FINAL

COMPREHENSIVE ENVIRONMENTAL DOCUMENT
PHASE II

GREATER NEW ORLEANS HURRICANE AND STORM DAMAGE RISK REDUCTION SYSTEM

October 2021

US Army Corps of Engineers®
New Orleans District

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SECTION 1
INTRODUCTION

The devastation to New Orleans and the gulf coast from Hurricanes Katrina and Rita included the loss of over 1,800 lives; it temporarily and permanently displaced many thousands of residents and resulted in estimated property damages in excess of $40 billion in New Orleans and as much as $100 billion along the gulf coast. To reduce the risk of hurricane and storm damage in metropolitan New Orleans, the United States Army Corps of Engineers (USACE) embarked on the largest civil works project in the USACE history to increase public safety and reduce property damage from storm surge in southeast Louisiana. The USACE evaluated the individual features of this endeavor through the National Environmental Policy Act (NEPA) Alternative Arrangements process in individual environmental reports (IERs) and documented the overall scale and scope in the Comprehensive Environmental Document (CED). The New Orleans District (CEMVN) was charged with implementing the Greater New Orleans (GNO) 100-year Hurricane Storm Damage Risk Reduction System (HSDRRS) construction effort. However, numerous USACE districts participated in design and planning with input from other Federal and State agencies. A list of abbreviations and acronyms is in Appendix A.

The GNO metropolitan area is in southeast Louisiana, where approximately two-thirds of the land mass is below mean sea level (MSL). In the City of New Orleans, elevations range from +28 feet to -13 feet North Atlantic Vertical Datum 88 (NAVD88). Due to the low elevations, southeast Louisiana is highly susceptible to damage from heavy rain and storm events. Hurricane Betsy, a storm of record, caused substantial damage, making its final landfall near Grand Isle, LA on September 10, 1965. The cyclone propelled damaging storm surge into Lake Pontchartrain, breaching levees in New Orleans and inundating several neighborhoods. Following Hurricane Betsy, Congress authorized the Lake Pontchartrain and Vicinity (LPV) Project in 1965 and later authorized the projects that would become the West Bank and Vicinity (WBV) Project in the 1980s and 1990s. However, due to lack of funding, construction on the system was not complete when Hurricanes Katrina and Rita struck the GNO metropolitan area in 2005, causing unprecedented damage. Hurricane Katrina made landfall as a Category 3 storm, resulting in the catastrophic overtopping and breaching of levees and floodwalls. As a result of the devastation caused by Hurricane Katrina, Congress authorized and funded the $14.6 billion work for hurricane and storm damage risk reduction projects in the GNO areas and southeastern Louisiana. This document addresses the parts of the GNO HSDRRS that make up the 100-year level of risk reduction (LORR) system. (Figure 1-1). The 100-year HSDRRS was designed to provide risk reduction from a hurricane event that would produce a 1 percent (%) annual chance exceedance surge elevation and associated waves. The 100-year HSDRRS will be referred to as "HSDRRS" throughout this document.

This CED is prepared in accordance with the NEPA Emergency Alternative Arrangements approved by the Council on Environmental Quality (CEQ) (Federal Register Volume 72, Number 48, Tuesday, March 13, 2007) and the CEQ's regulations (40 Code of Federal Regulations [CFR] §1500-1508) (1978), as reflected in the USACE Engineering Regulation (ER) 200-2-2. The NEPA Emergency Alternative Arrangements were put in place "to expeditiously complete environmental analysis of major portions of a new 100- year level of Hurricane and Storm Damage Reduction effort authorized and funded by the Administration and the Congress." In light of the emergency nature of the HSDRRS work, the CEQ approved the preparation of the Individual Environmental Reports (IERs), addendums, IER supplementals, and the CED in lieu of traditional environmental assessments (EA), or environmental impact statements (EIS) as allowed by CEQ NEPA Regulations (40 CFR §1506.11) in such circumstances. The Federal Register notice announcing the Emergency Alternative Arrangements for the HSDRRS is in Appendix B.

The USACE has described and analyzed each proposed project related to the construction of the 100-yr HSDRRS in an IER. The target date to complete construction and achieve 100-year level of hurricane and storm damage risk reduction was June 2011. When the NEPA Alternative Arrangements process was outlined in 2007, it was not conceived that design and associated environmental compliance activities would continue well beyond 2011. As a result, CEMVN decided to release the CED in phases. The first phase of the CED (CED Phase I) was released to the public in May 2013 and included a cumulative impact assessment of IERs with a signed decision record by November 15, 2010. The CED Phase I is incorporated by reference into this CED Phase II.

The purpose of the CED is to provide an assessment of the cumulative impacts resulting from the HSDRRS projects completed in the GNO metropolitan area and to analyze the cumulative impacts resulting from the HSDRRS projects in combination with other proposed and reasonably foreseeable future projects in southeast Louisiana. Although this document discusses other Federal and state programs, it is generally focused on the impacts from construction of the 100-yr HSDRRS on the human and natural environments of the GNO metropolitan area.

The scope for the CED is the 100-year HSDRRS which includes the Lake Pontchartrain and Vicinity (LPV) and Westbank and Vicinity (WBV) HSDRRS Projects, inclusive of separately authorized work that is sufficiently linked to these two projects and is needed to achieve the desired LORR. For LPV this includes armoring, repair/replace floodwalls, Permanent Canal Closures and Pumps (PCCP) and Outfall Canals, Inner Harbor Navigation Canal (IHNC) Surge Barrier and IHNC Seabrook Complex. For WBV this includes armoring and reinforcing/replacing floodwalls. This CED integrates the 100-year HSDRRS IERs into a single planning document and contains updated information for IERs that had incomplete or unavailable data at the time the respective IER Decision Record was approved. The "Proposed Action" as described in the IERs are features of the 100-year HSDRRS that are now constructed or are under construction (some mitigation construction is on-going). The 50-year period of analysis as described in the

CED is the same as used for the HSDRRS planning, from 2007 through 2057. Future levee lifts that will be required to continue to meet the 100-year LORR elevations are assessed as reasonably foreseeable future work beyond 2057. Those borrow sites that were not utilized for construction of the 100-year HSDRRS are discussed as sites that could be used for future construction (USACE 2007d, USACE 2008u, and USACE 2009z) whether for the 100-year HSDRRS features or other projects.

The formal termination of the Emergency Alternative Arrangements was announced in the Federal Register (Volume 80, Number 123) on Friday June 26, 2015 (Appendix B). The CEMVN transitioned back to preparing traditional NEPA documents in 2015. Once Alternative Arrangements ended, new 100-year HSDRRS construction and mitigation projects were assessed via EAs. In May of 2018, the CEMVN completed the last major project of the 100-year HSDRRS, the Permanent Canal Closures and Pump Stations on the three Orleans Parish outfall canals. Construction of the last compensatory mitigation project was completed August 2021. All but one armoring of 100-year HSDRRS levees is complete.

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This CED Phase II is the final step to complete the cumulative impacts analysis for the HSDRRS as required by the Alternative Arrangements. This Draft CED Phase II will be distributed for a 60-day public comment period. Once comments are addressed, the Final CED Phase II will be distributed for a 30-day public review period. No sooner than 30 days after the publication of the Final CED, the CEMVN Commander will sign a Record of Decision (ROD). The approved Decision Record will be available to the public and posted on the public website at https://www.mvn.usace.army.mil/Missions/Environmental/NEPA-Compliance-Documents/HSDRRS-Projects/Comprehensive-Environmental-Document/

1.1 PROJECT LOCATION

The 100-year HSDDRS is a 350-mile integrated system located within nine separate sub-basins in southeast Louisiana within the GNO metropolitan area as shown Figure 1-1. These sub-basins are also called polders and at times during design and construction these terms were used interchangeably; however, throughout this document the areas will be called sub-basins.

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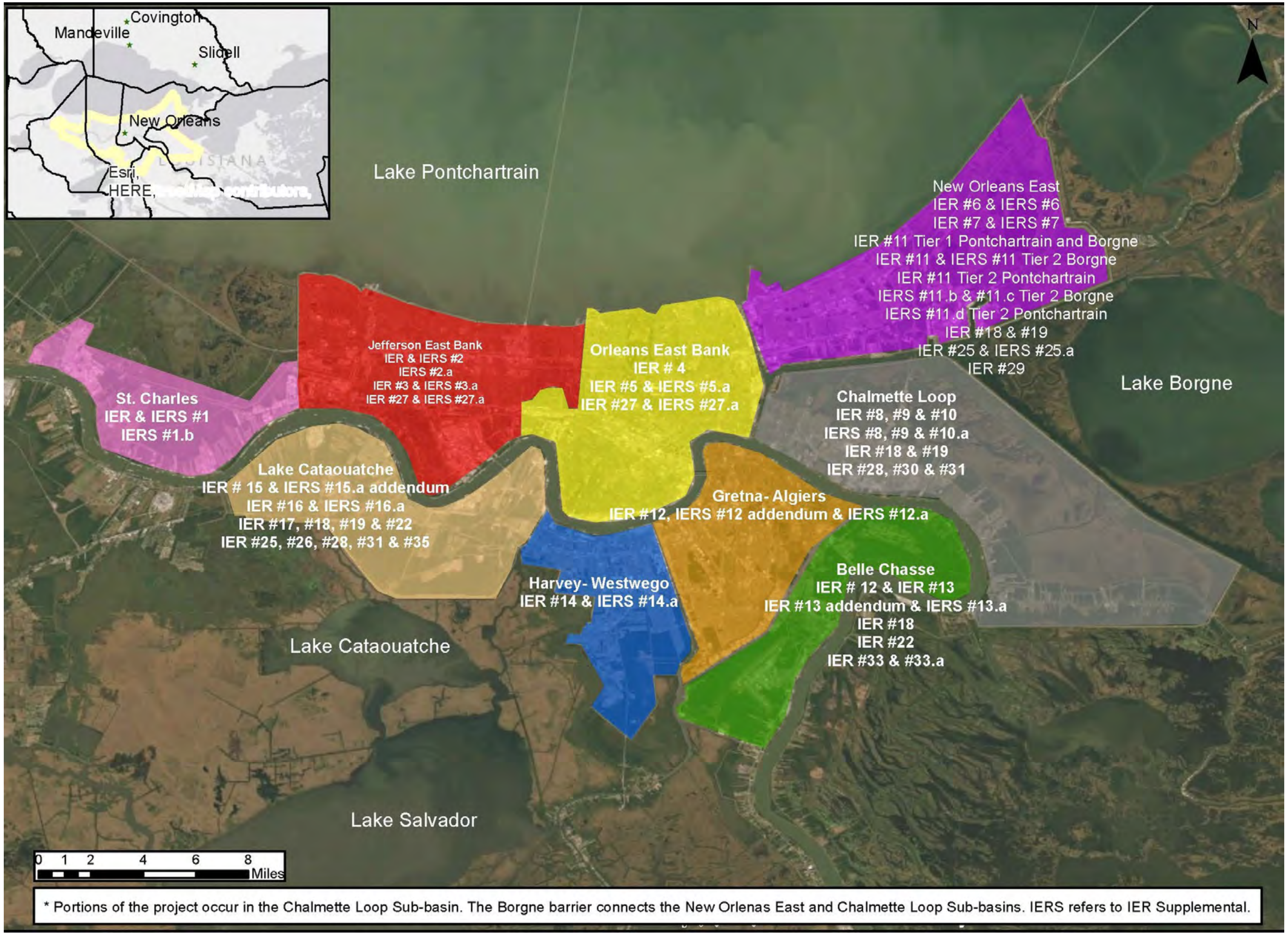

Figure 1-1: Vicinity Map and LPV and WBV IERs by Sub-basin

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The LPV HSDRRS is bounded to the west by the Bonnet Carré Spillway; to the north by the south shore of Lake Pontchartrain; to the east by the Gulf Intracoastal Waterway (GIWW) and the Mississippi River Gulf Outlet (MRGO) and to the south by the Mississippi River. The WBV HSDRRS is bounded to the north by the Mississippi River and to the south by the Western Tie-in and the Lake Cataouatche, Westwego to Harvey and Western Closure Complex levees and the Eastern Tie-In. The LPV and WBV 100-year HSDRRS consists of upgraded levees, floodwalls, closure structures, flood gates (including sector gates), a surge barrier, storm-proofed pump stations, gates structures and pumps (operated only during storm events), and modified drainage structures.

