected to impact biogeochemical cycling for wetlands within the proposed alignment. The project would provide for the protection of protected side wetlands, potentially extending their lifespan and their water quality functions. However, wetlands outside of the project are expected to experience an increase in wave energy and salinity, particularly during storm surge.

Cumulative Impacts: The proposed project, combined with other projects in the area, and activities could cumulatively impact water quality. Additionally, the combination of the proposed project and the several diversion projects could complicate water quality and hydrology, particularly for the protected side of the proposed alignment, leading to changes in wetlands biogeochemistry and water quality function. Cumulative impacts would be the incremental direct

and indirect impacts of implementing and operating the proposed hurricane storm damage risk reduction system described above plus the direct and indirect impacts attributable to other existing and authorized levee systems in the Pontchartrain Basin, the State and the Nation.

Alternative A
Direct, Indirect and Cumulative Impacts: The alignment of this alternative would minimize further impoundment of wetlands (3,564 acres as compared to 8,424 acres for Alternative C); hence, water quality impacts would be expected to be similar in nature, but less than, impacts associated with Alternative C.

Alternative D
Direct, Indirect and Cumulative Impacts: This alternative encloses the largest area by a significant margin (56,228 acres) while also having the greatest amount of new levee construction, water quality impacts associated with this alternative would be expected to be similar in nature but greater than impacts associated with Alternative C.

4.2 HUMAN ENVIRONMENT

4.2.1 Population and Housing

Alternative C
Direct and Indirect Impacts: Structural measures would have no direct impacts to population and housing. However, the non-structural measure of elevating residential structures would cause residents temporary and minor inconveniences related to relocating to a temporary residence and then returning to their elevated residence. Approximately 1,400 residences could be elevated in the Gramercy-Lutcher area. Non-structural acquisition of residential structures (buy out) could lead to a permanent loss of population and housing in the Gramercy/Lutcher area, if residents relocate outside the area. Indirect impacts for both the structural and non-structural features include reduced risk of hurricane storm surge damage to populations and housing. This would potentially enhance the stability and sustainability of population and housing resources behind the levee alignment. Elevating residential structures would affect access to elevated residences. Non-structural acquisition could lead to changes in population demographics, localized or on a larger scale. Non-structural acquisition could also lead to neighborhood housing interspersed with small to large areas of green space throughout the localized area. It is anticipated that local parish building codes would place restrictions on the elevation of future construction in the area where non-structural acquisition or raising in place is necessary. Implementation of the non-structural measure will be further developed and assessed during detailed feasibility-level design and provided in the final report.

Cumulative Impacts: Impacts would be the incremental direct and indirect impacts of implementing and operating the structural and non-structural measures of Alternative C on population and housing plus the direct and indirect impacts to by other previous, existing and authorized levee systems in the Pontchartrain Basin, the State and the Nation.

Alternative A
Direct, Indirect and Cumulative Impacts: Impacts would be the same as Alternative C.

Alternative D
Direct, Indirect and Cumulative Impacts: Impacts would be the same as Alternative C, except non-structural measures would not be included.

4.2.2 Employment, Business and Industrial Activity (including Agriculture)

Alternative C

Direct and Indirect Impacts: Proposed structural measures would cause the Cajun Pride Swamp Tours temporary loss of access to the adjacent waterway until construction of boat access to the waterway is restored following construction of this reach of the project. The non-structural measures of raising non-residential structures could temporarily interrupt business operations as they are relocated to temporary locations. The acquisition of non-residential structures could lead to a permanent loss of employment and business activity in the Gramercy/Lutcher area where a total of 46 non-residential structures are being considered for elevation and 90 non-residential structures are being considered for acquisition by government. Indirect impacts for both the structural and non-structural features include reduced risk of damages from hurricane storm surge. It is anticipated that local parish building codes would place restrictions on the elevation of future construction in the area where non-structural acquisition or raising in place is necessary. If a business is elevated then access to the elevated facility could be more difficult and business operations could be more difficult to conduct. If a business is acquired there could be loss of jobs and a portion of the local tax base in the area. In contrast to the potential adverse effects to the St. James Parish area described above, the St. Charles and St. John the Baptist Parishes areas would generally benefit from implementation of the hurricane and storm surge damage risk reduction measures which would allow these businesses, industries and agricultural operations to continue to operate during storm events. Implementation of the non-structural measure will be further developed and assessed during detailed feasibility-level design and provided in the final report.

Cumulative Impacts: Impacts would be the incremental direct and indirect impacts of implementing the proposed action plus the direct and indirect impacts by other previous, existing and authorized levee systems in the Pontchartrain Basin, the State and the Nation.

Alternative A

Direct, Indirect and Cumulative Impacts: Impacts would be the same as Alternative C.

Alternative D

Direct, Indirect and Cumulative Impacts: Impacts would be the same as Alternative C except all three parishes would be behind the levee alignment allowing for continued operation of businesses, industries and agriculture in St. James Parish during a storm surge event.

4.2.3 Public Facilities and Services

Alternative C

Direct and Indirect Impacts: Structural measures would not directly impact public facilities or services. However, non-structural measures of elevating public facilities would temporarily interrupt these services and inconvenience users until the facility is raised. Acquisition of public facilities could lead to relocation and/or a localized loss of public services in the Gramercy/Lutcher area. Indirect impacts for both the structural and non-structural features would include reduced risk of damage from hurricane storm surge for public facilities and services. In the event that a public facility is elevated, design will be such that the facility will be compliant with the requirements of the Americans With Disabilities Act. If it is necessary to acquire a public facility, it is likely that the facility will be substituted; however, it is likely that there could be temporary disruption of services. Implementation of the non-structural measure will be further developed and assessed during detailed feasibility-level design and provided in the final report.

Cumulative Impacts: Cumulative impacts would be the above described incremental direct and

indirect impacts on public facilities and services. It includes the direct and indirect impacts to public facilities and services by other previous, existing and authorized levee systems in the Pontchartrain Basin, the State and the Nation.

Alternative A
Direct, Indirect and Cumulative Impacts: Impacts would be the same as Alternative C.

Alternative D
Direct, Indirect and Cumulative Impacts: Impacts would be the same as Alternative C except for the absence of the indirect impacts associated with non-structural measures in the Gramercy/Lutcher area.

4.2.4 Transportation

Alternative C
Direct and Indirect Impacts: There would be no significant direct impacts. Rather, there would be minor temporary impacts in the form of increased vehicular congestion along roads, highways and streets during construction which cease following completion of construction activities. There would 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. Indirect impacts would include a lower risk of storm damage-related damages to the transportation infrastructure for areas behind the proposed levee alignment.

Cumulative Impacts: Impacts would be the incremental direct and indirect impacts of implementing and operating Alternative C plus the direct and indirect impacts by other previous, existing and authorized levee systems within the Pontchartrain Basin, the State and the Nation.

Alternative A
Direct, Indirect and Cumulative Impacts: Impacts would be the same as Alternative C.

Alternative D
Direct and Indirect Impacts: Direct impacts would be similar to Alternative C, except construction impacts, such as traffic congestion and deterioration of the transportation infrastructure, could affect a total of 28 miles of roads. Indirect impacts would be similar to Alternative C, except risk reduction from storm damages transportation infrastructure would extend into the western portion of the area. This alternative could reduce the risk of inundation to a ground level section of I-10 in the western portion of the area which could improve access for emergency responders and prevent delays of local and regional residents returning to residences after storm events.

Cumulative Impacts: Impacts would be similar to Alternative C, except storm surge risk reduction to the transportation infrastructure would extend into the western portion of the project area. These would be in addition to the direct and indirect impacts of other existing and authorized levee systems in the Pontchartrain Basin, the State and the Nation.

4.2.5 Community and Regional Growth

Alternative C
Direct and Indirect Impacts: There would be no direct impacts of the structural measures or with the non-structural measures of elevating structures. In contrast, acquisition of residential and non-residential structures could lead to a permanent loss of population and business activity in the Gramercy/Lutcher area thereby negatively affecting the community and regional growth in this area. There are 1571 residential and 90 non-residential structures considered for elevating and/or acquisition by the government which may impact community and regional growth.

Indirect impacts for both the structural and non-structural features of the alternative include reduced hurricane storm damage risk reduction for communities thereby contributing to potential growth opportunities for communities in the three-parish area. The proposed action could enable community growth to occur as the lower incidence of storm sure damage allows communities to focus more on community-building activities rather than preparing for and recovering from storm surge events. Implementation of the non-structural measure will be further developed and assessed during detailed feasibility-level design and provided in the final report.

Cumulative Impacts: Impacts would be the incremental direct and indirect impacts of implementing Alternative C on community and regional growth in addition to the direct and indirect impacts of other existing and authorized levees in the Pontchartrain Basin, the State and the Nation.

Alternative A
Direct, Indirect and Cumulative Impacts: Impacts would be the same as Alternative C.

Alternative D
Direct and Indirect Impacts: Direct impacts would include structural hurricane and storm surge damage risk reduction affecting community and regional growth for not only the St. Charles and St. John the Baptist Parishes, but also St. James Parish. Indirect impacts would be similar to Alternative C except over a three-parish area.

Cumulative Impacts: Impacts would be similar to Alternative C, except nonstructural measures would not be necessary in the Gramercy/Lutcher area. These incremental impacts would be in addition to the direct and indirect impacts to community and regional growth of other existing and authorized levee systems in the Pontchartrain Basin, the State and the Nation.

4.2.6 Tax Revenues and Property Values

Alternative C
Direct and Indirect Impacts: Property values near levee construction sites may decrease temporarily due to added traffic congestion and construction noise and dust. These impacts would be temporary and minor, lasting only during construction. It is unknown at this time if elevating structures would have any effects on property values. However, acquisition of properties could reduce tax revenues and property values. Currently, there are 1400 residential and 90 non-residential structures being considered for elevating and/or acquisition by the government. Implementation of the non-structural measure will be further developed and assessed during detailed feasibility-level design and provided in the final report. Implementation of the non-structural measure will be further developed and assessed during detailed feasibility-level design and provided in the final report.

Indirect impacts could include increases in tax revenues and property values due to the increased hurricane storm damage risk reduction for residential properties and businesses. Indirect impacts of non-structural measure of acquisition could result in a decrease in tax revenue and property values because they would be converted to green space.

Cumulative Impacts: Impacts would be the above described incremental direct and indirect impacts of implementing and operating Alternative C in addition to the direct and indirect impacts to tax revenues and property values by other previous, existing and authorized levee systems in the Pontchartrain Basin, the State and the Nation.

Alternative A
Direct Impacts: Impacts would be the same as Alternative C. Construction would be closer to development than Alternative C, thereby creating a greater chance of temporarily decreasing property values due to added traffic congestion, noise and dust during the construction.

Indirect and Cumulative Impacts: Impacts would be the same as Alternative C.

Alternative D
Direct Impacts: Direct impacts would include structural hurricane and storm surge damage risk reduction affecting tax revenues and property values not only for the St. Charles and St. John the Baptist Parishes, but also St. James Parish. Indirect impacts would be similar to Alternative C except over a three-parish area.

Indirect and Cumulative Impacts: Impacts would be the same as Alternative C.

4.2.7 Community Cohesion

Alternative C
Direct and Indirect Impacts: There would be no direct impacts from the structural measures. However, if residential structures are elevated then the residents would be temporarily relocated and community cohesion would be disrupted during the time the structures are being elevated. The acquisition of residential and non-residential structures could lead to a permanent loss of populations and business activities in the Gramercy/Lutcher area. This would have a negative impact on community cohesion in the area. Currently, there are 90 non-residential structures being considered for acquisition by government. Indirect impacts for both the structural and non-structural features include reduced storm damage risk for communities from the hurricane and storm surge damages, thus preserving the spatial patterns of social interaction and maintaining community cohesion. Non-structural measures may affect community cohesion in some localized areas in the St. James Parish area, especially with regard to acquisition. Implementation of the non-structural measure will be further developed and assessed during detailed feasibility-level design and provided in the final report.

Cumulative Impacts: Impacts would be the above described incremental direct and indirect impacts of implementing and operating Alternative C in addition to the direct and indirect impacts to community cohesion by other previous, existing and authorized levee systems in the Pontchartrain Basin, the State and the Nation.

Alternative A
Direct, Indirect and Cumulative Impacts: Impacts would be the same as Alternative C.

Alternative D
Direct and Indirect Impacts: Direct impacts would include structural hurricane and storm surge damage risk reduction for the St. Charles, St. John the Baptist and St. James Parishes. Direct and indirect impacts associated with non-structural measures would not be present under this alternative.