The 100-year HSDRRS consists of two congressionally authorized risk reduction projects (initially referred to as polders in earlier documents) - the Lake Pontchartrain & Vicinity (LPV) and the Westbank & Vicinity (WBV) projects. The LPV components are those located on the east side of the Mississippi River and the WBV components are those located on the west side of the Mississippi River.

Throughout this document, the terms LPV and WBV will be used when discussing the 100-year HSDRRS project components as a group. In accordance with congressional authorization, the HSDRRS is designed to provide the New Orleans region with 100-year level of hurricane and storm damage risk reduction (i.e., a level that reduces the risk of hurricane surge and wave-driven flooding that an area experiences to a 1 percent chance each year). To ensure 100-year LORR from storm surge traveling up the Mississippi River, a portion of the WBV project is co-located (built on top of) a reach of the Mississippi River Levee (MRL), which is part of the Mississippi River and Tributaries (MRT) Project. That 15.5-mile co-located WBV-MRL reach, from River Mile (RM) 70 to RM 85.5 was raised to the 100-year level of risk reduction (LORR) requirements. These WBV- MRL features, along with the existing MRL and perimeter protection from LPV and WBV features form a closed-loop system providing the residents and businesses in the GNO metropolitan area reduced risks from storm events. A series of detailed location maps are available in Appendix C.

The LPV Project components consist of 136.7 miles of structures situated east of the Mississippi River within five sub-basins, as shown in Figure 1-1. The LPV sub-basins are in St. Charles, Jefferson, Orleans, St. Bernard, and Plaquemines parishes. The overall project is designed to provide 100-year LORR to residents between Lake Ponchartrain and the Mississippi River levee from storm-driven surges primarily from Lake Pontchartrain and Lake Borgne. At the western terminus of the levee system in St. Charles Parish (Bonnet Carré Spillway East Guide Levee), there is an earthen levee that proceeds east along the north side of Airline Highway (U.S. Highway 61) to the Jefferson St. Charles Parish boundary and includes control structures and a pump station. In Jefferson Parish, there is a concrete floodwall along the Jefferson-St. Charles Parish line and an earthen levee along the Jefferson Parish Lakefront, which includes floodgates and pump stations. In Orleans Parish, the earthen levee is located along the shoreline of Lake Pontchartrain with parallel protection (levees, floodwalls, and floodgates) along three outfall canals (17th Street, Orleans Avenue, and London Avenue). Three permanent canal closures and pump stations are located, at the mouths of the 17th Street, Orleans Avenue, and London Avenue outfall canals. A series of earthen levees/floodwalls comprise the HSDRSS from the New Orleans Lakefront to the Gulf Intracoastal Waterway (GIWW) and include the Seabrook Floodgate Complex and portions of the Borgne Barrier. In St. Bernard Parish, the Inner Harbor Navigation Canal (IHNC)/GIWW floodwalls tie into levee segments that run parallel to the now de-authorized portion of the Mississippi River Gulf Outlet (MRGO) and tie-into the Mississippi River Levee in Plaquemines Parish. It also includes a sector gate at Bayou Dupre. Fronting protection and backflow prevention were used at numerous non-Federal pump stations in Orleans and Jefferson Parishes as part of the LPV portion of the HSDRRS. The levee heights are as follows:

- Maximum levee elevation for St Charles sub-basin is 16.5-ft.
- Maximum levee elevation for East Jeff sub-basin is 16.5-ft.
- Maximum levee elevation for Orleans East Bank sub-basin is 16.5-ft.
- Maximum levee elevation for New Orleans East sub-basin is 27.5-ft.
- Chalmette Loop sub-basin – there are no levees in this sub-basin. Floodwall maximum elevation is 31.5-ft.

All elevations for structures described are relative to mean sea level (msl) in the NAVD 88, unless otherwise indicated. The LPV Project components, such as levee and floodwall reinforcements and drainage enhancements, are discussed in Section 2.2 and illustrated in Appendix C (Location Maps 1 to 16).

The WBV Project components consists of 76.4 miles situated on the west bank of the Mississippi River within four sub-basins as shown in Figure 1-1. The WBV sub-basins are in St. Charles, Orleans, Jefferson, and Plaquemines parishes. The overall mission of the WBV components is to reduce the risk of storm surge from Lake Cataouatche, Lake Salvador, and other waterways leading to the Gulf of Mexico. In general, the existing project features were replaced, raised, or enhanced to achieve the 100-year storm risk reduction. More specifically, the Oakville Levee (eastern tie-in) connected the WBV to the MRT levees, which provide an HSDRRS "closure" of the risk reduction loop on the west bank. Levees at Hero Canal, Algiers Canal, Westwego to Harvey, and Lake Cataouatche were brought to 100-year risk reduction design standards. In addition, floodwalls throughout the west bank (such as at Bayou Segnette and Company Canal) were replaced and a closure complex called the Gulf Intracoastal Waterway West Closure Complex was constructed, which consists of a streamlined surge barrier, floodwall, levee alignment, sluice gates, sector gate, and pump station. Fronting protection and backflow prevention was also used at numerous non-Federal pump stations in Orleans, Jefferson, and Plaquemines parishes as part of the WBV portion of the HSDRRS.

The WBV projects include the construction of levees, floodwalls, floodgates, and a sector gate/pump station complex. These projects are discussed in Section 2.2 and illustrated in Appendix C (Location Maps 17 to 23). The levee heights within the sub-basins are as follows:

- Maximum levee elevation for Belle Chasse sub-basin is 15.0-ft.
- Maximum levee elevation for Gretna-Algiers sub-basin is 9.0-ft.
- Maximum levee elevation for Harvey-Westwego sub-basin is 14.0-ft.
- Maximum levee elevation for Lake Cat sub-basin is 14.5-ft.

BORROW

In 2007, the USACE began an unprecedented search for suitable material to rebuild and reinforce the HSDRRS in the GNO metropolitan area. It was originally estimated that the HSDRRS construction borrow requirement would amount to approximately 93 million cubic yards (mcy) of material. However, now that construction is complete, the HSDRRS construction of components such as earthen levees only required approximately 17 mcy of borrow material. Approximately 72 borrow sites within and surrounding the GNO metropolitan area were evaluated for potential use. The borrow sites are in twelve parishes in Louisiana, and one county in Mississippi (Figure 1-2). However, of those borrow sites investigated, only twenty-one borrow sites were excavated for construction. The additional borrow material required to raise the levees through a series of lifts through the 50-year project life (2007 – 2057) is projected to be approximately 9 mcy of borrow. Borrow location maps are in Appendix C.

1.2 PURPOSE, NEED, AND AUTHORITY

Purpose and Need

One of the greatest concerns throughout the GNO metropolitan area following Hurricane Katrina was how to reduce the risk of hurricane, storm, and flood damage for businesses and residences and increase public safety during major storm events. An integrated, comprehensive, and system-based approach to hurricane and storm damage risk reduction was needed to implement the new 100-year LORR authorized and funded by Congress. The 100-year HSDRRS was developed to achieve this goal.

Authority

Congress enacted legislation through a series of supplemental appropriation acts following Hurricanes Katrina and Rita to restore, replace, reinforce, armor, and accelerate completion of the risk reduction system damaged by the storms, and provided additional authority to the USACE to raise levee heights, enhance and construct new risk reduction components to achieve the 100-year LORR. Since the 2005 hurricane season, multiple supplemental appropriations were authorized for the 100-year HSDRRS work, and included:

- The U.S. Department of Defense (DoD), Emergency Supplemental Appropriations to Address Hurricanes in the Gulf of Mexico and Pandemic.

- Influenza Act of 2006 (3rd Supplemental - PL 109-148, Chapter 3, Construction, and Flood Control and Coastal Emergencies) authorized accelerated completion of the LPV and WBV projects and restoration of project features to design elevations at 100 percent Federal cost.

- The Emergency Supplemental Appropriations Act for Defense, the Global War on Terror, and Hurricane Recovery Act of 2006 (4th Supplemental - PL 109-234, Title II, Chapter 3, Construction, and Flood Control and Coastal Emergencies) authorized construction of the level of risk reduction necessary to achieve the certification required for participation in the National Flood Insurance Program, and other risk reduction measures such as the replacement or reinforcement of floodwalls, and armoring critical elements of the LPV and WBV projects.

- U.S. Troop Readiness, Veterans' Care, Katrina Recovery, and Iraq Accountability Appropriations Acts of 2007 (PL 110-28, Title IV, Chapter 3, Flood Control and Coastal Emergencies Section 4302) (5th Supplemental)

- Supplemental Appropriations Act, 2008 (6th Supplemental) (PL 110-252 Title III, Chapter 3, Construction)

- Consolidated Security, Disaster Assistance, and Continuing Appropriations Act of 2009 (PL 110-329), also called the 7th Supplemental.

The Water Resources and Reform Development Act (WRRDA) of 2014 (Public Law 113-121) Section 3017 authorizes the USACE to carry out measures that address consolidation, settlement, subsidence, sea level rise, and new datum to restore certain federally authorized hurricane and storm damage reduction projects to their authorized levels of protection, if it determines the necessary work is technically feasible, environmentally acceptable, and economically justified. The authority of Section 3017 to study and construct risk reduction measures terminates 10 years after the date of enactment of WRRDA 2014 on 10 June 2024. Projects covered by WRRDA 2014, Section 3017 include LPV and WBV.

Section 2013 of the WRRDA 2014 provides that the USACE shall be responsible for the operation and maintenance (O&M), including repair of the Inner Harbor Navigation Canal Surge Barrier (barge gate and sector gates crossing the GIWW); GIWW Western Closure Complex sector gates, sluice gates, and pump station; and sector gates and pump station on the Harvey Canal. The non-Federal share of the cost of operation, maintenance, repair, rehabilitation, and replacement of any structure pursuant to Section 2013 of WRRDA 2014 is 35 percent. While Section 2013 provides that the USACE is responsible for operations and maintenance, including repair, of these HSDRRS features, no funds have been appropriated for this purpose.