Cumulative Impacts: Impacts would be similar to Alternative C, except nonstructural measures for the Gramercy/Lutcher area are not included in this alternative. These incremental impacts would be in addition to the direct and indirect impacts of other existing and authorized levee systems in the Pontchartrain Basin, the State and the Nation.

4.2.8 Environmental Justice

Alternative C

Direct and Indirect Impacts: Discussion on the plan formulation and economic feasibility of screening alternatives can be found in Appendix D and Appendix E. During screening and optimization it was determined that it would not be economically justified to extend Alternative C into St. James Parish or to create a ring levee to address limited damages. Incorporating non-structural measures into Alternative C allows for an equal level of storm surge risk reduction across the three-parish area. Those properties eligible for acquisition may have an impact on the economic base found within these communities by removing portions of the population that contribute to the local economy. This may contribute to changes not only in community cohesion but also a potential collapse of the entire local community.

Despite existing base floor elevations differing among individual structures, structure-raising would provide the same level of risk reduction benefits per structure at year 2070 (end of the period of analysis). The costs of structure-raising would not be borne by any single individual or the community; rather, these costs would be part of the proposed project costs. Alternative C would provide additional safety to life, health and properties of residents and businesses within the study area by allowing storm water to first accumulate in a wetland area before potentially, in a worst case scenario, impacting structures. Drainage features and pumps included in this alternative would reduce this risk to residents.

Cumulative Impacts: Cumulative impacts would be the incremental direct and indirect impacts of implementing storm damage risk reduction measures on minority and low income populations in the area plus the direct and indirect impacts on minority and low income populations from hurricane storm damage risk management projects within the Pontchartrain Basin, the State and the Nation.

Alternative A

Direct, Indirect and Cumulative Impacts: Impacts would be the same as Alternative C.

Alternative D

Direct, Indirect and Cumulative Impacts: Alternative D extend structural measures for hurricane and storm damage risk reduction for all populations within the area removing the direct, indirect and cumulative impacts associated with the non-structural measures.

4.3 NATURAL ENVIRONMENT

4.3.1 Soils, Water bottoms and Prime and Unique Farmlands

Alternative C

Direct Impacts: A total of 856 acres, would be converted to levee, including 775 acres of primarily hydric soils of Cancienne and Fausse soils in St. Charles Parish; and Cancienne and Carville, Barbary, Schreiber and Gramercy soils in St. John the Baptist Parish (Table 4-1).

Approximately 14.8 acres of water bottoms in canals such as Reserve Flood Relief Canal and waterways such as the Mississippi Bayou would also be impacted. A total of approximately 55.4 acres of land classified as prime farmlands would be converted to nonagricultural use. Project impacts would be related to the construction of levee earthwork fill, geotextile, T-walls, storm damage gates, drainage gates, sheetpile, riprap, gates and pumping stations. The remaining project-induced impacts would be to existing developed areas such as highways and pipeline rights-of-way. The CEMVN has coordinated these potential impacts with the NRCS (Appendix A) and determined that the proposed conversion would be consistent with the Farmland Protection Policy Act and the USACE's internal policies. It is anticipated that the

Bonnet Carré government furnished borrow site has enough borrow material for the entire proposed action. Raising structures would have no direct impacts on soils or water bottoms; whereas, the acquisition of structures would result in soils returned to "green space" (i.e., structures, including slab foundations, would be removed from the area).

Table 4-1: Soil associations directly impacted by alternative alignments.

Soil Association	Alternative A	Alternative C	Alternative D
Cancienne and Carville soils (CR)	0.22 acres	-	0.22 acres
Levees-borrow pits (LV)	3.1 acres	3.6 acres	3.6 acres
Cancienne silty clay loam (Cn)	6.7 acres	18.7 acres	18.1 acres
Fausse clay (FA)	6.6 acres	14 acres	14 acres
Cancienne and Carville soils (CT)	143.8 acres	247.7 acres	239.6 acres
Barbary soils (Ba)	49.3 acres	451.5 acres	894.1 acres
Carville silt loam (CvA)	3.0 acres	-	-
Schriever clay (Sm)	129.5 acres	62.6 acres	-
Gramercy silty clay (GrA)	16.7 acres	35.1 acres	-
Schriever clay, 0 to 1 percent slopes (SkA)	32.8 acres	16.3 acres	-
Cancienne silt loam (CmA)	3.9 acres	10.7 acres	-
Cancienne silty clay loam (CnA)	6.4 acres	-	-

Indirect Impacts: Up to approximately 8,424 acres of hydric soils could be affected due to enclosing the area within the levee and pump system. The levee and pump system would be a gravity drainage system with pumps operated only during hurricane/tropical storm surge events of approximately 1.7 storm events per year and would be closed for approximately 8.5 days per year. Consequently, hydrologic connectivity would be generally maintained with the surrounding swamps and Lakes Maurepas and Pontchartrain, except during the closing of the system for hurricane/tropical storm surge events. Preliminary hydrologic modeling (not including rainfall) indicates that future with-project daily water stages on the protected side would be similar to future without-project conditions. In addition, future with-project flows into and out of the protected system (not including rainfall) would also be similar to future without project conditions, but there could be a brief time lag of approximately ten minutes (Section 4.1.1). The proposed action is not anticipated to convert any existing hydric or non-hydric soils, to a different soil type.

Cumulative Impacts: Cumulative impacts would be the incremental direct and indirect impacts of implementing Alternative C plus the direct and indirect impacts attributable to other previous, existing and authorized projects in the Pontchartrain Basin, the State and the Nation.

Alternative A

Direct and Indirect Impacts: Direct impacts would be similar to Alternative C with the following exceptions: a total footprint of 411 acres with direct impacts to approximately 376 acres of primarily hydric soils in St. John the Baptist Parish; impacts to Cancienne and Fausse soil associations in St. Charles Parish; and impacts of levee/structures construction to 7.8 acres of waterbottoms (Table 4-1). Additionally, approximately 53.4 acres of land classified as prime farmlands would be converted to nonagricultural use. Indirect impacts would be similar to Alternative C except Alternative A could indirectly affect up to 3,564 acres.

Cumulative Impacts: Cumulative impacts would be similar to Alternative C with the following exceptions: there would be an incremental total of about 411 acres of direct impacts and up to 3,564 acres of indirect impacts on soil resources and water bottoms; about 53.4 acres of

farmlands converted to non-agricultural use; in addition to the direct and indirect impacts attributable to soils, water bottoms and prime and unique farmlands attributable to other existing and authorized levee systems in the Pontchartrain Basin, the State and the Nation.

Alternative D

Direct, Indirect and Cumulative Impacts: Direct impacts would be similar to Alternative C with the following exceptions: Alternative D, with a total footprint of 1,181 acres, would directly impact approximately 1,115 acres of primarily hydric soils of Cancienne and Fausse soils in St. Charles Parish; Cancienne and Carville, Barbary, Schriever and Gamercy soil associations in St. John the Baptist Parish; and Barbary soils in Ascension and St. James Parishes. Alternative D would also directly impact approximately 17.5 acres of water bottoms, including the Blind River and Mississippi Bayou. No prime or unique farmlands would be impacted. Indirect impacts would be similar to Alternative C except Alternative D could indirectly affect up to 56,228 acres. Cumulative impacts would be similar to Alternative C with the following exceptions: incremental direct impacts of approximately 1,115 acres of soil resources and 17.5 acres of water bottoms; and up to 56,228 acres of indirect impacts in addition to the direct and indirect impacts to soil resources, water bottoms and prime and unique farmlands attributable to other existing and authorized levee systems in the Pontchartrain Basin, the State and the Nation.

4.3.2 Vegetation Resources

Alternative C

Direct Impacts: Alternative C would directly impact a total of approximately 719 acres of wetlands including primarily forested wetlands/swamp along the reach of the alignment located north of US-61, and approximately 55 acres of dry and/or wet BLH located along the reach of the alignment located south of US-61 (Table 4-2 and Figure 4-3).

Table 4-2: Direct impacts resulting in loss of vegetation resources.

Alternative and Habitat Type	Direct Impacts
Alternative C -- forested wetlands/swamp	719.16 acres
Alternative C -- dry and/or wet BLH	55.97 acres
Subtotal Alternative C -- wetlands impacted	775.13 acres
Alternative C – non-wetlands	80.87 acres
TOTAL ALTERNATIVE C	856 acres
Alternative A -- forested wetlands/swamp	358.26 acres
Alternative A -- dry and/or wet BLH)	18.29 acres
Subtotal Alternative A -- wetlands impacted	376.55 acres
Alternative A -- non-wetlands	34.45 acres
TOTAL ALTERNATIVE A	411 acres
Alternative D -- forested wetlands/swamp	1,115.08 acres
Alternative D – non-wetlands	65.92 acres
TOTAL ALTERNATIVE D	1,181 acres

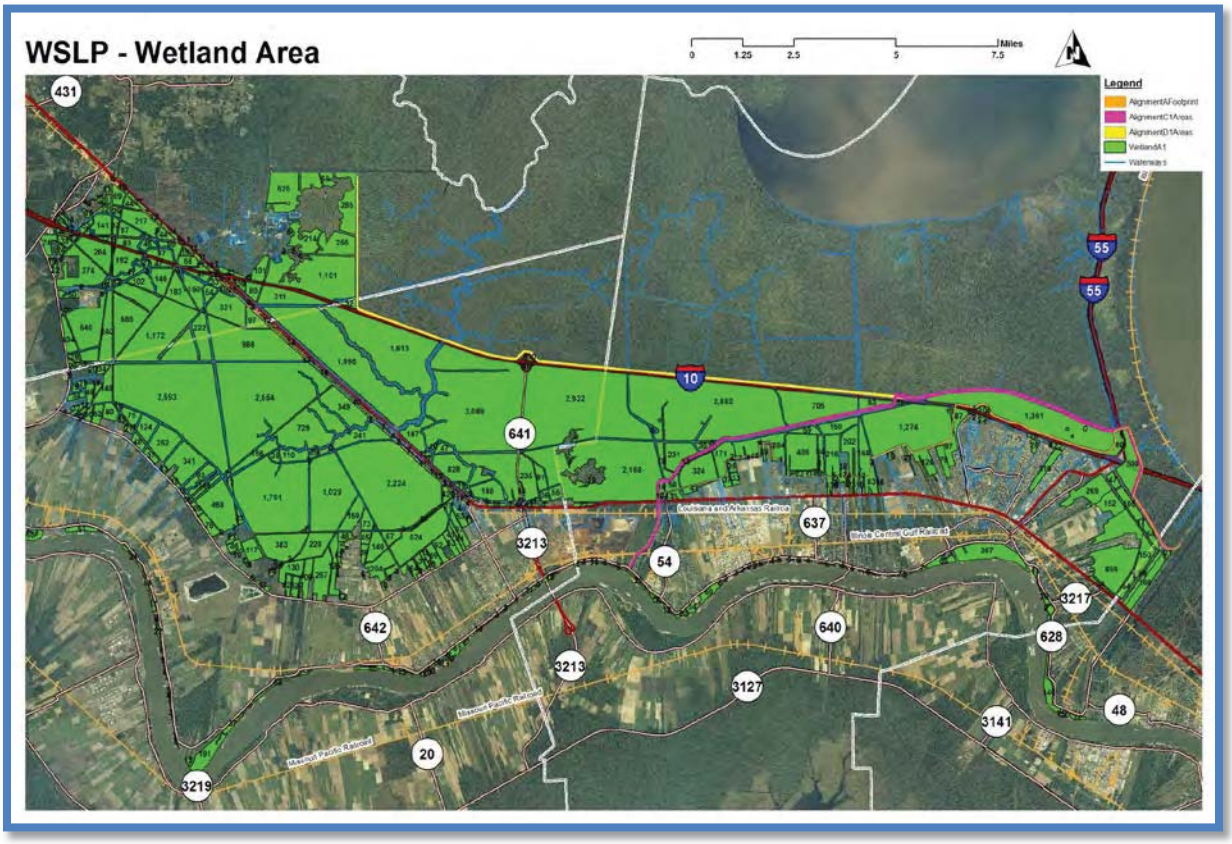


Figure 4-3: Wetland areas within each alternative in the final alternative array.

At this stage of the study, we have yet to conduct a traditional habitat impact analysis using the Wetland Value Assessment (WVA) methodology. In an effort to assess the scope of potential habitat impacts associated with the various alternatives, project-induced impacts to habitats were preliminarily determined utilizing existing information about the area from the Coastwide Reference Monitoring System (CRMS).