Figure 1-2: Parishes with Borrow Sites Located Inside and Outside of the HSDRRS

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1.3 PUBLIC SCOPING

A scoping meeting was held September 2, 2009. Scoping comments were transcribed as expressed in the meeting. Comments received and the USACE responses are in Appendix E. Comments ranged from concerns related to environmental justice, induced development, public safety, insurance, transportation, global warming, cost sharing of mitigation.

1.4 PUBLIC CONCERNS

The foremost public concern expressed was regarding reducing the risk of hurricane, storm and flood damage for businesses and residences, and enhancing public safety during major storm events in the Greater New Orleans metropolitan area. Comments and responses for each of the NEPA documents are available at https://www.mvn.usace.army.mil/HSDRRS-Projects/. Comments received on this CED Phase II and CEMVN responses to those comments are included in Appendix D.

1.5 HYDRAULIC ANALYSIS FOR THE HSDRRS

The Interagency Performance Evaluation Team (IPET) evaluated the performance of the LPV and WBV projects as they existed at the time of Hurricane Katrina. In 2006, the IPET published the report *Performance Evaluation of the New Orleans and Southeast Louisiana Hurricane Protection System* which determined the facts concerning the performance of the existing hurricane protection system during Hurricane Katrina in August 2005. The information gained provided a body of knowledge to assist in planning and designing more effective risk reduction features in the future. A state-of-the-art modeling/analysis approach was developed in 2006-2010 by a multi-agency team of experts to estimate the surge hazard for the Louisiana coast and design a new risk reduction system, incorporating the risk-based framework recommended in the IPET Report. The LPV/WBV HSDRRS is authorized to reduce the risk associated with a surge and wave event with a 1% chance of occurring in any given year. In order to estimate the surge and wave hazard facing the LPV/WBV HSDRRS, statistical data to sufficiently address the 1% chance exceedance surge and wave event was established. One hundred fifty-two (152) storms were selected to expand the limited historical data record (~50 years) and statistically represent the full probabilistic space of storms expected to occur. Using state-of-the-art hydrodynamic modeling software, including Advanced CIRCulation (ADCIRC), the surge and wave responses were generated for all 152 synthetic storms for thousands of locations along the coast of Louisiana. Using the Joint Probability Method – Optimal Sampling (JPM-OS) statistical methodology,100-year and 500-year surges (and associated waves) and uncertainty were developed for each location along the coast. Design elevations for the 100-year HSDRRS were based on these modeling efforts.

In 2012, after Hurricane Isaac, the USACE produced a report titled "*Hurricane Isaac With and Without 2012 100-YEAR HSDRRS Evaluation*" that documented the effects of the 100-year HSDRRS on the surrounding communities during Hurricane Isaac. The Hurricane Isaac model simulations showed that any changes of water level due to the construction of the 100-year HSDRRS system, as it existed in 2012, are 0.4 ft or less at communities outside the system. To further address the issue of flooding outside the 100-year HSDRRS during hurricane surge events, additional modeling was conducted as part of the evaluation of the 100-year HSDRRS effects for the CED. The analysis evaluated the projected storm surge levels in areas outside the LPV and WBV areas comparing the following scenarios: the levee system existed in the year 1965 (pre-Betsy, pre-Federal levees), in 2005 (pre-Katrina) and in 2012 (post-100-year HSDRRS construction). The analysis describes and evaluates the past, present and potential cumulative storm surge impacts of the completed 100-year HSDRRS on the surrounding areas. The impacts to surge elevations vary by location, with the largest impacts in the immediate vicinity of the 100-year HSDRRS. At the IHNC Surge Barrier, a 2.8 ft increase in 100-yr surge levels can be attributed to the effect of the 100-year HSDRRS as compared to the 1965 pre-Betsy levee system. The analysis shows a 1.2 ft increase in the100-year water level at Venetian Isles, New Orleans, LA, which is located near the IHNC Surge Barrier. The effects of the system decrease with increased distance from the major levees and structures. At Eden Isle, Slidell, LA, a 0.2 ft increase to the 100-year water level was estimated.

The final reports, titled "An Evaluation of Storm Surge in Areas Outside the Greater New Orleans Hurricane and Storm Damage Risk Reduction System" and the "Sensitivity Analysis of Relative Sea Level Rise on Gate Closure Frequency for Lake Pontchartrain and Vicinity/West Bank and Vicinity 1% Hurricane and Storm Damage Risk Reduction System" are included in Appendix T.

1.6 INDEPENDENT EXTERNAL PEER REVIEW

It is the USACE policy that all its planning, engineering and scientific work undergo an open, dynamic, and rigorous review process. Technical, scientific and engineering information that is relied upon to support recommendations in decision documents or form the basis of designs, specifications and/or operation & maintenance (O&M) requirements are reviewed to ensure technical quality and practical application (refence Engineering Circular (EC) 1165-2-214, dated 15 December 2012). The purpose of the independent external peer review (IEPR) is to provide the Chief of Engineers with an independent assessment of the project or work product. Including the panel's assessment of the adequacy and acceptability of the economic, engineering, environmental methods, models, data, and analyses used, as well as the range of alternatives, and the adequacy of risk and uncertainty analyses. The USACE review process is based on a few simple but fundamental principles:

(1) Peer review is key to high quality decision and implementation documents. Reviews have significantly contributed to improved quality of work in the planning, design, and construction of projects.
(2) Reviews shall be scalable, deliberate, life cycle and concurrent with normal business processes.
(3) A review performed outside the "home" district, shall be completed on all decision and implementation documents. For other products, a risk-informed decision will be made on whether to perform such a review.

(4) Selection of review panel members for IEPR efforts will adhere to the National Academy of Science (NAS) Policy on Committee Composition and Balance and Conflicts of Interest, which sets the standard for “independence” in review process and complexity in a national context; and
(5) Consistent review policy shall be applied to all civil works work products.

The USACE developed a peer review plan to provide a technical peer review mechanism for the HSDRRS as required under the WRDA of 2007, dated Nov 8, 2007. WRDA 2007 includes three provisions that fall under the umbrella of IEPR.

(1) Section 2034 of WRDA 2007, titled “Independent Peer Review”, applies to project studies. Project studies may be subject to a peer review by an independent panel of experts under certain conditions.
(2) Section 2035 of WRDA 2007, titled “Safety Assurance Review”, addresses requirements for the design and construction activities for hurricane and storm damage reduction and flood damage reduction projects. The Chief of Engineers shall ensure that the design and construction activities for hurricane and storm damage reduction and flood damage reduction projects are reviewed by independent experts under this section if the Chief of Engineers determines that a review by independent experts is necessary to assure public health, safety, and welfare.
(3) Section 7009 of WRDA 2007, titled “Independent Review”, establishes a council to be known as the Louisiana Water Resources Council (LWRC), which shall serve as the exclusive peer review panel for activities conducted by the USACE in areas of Louisiana declared as major disaster areas after Hurricanes Katrina and Rita in 2005, in accordance with requirements of Section 2034.

The initial HSDRRS IEPR Plan was approved by USACE Headquarters September 19, 2008. Since that time, the plan has been revised twice. The first revision, dated October 22, 2008, eliminated duplicate features and refocused the review to a higher level of unique features; focused on innovative techniques, design assumptions and changes through project phases (design, construction, operations and maintenance, and monitoring); and added new requirements that deviated from design guidelines. The second revision to the review plan, dated December 6, 2012, was made to evaluate nine unique features/activities and seven system application documents. The final review plan was approved by USACE Headquarters December 12, 2012. The review plan included input from the State of Louisiana, the CPRAB, the Southeast Louisiana Flood Protection Authority – East, the Southeast Louisiana Flood Protection Authority – West, and the levee districts under the supervision of the Southeast Louisiana Flood Protection Authorities.

Battelle Memorial Institute (hereafter Battelle), as a 501(c)(3) nonprofit science and technology organization, was engaged early on to coordinate the IEPR of the HSDRRS Design Guidelines. Battelle selected IEPR panel members using a policy developed by the National Academy of Science to ensure that the reviewers had no conflicts of interest with the projects they were reviewing (USACE 2008a).

In accordance with Section 7009 of WRDA 2007, the LWRC was established on September 28, 2010, to serve as the exclusive peer review panel for the disaster recovery activities in the State of Louisiana. This council is responsible for peer reviewing activities conducted by the USACE in areas of Louisiana declared as major disaster areas after Hurricanes Katrina and Rita in 2005, in accordance with requirements of Section 2034 and 2035.

The criteria for designing and constructing the GNO HSDRRS levees and structures are based on the HSDRRS Design Guidelines, which is a vital component of the system. The Design Guidelines underwent a rigorous review by Battelle. When developing the scope for the review of specific features or products, one of the requirements was to ensure that the design was consistent with the HSDRRS Design Guidelines and standard practices for safety assurance reviews. It was critical for the reviewers to have the knowledge and familiarity of the Design Guidelines; therefore, it was recommended that ongoing and new reviews of the HSDRRS products/features continue under Battelle instead of under the LWRC. It was decided that the LWRC would peer review all non-HSDRRS projects or products, as well as the HSDRRS environmental mitigation projects, the New Orleans to Venice Federal Project, and the Plaquemines Parish Non-Federal Levee Project.

In accordance with Section 2035, IEPR efforts included the review of design and construction activities prior to the initiation of physical construction and periodically thereafter. Peer review during construction included observation and comment on the critical construction elements of the project. Since January 2010, IEPR has been conducted in accordance with EC 1165-2-209.

Unique activities and plan system application documents identified in the IEPR Plan for review by the IEPR team are listed in Table 1-1

Table 1-1: Unique Activities and Plan System Application IEPR Documents

Identified Unique Activities	Approved
PCCP 01-17th Street Closure and Pumps: Orleans Avenue Closure and Pumps; London Avenue Closure and Pumps	pending MVD approval
GNOHSDRRS Lake Pontchartrain and Vicinity 111.01 - CSX Railroad to Michoud Canal (Deep Soil Mixing Design Guidelines)	14-Jul-11
West Bank and Vicinity, LA (WBV) Gulf Intracoastal Waterway - West Closure Complex (GIWW-WCC)	23-Aug-14
GNOHSDRRS Crossings with I-10 and I-310, Lake Pontchartrain and Vicinity 03.2a and 06e.2	15-Jan-14
GNOHSDRRS Lake Pontchartrain & Vicinity 109.02a - New Orleans East Levee, Southpoint to CSX Railroad	18-Mar-13
LPV 145 – Bayou Bienvenue to Bayou Dupre	24-May-13
Pre-Post Isaac Modeling	15-Feb-13
GNOHSDRRS West Bank and Vicinity - 14.e.2 - V-Line Levee, East of Vertex-Phase 2	9-May-13
GNO HSDRRS West Bank and Vicinity (WBV) 14c.2, New Westwego Pump Station to Orleans Village, 3rd Enlargement, Phase I	20-May-15

Greater New Orleans HSDRRS Inner Harbor Navigation Canal (IHNC-02), Lake Borgne Protection Project	28-May-15
Final Independent External Peer Review Report Decision and Implementation Documents for Environmental Mitigation for Lake Pontchartrain and Vicinity, HSDRRS Louisiana	21-Feb-14
IEPR Report for the Decision and Implementation Documents for Environmental Mitigation for the West Bank & Vicinity, New Orleans, Louisiana, HSDRRS	26-Aug-14
Plan System Application	
GNOHSDRRS Design Guidelines	14-Sep-15
GNOHSDRRS Armoring Research Summary and Armoring Guidance Manual	6-Oct-14
Phase IV Report of Spiral Welded Pipe Piles for Coastal Structures	22-Sep-11
Aberrant Barge Impact Loads on Hurricane and Storm Damage Risk Reduction System Floodwalls	31-Oct-11
HSDRRS - Design Elevation Report and Addendum	1-Aug-14
Harvey & Algiers Canal 100-year Alternative	4-Oct-13

The IEPR Plan Unique Activities, System Application Documents and Process documents are available at https://www.mvn.usace.army.mil/Project-Review-Plans/

1.7 DATA GAPS AND UNCERTAINTIES

To meet the aggressive June 2011 construction timetable, many IERs were released with data gaps in which impacts may not have been fully understood or engineering evaluations were incomplete or subject to change. Table 1-2 lists the IERs with specific data gaps and where the assessment of the gaps is addressed.