In order to assess the impacts of the alternative alignments on the habitat, data was obtained from the CRMS Site Level Report Cards for sites CRMS0059, CRMS5373, CRMS0039, CRMS5167 and CRMS0065 which are most applicable to the project location. In these reports three indices have been developed: a floristic quality (FQI), hydrologic (HI) and submergence vulnerability (SVI).

To assess the proposed levee alignment habitat impacts, data was obtained from the CRMS Site Level Report Cards for sites CRMS0059, CRMS5373, CRMS0039, CRMS5167 and CRMS0065; which are most applicable to the project location. These reports present three indices: floristic quality (FQI), hydrologic (HI) and submergence vulnerability (SVI). CRMS Analytical Teams, made up of agency and academic personnel, developed these indices based on the suite of parameters available from the 2006 to 2009 CRMS dataset.

The Floristic Quality Index (FQI) is used throughout the world to determine wetland quality based on plant species composition for a geographic area of interest. The FQI developed with the CRMS data is specific to coastal Louisiana. FQI scores from 0 to 100 are calculated for a sampling station and are based on the percent cover values and the Coefficient of Conservatism (CC score) of the species present (Cretini et al. 2012). The Hydrologic Index (HI)

jointly assesses the suitability of two critical aspects of wetland hydrology, average salinity and percent time storm damaged, in maximizing vegetation primary productivity. The HI score (between 0 and 100) corresponds to the percent of maximum vegetation productivity expected to occur if the separate effects of salinity and inundation interact in a multiplicative fashion on vegetation productivity (Snedden and Swenson 2012). Submergence Vulnerability Index (SVI) scores are currently unavailable for the five CRMS sites listed above because the data collection thresholds for wetland elevation change and vertical accretion have not been met (Personal communication, Sarai Piazza, USGS, May 9, 2013).

Based on proximity of CRMS site locations to proposed alternative alignments, a combination of site CRMS0059 and CRMS5373 was utilized for analyzing habitat impacts of Alternatives A and C (TSP). All identified CRMS sites in the area were used for analyzing Alternative D. The FQI of each site by alternative were combined to obtain an average, and then converted the Index number into 0.1 to 1.0 range. The same process was utilized for determining the HI. Unfortunately the HI was unavailable for sites CRMS0059 and CRMS0065 because those sites did not meet salinity and/or water level data completeness threshold (70 percent per water year) in order to calculate an HI score. Next the FQI and HI (0.1-1.0) numbers were averaged to obtain a single number to apply for habitat quality for each alternative. Note that the FQI is calculated on herbaceous vegetation. The CRMS Analytical Teams have developed a Forested FQI that accounts for trees; however, it is still undergoing peer review. Though the Forested FQI would have been preferred, the herbaceous FQI is still useful as a comparison evaluation between alternatives.

The results of this analysis are presented in Table 4-3 and Table 4-4**.** Alternative C and Alternative A had the same average FQI, which was greater than Alternative D. This analysis also indicates that Alternative C and Alternative A would be equivalent with regard to the FQI used throughout the world to determine wetland quality based on herbaceous plant species composition. Alternatives C (TSP) and Alternative A had the same average combined HI (i.e., vegetation primary productivity) and FQI which was greater than Alternative D. These results indicate that the habitat quality for both Alternative C and Alternative A project areas are equivalent and greater than the habitat quality in Alternative D project area. The FQI score for each of the final array of alternatives was compared to both the Pontchartrain Basin Scale and Coastwide Scale FQI scores of 2006 through 2012.

Table 4-3: Average FQI, minimum and maximum FQI, and FQI converted to values between 0.1 – 1.0 for each alternative in the final alternative array.

Alternative	Average FQI	Minimum FQI	Maximum FQI	Average converted FQI
Alternative A and C	19.78592	16.12832	23.44351	0.197859
Alternative D	18.45094	14.13925	22.76262	0.184509

Table 4-4: HI, FQI, and average of the combination of HI and FQI for each alternative in the final alternative array.

Alternative	HI	FQI	Average of HI + FQI
Alternative A and C	0.864	0.197859	0.53093
Alternative D	0.769285714	0.184509	0.476898

Although this approach is not ideal for developing habitat quality, given the expedited time line and available data, this approach, because it was data driven, was considered to be better than any other option available until detailed feasibility-level habitat analysis can be conducted. Eventually the CRMS Analytical Teams may develop formulas to combine these indices into a

single number, which would be greatly used. Unfortunately, that method is not yet developed, so we decided to maintain a simplified approach in using averages. It is expected that once feasibility analysis is conducted on the Alternative C, an interagency team will conduct a full habitat evaluation using the Wetland Value Assessment (WVA) methodology.

Indirect Impacts: Alternative C could potentially indirectly impact up to approximately 8,424 acres of primarily forested wetlands/swamp habitats used by fish and wildlife for shelter, nesting, feeding, roosting, cover, nursery and other life requirements. This would include cypress-tupelo swamp, the bald eagle, alligator snapping turtles, osprey, paddlefish, manatee, swamp milkweed, floating antler fern and rooted spike-rush (LDWF 2013), listed species and rare, unique or imperiled vegetative communities in the project area. However, preliminary hydrologic modeling indicates that the project design would have minimal changes to flows or stages on either the protected or unprotected sides. To accomplish this, the proposed levee system designs would include culverts with sluice gates joining directly with each of the existing culverts under I-10. Similarly, culverts would be included within the levee system along those levee reaches presently open to the surrounding wetlands system in order to retain hydrologic connectivity between the protected and unprotected areas. These structures would only be closed on average for 1.7 storm events annually, or about 8.5 days annually.

Additional indirect impacts would be the potential prevention of saltwater intrusion into the levee-enclosed system when structures are closed for hurricane/tropical storm surge events. Gates, such as along the Reserve Relief Canal and levee culverts would be closed for hurricane/tropical storm surge events on average frequency of about 1.7 times per year; which would result in the closure of the levee system for an average duration of about 8.5 days per year. Closure of the levee system during these storm surge events would reduce minor salt water intrusion into wetland habitats enclosed by the levee system. This could provide some reduction of the potential ecological stresses associated with saltwater intrusion and could also help reduce the conversion of existing forested wetlands and swamps to marsh and open water habitats.

It is unknown at this stage of the study process how water levels within the enclosed system would be managed with regard to increased in RSLR. It is also unknown the magnitude of the potential for substantial additional indirect impacts to enclosed forested wetlands, swamp and fish and wildlife resources. Later phases of this study will analyze and determine the extent of potential indirect impacts due to operation of the alternatives.

Cumulative Impacts: Cumulative impacts would be the incremental direct (856 acres) and indirect (up to 8,424 acres) impacts of implementing and operating Alternative C on vegetation resources plus the direct and indirect impacts attributable to other previous, existing and authorized levee systems in the Pontchartrain Basin, the State and the Nation.

Alternative A

Direct Impacts: Direct impacts would be similar to Alternative C with the following exceptions: of the total of 411 acres directly impacted, 358 acres of forested wetlands and swamp, 18 acres of BLH, for a total of approximately 376 acres of wetland vegetation would be directly impacted.

Indirect Impacts: Indirect impacts would be similar to Alternative C except 3,564 acres of forested wetlands and swamp habitat could be impacted.

Cumulative Impacts: Cumulative impacts would be similar to Alternative C with these exceptions: there would be an incremental total of 376 acres of direct impacts and up to

3,564 acres of indirect impacts plus the direct and indirect impacts attributable to other existing and authorized levee systems in the Pontchartrain Basin, the State and the Nation.

Alternative D

Direct Impacts: Direct impacts would be similar to Alternative C with the following exceptions: approximately 1,115 acres of forested wetlands and swamp could be directly impacted.

Indirect Impacts: Indirect impacts would be similar to Alternative C except up to 56,228 acres could be impacted.

Cumulative Impacts: Cumulative impacts would be similar to Alternative C with the following exceptions: there would be an incremental total of 1,115 acres of direct impacts and up to 56,228 acres of indirect impacts plus the direct and indirect impacts attributable to other existing and authorized levee systems in the Pontchartrain Basin, the State and the Nation.

4.3.3 Wildlife Resources

Alternative C

Direct and Indirect Impacts: Of the 856 acres impacted, approximately 775 acres are primarily forested wetlands and swamp habitats along the reach of the proposed alignment located north of US-61; and approximately 18.29 acres of dry and/or wet BLH are located along the reach of the alignment south of US-61. Up to approximately 8,424 acres of primarily forested wetlands/swamp wildlife habitats would be indirectly impacted. However, preliminary hydrologic modeling indicates the project design would have minimal changes to flows or stages on either the protected or unprotected sides. It is anticipated that during detailed feasibility-level design, the levee system hydrologic connectivity would be more fully designed and optimized to retain hydrologic connectivity between areas that are within and outside of the levee alignment.

Wildlife access into and out of the levee-enclosed system would not be significantly impacted as most wildlife are highly mobile. However, aquatic wildlife would be temporarily restricted from entering the project area on average about 8.5 days per year due to closure of the levee system during hurricane/tropical storm surge events. Closure of the levee system during these storm surge events would reduce minor salt water intrusion into wetland habitats enclosed by the levee system. This could provide some reduction of the potential ecological stresses associated with saltwater intrusion and could also help reduce the conversion of existing forested wetlands and swamps wildlife habitat to marsh and open water habitats thereby protecting enclosed cypress-tupelo swamp for continued wildlife use. This would be especially important as RSLR is projected to increase.

Cumulative Impacts: Cumulative impacts would be the incremental direct (856 acres) and indirect (up to 8,424 acres) impacts of implementing and operating Alternative C on wildlife resources plus the direct and indirect impacts to wildlife resources attributable to other previous, existing and authorized levee systems in the Pontchartrain Basin, the State and the Nation.

Alternative A

Direct, Indirect and Cumulative Impacts: Direct impacts would be similar to Alternative C with the following exceptions: of the total of 411 acres directly impacted, approximately 358 acres of forested wetlands and swamp wildlife habitat and approximately 18 acres of BLH wildlife habitat, for a total of approximately 376 acres of wetland habitats, would be directly impacted. Indirect impacts would be similar to Alternative C except up to approximately 3,564 acres could be affected. Cumulative impacts would be similar to Alternative C with the following exceptions: there would be an incremental total of about 376 acres of wildlife habitats directly impacted and

up to approximately 3,564 acres of indirect impacts on habitats utilized by wildlife resources, in addition to the direct and indirect impacts attributable to other existing and authorized levee systems in the Pontchartrain Basin, the State and the Nation.

Alternative D

Direct, Indirect and Cumulative Impacts: Direct impacts would be similar to Alternative C with these exceptions: of the total of 1,181 acres directly impacted, approximately 1,115 acres of forested wetlands and swamp wildlife habitat would be directly impacted. Indirect impacts would be similar to Alternative C except that approximately 8,424 acres could be affected. Cumulative impacts would be similar to Alternative C with the following exceptions: there would be an incremental total of 1,115 acres of direct impacts to wildlife habitat and up to approximately 56,228 acres of indirect impacts and the direct and indirect impacts attributable to other existing and authorized levee systems in the Pontchartrain Basin, the State and the Nation.

4.3.4 Aquatic and Fisheries Resources

Alternative C

Direct and Indirect Impacts: Approximately 719 acres of existing benthos swamp habitat would be converted into upland grass covered (levee) habitat. Sessile organisms would be buried during construction. Mobile species of fish, shellfish and other aquatic resources would either avoid the area during construction (fish) or be moved out of the way due to water displacement (plankton). Up to 8,424 acres of forested wetland and swamp habitats utilized by aquatic and fishery recourses could be indirectly impacted. However, preliminary hydrologic modeling indicates that the project design would have minimal changes to flows or stages on either the protected or unprotected sides. It is anticipated that during detailed feasibility-level design, the proposed levee system hydrologic connectivity would be more fully designed and optimized to retain hydrologic connectivity between areas that are within and outside of the levee alignment.

Aquatic organism access into and out of the proposed action area would be impacted; additional culverts may deter some species from swimming through those structures. Aquatic species would be temporarily restricted from entering the proposed action area on average about 8.5 days per year due to closing gates and culverts in preparation for storm surge. This impact could be significant for the catadromous American eel that needs the fresh water areas for development and access to the ocean for breeding. If the closures occur, when the elvers stage enter the swamps there would be a recruitment age class loss. For marine species the impact would not be significant because their movement into the area is less dependent on tidal action and stage of development. Fresh water species would breed in the enclosed area for the most part and would not be indirectly impacted by the closure.