Table 1-2: Specific Data Gaps by IER

CED Phase II	IER[1]	Data Gap	Assessed
		Risk Reduction	
	IER #7	Monitoring of submerged aquatic vegetation	Section 5.3.2.2
	IER #11 Tier 1 Pontchartrain and Borgne	Results from the Engineer Research and Development Center (ERDC) hydrologic modeling efforts which are currently underway for the project area. Phase II Cultural Resource Investigation of suspected high potential sites. Consultation with SHPO and Indian Tribes to occur in Tier 2 NEPA document. Maintain a water flow capacity that is comparable to the waterway's capacity prior to construction. Maintain a water flow capacity that is comparable to the waterway's capacity prior to construction.	Tier 2 document assessed design changes
*	IER #11 Tier 2 Pontchartrain	Monitoring of dissolved oxygen levels and impacts on aquatic resources and fisheries. If the results of monitoring demonstrate the need for additional hydrologic modeling to address impacts, USACE will complete the additional modeling to evaluate alternatives for rectification or mitigation to offset adverse impacts within authorization and funding limits.	Section 5.3.2.2 and Appendix G

CED Phase II	IER[1]	Data Gap	Assessed
	IER #11 Tier 2 Borgne	Safe water elevation (SWE) studies were underway for the existing levees and floodwalls on the IHNC and GIWW between Lake Pontchartrain and the proposed action. The study was conducted to determine whether any modifications or remedial actions were necessary to ensure that the levees and floodwalls meet current design criteria and future conditions with a barrier at Seabrook and within the Borgne 1 location range.	Section 5.3.2.2
	IER #12	Study augmenting the Bayou aux Carpes Clean Water Act (CWA) Section 404(c) area to avoid or minimize ecological impacts from the HSDRRS. SEA #581 evaluated augmentation measures. The BAC Site Augmentation Measures Evaluation Report is attached to SEA #581 as Appendix 7.	Section 5.3.2.2 and 5.3.6.1
	IER #15	Contractor-furnished borrow source.	Contractor-furnished borrow IER
	IER #16	Contractor-furnished borrow source	Contractor-furnished borrow IER
	IER #17	Contractor-furnished borrow	Contractor-furnished borrow IER
*	EA 550	Unknown amount of borrow available in borrow sites, which borrow sites the requester might utilize therefore transportation impacts are unknown and would be addressed in CED	Appendix F Transportation Report
*	EA 549	Unknown amount of borrow available in borrow sites, which borrow sites the requester might utilize therefore transportation impacts are unknown and would be addressed in CED	Appendix F Transportation Report
Borrow			
	IER #18	Borrow pit requires archaeological monitoring	Section 4.2.9 and 5.3.1.14

[1] Data gaps were addressed in CED Phase I

Data gaps consistent among the IERs includes:

- Engineering evaluations and design: Due to the emergency nature of the effort, most of the IERs were finalized before design and engineering evaluations were 100% complete. Once engineering evaluations and design were finalized, any substantial changes were addressed in subsequent supplementals to the IER. Impacts resulting from the changes are discussed within Section 4 by relevant resource.

- Socioeconomics and Environmental Justice: Various IERs had limited discussion of demographic and income data, along with pertinent maps, tables, and photographs. Socioeconomics and environmental justice data satisfying this issue are found in section 4.2.14.

- Visual, Air Quality, Noise Impacts: Most of the borrow IERs lacked specific information concerning noise, air quality and visual impacts. It was determined at that time that impacts once known would be discussed in the CED. Impact discussions for these resources are in Section 4.2.10, .2.11, and 4.2.12 respectively.

- Geotechnical data: For many borrow IERs, geotechnical evaluations had not been completed, thus final footprints for the borrow areas varied based on the completed evaluations.

- Transportation: The proposed action in most IERs, as well as borrow IERs, could not definitively identify access routes to the construction areas. A transportation study was conducted in 2009 to determine transportation impacts. The transportation analysis was updated with actual data from completed project construction, such as distance traveled to transport materials during construction, lane and road closures, number of truck trips, and material transport methods. The information was collected from construction documents, such as narrative completion reports, pay estimates, material receipts, discussions with Project Engineers, Construction Managers, and best professional judgement. The 2015 Transportation Report is included in the Appendix F. Other transportation information can be found in section 4.2.13.

- Mitigation: All approved IER Decision Records stated that the USACE would provide a final mitigation plan. A summary of the mitigation plan is included in Section 5.2 of this document. The construction of mitigation could be impacted by tropical storms, increased sea level rise, climate change, errors in analysis and implementation. Upon completion of as-builts a final reassessment will be conducted to ensure all impacts from constructing HSDRRS are fully mitigated. Adaptive management and monitoring will also help to ensure full mitigation for HSDRRS impacts are achieved.

- Cumulative Impacts Analysis: The cumulative impact analysis for 100-year HSDRRS work is the purpose of this document.

1.8 NATIONAL FLOOD INSURANCE PROGRAM

The completed HSDRRS achieves the levels of risk reduction for storm surge and waves that are necessary for certification for the National Flood Insurance Program (NFIP). The NFIP is managed by the Federal Emergency Management Agency (FEMA) and contains three main components: flood insurance, floodplain management, and flood hazard mapping. FEMA notified CEMVN by letter dated February 20, 2014, that the completed HSDRRS, which provides the 1 percent annual chance exceedance flood risk reduction (also referred to as the 100-year LORR) achieved the levels of risk reduction for storm surge and waves necessary for the certification required to participate in the NFIP (Appendix B). The 1 percent annual chance exceedance flood is the standard for the NFIP and is used to administer floodplain management programs.

FEMA designated areas within the 100-year HSDRRS as a Zone X, or moderate risk zone (http://www.fema.gov/), indicating that flood risk still exists even where a levee in place meets the NFIP requirements. Flood risk management measures, such as elevating structures, maintaining current warning systems and evacuation plans, and wisely managing floodplain development minimize this residual risk. An area that is subject to inundation by the 1 percent annual chance exceedance flood could be mapped as a high risk, or special flood hazard, area on the flood insurance rate map (FIRM).

An NFIP levee system certification evaluation focuses only on the 1 percent annual chance exceedance flood, which is a FEMA flood insurance standard, not a public safety standard. The 100-year HSDRRS provides 100-year storm damage risk reduction through a variety of structures designed to withstand the height of the 100-year storm surge water level, wave run-up, and associated uncertainties. The 100-year HSDRRS does not address or improve interior forced drainage of excess rainfall within the project area; therefore, the HSDRRS does not provide risk reduction from a 100-year flood event, which has a 1 percent chance of occurring each year at a given location based on rainfall. The 100-year flood event is also influenced by interior drainage, pumping capacities, and river levees and floodwalls.

1.9 CED PHASE I

The Draft CED Phase I was completed May 2013 and released for a 30-day public review period, which ended June 28, 2013. Draft CED Phase I evaluated cumulative impacts for the 100-year HSDRRS components addressed in and incorporated information from IERs and Supplemental IERs completed as of November 15, 2010. As of that date, forty IER Decision Records had been signed. See Draft CED Phase I, Appendix I. In the Draft CED Phase I, the cumulative impacts assessment concluded that there have been short-term, temporary impacts to transportation, noise, air quality, and aesthetics, and regional cumulative long-term permanent impacts to soils, including prime farmland soils, wildlife habitat, wetlands and bottomland hardwoods (BLH).

SECTION 2

DESCRIPTION OF THE 100-YEAR HSDRRS

The 100-year HSDRRS is composed of components located on the east (LPV features) and west (WBV features) banks of the Mississippi River in the GNO metropolitan area. The HSDRRS project area consists of nine separate sub-basins encompassing parts of St. Charles, Jefferson, Orleans, St. Bernard, and Plaquemines parishes as shown in figure 1-2). The risk reduction structures addressed by the IERs consist of approximately 213 miles of levees, floodwalls, floodgates, sector gates, closure structures, and pump station structures.

2.1 ALTERNATIVES DEVELOPMENT

CEMVN employed an integrated, comprehensive, and systems-based approach in designing the HSDRRS; as such, each reach had its own range of alternatives based on the area's specific design requirements to meet the 100-year LORR.

As stated in Section 1, the 100-year LORR means reduced risk from a storm surge that has a 1 percent chance of occurring or being exceeded in any given year. The 1 percent chance is based on the combined chances of a storm of a certain size and intensity (pressure) following a certain track. Different combinations of size, intensity and track can result in a 100-year surge event. Experts used computers to generate models of 152 different hurricanes with a wide variety of paths, forward speeds, rainfall volumes, intensities, and physical size (radius). Supercomputers then calculated the conditions that would result from these 152 theoretical storms. This data allowed the Corps to estimate the amount of surge and waves that would be produced by various storms in the GNO metropolitan area. The surge and wave data were then used as the basis for determining the structural specifications (height, elevation, etc.) required for the HSDRRS. Designs were based on calculations that involved still water levels, storm surge, and wave run-up.

Levees were built to provide the 100-year LORR. Structural superiority is incorporated in the design elevation for those structures that would be very difficult to rebuild, if damaged, due to disruption in services. Examples where structural superiority is factored into the design are major highway and railroad flood gates that require detours, pumping station fronting protection where repairs would require reductions to pumping capacity, and sector gated structures. These structures are constructed to the 2057 levels plus 1-2 foot for structural superiority. Floodwalls that may be reconstructed in areas with little or no disruption of services were constructed to the 2057 level.

These factors were considered at each site so that the resulting levee or floodwall was built not only to the correct height to achieve the 1% LORR, but also had the right shape, and slope for its location. For more information on the design guidelines refer to https://www.mvn.usace.army.mil/Hurricane-Design-Guidelines/

The NEPA requires that a Federal agency consider an alternative of "no action" in addition to the proposed action and other reasonable alternatives. Section 73 of the WRDA of 1974 (PL 93-251) requires the USACE consider non-structural measures to reduce or prevent flood damage; therefore, both a "No Action" alternative and a non-structural alternative were considered for each reach of the system. In addition to the alternatives mandated by the NEPA and WRDA, a range of reasonable "action" alternatives that met the project's purpose and need were formulated through input by the project delivery team, value engineering team, engineering and design consultants, affected local governments, the public, and resource agencies for specific HSDRRS alignments. Typically, the "action" alternatives were composed of alternative alignments for that specific reach. Scales of effect were considered to evaluate various alternatives that could be used within a given reach. The alternatives were evaluated for cost effectiveness, engineering effectiveness, environmental protection, and social acceptability.

Once a full range of alternatives was established for each reach, the USACE used the alternatives evaluation process (AEP), a systematic process, for recommending a preferred alternative or "proposed action" (USACE 2008f) to evaluate the alternatives. Alternatives formulated included both structural and non-structural measures. Those alternatives that did not adequately meet the above criteria were considered infeasible and eliminated from further study (USACE 2008f). Reaches were identified by a project identification number that included the authorized project component descriptor (LPV or WBV) and a numerical descriptor. All reasonable action alternatives were evaluated for each reach (i.e., LPV-106) and for entire alignments within each sub-basin (i.e., Chalmette Loop). This reach-based analysis allowed for individual reach alternative decisions to be made in a manner cognizant of unique local circumstances. At the same time, the alternatives analysis and selection remained integrated and comprehensive, considering reaches in relation to one another and other past, present, and reasonably foreseeable future actions. For a full description of the AEP process and the development of alternatives for each component and reach, refer to the CED Phase I.

2.2 NO ACTION ALTERNATIVE

Under the No Action Alternative, the 100-year HSDRRS would be rebuilt to the previously authorized elevations using current design criteria (as authorized under the Flood Control Act of 1965, PL 89-288, Title II, Section 204) rather than to the 100-year LORR. Maintenance of all existing components and structures would continue as identified in previous approved documents. The level of hurricane and storm damage risk reduction would not change within the nine sub-basins. Each IER described the No Action Alternative to provide a baseline for comparison of impacts on relevant resources. Although considered through the AEP, the No Action Alternative was not chosen as the selected plan in any of the IERs.

2.3 APPROVED ACTIONS

A total of 66 IERs, supplemental IERs and mitigation EAs were approved. The proposed actions as discussed in the IERs are now constructed, fully operational and providing the 100-year LORR since September 2011. The general IER project locations are illustrated in Figure 1-1 and 1-2. Location maps of the project alignments are in Appendix C. Table 2-1 lists the IERs with a hyperlink to the final documents for further information.

- IERs 1-17 assessed impacts of the risk reduction features for LPV and WBV HSDRRS.
- IERs 27 and 27a assessed impacts of the outfall canal remediation project.
- IERs 33 and 33a assessed impacts of the WBV-MRL Engineered Alternative Measures and Resilient Features co-located levee feature.
- IERs 18 – 35 (excluding nos. 20, 21, 24 and 34) assessed impacts associated with both government- and contractor- furnished borrow sites and a stockpile site. Seventy-two borrow sites located in twelve parishes in Louisiana, and one county in Mississippi were evaluated.
- Programmatic IERs (PIERs) 36 and 37 assessed the programmatic mitigation plans for the LPV and WBV, respectively. Specific mitigation sites were further assessed through tiered IERs/EAs.
- Supplemental NEPA documents assessed changes that occurred in the project engineering and design or project location.

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Figure 2-1: Need Title

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Table 2-1: List of Alternative Arrangement Documents

IER, IERS, EA	Basin	Sub-Basin	Parish	Title	Decision Record
1 S #1. a *S #1. b	LPV	St. Charles	St. Charles	La Branche Wetlands Levee https://www.mvn.usace.army.mil/LaBranche-Wetlands-Levee/	9-Jun-2008 29-Jun-2009 6-Jul-2011
#2 S #2 *S #2. a	LPV	Jefferson East Bank (EB)	St. Charles, Jefferson	West Return Floodwall https://www.mvn.usace.army.mil/West-Return-Floodwall	18-Jul-2008 29-Oct-2009 9-Feb-2012
#3 S #3. a	LPV	Jefferson EB	Jefferson	Lakefront Levee https://www.mvn.usace.army.mil/Lakefront-Levee	25-Jul-2008 18-Dec-2009
#4	LPV	Orleans EB	Orleans	New Orleans Lakefront Levee, West of Inner Harbor Navigation Canal https://www.mvn.usace.army.mil/New-Orleans-Lakefront-Levee	19-Mar-2009
#5 *S #5. a	LPV	Orleans EB	Orleans	Outfall Canal Closure Structures, 17th Street Canal, Orleans Avenue Canal and London Avenue Canal https://www.mvn.usace.army.mil/Permanent-Protection-System	30-Jun-2009 30-Jun-2014
#6 S #6	LPV	New Orleans East	Orleans	Citrus Lakefront Levee https://www.mvn.usace.army.mil/Citrus-Lakefront-Levee	25-Jun-2009 8-Feb-2010
#7 S #7	LPV	New Orleans East	Orleans	New Orleans East Lakefront to Michoud Canal https://www.mvn.usace.army.mil/New-Orleans-East-Levee	19-Jun-2009 3-May-2010
#8	LPV	Chalmette Loop	St. Bernard	Bayou Dupre Control Structure https://www.mvn.usace.army.mil/Bayou-Bienvenue-Bayou-Dupre-Control-Structures	23-Jun-2009
#9	LPV	Chalmette Loop	St. Bernard	Caernarvon Floodwall https://www.mvn.usace.army.mil/IER-9	8-Feb-2010
#10 *S #8,9,10. a	LPV	Chalmette Loop	St. Bernard	Chalmette Loop Levee https://www.mvn.usace.army.mil/Chalmette-Loop-Levee	26-May-2009 20-Mar-2013
#11 Tier 1 Pontchartrain and Borgne #11 Tier 2 Borgne S #11 Tier 2 Borgne #11 Tier 2 Pontchartrain *S #11. b Tier 2 Borgne S #11.c Tier 2 Borgne S #11. d Tier 2 Pontchartrain	LPV	New Orleans East	Orleans	Improved Protection on the Inner Harbor Navigation Canal https://www.mvn.usace.army.mil/IHNC-Navigable-Floodgates	14-Mar-2008 21-Oct-2008 10-Dec-2009 1-Apr-2010 29-Nov-2010 22-Mar-2011 30-May-2012
#12	WBV	Gretna-	Jefferson	GIWW, Harvey and Algiers Canal	18-Feb-2009

IER, IERS, EA	Basin	Sub-Basin	Parish	Title	Decision Record
*S #12 addendum		Algiers	Orleans, Plaquemines	Levee and Floodwalls https://www.mvn.usace.army.mil/Harvey-Algiers-Canal-Levee-Floodwall	20-Nov-2010
*S #12. a					23-Feb-2011
*EA #581				Jean Lafitte National Historical Park and Preserve Augmentation Features Supplemental EA and National Historic Preservation Act Assessment of Effects, WBV, HSDRRS Augmentation https://www.mvn.usace.army.mil/SEA581/	01-Apr-2021
*#13 Addendum	WBV	Belle Chasse	Plaquemines	Hero Canal Levee and Eastern Terminus 12/13 Waterline WBV https://www.mvn.usace.army.mil/Hero-Canal-Levee-Eastern-Terminus	4-Dec-2009
*S #13a					21-Apr-2011
S #12 / 13					4-Feb-2011
#14	WBV	Harvey-Westwego	Jefferson	Westwego to Harvey Levee https://www.mvn.usace.army.mil/Harvey-to-Westwego-Levee	26-Aug-2008
S #14. a					9-Feb-2010
#15	WBV	Lake Cataouatche	Jefferson	Lake Cataouatche Levee https://www.mvn.usace.army.mil/Lake-Cataouatche-Levee	12-Jun-2008
*S #15. a addendum					7-Sep-2011
#16	WBV	Lake Cataouatche	Jefferson	Western Terminus Levee https://www.mvn.usace.army.mil/Western-Terminus-Levee	12-Jun-2009
S #16. a					24-Aug-2010
#17	WBV	Lake Cataouatche	Jefferson	Company Canal Floodwall https://www.mvn.usace.army.mil/Company-Canal-Floodwall	21-Jan-2009
#27	LPV	Orleans EB	Jefferson and Orleans	Outfall Canal Remediation https://www.mvn.usace.army.mil/Outfall-Canal-Remediation	10-July 2010
IERS 27a					15-Apr-2011
*#33	WBV	Belle Chasse	Plaquemine Orleans	Mississippi River Co-Located Levees https://www.mvn.usace.army.mil/MRL-Co-Located-Levees	31-Dec-2010
*S #33. a					11-Jan-2012
#18	N/A	New Orleans East, Chalmette Loop, Belle Chasse, Lake Cataouatche	Plaquemines St. Bernard, St. Charles	Government Furnished Borrow #1 https://www.mvn.usace.army.mil/IER-18	21-Feb-2008
#19	N/A	New Orleans East, Chalmette Loop, Lake Cataouatche	Iberville, Plaquemines Hancock County, MS	Pre-Approved Contractor Furnished Borrow #1 https://www.mvn.usace.army.mil/IER-19	14-Feb-2008
#22	N/A	Belle Chasse, Lake Cataouatche	Plaquemines	Government Furnished Borrow #2 https://www.mvn.usace.army.mil/IER-22	30-May-2008
#23	N/A	N/A	Plaquemines St. Bernard, St. Charles, Hancock County, MS	Contractor Furnished Borrow #2 https://www.mvn.usace.army.mil/IER-23	6-May-2008
#25	N/A	New Orleans East, Lake	Jefferson, Orleans	Government Furnished Borrow #3	3-Feb-2009

IER, IERS, EA	Basin	Sub-Basin	Parish	Title	Decision Record
		Cataouatche	East, Plaquemines	https://www.mvn.usace.army.mil/IER-25	
*S #25. a				Government Furnished Borrow #3: Stumpf Stockpile Clearance Supplement https://www.mvn.usace.army.mil/IER-25	13-Jan-2012
#26	N/A	Lake Cataouatche	Plaquemines St. John the Baptist, Hancock County, MS	Pre-Approved Contractor Furnished Borrow #3 https://www.mvn.usace.army.mil/IER-26	20-Oct-2008
#28	N/A	Chalmette Loop, Lake Cataouatche	Plaquemines	Government Furnished Borrow #4 https://www.mvn.usace.army.mil/IER-28	31-Jul-2009
#29	N/A	New Orleans East	St. John the Baptist, St. Tammany	Contractor Furnished Borrow #4 https://www.mvn.usace.army.mil/IER-29	8-Sep-2009
#30	N/A	Chalmette Loop	St. James, Hancock County	Contractor Furnished Borrow #5 https://www.mvn.usace.army.mil/IER-30	28-Sep-2009
#31	N/A	Chalmette Loop, Lake Cataouatche	East Baton Rouge, Lafourche, Plaquemines St. Bernard, St. Tammany Hancock County	Contractor Furnished Borrow #7 https://www.mvn.usace.army.mil/IER-31	29-Oct-2010
#32	N/A	N/A	Ascension, Plaquemines St. Charles	Contractor Furnished Borrow #6 https://www.mvn.usace.army.mil/IER-32	22-Jan-2010
*#35	N/A	Lake Cataouatche	Jefferson St. John the Baptist	Contractor Furnished Borrow #8 https://www.mvn.usace.army.mil/IER-35	19-Dec-2011
*PIER #36	LPV	N/A	St. Tammany and Orleans	Programmatic LPV HSDRRS Mitigation https://www.mvn.usace.army.mil/PIER-36	22-Nov-2013
*PIER #36 Tiered IER 1				Milton Island Marsh Restoration	19-Sep-2014
*PIER #36S (SIER 1)				Bayou Sauvage, Turtle Bayou & New Zydeco Ridge Restoration Supplement 1 https://www.mvn.usace.army.mil/PIER36SIER1.pdf	20-Oct-2015
*EA #546 SPIER 36 S1				Bayou Sauvage, Turtle Bayou & New Zydeco Ridge https://www.mvn.usace.army.mil/SEA546SIER1.pdf	1-Jul-2016
*PIER #37	WBV	N/A	N/A	Programmatic WBV HSDRRS Mitigation https://www.mvn.usace.army.mil/PIER-37	13-Jun-2014
*PIER #37 Tier1 NPS Joint EA			Jefferson	WBV HSDRRS Mitigation Jean Lafitte National Historical Park and Preserve Mitigation Features https://www.mvn.usace.army.mil/PIER3	17-Dec-2015 USACE 3-Mar-2016 NPS