Cumulative Impacts: Impacts would be the incremental direct (719 acres) and indirect (up to 8,424 acres) impacts of implementing Alternative C and impacts attributable to other previous, existing and authorized levee systems in the Pontchartrain Basin, the State and the Nation.

Alternative A

Direct, Indirect and Cumulative Impacts: Direct impacts would be similar to Alternative C with the following exceptions: approximately 358 acres of benthos would be directly impacted. Indirect impacts would be similar to Alternative C except Alternative A would enclose approximately 3,564 acres of aquatic habitat; hence, there would likely be a less significant impact on the American eels. Cumulative impacts would be similar to Alternative C with the following exceptions: there would be an incremental total of about 358 acres of aquatic habitats directly impacted and up to about 3,564 acres of indirect impacts on these resources. These incremental impacts would be in addition to the direct and indirect impacts attributable to other

existing and authorized levee systems in the Pontchartrain Basin, the State and the Nation.

Alternative D

Direct, Indirect and Cumulative Impacts: Direct impacts would be greater than Alternative C because approximately 1,115 acres of benthos would be directly impacted. Indirect impacts would be greater than Alternative C. Approximately 56,228 acres of aquatic habitats would be enclosed in the levee system; hence, a greater significant impact on American eels. Cumulative impacts would be similar to Alternative C with these exceptions: there would be an incremental total of about 1,115 acres of aquatic habitats directly impacted and up to 56,228 acres of indirect impact on these resources plus the direct and indirect impacts attributable to other existing and authorized levee systems in the Pontchartrain Basin, the State and the Nation.

4.3.5 Essential Fish Habitat (EFH)

Alternative C

Direct, Indirect and Cumulative Impacts: Alternative C would have no direct, indirect, or cumulative impacts on EFH since no EFH intersects the proposed alignment or the proposed enclosed area in the near term (Figure 2-7). Closure of the levee system during hurricane/tropical storm surge events would reduce minor salt water intrusion into wetland habitats in the proposed levee system. This could provide some reduction of the potential ecological stresses associated with saltwater intrusion and could also help reduce the conversion of existing forested wetlands and swamps to marsh and open water habitats (EFH). If operating plan changes close the levee system more often due to RSLR, then those impacts would have to be analyzed and documented in a future supplemental NEPA document. The incremental direct and indirect impacts would be in addition to the direct and indirect impacts to EFH attributable to previous, existing and authorized levee systems implemented in the Pontchartrain Basin, the State and the Nation.

Alternative A

Direct, Indirect and Cumulative Impacts: Impacts would be similar to Alternative C. There would be a lower risk that a change in operating plan, due to RSLR, would have an adverse impact on EFH because there would be fewer acres of forested wetlands and swamp habitat susceptible to habitat conversion which would be enclosed by Alternative A.

Alternative D

Direct and Indirect Impacts: There would be no direct impact to white shrimp EFH. There would be direct impacts to red drum EFH where the gate on Blind River is built. The soft bottom habitat, EFH red drum habitat, in the footprint would be permanently removed from use. There would be no indirect impact on white shrimp EFH. Indirect impacts to red fish EFH would occur. Red drum EFH areas located within the construction turbidity plume may not be usable during construction. However, this impact would be temporary. The EFH area of Blind River inside the proposed levee system could be slightly less accessible by red fish after the levee structure is in place. However, the intent of the tentative levee design is to allow for existing flows and cross sections and should not hinder red fish access.

Cumulative Impacts: Impacts would be similar to those of the future without-project conditions. Closure of the levee system during hurricane/tropical storm surge events would reduce minor salt water intrusion into wetland habitats enclosed by the levee system. This could provide some reduction of the potential ecological stresses associated with saltwater intrusion and could also help reduce the conversion of existing forested wetlands and swamps to open water EFH. It is unknown at this stage of the study process how water levels within the enclosed system would respond with regard to increased in RSLR. The magnitude of the potential for substantial

additional indirect impacts to enclosed forested wetlands, swamp and EFH is also unknown. These incremental direct and indirect impacts would be in addition to the direct and indirect impacts to EFH attributable to previous, existing and authorized levee systems implemented in the Pontchartrain Basin, the State and the Nation.

4.3.6 Threatened and Endangered Species

Alternative C

Direct and Indirect Impacts: Based on review of existing data and preliminary field surveys, the CEMVN finds that implementation of the proposed action would have no effects on any known listed species or their critical habitat, Bald eagles or colonial nesting waterbirds. Alternative C would directly impact (destroy) the following acres of habitats potentially utilized by listed species, the bald eagle and colonial nesting waterbirds: a total of 856 acres with approximately 775 acres of primarily forested wetlands and swamp habitats along the reach of the proposed alignment located north of US-61; as well as the approximately 18.29 acres of dry and/or wet BLH along the reach of the alignment located south of US-61. Other, adjacent forested wetlands and swamp habitats are available for use by listed species, the Bald Eagle and colonial nesting waterbirds. Alternative C could potentially indirectly degrade up to approximately 8,424 acres of primarily forested wetlands/swamp habitats potentially utilized by listed species, the bald eagle and colonial nesting waterbirds. However, preliminary hydrologic modeling indicates that the project design would have minimal changes to flows or stages on either the protected or unprotected sides. It is anticipated that during detailed feasibility-level design, the proposed levee system hydrologic connectivity would be more fully designed and optimized to retain hydrologic connectivity between areas that are within and outside of the levee alignment.

Access into and out of the project area would not be significantly impacted for the bald eagle or colonial nesting waterbirds. Gulf sturgeon and the West Indian Manatee would be temporarily restricted from entering the proposed action area on average about 8.5 days per year due to closing gates and culverts in preparation for storm surge events.

To deter colonial nesting water birds from establishing active nesting colonies in the construction areas, a Nesting Prevention Plan would be developed, in coordination with the USFWS and LDWF. If measures to prevent colonial nesting bird populations are not successful in the area, construction-related activities that would occur within 1,000 feet of a colony could be restricted to the non-nesting period, which in this region generally extends from September 1 to February 15, depending on the species present. This restriction would likely pose significant problems to construction activity schedules. If wading bird nesting colonies become established in the area, the 1,000 foot buffer must be maintained unless coordination with the USFWS indicates that the buffer zone may be reduced based on the species present or an agreement is reached with USFWS that allows a modified process to be adopted.

Alternative C would have no effect on any of the listed species or their critical habitat, Bald Eagles or colonial nesting waterbirds. There are existing Bald Eagle nests in the area; however, based on information provided by USFWS, all nests are beyond 1,500 feet from the proposed project alignments. Two potentially active waterbird rookeries exist within 1,000 feet of the proposed alignments. Before construction the USFWS and CEMVN will survey the area to confirm if the rookeries are active or not. USFWS guidelines would be utilized during construction to avoid any impacts to above described species, if encountered.

Cumulative Impacts: Impacts would be the incremental direct (convert 856 acres to levee habitat) and indirect (enclose and change hydrologic exchange of up to 8,424 acres) impacts of implementing and operating Alternative C on forested wetlands and swamps and other less

numerous habitats potentially utilized by listed species, the bald eagle and colonial nesting waterbirds. These incremental impacts would be in addition to the direct and indirect impacts to listed species, the bald eagle and colonial nesting waterbirds by other previous, existing and authorized levee systems in the Pontchartrain Basin, the State and the Nation.

Alternative A

Direct, Indirect and Cumulative Impacts: Direct impacts would be similar to Alternative C with theses exceptions: of the total 411 acres directly impacted, approximately 358 acres are forested wetlands and swamp habitat and approximately 18 acres are BLH habitat; for a total of 376 acres of wetland habitats directly impacted (destroyed). Other, adjacent forested wetlands and swamp habitats are available for use by listed species, the bald eagle and colonial nesting waterbirds. Indirect impacts would be similar to Alternative C except up to 3,564 acres could potentially be indirectly impacted. The implementation of Alternative A would have no effect on any listed species or their critical habitat, Bald Eagles or colonial nesting waterbirds. Cumulative impacts would be similar to Alternative C with these exceptions: there would be an incremental total of about 376 acres of direct impacts and up to approximately 56,228 acres of indirect impacts to forested wetlands, swamps and other wetland habitats utilized by listed species, the bald eagle and colonial nesting waterbirds plus the direct and indirect impacts of other existing and authorized levee systems in the Pontchartrain Basin, the State and the Nation.

Alternative D

Direct, Indirect and Cumulative Impacts: Direct impacts would be similar to Alternative C with the following exceptions: of the total 1,181 acres potentially impacted by implementation of Alternative D, approximately 1,115 acres of forested wetlands and swamp habitats potentially utilized by listed species, the Bald Eagle and colonial nesting waterbirds would be directly impacted. Indirect impacts would be similar to Alternative C except up to 56,228 acres could be potentially impacted. Cumulative impacts would be similar to Alternative C with these exceptions: there would be an incremental total of about 1,115 acres of direct impacts and up to about 56,228 acre of indirect impacts to forested wetlands, swamps and other wetlands potentially utilized by listed species, the bald eagle and colonial nesting waterbirds. These incremental project-induced impacts would be in addition to the direct and indirect impacts of other existing and authorized levees in the Pontchartrain Basin, the State and the Nation.

4.3.7 Cultural and Historic Resources

Alternative C

Direct and Indirect Impacts: With a total footprint of 856 acres, Alternative C has a chance to directly affect any recorded cultural resources or an unrecorded cultural resource that may exist within its footprint, or its borrow source or mitigation areas. Site 16SJB68 is located at the western end of Alternative C, and would require further investigation as to whether it may be adversely affected by construction of Alignment C (TSP). There are no other currently recorded cultural resources within the Alternative C footprint. A large portion of the Alignment C (TSP) footprint has been surveyed via inclusion in cultural resource surveys for other purposes with no cultural resources recorded or expected. Regardless, portions of Alignment C (TSP), especially those closes to waterways, do retain a likelihood to contain unrecorded cultural resources that could be damaged by the construction of Alignment C (TSP). Indirect impacts of Alignment C (TSP) would not be substantial. Known or unknown cultural resources on either side of the alignment could receive indirect impacts via hurricane/tropical storm surge damage events.

Cumulative Impacts: Cumulative impacts would be the incremental direct and indirect impacts of implementing Alternative C plus the direct and indirect impacts to cultural resources by other previous, existing and authorized levees in the Pontchartrain Basin, the State and the Nation.

Alternative A

Direct, Indirect and Cumulative Impacts: Direct impacts would be similar to Alternative C. Site 16SJB68 overlaps the western edge of Alignment A, and would require testing to determine if adverse impacts may occur to the resource by construction of Alternative A. There are no other currently recorded cultural resources within the Alternative A footprint. An alignment similar to Alignment A was surveyed for cultural resources in 2003 and found no cultural resources. Previously unsurveyed areas of Alignment A will need to be examined for potential cultural resources before construction. Cumulative impacts would be similar to Alternative C.

Alternative D

Direct, Indirect and Cumulative Impacts: Direct impacts would be similar to Alternative C with exception that Alternative D has a footprint of 1,181 acres. Alternative D does not directly intersect any recorded and known cultural resources. There are cultural resources recorded in close proximity. Alternative D crosses many natural waterways considered high potential areas for cultural resources. Indirect and cumulative impacts would be similar to Alternative C.

4.3.8 Aesthetics and Visual Resources

Alternative C

Direct Impacts: Alternative C footprint is wider than Alternatives A or D giving it a wider direct area of effect. Even with this wider footprint, direct impacts to visual resources would be minimal in residential and agricultural areas. Much of the levee system would be in areas that are screened by deep forest and swamp, or are remote and have minimal access. Residential areas near the levee construction may see increases in dust and noise levels during construction. This is a temporary impact and conditions should return to preconstruction levels after completion of the project. View sheds from I-10 may also be altered near the intersection with I-55 and further west where the proposed levee crosses under the interstate. Where once a natural landscape of water, marsh, or swamp could be seen, a green topped levee with a wide footprint and storm damage walls would now be seen. The proposed levee system intersects and crosses the Maurepas Swamp WMA boundaries. In those areas, access for recreation will be limited.