IER, IERS, EA	Basin	Sub-Basin	Parish	Title	Decision Record
				7TIER1EA.pdf	
*SPIER #37a				Mitigation for Protected Side Bottomland Hardwoods Dry WBV HSDRRS https://www.mvn.usace.army.mil/SPIER37a.pdf	4-Mar-2016
*SEA #548 Tier 1 of PIER #37 NPS Joint EA				WBV Lake Cataouatche Borrow Area Expansion and Access Features, JLNHPP Mitigation Features https://www.mvn.usace.army.mil/Portals/56/Users/194/42/2242/PIER%2037,%20TIER%201%20EA%20Final.pdf	2-Nov-2016 USACE 20-Oct-2016 NPS
*SEA #572			Lafourche	BLH-wet and swamp mitigation, Lafourche Parish, Louisiana https://www.mvn.usace.army.mil/SEA572.pdf	11-Jul-2019

* IER, Supplementals and EAs completed after November 2010.

The total length of constructed levee and floodwall by LPV and WBV basins are listed in Table 2-2.

Table 2-2: Risk Reduction Features Length by Basin

Basin	Length (lf.)	Length (mi.)	% of LPV	% of WBV	% of HSDRRS
LPV: St. Charles	52,768	9.99	7%		5%
LPV: Jefferson East Bank	122,305	23.16	17%		11%
LPV: Orleans East Bank	138,492	26.23	19%		12%
LPV: New Orleans East	237,349	44.95	33%		21%
LPV: Chalmette Loop	170,692	32.33	24%		15%
LPV: Total	**721,605**	**136.67**	**100%**		**64%**

WBV: Lake Cataouatche	73,409	13.90		18%	7%
WBV: Harvey-Westwego	107,584	20.38		27%	10%
WBV: Gretna-Algiers	69,424	13.15		17%	6%
WBV: Belle Chasse	72,756	13.78		18%	6%
WBV: Belle Chase-River Tie-in	80,287	15.21		20%	7%
WBV: Total	**403,461**	**76.41**		**100%**	**36%**

Total	**1,125,066**	**213.08**

The total length of levee and floodwall by basin, parish and sub-basin are listed in Table 2-3.

Table 2-3: Risk Reduction Features Length by Parish and Subbasin

Basin	Length (lf.)	Length (mi.)	% of LPV	% of WBV	% of HSDRRS
St. Charles					
LPV: St. Charles	52,768	9.99	7%		5%
WBV: Lake Cataouatche	21,805	4.13		5%	2%
LPV: Total	**52,768**	**9.99**	**7%**		**5%**
WBV: Total	**21,805**	**4.13**		**5%**	**2%**
Jefferson					
LPV: Jefferson East Bank	122,305	23.16	17%		11%
WBV: Lake Cataouatche	51,604	9.77		13%	5%
WBV: Harvey-Westwego	107,584	20.38		27%	10%
WBV: Gretna-Algiers	15,764	2.99		4%	1%
LPV: Total	**122,305**	**23.16**	**17%**		**11%**
WBV: Total	**174,952**	**33.13**		**43%**	**16%**
Orleans					
LPV: Orleans East Bank	138,492	26.23	19%		12%
LPV: New Orleans East	237,349	44.95	33%		21%
LPV: Chalmette Loop	45,765	8.67	6%		4%
WBV: Gretna-Algiers	11,271	2.13		3%	1%
WBV: Belle Chasse	9,779	1.85		2%	1%
WBV: Belle Chase-River Tie-in	19,168	3.63		5%	2%
LPV: Total	**421,606**	**79.85**	**58%**		**37%**
WBV: Total	**40,218**	**7.62**		**10%**	**4%**
St. Bernard					
LPV: Chalmette Loop	122,482	23.20	17%		11%
LPV: Total	**122,482**	**23.20**	**17%**		**11%**
WBV: Total	**0**	**0.00**			
Plaquemines					
LPV: Chalmette Loop	2,445	0.46	0%		0%
WBV: Gretna-Algiers	42,389	8.03		11%	4%
WBV: Belle Chasse	62,978	11.93		16%	6%
WBV: Belle Chase-River Tie-in	61,119	11.58		15%	5%
LPV: Total	**2,445**	**0.46**	**0%**		**0%**
WBV: Total	**166,485**	**31.53**		**41%**	**15%**
Total	**1,125,066**	**213.08**			

2.3.1 LAKE PONTCHARTRAIN AND VICINITY

The LPV components were addressed in 32 IERs, supplemental IERs and mitigation IERs/EAs, which evaluated project features providing 100-year LORR for New Orleans and the surrounding east bank parishes. IERs 1-11 assessed impacts for east bank flood risk reduction projects. To make a complete and closed system, the Mississippi River and Tributaries' Mississippi River Levee (MRL) and the Upper Bonnet Carré Guide Levee provide risk reduction from riverine flood risks.

The LPV projects provide greater than 137 miles of 100-year risk reduction improvements, with approximately 43 miles of improvements directly along the southern shore of Lake Pontchartrain (figure 2-2). The LPV includes four parishes (St. Charles, Jefferson, Orleans and St. Bernard) and five sub-basins located in the GNO metropolitan area on the east bank of the Mississippi River.

2.3.1.1 St. Charles Sub-basin, St. Charles Parish

In St. Charles Parish, the Corps constructed 10 miles of levees, four drainage structures, four floodwalls, a vehicular access gate, and a railroad gate. (parish projects are labeled in light purple on the Figure 2-2.).

2.3.1.2 Jefferson East Bank Sub-basin, Jefferson Parish

In Jefferson Parish, the Corps constructed a 3.5-mile floodwall along the Jefferson-St. Charles Parish line, 23.16 miles of levees, floodwalls, floodgates, and fronting protection at the four large pump stations along the Jefferson Parish Lakefront. (Parish projects are labeled in red on Figure 2-2.)

2.3.1.3 Orleans East Bank and New Orleans East Sub-basin, Orleans Parish

In Orleans Parish, the Corps constructed 45-miles of levee, floodwalls, floodgates in the New Orleans Metro area, the New Orleans East area, the outfall canals, the Seabrook Floodgate Complex and the IHNC - Lake Borgne Surge Barrier. (Orleans EB projects are labeled in yellow and New Orleans East are labeled in dark purple on Figure 2-2.)

In New Orleans Metro, the Corps constructed new T-walls and vehicle floodgates; raised existing levees and roadway ramps; and modified and strengthened existing floodgates, floodwalls, and the Bayou St. John sector gate.

In New Orleans East, the Corps raised approximately 25 miles of levees and constructed approximately 2 miles of floodwalls around the perimeter of New Orleans East. Levee enlargement techniques in this area included wick drains and a sand drainage blanket to strengthen and consolidate the underlying soil and deep soil mixing.

2.3.1.4 Chalmette Loop Sub-basin, St. Bernard Parish

In St. Bernard Parish, the Corps constructed approximately 23.2 miles of levee, floodwalls and floodgates including a T-wall constructed on the Chalmette Loop levee,

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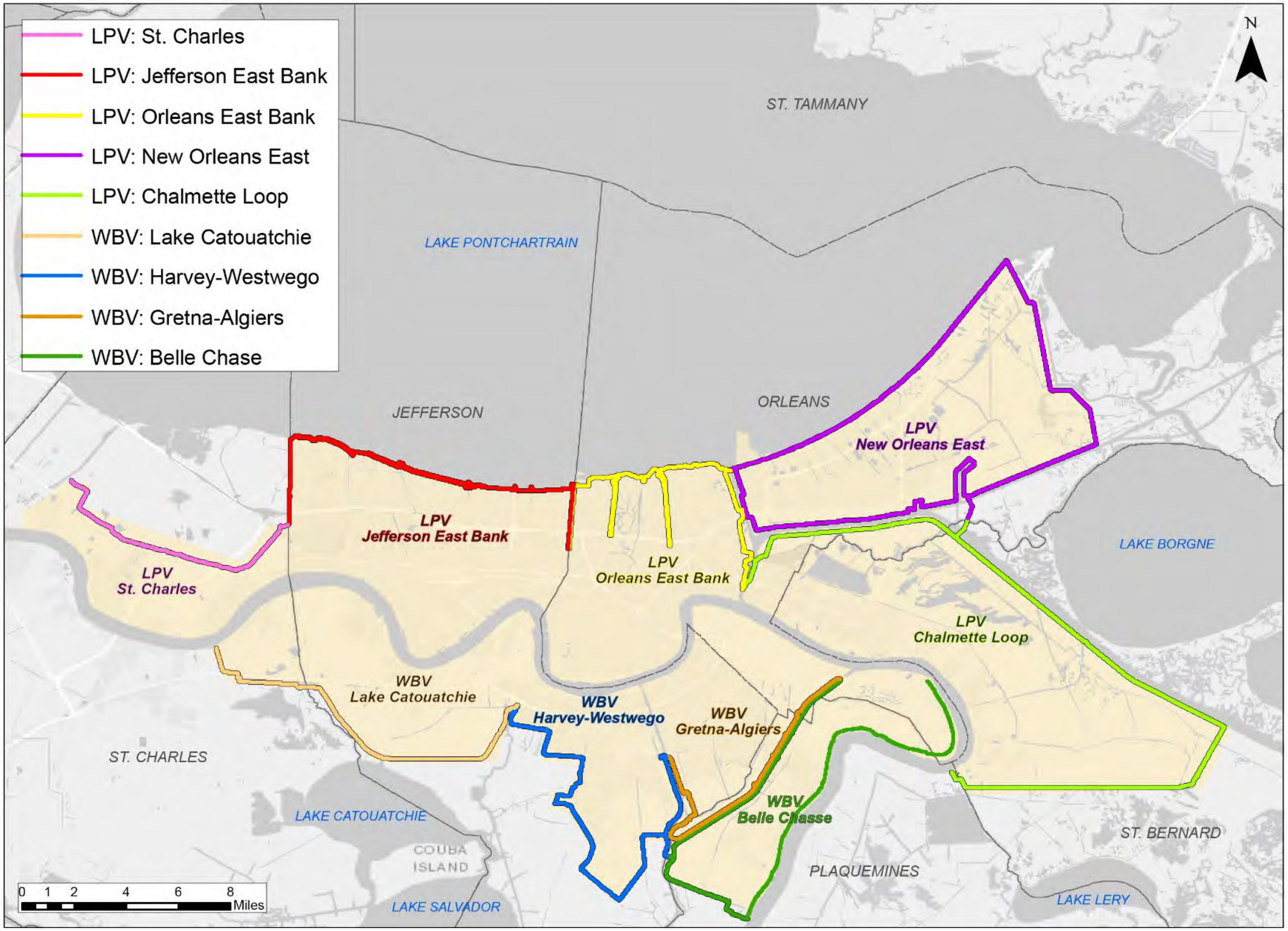

Figure 2-2: Lake Pontchartrain and Vicinity

the Bayou Dupre sector gate, tie-ins and a roadway. (Parish projects are labeled in lime green on Figure 2-2.)

2.3.2 LPV COMPONENT

Table 2-2 provides a summary of the LPV project reaches running west to east beginning with the St. Charles levee at the Bonnet Carré Spillway just north of Norco, traversing east to the west return wall situated west of Kenner; north along the Lakefront, south shore of Lake Pontchartrain, to the east by the GIWW and the MRGO. The two major structures for the LPV are the Inner Harbor Navigation Canal (IHNC) Surge Barrier and Seabrook Floodgate Complex. A brief summary of the LPV components is listed below.

Table 2-4: LPV HSDRRS Components

IER *	LPV Reach	Reach	NCC	Map #
1/S 1/S 1b*	03d.2	Airport Runway10 Levee - Phase 2. The existing 3200-ft levee segment adjoins LPV-04.2B on the south and the West Return Floodwall to the north. The levee work included a 4-ft floodside shift	7/27/2012	2
	04.1	Levee - Reach 1A. 1B & 2A - Phase 1 and 2. Raised the levees from Bayou Trepanier to Shell Pipeline and from Walker Drainage Structure (DS) to Canadian National Railroad to 100-year LORR.	1/14/2011	2
	04.2A	Levee Reach 1B from I-310 to Walker Drainage Structure - Phase 2. Existing levee raised to +16.5 feet NAVD88 and the existing Gulf South Floodwall replaced and rebuilt to +17.0 feet NAVD88. The Gulf South Pipeline Floodwall consists of 464 LF of floodwall where the pipeline (formerly known as Koch-Gateway Pipeline) crosses the levee project.	1/14/2011	2
	04.2B	Levee Reach 1B from I-310 to Walker Drainage Structure, Phase 2	5/2/2013	2
	04-2B	Levee - Reach 1B from I-310 to Walker Drainage Structure - Phase 2. Raised 9,217 feet of levee to an elevation of +16.0 feet NAVD88 and also relocates the Fox Lane access road.	5/2/2013	2
	05.1	Levee - Reach 2B (2nd lift) - Phase 1. consists of approx. 2.2 miles of earthen levee in St. Charles Parish, north of St. Rose. Constructed protected side and floodside stability berms and a roadway on the protected side stability berm. Increased levee embankment to elevation 15.0, as required by foundation conditions.	8/20/2013	1
	05.2A	Levee - Reach 2A Shell Pipeline to Goodhope and Shell pipeline Floodwall Replacement - Phase 2. Raise approx1 mile of levee extending from the Shell Pipeline Floodwall on the west to the vicinity of the Goodhope Floodwall on the east 16.5-ft NAVD88.	10/30/2012	1
	05-2B	Levee - Reach 2B - from Goodhope to Cross Bayou - Phase 2. Raise about two miles of levee extending from the Goodhope Floodwall on the west, to the vicinity of the Cross-Bayou Pump Station on the east to construction grade of 16.5-ft NAVD88	8/20/2013	1

	06.1	Floodwall Tie-ins & Bayou trepagnier Drainage Structure - Phase 1. Consists of short segments of concrete T-wall and uncapped sheet pile I-wall at Trepagnier Pump Station Floodwall -- 307 LF; Shell Pipeline Floodwall -- 113 LF; Good Hope Floodwall and Swing Gate -- 378 LF; Gulf South Floodwall -- 140 LF; Canadian National Railroad Gate -- 149 LF; Bonnet Carré Floodwall	3/28/2012	1
	06a.2	Bayou Trepagnier Complex Floodwall Phase 2. Construction of 587-ft of new T-wall fronting protection for Bayou Trepagnier PS to 18.5-ft NAVD88, removing the existing drainage structure, and replacing adjoining floodwalls to an elevation of 16.5-ft NAVD88.	3/28/2012	1
	06b.2	Shell Pipeline Floodwall Phase 2 - Constructing floodwall where the Shell Pipeline crosses the project. The center of the floodwall is a 160-foot-long concrete T-wall section built to +17.0 feet.	5/20/2012	1
	06c.2	Goodhope Floodwall Phase 2. This section is a 466 LF floodwall segment. The center portion consists of concrete T-wall monoliths built to +17 feet, one of which having a vehicle swing gate.	3/27/2012	1
	06.e1	Floodwall under I-310 - Phase 1. Constructed 1745-LF of uncapped steel sheet pile I-wall near I-310 and Airline Hwy interchange; stability berms, scour pads for overtopping protection, and scour protection at levee/I-wall transitions	6/7/2012	2
	06e.2	Floodwall Under I-310 - Phase 2. Constructed floodwall under I-310 to 15.5-ft, Floodwall under the I-310 main spans, was built to 13.5-ft. Steel plates are attached to the top of this floodwall to reduce wave splash over I-310.	6/7/2012	2
	06f.2	Illinois Central Railroad Gate - Phase 2. Modified the existing gate to incorporate a hydraulic closure mechanism and rebuilt adjacent floodwalls to an elevation of +15.5-ft NAVD88. Reconstructed 421-ft floodwall.	10/30/2012	2
	07.1	St. Charles Drainage Structure (DS) Tie-Ins - Phase 1. Construction of earthen stability berms, scour pads, and scour protections at levee/I-wall transitions as follows: Cross Bayou DS--280 LF of I-wall, 468 LF; St. Rose DS-- 331 LF of I-wall, 581 LF; Almedia DS--130 LF of I-wall, 222 LF; Walker DS--130 LF of I-wall 228 LF	7/26/2012	2
	07b.2	Cross Bayou Drainage Structure - Phase 2. consists of about 468 LF of FW at the Cross-Bayou DS.	7/26/2012	2
	7b.2a	Cross Bayou Access Bridge and Pile Load Test	11/12/2010	2
	07c.2	St. Rose Drainage Structure (DS) & Levee - Phase 2. Consists of 895 LF of floodwall at the St. Rose DS and the eastern portion of Reach 1A Levee. The floodwall is a combination of a DS flanked on each side by concrete T-walls. A new structure was built on the floodside of the existing alignment. In addition, 2,800 LF of the Reach 1A Levee between the St. Rose DS and I-310 FW was constructed under to facilitate access and alleviate congestion.	7/26/2012	2
	07d.2	Almedia/Walker Drainage Structure - Phase 2. Constructed approximately 346 feet and 540 feet of new T-wall.	7/26/2012	2

2/S 2/S 2a	03.2a	West Return Floodwall (Southern Segment). Consists of 3.3 miles of floodwall, beginning in the vicinity of the Louis Armstrong Airport and extending northward along the Jefferson-St Charles Parish line to the Lakefront levee on the south shore of Lake Pontchartrain.	11/28/2012	2
	03.2B	West Return Floodwall (Northern Segment) Phase 2. Consists of 3 miles of floodwall beginning at Interstate Highway 10 and extending northward along the Jefferson - St. Charles Parish Line to the Lakefront levee on the south shore of Lake Pontchartrain.	12/11/2012	2
	03.2b.1	West Return Floodwall (Northern Segment) Lakeside Runoff Collection System. Consists of a system of swales, drop inlets, and subsurface pipes within the levee district right of way that collect rainfall runoff and seepage from the protected side of 2.5-mile-long portion of the LPV-3.2B	3/31/2015	2
	03.2b.2	Landside Runoff Lip Levee Drainage along West Return Floodwall	3/31/2015	2
	03a.1	West Return Floodwall - Vintage Phase I. Construction of 1600-lf of West Return floodwall I-wall, plus a small earthen berm and scour protection on the landside of the new I-wall in the vicinity of Vintage Blvd.	3/31/2015	2
	03c.1	West Return Floodwall - I-wall @ I-10 - Phase 1. consists of a 460 LF section of sheet pile founded reinforced concrete I-wall underneath the I-10 highway on the Jefferson-St Charles Parish line.	3/31/2015	2
3/S 3.a	00.1	Reach 1 Lakefront Levee - Phase 1. Levee - approx. 2 miles of levee along the East Jefferson lakefront from the east end of the Re-curve Floodwall adjacent to the West Return Canal to the west of the tie-in floodwall on west side of pump station #4.	7/26/2012	3
	00.2	Reach 1 Lakefront Levee - Phase 2. This segment consists of approximately 2 miles of levee along the East Jefferson Lakefront from the east end of the Re-curve floodwall adjacent to the West Return Canal to the west end of the tie-in floodwall of the west side of PS #4 Duncan.	7/26/2012	3
	01.1	Reach 2 Lakefront Levee - Phase 1 & 2. This section of levee runs approx. 1.5 miles along the East Jefferson Lakefront from the east end of the tie-in floodwall on the east side of PS #4 Duncan to the west end of the tie-in floodwall on the west side of the PS #3 Elmwood.	9/12/2014	3
	01.2	Reach 3 Lakefront Levee (3rd lift) - Phase I - This section consists of approx. 11,960-ft of levees, starting at Elmwood Canal, running to Suburban Canal.	9/12/2014	3
	02.1	Reach 3 - 2.3 miles along the East Jefferson lakefront from the east end of the tie-in floodwall on the east side of PS #3 Suburban to the west end of the tie-in floodwall on the west side of the PS #2 Elmwood. Reach 3 Lakefront Levee (3rd lift) - Phase I	8/8/2012	4
	02.2	Reach 3 - 4th Enlargement - Phase 2. Consists of approx. 2.3 miles along the East Jefferson lakefront from the east end of the tie-in floodwall on the east side of PS #3 Suburban to the west end of the tie-in floodwall on the west side of the PS #2 Elmwood.	8/8/2012	4
	7B-2a	Jefferson Parish Lakefront and Bonnabel Breakwater at Metairie, LA, Jefferson Parish	11/12/2010	4