Indirect Impacts: The River Road Scenic Byway may see temporary impacts due to truck traffic and construction vehicles, but impacts would be minimal. Construction of the proposed levee system would most likely require a storm damage control gate or other structure across US-61. This could reduce the visual quality of the drive along the Byway. The affected area of wetlands south of the proposed levee system could be approximately 8,424 acres which could change the landscape of the region due to water channel and drainage way closures or redirections.

Cumulative Impacts: Hydrologic units and drainage throughout the area of effect would be dramatically changed due to the introduction or enlargement of a large levee system to the area. Existing canals and channels could be altered or closed, changing water flows and altering the landscape. Cumulative impacts would be the incremental direct and indirect impacts of implementing Alternative C on visual resources plus the direct and indirect impacts by other existing and authorized levee systems in the Pontchartrain Basin, the State and the Nation.

Alternative A

Direct, Indirect and Cumulative Impacts: Direct impacts to the visual resources would be similar to those described under Alternative C except the footprint of Alternative A is smaller in size than that of Alternative C. Indirect impacts to the visual resources would be similar to those described under Alternative C. The affected wetlands would be much less than the TSP with only 3,564 acres of potential impacts. Cumulative impacts would be similar to Alternative C.

Alternative D

Direct, Indirect and Cumulative Impacts: Direct, indirect and cumulative impacts to resources would be similar to those for Alternative C with the exception of the Blind River, a designated Wild and Scenic River, longer levee and potential impacts to 56,228 acres of wetlands.

4.3.9 Recreation Resources

Alternative C

Direct Impacts: Approximately four miles of the levee is within the Maurepas Swamp WMA. Depending on levee designs, the WMA may be less accessible by land and water to recreation users. The LDWF boat launches at the Hope Canal and Reserve Relief Canal, Cajun Pride Swamp Tours, the I-55 launch and the I-10 launch; and a recreational camp within the levee alignment would be affected by the proposed action. Nonstructural measures impacts could include raising buildings, such as visitor and community centers; but would not include effects on outdoor facilities such as golf courses, swimming pools, tennis courts, boat launches, playgrounds, or ball fields. Facilities that are raised would benefit from the added protection. Buyouts of facilities may decrease recreational opportunities for the community.

Indirect Impacts: Recreationists may have less access to Maurepas Swamp WMA. Boat launches may be closed permanently, closed during construction, or relocated. People with recreational camps may not be able to access their camps. Impacts to boat launches and camps could be mitigated through compensation, relocation, or other appropriate measures.

Cumulative Impacts: Area diversion projects (LCA CBRD and the Maurepas Diversions) would provide fresh water and improve wetlands. The WSLP project could decrease salt water intrusion resulting from hurricane/tropical storm surge events, which would improve fish and wildlife habitat and increase opportunities for fresh water fishing and hunting. As levees are built, recreational access through canals and bayous would decrease, but recreational infrastructure would realize a reduction in risk of damage from hurricane/tropical storm surge events. These incremental direct and indirect impacts would be in addition to direct and indirect impacts to recreation resources attributable to other previous, existing and authorized levee systems in the Pontchartrain Basin, the State and the Nation.

Alternative A

Direct, Indirect and Cumulative Impacts: Direct impacts would be similar to Alternative C with the following exceptions. The LDWF Hope Canal boat launch 0.2 mile north of Alternative A would not be impacted. There would be impacts to waterway access to the Hope Canal rather than the launch itself. The levee alignment crosses the access road to a recreational camp and would block access to it. Indirect and cumulative impacts would be similar to Alternative C.

Alternative D

Direct, Indirect and Cumulative Impacts: Direct impacts would be similar to Alternative C except there would be an additional 16 miles of levee alignment impacts to the Maurepas Swamp WMA. This alternative would impact waterway access to the Hope Canal rather than the launch itself. Additionally, the alignment would block water access to the St. James Boat Club and the US-61 boat launch. Indirect impacts would be similar to Alternative C. Cumulative impacts would be similar to Alternative C; however this alternative would limit recreational access to the Maurepas Swamp WMA to a greater extent because of the greater length of the alignment.

4.3.10 Noise

Alternative C

Direct, Indirect and Cumulative Impacts: There would be temporary and localized increased

noise levels related to construction. Most of the alignment is remote and unpopulated so noise would not affect any nearby communities. The area south of US-61 and in the general vicinity of the I-10/I-55 intersection is populated and may be impacted by construction noise. After construction, noise levels would return to pre-construction conditions. Construction equipment is limited in the level of noise that can be emitted. Institutional recognition of noise, such as the regulations for Occupational Noise Exposure (29 CFR §1910.95) under the Occupational Safety and Health Act of 1970, as amended, would continue. This mandates that noise levels emitted from construction equipment be below 90 dB for exposures of eight hours per day or more. Noise may cause some temporary and minor annoyance to residents adjacent to the proposed alignment south of US-61 and business customers and workers (e.g., Shell gasoline station and casino) near the intersection of I-10/I-55. However, the Occupational Noise Exposure (29 CFR §1910.95) under the Occupational Safety and Health Act of 1970, as amended, would continue. Local fish and wildlife species may relocate during construction. Noise effects are expected to be localized, temporary and minor. Administrative and/or engineering controls, determining and implementing appropriate buffer zones, and implementing construction activity windows, shall address these issues. Any cumulative impacts would be temporary and minor in nature.

Alternative A

Direct, Indirect and Cumulative Impacts: Direct, indirect and cumulative impacts would be similar to Alternative C except over a smaller area.

Alternative D

Direct, Indirect and Cumulative Impacts: Impacts would be similar to Alternative C except there would be no impacts to residents south of the I-10 or US Highway 61; and there would be greater temporary and minor impacts to fish and wildlife resources along the longer alignment.

Figure 4-4: Laplace, Louisiana after Hurricane Isaac.

5.0 TENTATIVELY SELECTED PLAN (*NEPA Required)

Alternative C is the Tentatively Selected Plan (TSP). Feasibility-level design will commence after the SMART Planning Agency Decision Milestone and will finish before a Final Report.

5.1 Description of the Tentatively Plan

The TSP is an 18.27-mile risk reduction system around the communities of Montz, Laplace, Reserve and Garyville with non-structural components in St. James Parish. The alignment of the TSP is shown in Figure 3-4. The risk of storm surge damage would be reduced for over 7,000 structures and four miles of I-10 located in the system. Inclusion of this segment of I-10 would help maintain a major emergency evacuation and re-entry route for residents of southeast Louisiana, including residents in the New Orleans metropolitan area. The TSP also includes non-structural measures for 1,571 structures in the communities of Gramercy, Lutcher and Grand Point that are located outside of the proposed levee system. It is estimated that these non-structural measures would include elevation of 1,481 structures and acquisition of 90 structures. Implementation of non-structural features will be developed in more detail during feasibility level of design and analysis during which time an economic analysis will be conducted based on economic reaches. In developing the plan, consideration with be given to community cohesion and the requirements of EO 12898.

The structural component of the system would consist of earthen levees, floodwalls (T-walls), floodgates, drainage structures and pump stations located along the alignment. The preliminary level of design, based on modeling for a 1 percent AEP storm event includes levee elevations that would range from +13.5 NAVD88 on the eastern reaches near the Bonnet Carré Spillway to +7.0 NAVD88 in the western portion of the project area. They would be constructed with 3:1 side slopes with a 10-foot crown width. Construction of levees would involve the placement of 3,100,000 cubic yards of compacted and uncompacted clay (borrow) material on top of 3,400,000 square yards of geotextile fabric. Approximately 26,124 cubic yards of aggregate limestone would be used to build a road on the levee crown. A conveyance canal at a depth of -10 ft. NAVD88 would be situated along the levee. Floodwalls would be located under the I-10/I-55 interchange and other areas where space is limited. Nine floodwall sections would span 5,304 linear feet over the length of the system. The system would include 2,080 feet of drainage gates, 288 feet of roadway gates, two railway gates, and thirty-six pipeline crossings. Four pump stations would be located along the alignment to ensure the project does not adversely impact local drainage. Design parameters will be further refined during feasibility level design and analysis which may result in changes to the design parameters; however the TSP is anticipated to reduce risk for at minimum a 1 percent AEP storm event but not exceed a 0.5 percent AEP storm event.

The TSP would maintain hydrologic connectivity to the extent practicable through the use of water control structures except during closure for hurricane and tropical storm surge events. When the system is closed, pumps would operate on average for 1.7 storm events per year, which equates to closure of structures on average 8.5 days per year.

The structural alignment would directly convert approximately 856 acres to uplands including approximately 775 acres of hydric soils, 14.8 acres of water bottoms and 55.4 acres of prime farmlands. Approximately 8,424 acres of wetlands could be indirectly impacted due to enclosing the project area within the levee system. Further investigation is required to determine if cultural resources are located within any part of the footprint. Additional environmental investigations will be performed during feasibility-level design and analysis.




The estimated cost of the TSP is $880,851,070. The BCR for the TSP is equal to 1.63 to 1 with annualized net benefits equal to approximately $23,000,000.

5.1.1 Real Estate Requirements

A Real Estate Plan (REP) describing the real estate requirements and costs for the project can be found in Appendix C. The REP was prepared with estimated right-of-way (ROW) requirements based on available information. The REP and real estate cost estimates will be revised during feasibility-level design and analysis.

The estimated cost of real estate acquisition for structural features is $3,283,000. The alignment follows State-owned land and the property of approximately 120 owners. A standard perpetual levee easement for approximately 856 acres will be acquired for the construction of levees and floodwalls. A non-standard perpetual underground piling easement will also be acquired for all floodwalls. A standard Drainage Ditch Easement would be acquired for the areas needed for the conveyance canal. Borrow material for this project would come from the Bonnet Carré Spillway which is owned in fee by the Federal Government or from alternative sources not yet identified. A standard temporary work area easement will be acquired for staging areas. Mitigation land will be acquired in fee, excluding rights to minerals (with restrictions on use of surface). A non-material deviation will be made to the standard road easement to revise the rights necessary for a temporary non-exclusive road access (Appendix C).

The estimated cost of real estate acquisition for the non-structural feature is $81,417,000. Approximately 1,571 landowners may be impacted by this feature. The feature entails property acquisitions and structure raisings. At this time there has not been sufficient evaluation to determine particular structures to be included in the feature. A detailed evaluation of the work entailed in structure raising will be accomplished during the feasibility level design and analysis. At that time, the appropriate real estate interests to be acquired for non-structural measures will be determined, and the real estate costs will be refined. Displaced persons and businesses may be entitled to Public Law 91-646, Title II Relocations Assistance.

The total estimated cost of real estate for the project is $84,700,000. The CPRAB will have the responsibility of acquiring all necessary real estate interests for the project.

5.1.2 Relocation Assistance

Levee construction may cause relocations and/or temporary interruptions to pipelines. The existing carrier line would remain in operation while a bypass line would be constructed through a sleeve in the T-wall cutoff piles. When a bypass is complete and in place, the tie-in with the existing line would follow. Potential cost of this work is presented in Table 5-1. Detailed information will be developed during feasibility-level design and analysis.

Table 5-1: Unit cost of pipeline relocations.

Description	Estimated Quantity	Cost
≤6" Diameter	14	$515,000 each
>6" to ≤12" Diameter	16	$700,000 each
>18" to ≤24" Diameter	5	$1,550,000 each
> 24" Diameter	1	$1,920,000 each

5.1.3 Operation and Maintenance, Repair, Rehabilitation and Replacement

The purpose of operation and maintenance, repair, rehabilitation and replacement (OMRR&R) is to sustain the constructed project. The estimated annual OMRR&R cost is $4,128,075 (Table 3-4). This estimate will be further refined during feasibility-level design and analysis. After the

District Engineer provides notice of construction completion for the project, or functional portion of the project, the CPRAB will commence OMRR&R responsibilities associated with the project.

5.1.4 Benefit Analysis

Project Benefits

Models were run to determine the effects of storms on area resources. Hydrologic modeling results were developed to help establish the existing and future conditions and determine potential measures needed to address surge and storm-related damages. A database of values, types, and first floor elevations was developed for all structures in the area. This information was compared to the surge modeling to determine storm damages. Maps showing inundation of structures that could be damaged under FWP conditions will be developed.

Mitigation Plan Benefits

Habitat value analysis will be completed during feasibility-level design and analysis. Ecological model results will be combined with cost data to develop mitigation plans.

5.1.5 Risk & Uncertainty Analysis

Risk and uncertainty are intrinsic in water resources planning and design. This section describes various categories of risk and uncertainty pertinent to the study. Risk and uncertainty will be further considered during feasibility-level design and analysis.

5.1.5.1 Environmental Factors

Relative Sea Level Rise*:* There is uncertainty about how much sea level change (SLC) would occur in the region. Higher than estimated RSLR could cause salt water intrusion into the freshwater swamp causing significant changes to this habitat.

An assessment of RSLR was included in plan formulation and alternatives analysis. The evaluation of RSLR is documented in Appendix B and will be refined during feasibility level design and analysis. Calculations based on EC 1165-2-212 determined that the low, intermediate and high rates of RSLR at 2070 are 1.81 feet per year, 2.32 feet per year, and 3.95 feet per year, respectively (Table 2-2). The intermediate RSLR rate was applied.

RSLR could impact the benefits achieved by the TSP. Because the project was developed using the intermediate RSLR rate, the TSP would provide more benefits than anticipated should the low RSLR rate result and less benefits with the high RSLR rate. The non-structural 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.

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

5.1.5.2 Engineering Factors

Levee/Structure Failure: The risk associated with the levee/structure system is its stability. Analysis of the earthen levee and associated T-walls and gates will be evaluated during feasibility-level design and analysis, and included in Appendix B. The levee and other features will be constructed to meet USACE standards.

Hydrologic Flows: There is uncertainty as to whether the levee system would potentially induce flooding internally and externally to the levee alignment. Modeling results will be analyzed during feasibility level design and included in the final report. Hydrologic modeling (ADCIRC and STWAVE) will show if the TSP could potentially induce flooding in these area and allow for more accurate engineering and design of the levee system. The project will incorporate features to mitigate for any potential induced flooding.

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

Models are limited by basic, underlying assumptions and uncertainties. Some of the simplifying assumptions include the model parameters. A sensitivity discussion will be completed during feasibility-level design and analysis and included in Appendix B of the final report. Another uncertainty is that a limited number of storm scenarios are modeled. It is assumed that various storm scenarios over a number of years will represent a much higher indicator of the levees ability to withstand major storm events.

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

5.1.5.3 Economic Factors

The risk for economics is in under or overestimating the future benefits associated with the project alternatives. The with-project damages and overall benefits associated with the alternatives were estimated based on the existing and future without-project damages. This could potentially result in the TSP not being economically justified or preliminary estimates of the benefit cost ratios being overstated. A full economic analysis will be conducted during feasibly level design and documented in the final report. Additional uncertainty surrounding variables such as population growth, first floor elevations, structure value, depth damage relationships and additional inputs are consistent with typically accepted project uncertainty.

The Hydrologic Engineering Center Flood Damage Analysis (HEC-FDA) Version 1.2.5a certified model was used to calculate the damages for the without project existing and future conditions. Economic and engineering inputs were necessary for the model to calculate damages for existing conditions (2012), the project base year (2020) and the final year in the period of analysis (2070). The inputs included structure inventory, future development, contents-to-structure value ratios, vehicles, first floor elevations and depth-damage relationships, ground elevations and without-project stage probability relationships.

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

5.1.5.4 Implementation Factors

Non-structural costs were based on a 100% structural survey of area improvements. Structures located in the 2020 and 2070 100-year floodplains were evaluated by comparing the cost of elevating the structure to the cost of acquiring the structure. The greater cost was used to determine an estimate of the cost of the non-structural feature. Relative sea level rise greatly impacts the number of structures to be raised, resulting in uncertainty as to how many structures would have to be raised. A minimum cost of the non-structural feature of $53,143,789 was developed based on the cost of reducing risk to structures in the 2020 100-year floodplain. A maximum cost of $305,256,794 was developed based on the cost of reducing risk to structures in the 2070 100-year floodplain. During feasibility level of design, the non-structural feature will be further evaluated by economic reach. The resulting evaluation may reduce the number of structures that would be included in the non-structural feature.

5.2 Implementation Requirements

5.2.1 Preconstruction Engineering and Design

Detailed design of the WSLP Project will be shared between CPRAB and the USACE. All detailed design will be in accordance with USACE's regulations and standards.

5.2.2 Construction and LERRD

Construction would be in accordance with the USACE's regulations and standards. Lands, easements, right-of-ways, relocations and disposal areas (LERRD) would be the responsibility of the CPRAB (Appendix C).

5.2.3 Cost Sharing

The State of Louisiana, acting through the PLD, is the non-Federal sponsor for the feasibility study. The cost-share during the feasibility phase is 50% Federal and 50% non-Federal. Following the feasibility phase, the CPRAB will be the non-Federal Sponsor for the planning, design, construction, operation, maintenance, repair, replacement and rehabilitation of the project. The cost share for the planning, design and construction of the project will be 65% Federal and 35% non-Federal. The CPRAB must provide all project LERRD required for the project. OMRR&R of the project would be a 100% CPRAB responsibility. A full description of the non-Federal and Federal responsibilities after the feasibility phase of the project is contained in Section 8.2 of this report. The OMRR&R costs are estimated to have a present value of $4,128,075 at 2012 price levels and include a 25% contingency. AM&M costs are not included in the estimate at this time; those costs will be included in the final report. Table 5-2 presents the cost apportionment.

Table 5-2: Cost apportionment of the TSP.

	Total	Federal	Non-Federal
PED	$7,500,000	$4,875,000	$2,625,000
Construction	$761,051,070	$557,500,446	$203,550,625
Pipeline Relocations	$35,100,000	-	$35,100,000
Lands, Easements, & ROW*	$84,700,000	$15,052,750	$69,647,250
Total First Costs**	**$888,351,070**	**$577,428,196**	**$310,922,875**

*** Federal costs are Administrative Cost of Non-Federal Sponsor Oversight**
**** Monitoring and Adaptive Management costs not included.**

5.3 Mitigation Plan

Although mitigation planning was integrated into the overall plan formulation process, implementation of the TSP requires compensatory mitigation for unavoidable project-induced

impacts that will require replacing or providing substitute resources. A mitigation plan for the TSP will be completed following the feasibility level design and analysis and will be included in the final report. Additional information is located in Appendix A.

5.4 Adaptive Management & Monitoring

Incorporation of AM&M activities into the mitigation plan will address ecological and other uncertainties that could prevent successful implementation of mitigation project measures. The AM&M Plan will establish a framework for decision-making that utilizes monitoring results and other information, as it becomes available, to update project knowledge and adjust mitigation management actions through adaptive management. Integration of AM&M into the mitigation project will ensure success under a wide range of conditions and enable implementing corrective actions in cases where monitoring demonstrates that the mitigation project or measures are not achieving ecological success. An AM&M plan will be developed and included as part of the mitigation plan in the final report. Additional information is located in Appendix A.

5.5 Views of the Non-Federal Sponsor

The PLD and the CPRAB support and recognize the importance of hurricane risk reduction in St. Charles, St. John the Baptist and St. James Parishes. This study is included in the 2012 Louisiana Comprehensive Master Plan for a Sustainable Coast and is supported by the Louisiana Congressional delegation. The USACE has worked as a team along with an interagency team and local stakeholders to develop a feasible comprehensive plan that would provide hurricane storm surge risk reduction to the citizens in the area. Construction of the proposed system would immediately allow for improved storm surge risk reduction in the three-parish area, which could potentially reduce life, health and safety risk to residents and interruptions to vital hurricane evacuation routes.

Figure 5-1: St. James Parish flooding after Hurricane Isaac.

6.0 ENVIRONMENTAL LAWS & COMPLIANCE (*NEPA Required)

There are many Federal and state laws pertaining to the enhancement, management and protection of the environment. Federal projects must comply with environmental laws, regulations, policies, rules and guidance in Appendix A. The team coordinated with Federal and state resource agencies during planning and will continue to coordinate. Compliance with laws will be accomplished upon review of this report by appropriate agencies and the public, and with the signing of a Record of Decision by the Assistant Secretary of the Army for Civil Works.

6.1 Clean Air Act of 1972 (Air Quality)

The Clean Air Act (CAA) sets goals and standards for the quality and purity of air. It requires the Environmental Protection Agency to set National Ambient Air Quality Standards (NAAQS) for pollutants considered harmful to public health and the environment. The project area is in St. Charles, St. James and St. John the Baptist Parishes, which are currently in attainment of NAAQS. The Louisiana Department of Environmental Quality is not required by the CAA and Louisiana Administrative Code, Title 33 to grant a general conformity determination.

6.2 Clean Water Act of 1972 – Section 401 (Water Quality)

The Clean Water Act (CWA) sets and maintains goals and standards for water quality and purity. Section 401 requires a Water Quality Certification from the Louisiana Department of Environmental Quality that a proposed project does not violate established effluent limitations and water quality standards. Section 401 compliance will be documented in the final report.

6.3 Clean Water Act of 1972 – Section 404(b)(1) (Wetlands)

The USACE administers regulations under Section 404(b)(1) of the CWA, which establishes a program to regulate the discharge of dredged and fill material into waters of the U.S., including wetlands. Potential project-induced impacts subject to these regulations will be evaluated during feasibility level design. A completed 404(b)(1) evaluation will be included in the final report.

6.4 Coastal Zone Management Act of 1972 (Coastal Zone Development)

The Coastal Zone Management Act is a partnership structure allowing states and the Federal government to work together for the protection of U.S. coastal zones from environmentally harmful over-development. Potential project-induced impacts will be evaluated during feasibility level design. They will be described in a Consistency Determination that will be submitted to the Louisiana Department of Natural Resources to review for consistency with the Louisiana Coastal Resource Program. The determination and findings will be provided in the final report.

6.5 Endangered Species Act of 1973 (Threatened & Endangered Species)

The Endangered Species Act (ESA) is designed to protect and recover threatened and endangered (T&E) species of fish, wildlife and plants. The CEMVN is coordinating with the USFWS and the National Marine Fisheries Service (NMFS) to ensure for the protection of those T&E species under their respective jurisdictions. The USFWS identified in their January 9, 2009 coordination letter two T&E species, the Gulf sturgeon and the West Indian manatee, that are known to occur or occasionally occur in the project area. No plants were identified as being threatened or endangered in the project area. There are no T&E species or their critical habitat under NMFS jurisdiction located in the project area that would be impacted by the proposed action. Based on review of existing data and preliminary field surveys, the CEMVN finds that implementation of the TSP would have no effect on any listed species or their critical habitat.

6.6 Bald and Golden Eagle Protection Act of 1940 (Bald Eagles)

The Bald and Golden Eagle Protection Act protects two eagle species. Bald eagled occur or occasionally occur in the project area. Based on review of existing data and preliminary field surveys, the CEMVN finds that implementation of the TSP would have no effect on bald eagles.

6.7 Louisiana State Threatened and Endangered Species and Rare and Unique Habitat

The Louisiana Department of Wildlife and Fisheries (LDWF) Louisiana Natural Heritage Program (LNHP) lists T&E species, and rare, unique and imperiled habitats in the State of Louisiana. Based on review of the LNHP online database, rare or unique cypress-tupelo swamp habitat, bald eagles, alligator snapping turtles, osprey, paddlefish, manatees, swamp milkweed, floating antler fern and rooted spike-rush is found in the project area (LDWF 2013).

6.8 Colonial Nesting Water Birds

The USFWS indicated in their January 9, 2009 coordination letter that the project area is known to support colonial nesting water birds (e.g., herons, egrets, ibis, night-herons and roseate spoonbills). Based on review of existing data and preliminary field surveys, the CEMVN finds that implementation of the TSP would have no effect on colonial nesting water birds.

6.9 Farmland Protection Policy Act of 1981 (Farmland)

The Farmland Protection Policy Act (FPPA) is intended to minimize the impact of Federal programs on the unnecessary and irreversible conversion of farmland to nonagricultural uses. Projects are subject to requirements if they may irreversibly convert farmland to nonagricultural use and are completed by a Federal agency or with assistance from a Federal agency. In its review of the proposed project the NRCS determined that the TSP will impact 55.4 acres of prime or unique farmland and that the project will not impact NRCS work in the vicinity (June 8, 2013 email). No actions will be taken to avoid impacts to farmland.

6.10 Fish and Wildlife Coordination Act of 1934 (Fish & Wildlife)

The Fish and Wildlife Coordination Act (FWCA) provides authority for the USFWS involvement in evaluating impacts to fish and wildlife from proposed water resource development projects. It requires that fish and wildlife resources receive equal consideration to other project features. It requires Federal agencies that construct, license or permit water resource development projects to first consult with the USFWS, NMFS and state resource agencies regarding the impacts on fish and wildlife resources and measures to mitigate these impacts. Section 2(b) requires the USFWS to produce a Coordination Act Report (FWCAR) that details existing fish and wildlife resources in a project area, potential impacts due to a proposed project and recommendations for a project. The draft FWCAR includes the USFWS positions and recommendations. This draft document, CEMVN's responses and coordination planning aid letters are found in Appendix A.

The USFWS, as part of their coordination efforts, provided a map depicting colonial nesting waterbird (e.g., herons, egrets, ibis, night-herons, and roseate spoonbills) rookeries within the area. Two potentially active rookeries may exist within 1,000 feet of the proposed alignment. USFWS and USACE biologists will survey the area before construction to confirm active rookery locations. If active rookeries exist within 1,000 feet of an alignment, this could be a project constraint. USFWS guidelines would be followed to avoid adverse impacts to these species.

A January 29, 2009, NMFS letter indicates that aquatic and wetland habitats in the area include estuarine emergent wetlands, submerged aquatic vegetation, mud substrates, and estuarine water column. These habitats provide EFH for white shrimp and red drum. Waterbodies and wetlands provide nursery and foraging habitats for a variety of fish species, some of which may serve as prey for other fish species designated as EFH species (e.g., mackerel, snapper, and grouper) and highly migratory fishes (e.g., billfish and sharks). The NMFS letter indicates the area provides foraging and nursery habitat for economically important marine fishery resources including striped mullet, Atlantic croaker, blue crab, and Gulf menhaden. In addition to providing habitat for species with designated EFH, the area is important for Federal and state-managed species. It provides foraging and nursery areas for prey species (gulf menhaden and bay

anchovy) (Penland et al. 2002) eaten by predators, such as sand seatrout, spotted seatrout, catfish and crappie (LDWF 2009, Hastings 2001), and highly migratory species.

6.11 Magnuson-Stevens Fishery Conservation and Management Act of 1976 and The Magnuson-Stevens Act Reauthorization of 2006 (Essential Fish Habitat)

The law and its reauthorization govern marine fisheries management in the U.S. Essential Fish Habitat (EFH) does not intersect the proposed alignment or the enclosed area in the near term. The CEMVN has determined that the TSP would have no impacts to EFH.

6.12 Marine Mammal Protection Act of 1972 (Marine Mammals)

The Marine Mammal Protection Act (MMPA) protects whales, dolphins, sea lions, seals, manatees and other species of marine mammals. The CEMVN finds the TSP would have no effect on marine mammals that may occasionally be found in the project area. To avoid "takings" of the West Indian manatee and ensure compliance with the MMPA, the CEMVN commits that 1) all construction personnel will be educated about the MMPA, the ESA and the West Indian manatee, 2) a search for manatees in the project area and mitigation areas would be conducted before construction, and 3) appropriate best management practices to avoid or minimize potential entrapment of manatees during construction would be implemented.

6.13 Migratory Bird Treaty Act of 1918 and Migratory Bird Conservation Act of 1929 (Migratory Birds)

The Migratory Bird Treaty Act (MBTA) and the Migratory Bird Conservation Act (MBCA) protect migratory birds and their habitat. Many important habitats in the project area provide migratory bird shelter, nesting, feeding and roosting habitat. The TSP would potentially convert 719 acres of forested wetland/swamp habitat and 55 acres of dry and/or wet BLH habitat to levee. In addition, the TSP would enclose and potentially change hydrologic conditions of up to 8,424 acres of forested wetlands/swamp and BLH habitats. Implementation of the TSP will require compensatory mitigation for unavoidable project-induced impacts to bird and wildlife habitat.

6.14 National Historic Preservation Act of 1966 (Cultural and Historic Resources)

In compliance with Section 106 of the National Historic Preservation Act (NHPA) and 36 CFR §800, Federal agencies are required to identify and consider the potential effects that their undertakings might have on significant historic properties, district, site, building, structure, or object that is included in or eligible for inclusion in the National Register. Additionally, a Federal agency shall consult with any tribe that attaches religious and cultural significance to such properties. Agencies shall afford the State Historic Preservation Officer (SHPO) and tribes a reasonable opportunity to comment before decisions are made. Any National Register eligible sites would be avoided to the maximum extent possible and any potential adverse effects would be mitigated. A variety of mitigation measures are possible, ranging from avoidance to data recovery to other types of documentation. Mitigation can take place at the site directly affected or can be concentrated at any one site. Decisions on mitigation strategies would be made under a Memorandum of Agreement among the CEMVN, the Louisiana SHPO and any consulting Indian tribes. Sites unevaluated for National Register eligibility would either have to be avoided or further research would be carried out in order to determine National Register eligibility.

The CEMVN has not yet presented a formal conclusion for cultural resources in coordination with the Louisiana SHPO and the Federally-recognized tribes. A letter presenting the alternatives discussed in this document and the research conducted thus far was mailed to the Louisiana SHPO on May 3, 2013. The CEMVN will continue Section 106 consultation and finalize assessment of previous studies and necessary further study during feasibility level design. Compliance with Section 106 will be documented in a final report.

6.14.1 Tribal Consultation (Tribal Interests)

In partial fulfillment of EO 13175 ("Consultation and Coordination With Indian Tribal Governments"), NEPA and Section 106, consultation was initiated with Federally-recognized Tribes: Alabama-Coushatta Tribe of Texas, Caddo Nation of Oklahoma, Chitimacha Tribe of Louisiana, Choctaw Nation of Oklahoma, Coushatta Tribe of Louisiana, Jena Band of Choctaw Indians, Mississippi Band of Choctaw Indians, Quapaw Tribe of Oklahoma, Seminole Nation of Oklahoma, Seminole Tribe of Florida and Tunica-Biloxi Tribe of Louisiana. In a May 3, 2013, letter, the CEMVN summarized the study authority and history of investigations, study area and proposed alignments, offering tribes the opportunity to review and comment on the potential of the proposed action to significantly affect protected tribal resources, tribal rights, or Indian lands. The CEMVN will consult with these tribes. Correspondence will be included in the final report.

6.15 Resource Conservation and Recovery Act of 1976, as amended by the Hazardous and Solid Waste Amendments of 1984

A Phase I Environmental Site Assessment (ESA) is required for all of the USACE Civil Works Projects, to facilitate early identification and appropriate consideration of potential Hazardous, Toxic, and Radioactive Waste (HTRW) problems. HTRW includes any material listed as a "Hazardous Substance" under Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). Other regulated contaminants include those substances that are not included under CERCLA but pose a potential health or safety hazard, and are regulated. Examples include, but are not limited to, many industrial wastes, naturally occurring radioactive materials (NORM), many products and wastes associated with the oil and gas industry, herbicides, and pesticides. Engineer Regulation ER 1165-2-132 and Division Regulation DIVR 1165-2-9 established policies for conducting HTRW review for USACE Civil Works Projects.

The area has a lot of undeveloped property, mostly wetlands. It contains numerous oil and gas wells, with associated waste pits, and pipelines (Figure 3-7). The area is heavily industrialized, mainly with facilities associated with oil, gas, and petrochemical production, including the Shell NORCO and Valero St. Charles refineries just outside the project area; there are other industrial facilities within the project area. All these industrial facilities have the potential to be chemical discharge sources, which can occur at unpredictable times. Alignments A, C, and D all have some potential Recognized Environmental Conditions (RECs) near or within the alignment, but no RECs have been identified at this time. The TSP will be analyzed during feasibility level project design and a standard Phase I Environmental Site Assessment will be prepared to identify potential RECs and to avoid areas that could contain substances of concern.

6.16 Wild and Scenic River Act of 1968 (Rivers)

The Wild and Scenic Rivers Act establishes a National Wild and Scenic Rivers System. The Louisiana Scenic Rivers Act recognizes and implements the 1968 Federal law, to preserve, protect and enhance the wilderness qualities, scenic beauties and ecological regimes of rivers and streams. Any construction within 100 feet of a scenic stream requires a scenic streams permit. The TSP would not impact the Blind River, the only scenic river within the project area.

6.17 Executive Order 11514, Protection and Enhancement of Environmental Quality

EO 11514 directs Federal agencies to "initiate measures needed to direct their policies, plans and programs so as to meet national environmental goals." The TSP complies with EO 11514.

6.18 Executive Order 11988, Floodplain Management

EO 11988 directs agencies to avoid development in floodplains to the maximum extent feasible. The TSP would reduce risk to the existing structures within the floodplain. The CEMVN is providing storm surge information to inform the St. Charles, St. James and St. John the Baptist Parishes Floodplain Administrators in their floodplain management implementation.

6.19 Executive Order 11990, Protection of Wetlands

Executive Order 11990 directs Federal agencies to avoid to the extent possible the long and short term adverse impacts associated with the destruction or modification of wetlands, and to avoid direct or indirect support of new construction in wetlands wherever there is a practicable alternative. Mitigation planning was integrated into the planning by considering, individually and collectively, each of the NEPA mitigation actions of avoiding, minimizing, reducing and rectifying potential adverse impacts to wetlands to the extent practicable. Implementing the TSP requires compensatory mitigation for unavoidable impacts that will require replacing or providing substitute resources. A mitigation plan will be completed during feasibility level design and will be included in the final report. Unavoidable project-induced impacts will be mitigated in-kind, and hence, the proposed action complies with the EO 11990.

6.20 Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations

EO 12898 requires agencies to make achieving environmental justice (EJ) part of their missions by identifying and addressing disproportionately high and adverse human health or environmental effects of programs, policies and activities on minority populations and low-income populations. Potential EJ issues have been considered throughout planning. As part of the NEPA process, public and scoping meetings were held and attention was given to EJ issues. A public meeting specific to EJ issues was held on May 21, 2013 at the Knights of Columbus Hall in Lutcher, Louisiana. During these meetings, information was made available to the public to help assist in the identification of potential EJ issues. The CEMVN has concluded that there would be no potential EJ issues from implementing the TSP. The CEMVN encourages any interested parties to inform the agency of potential EJ concerns.

6.21 Executive Order 13112, Invasive Species

EO 13112 directs Federal agencies to prevent the introduction of invasive species; provide for their control; and minimize the economic, ecological and human health impacts that invasive species cause. The TSP is consistent with EO 13112 to the extent practicable and permitted by law and subject to the availability of appropriations, and within Administration budgetary limits. Relevant programs and authorities to prevent the introduction of invasive species would be used during construction. The CEMVN will not authorize, fund, or carry out actions likely to cause or promote the introduction or spread of invasive species in the United States or elsewhere unless the CEMVN has determined and made public its determination that the benefits of such actions clearly outweigh the potential harm caused by invasive species; and that all feasible and prudent measures to minimize risk of harm would be taken in conjunction with the actions.

6.22 Executive Order 13186, Responsibilities of Federal Agencies to Protect Migratory Birds

EO 13186 directs Federal agencies to take actions to further implement the Migratory Bird Treaty Act. The TSP has been evaluated for potential effects on migratory birds, with emphasis on species of concern. Many important habitats in the project area provide migratory bird shelter, nesting, feeding and roosting habitat. The TSP would potentially convert 719 acres of forested wetland/swamp habitat and 55 acres of dry and/or wet BLH habitat to levee. The TSP would enclose and potentially change hydrologic conditions of up to 8,424 acres of forested wetlands/swamp and BLH habitats. Implementation of the TSP will require compensatory mitigation for unavoidable project-induced impacts to bird and wildlife habitat.

7.0 PUBLIC INVOLVEMENT (*NEPA REQUIRED)

Public involvement is an important part of planning and decision-making. Agencies, non-governmental organizations, and citizens provided valuable input for TSP.

7.1 Public Meetings and Other Coordination Efforts

Public meetings in the three parish area were held during the study. These meetings included:

- June 6, 2013 - Project update to the CPRAB, Federal Emergency Management Agency (FEMA), Louisiana Department of Transportation and Development (LDOTD), Federal Highway Administration (FHWA), and other government agencies
- May 21, 2013 - Environmental justice community meeting in St. James Parish
- May 6, 2013 - Project update to CPRAB, FEMA, LDOTD, FHWA, and other agencies
- April 30, 2012 – Project update in St. John the Baptist Parish
- March 19, 2013 - Update to CPRAB, FEMA, LDOTD, FHWA, and other agencies
- February 22, 2013 - Update to CPRAB, FEMA, LDOTD, FHWA, and other agencies
- January 31, 2013 - Update to CPRAB, FEMA, LDOTD, FHWA, and other agencies
- November 15, 2012 - Project update in St. John the Baptist Parish
- February 16, 2011 - Project update to the St. John's Riverlands Civic Association
- January 21, 2009 - Public scoping meeting in St. John the Baptist Parish

Meeting participants were generally most interested in potential levee alignments and impacts to their communities. Other comments focused on the construction schedule, potential impacts to wetlands, the value of hurricane evacuation routes, and funding.

7.2 Draft Report Recipients

This report was distributed to Federal, state, and local agencies; businesses, libraries, and universities; and others. These stakeholders received a copy of the report (Table 7-1).

Table 7-1: List of report recipients.

Louisiana Congressional Delegation	Louisiana State Senators &	Levee Districts & Floodplain
Senator Mary Landrieu	Jody Amedee, State Senator	Amite River Basin Commission
Senator David Vitter	Randal L. Gaines, State Representative	Lafourche Basin Levee District
Congressman Rodney Alexander	Gregory A. Miller, State Representative	Pontchartrain Levee District
Congressman Charles W. Boustany, Jr.	Ed Price, State Representative	
Congressman William Cassidy	Gary L. Smith, Jr., State Senator	
Congressman John Fleming	Tom Willmott, State Representative	
Congressman Cedric Richmond		
Congressman Steve Scalise		
St. Charles Parish Government	**St. James Parish Government**	**St. John the Baptist Government**
V.J. St. Pierre, Jr., Parish President	Timothy P. "Timmy" Roussel	Natalie Robottom, Parish President
Parish Council	District Conservationist	
Permit Officer	Director of Operations	
	Parish Police Jury	
Town of Gramercy Government	**Town of Lutcher Government**	**Town of Vacherie Government**
Mayor	Clerk	Town Council
Aldermen	Aldermen	
Permit Official		
Federal Agencies		
Advisory Council on Historic Preservation	**Department of Energy:** Office of Environmental Compliance	**Department of Transportation:** Division Administrator, Federal Highway Administration; Southwest Region, Federal Aviation
Department of Agriculture: Carl J. Breville. *Natural Resources Conservation Service:* Kevin Norton, State Conservationist; Michael Trusclair, District Conservationist	**Department of Homeland Security:** *Federal Emergency Management Agency:* Gary Zimmerer, Region VI	**Environmental Protection Agency:** Office of Federal Activities, EIS Filing Section: Region VI, Marine and Wetlands Section; Rhonda Smith, Region VI - Office of Planning and




Department of the Army: Rayford E. Wilbanks, MVD	**Department of the Interior:** *Office of Environmental Policy and Compliance. U.S. Fish and Wildlife Service:* Lacombe Office ; Lafayette Field Office, Jeff Weller, Field Supervisor	**Department of Commerce:** *National Oceanic and Atmospheric Administration:* David Bernhart, Protected Species Division; Richard Hartman, Habitat Conservation Division; NEPA Coordinator, Office of Program, Planning & Integration
State Agencies and Offices		
Honorable Bobby Jindal	**Louisiana Department of Agriculture & Forestry:** Office of Forestry; Mike Strain; Matthew Keppinger, Office of Agriculture & Environmental Science	**Louisiana Department of Public Works**
Lieutenant Governor Jay Dardenne	**Louisiana Department of Environmental Quality:** Environmental Planning Division ; Office of the Secretary; Scott Guilliams	**Louisiana Department of Transportation & Development**
Louisiana Secretary of State	**Louisiana Department of Health & Hospitals:** Office of Public Health, Center for Environmental Health	**Louisiana Department of Wildlife and Fisheries:** Secretary; Maurice B. Watson; Tim Morrison; Gary Lester, Natural Heritage Program
Attorney General's Office	**Louisiana Department of Natural Resources:** Keith Lovell, Interagency Affairs; Charlie Mestayer, Lafayette Field Office; Division of State Lands; Office of Conservation, Surface Mining Division; Consistency Coordinator, Coastal Resources Program	**Louisiana Division of Administration:** State Land Office; State Planning Office
Governor's Office for Coastal Activities	**Coastal Protection and Restoration Authority Board:** Garret Graves	**Louisiana Office of Cultural Development:** Pam Breaux, State Historic Preservation Officer; Division of Outdoor Recreation
Coastal Protection and Restoration Authority: Stephanie Zumo		**Louisiana State Board of Commerce & Industry**
Native American Tribes		
Adai Caddo Indians of Louisiana	Clifton Choctaw Tribe of Louisiana	Point au Chien Tribe
Alabama Coushatta Tribe of Texas	Coushatta Tribe of Louisiana	Quapaw Tribe of Oklahoma
Biloxi Chitimacha Confederation/Bayou	Four-Winds Cherokee Tribe	Seminole Tribe of Florida
Caddo Nation	Grand Caillou/Dulac Band	Seminole Nation of Oklahoma
Chitimacha Tribe of Louisiana	Isle de Jean Charles Band	Tunica-Biloxi Tribe of Louisiana
Choctaw-Apache Tribe of Ebarb	Jena Band of Choctaw Indians	United Houma Nation
Choctaw Nation of Oklahoma	Louisiana Choctaw Tribe	
Media Outlets	**Businesses & Individuals**	**Libraries & Universities**
St Charles Herald Guide	Entergy	St. John The Baptist Parish Library
L'Observateur	Wally Landry, Crucial, Inc.	St. James Parish Library
News Examiner	Donald Landry, South Louisiana Environmental Council	**Louisiana State University:** Craig A. Johnson, Louisiana Geographic Information Center; Charles Wilson,

7.3 Views of the Public

This report is available for public review and comment for 45 days. The final report will include comments received. Comments received at public meetings will be included.

8.0 RECOMMENDATIONS

Information found in this document and further developed during feasibility analysis, as well as input from agencies and comments from the public, will help refine the potential solutions to reduce hurricane and storm surge flood damages to St. Charles, St. John the Baptist and St. James Parishes, Louisiana. These sources of information will assist the USACE Commander in making an informed decision, which will be documented in the final report.

8.1 Recommended Plan

The TSP is Alternative C, which is also the NED plan, which maximizes net benefits consistent with protecting the Nation's environment. Alternative C begins at the west guide levee of the Bonnet Carré Spillway and extends to Hope Canal. The levee then tracks south to a location near the Mississippi River Levee. It is approximately 18.27 miles long and includes 4 pump stations along the alignment. Borrow material would come from the Bonnet Carré Spillway or alternative borrow sources not yet identified. It would also require environmental control structures (culverts with flap gates) along the length of the alignment that would be operated during hurricane and tropical storm surge events. See Appendix B for detailed engineering information.

8.2 Plan Implementation

The following sections describe the NFS financing and the division of plan responsibilities.

Federal and Non-Federal Cost-Sharing

The State of Louisiana acting through the PLD, is the NFS for the feasibility phase of the project. The cost-share during the feasibility phase is 50 percent Federal and 50 percent non-Federal. Following the feasibility phase, CPRAB will be the non-Federal sponsor for planning, design, construction, operation, maintenance, repair, replacement and rehabilitation. The cost share for the planning, design and construction of the project will be 65 percent Federal and 35 percent non-Federal. Among other responsibilities, the CPRAB must provide all project LERRDs required for the project and submit any work-in-kind request to the Federal government for the pre-construction engineering, and design (PED) of the project. The OMRR&R cost of the project is estimated to be approximately $4,128,075 and is a 100 percent CPRAB responsibility. The project construction cost is estimated to be approximately $880,851,070. These costs are subject to revision as a result of feasibility level design and will be documented in the final report.

8.2.1 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). The Government, subject to Congressional authorization and the availability of funds 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.

8.2.2 Non-Federal Responsibilities

Federal implementation of the project would be subject to the NFS agreeing to comply with applicable Federal laws and policies, including but not limited to the following:




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

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

2. Provide, 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) Shall not use funds from other Federal programs, including any non-Federal contribution required as a matching share therefore, to meet any of the non-Federal obligations for the project unless the Federal agency providing the Federal portion of such funds verifies in writing that expenditure of such funds for such purpose is authorized;

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

d) Agree to participate in and comply with applicable Federal floodplain management and flood insurance programs;

e) 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 interest 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;

f) 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;

g) 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;

h) 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;

i) For so long as the project remains authorized, OMRR&R 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;

j) Give the Federal government a right to enter, at reasonable times and in a reasonable manner, upon property that the NFS owns or controls for access to the project for the purpose of completing, inspecting, operating, maintaining, repairing, rehabilitating, or replacing the project;

k) 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;

l) 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 CFR Section 33.20;

m) 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.);

n) 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 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 NFS with prior specific written direction, in which case the NFS shall perform such investigations in accordance with such written direction;

o) Assume, as between the Federal government and the NFS, 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;

p) Agree, as between the Federal government and the NFS, that the NFS 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; and

q) Comply with Section 221 of Public Law 91-611, Flood Control Act of 1970, as amended (42 U.S.C. 1962d-5b), and Section 103(j) of the Water Resources Development Act of 1986, Public Law 99-662, as amended (33 U.S.C. 2213(j)), which provides that the Secretary of the Army shall not commence the construction of any water resources project or separable element thereof, until each non-Federal interest has entered into a written agreement to furnish its required cooperation for the project or separable element.

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 requested betterments or additional work, or any portion thereof, the Government shall so notify the NFS in writing that sets forth any applicable terms and conditions.

9.0 LIST OF PREPARERS (*NEPA Required)

Name	Office	Discipline/Role
Tim Axtman	RPEDS Plan Formulation Branch	Senior Plan Formulator
Christopher Brown	RPEDS Environmental Compliance Branch	HTRW
Troy Constance	Chief, RPEDS	District Quality Control
Travis Creel	RPEDS, Plan Formulation Branch	Lead Plan Formulator
Rob Dauenhauer	Engineering Division, Structures Branch	Structures Design
Nathan Dayan	RPEDS Environmental Planning Branch	Fisheries Resources, Essential Fish Habitat
Pamela DeLoach	Engineering Division, Engineering Control Branch	District Quality Control
Joan Exnicios	Chief, RPEDS Environmental Planning Branch	District Quality Control
Douglas Ferrell	Engineering Division, Design Services Branch	Relocations
Tammy Gilmore	RPEDS Environmental Planning Branch	Wildlife Resources, Endangered Species
Eric Glisch	Engineering Division, Hydraulics and Hydrologic Branch	Water Quality
Richel Green	Engineering Division, Design Services Branch	Relocations
Judith Gutierrez	Real Estate Division	District Quality Control
Rebecca Hill	RPEDS Environmental Planning Branch	Tribal Liaison Coordination
Paul Hughbanks	RPEDS Environmental Planning Branch	Archaeology
William P. Klein Jr.	RPEDS Environmental Planning Branch	Environmental Manager, Environmental Resources Planning, Mitigation, Adaptive Management and Monitoring, Habitat Impacts
Fay Lachney	RPEDS Plan Formulation Branch	Senior Plan Formulator
Patricia Leroux	RPEDS Environmental Planning Branch	Appendices, Vegetation Resources
J. Ben Logan	RPEDS Economics Branch	Socioeconomic Resources
Keven Lovetro	RPEDS Economics Branch	Socioeconomic Resources
Brian Maestri	RPEDS Economics Branch	Socioeconomic Resources
Greg Miller	Chief, RPEDS Plan Formulation Branch	District Quality Control
Kelly McCaffrey	RPEDS Environmental Planning Branch	Aesthetic Resources
An Nguyen	Engineering Division, Civil Branch	Levee Design
Darrell Normand	Engineering Division, Design Services Branch	Cost Engineering
Paul Oakland	Engineering Division, Design Services Branch	Relocations
Hasan Pourtaheri	Engineering Division, Hydraulics and Hydrologic Branch	ADCIRC & Surge Modeling
Miguel Ramos	Engineering Division, Design Services Branch	Cost Engineering
Courtney Reed	RPEDS Economics Branch	Socioeconomic Resources
Jerica Richardson	RPEDS, Plan Formulation Branch	Lead Plan Formulator
Sandra Stiles	RPEDS Environmental Planning Branch	District Quality Control
Christopher Talbert	Engineering Division, Design Services Branch	Relocations
Danielle Tommaso	RPEDS, Plan Formulation Branch	Plan Formulator
Ron Taylor	Engineering Division, Hydraulics and Hydrologic Branch	Interior Drainage
Walter Teckemeyer	Engineering Division, Engineering Control Branch	Project Engineer
Jeff Varisco	Programs & Project Management Division	Project Manager
Jennifer Wedge	Engineering Division, Structures Branch	Structures Design
Debra Wright	RPEDS Environmental Planning Branch	Recreational Resources