	09.1	PS#1 Bonnabel Floodwall Tie-ins & Floodwall/Gate at Boat Launch.	11/12/2010	4
	09.2	Bonnabel PS #1 Fronting Protection and Breakwater Modifications.	11/26/2013	4
	09.2	PS #1 (Bonnabel), #2 (Suburban), #3 Elmwood and #4 Duncan Modifications, Fronting Protection, Positive Cutoff and Floodwall Tie-ins - Phase 2. LPV-09.2, 10.2, 11.2 and 12.2 have been combined into 09.2. Fronting protection was constructed across the discharge basins at PS #1-4, and modifications to the two existing breakwaters at PS #2 and 3.	11/26/2013	3
	9A.2	Jefferson Parish Lakefront and Bonnabel Breakwater - Phase 2. Located on the east side of Causeway bridge and at the end of the Bonnabel canal, constructed breakwater protection consists of a concrete monolith atop concrete pilings. The structure extends approx. 850-ft with a top EL of 14-ft.	11/12/2010	3
	10.1	PS #2 Suburban Floodwall Tie-ins - Phase 1. Improved I-wall stability, drive new uncapped sheet pile behind existing I-wall.	11/26/2013	3
	11	Elmwood PS #3 and associated Fronting Protection and Floodwall Tie-ins.	11/26/2013	3
	12a.2	Duncan Pump Station #4 and associated fronting protection and floodwall tie-*ins* currently there are no breakwaters associated with LPV 12. However, there is back flow protection (air suppression and valves) in place for the station. The current elevation ranges from 16.0 to 22.0 ft at the tie-ins to 22 ft at the pump station.	2/2/2011	3
	16.2	Bonnabel Boat Launch Floodwall and Gate	5/17/2012	4
	17.2	Causeway Bridge Abutment and Floodwall Tie-Ins	7/23/2013	4
	18.2	Williams Boulevard Floodgate	5/30/2012	3
	19.2	Reach 4 - 3rd Enlargement - Phase 2. Enlarge to 16.8-ft approximately 10,285-ft of levees, starting at Suburban Canal, and running to Bonnabel Canal.	8/14/2012	4
	20.1	Reach 5 Lakefront Levee - Phase 1 and 2. Raise approx. 6,820-ft of levees to 15.5-ft starting at Bonnabel Canal and running to the 17th Street Canal.	8/14/2012	4
	20.2	Reach 3 and 4 Berm enlargement and Foreshore	9/26/2013	4
4	101	Lake Marina Avenue Floodwall; Gate L1, L2, L1A, and L5; Gate L3 and L1B; Gate L4;	5/13/2010	4
	102	Canal Boulevard Ramp	11/19/2010	5
	102.01	Lake Marina Avenue to Orleans Canal Levee	11/19/2010	5
	103	Water Stop; Rail Street; Lake Terrace Dr; Bayou St. John Floodwall; Sector Gate Closure Structure; Marconi Dr Gate; Gate L10	12/17/2018	4, 5
	103.01	London Canal to Orleans Canal Levee	11/19/2010	4,5
	103.01A 1	East Bank Orleans Outfall Canal to West Bank London Avenue Outfall Canal	8/22/2012	4,5
	103.01A 2	East Bank Orleans Outfall Canal to Westbank London Avenue Outfall Canal	8/2/2012	4,5
	104.02b	Orleans Metro Seepage Cutoff, Seabrook to Franklin Ave	10/31/2013	5
	104.01a	London Avenue to IHNC Authorized Leve	12/2/2012	5
5/S 5	101.02	Lakefront Levee OEB - 17th Street Canal/ROW. Replace I-walls with T-walls and construct new gates. Constructed T-wall and floodgates from 17th Street Canal to Topaz St.	12/17/2012	4

		along West Marina Ave and Lakeshore Drive.		
	103.1A3	Demolition of Interim Closure Structures	12/17/2018	4,5
	PCCP-01	Construct permanent canal closures and pump stations (PCCP) at the mouths of 17th Street, Orleans Avenue, and London Avenue canals to operate concurrently or in series with existing drainage PS	5/1/2018	5
	104.2	London Avenue Canal/ROW	12/31/2012	5
27/S 27a/ EA 496	OFC-03	Remediation of Floodwalls on London Ave Canal	10/31/2013	4
	OFC-04a	Remediation of FWs on the Orleans Ave Canal	9/27/2013	4
	OFC-05	Remediation of FWs on the 17th Street Canal	2/20/2013	4
	OFC-06	Remediation of Canal Walls for the Orleans Ave Canal	3/9/2012	4
	OFC-07	17th and London Avenue Outfall Canals Remediation	3/31/2015	4
11 Tier 1/ 11 Tier 2 P***/ S 11.d Tier 2 P***	IHNC-01	Seabrook Gate - located 540-ft south of the Ted Hickey bridge at the confluence of the IHNC and Lake Pontchartrain. It has a 95 ft navigable sector gate with a 16-ft sill elevation and 2 auxiliary flow non-navigable 50-ft wide vertical lift gates. T-walls were constructed to tie back to existing lateral protection within the IHNC. The Gate Complex and T-Wall were built +16.00-ft	12/2/2013	5
	IHNC-10	France Road Gate and Road Ramp	9/28/2012	
6/S 6	104.02	Lakefront Airport Floodwalls	12/4/2012	5
	105	Lakefront Airport Floodwall, Downman Road Gate, Hayne Boulevard Floodwall and Levee	2/26/2014	5
	105.01	Lakefront Airport Floodwalls	12/3/2012	5
	105.02	Fronting Protection and Breakwater Modifications	11/26/2013	5
	106	Lake Pontchartrain Levee, Floodwall, Fronting protection, Citrus PS Gate, Jahncke PS Gate	7/25/2013	7
	107	Lincoln Beach Floodwall, Levee, Gate	10/26/2012	7
11 Tier 1/ 11 Tier 2 B**** / S 11.a Tier 2 B/ S 11.b Tier 2 B/	IHNC - 02	IHNC Remediation - IHNC Lake Borgne. The barrier floodwall was constructed of 66" spuncast piles, closure piles, 36" steel batter piles, a precast cap beam, and a cast in place parapet wall. The south storm surge barrier extends from the St. Bernard Levee to the Bayou Bienvenue Gate. The north storm surge barrier extends from the Bayou Bienvenue Gate to the GIWW Gate Structure. Work included 3 navigable gates; Bayou Bienvenue lift gate, GIWW Bypass Barge gate, and GIWW sector gate.	12/6/2014	6, 8
	IHNC-02a	Bulkhead and Platform Repair at IHNC Surge Barrier	12/6/2014	6, 8
	IHNC-02b	Installation of Permanent Tripping Dolphins to replace the temporary dolphins removed during construction.	12/6/2014	6, 8

S 11.c Tier 2 B	IHNC-02d	Inspection and Modification of Two Windlass Hydraulic Power Units at the GIWW Surge Barrier Barge Gate	12/6/2014	12
	192.02b	IHNC Restoration of Levees, 1-wall and T-wall modifications Reach II	8/28/2013	9
	108	Paris Road to South Point Levee	10/26/2012	
	192.02	Wetlands Structural Wall Barrier/Shoreline protection	6/20/2013	12
	192.03	IHNC Interior Levees & Floodwalls, Relief Wells	7/20/2012	12
IER 7, IERS 7	101	New Orleans East Levee - CSX Railroad to Michoud Canal (W912P8-09-C-0062) - Orleans	11/6/2014	4
	109	Bayou Sauvage Levee; Bayou Sauvage Drainage Control Structures and Two Pump Stations; US 11 Gate; US 90 Gate		9, 10, 11
	109.02a	New Orleans East Levee - South Point to CSX Railroad	7/31/2014	12
	109.02b	I-10 Highway Crossing Levee Enlargement	3/5/2013	9
	110	CSX Railroad Gate	6/4/2012	11
	111.01	CSX Railroad to Michoud Canal	11/6/2014	11
	113	Michoud Slip/Canal Levee	2/21/2013	11
	192.02	Reach 2, Repair and Restoration of Existing Levees and Floodwalls from Lake Front Floodwall to Michoud Canal Floodwall.	5/2/2013	12
IER 8	103.1As	Chalmette Loop Levee, Bayou Dupre Floodgate	5/13/2015	13
	144	Chalmette Loop Levee, Bayou Bienvenu to Bayou Dupre	2/24/2015	13
	144	Chalmette Loop Levee - Bayou Dupre Control Structure. Constructed a new sector gate tied to T-walls to EL 31-ft. The T-wall transition is tied to the LPV 145 and LPV146 T-walls on top of existing levee to El.+ 29-ft. Control houses with generators were constructed on both sides of the gate.	5/29/2015	13
	146	Chalmette Loop Levee - Bayou Dupree to LA 46. Constructed a reinforced concrete T-wall on the existing levee to EL 31.5-ft. An emergency bypass ramp for Hwy 46 was constructed parallel to the hwy for evacuation purposes. Four earthen ramps and gates were constructed for wildlife passage.	9/5/2014	14
	147	Chalmette Loop Levee - Hwy 46 Floodgates. Constructed an overhead trolley gate across Hwy 46 with removable beams to EL +30-ft.	2/8/2013	15
	148.01	Chalmette Loop Levee - Hwy 46 to River, Verret to Caernarvon Canal. Levee was constructed to authorized grade	8/27/2013	15
	148.02	Chalmette Loop Levee - Hwy 46 to River, Verret to Caernarvon. Construct T-wall on top of 43,370-ft of existing levee to EL 31.5-ft and install trolley gate across Bayou Road. A trolley gate was constructed across Bayou Road.	9/5/2014	15
IER 9	1.2	Chalmette Loop Levee - Hwy 46 to River, Verret to Caernarvon	9/5/2014	3
	20.2	Caernarvon Canal Floodwall, St. Bernard and Plaquemines Parishes	8/27/2013	4
	149	Caernarvon Floodwall (MRL to LPV-148 tie-in)	9/19/2014	16
	149	Caernarvon Canal at LA 39 - Replace railroad floodgates. A T-wall was constructed to El 24-ft along an offset alignment that crosses the Caernarvon Canal and ties into the MRL. Construction of new gates for Highway 39 and the Norfolk-Southern railroad. The existing floodwall was constructed to El 14.0. A sector gate was constructed across Caernarvon	9/19/2014	16

		Canal.		
	149a	MRL Tie-in Overtopping Prevention	9/19/2014	16
	149AR	Access Roads, Caernarvon Floodwall. A 15-ft wide permanent access road was constructed on the protected side of the LPV 149 FW to accommodate operation of the Caernarvon Canal sector gate and maintenance of the floodwall system.	9/19/2014	16
IER 10	145	Chalmette Loop Levee - Bayou Bienvenu to Bayou Dupree. Constructed a new reinforced concrete T-wall to EL 31.5-ft on the existing levee.	3/24/2015	12, 13
	145a	Bayou Bienvenu Swing Bridge. Constructed a moveable 135-ft swing bridge across Bayou Bienvenu (LPV 144.01) in St. Bernard Parish.	5/20/2016	12,13

*Bold text – IERs, Supplement completed after November 2010.
** Design elevations are presented in feet NAVD88
*** P = Pontchartrain
****B = Borgne

2.3.2.1 Labranche Wetlands, St. Charles Parish Levee and Floodwall Improvements (IER 1, 2)

Located on the east bank of the Mississippi River, the boundary of the St. Charles Parish project area includes the Bonnet Carré Spillway lower guide levee, which runs from the Mississippi River until slightly north of Airline Highway (US Hwy. 61), then turns east roughly paralleling Airline Hwy. (US Hwy. 61) to the Jefferson-St. Charles Parish boundary near the Louis Armstrong New Orleans International Airport, where it ties into the LPV-Jefferson Parish project.

This portion of the system is divided into four reaches, which include approximately 9.5 miles of levees, four drainage structures, four floodwalls and a railroad gate. Construction of the risk reduction features included the development of a bird abatement program, which prevented birds from nesting near the project site and delaying construction (Figure 2-3).

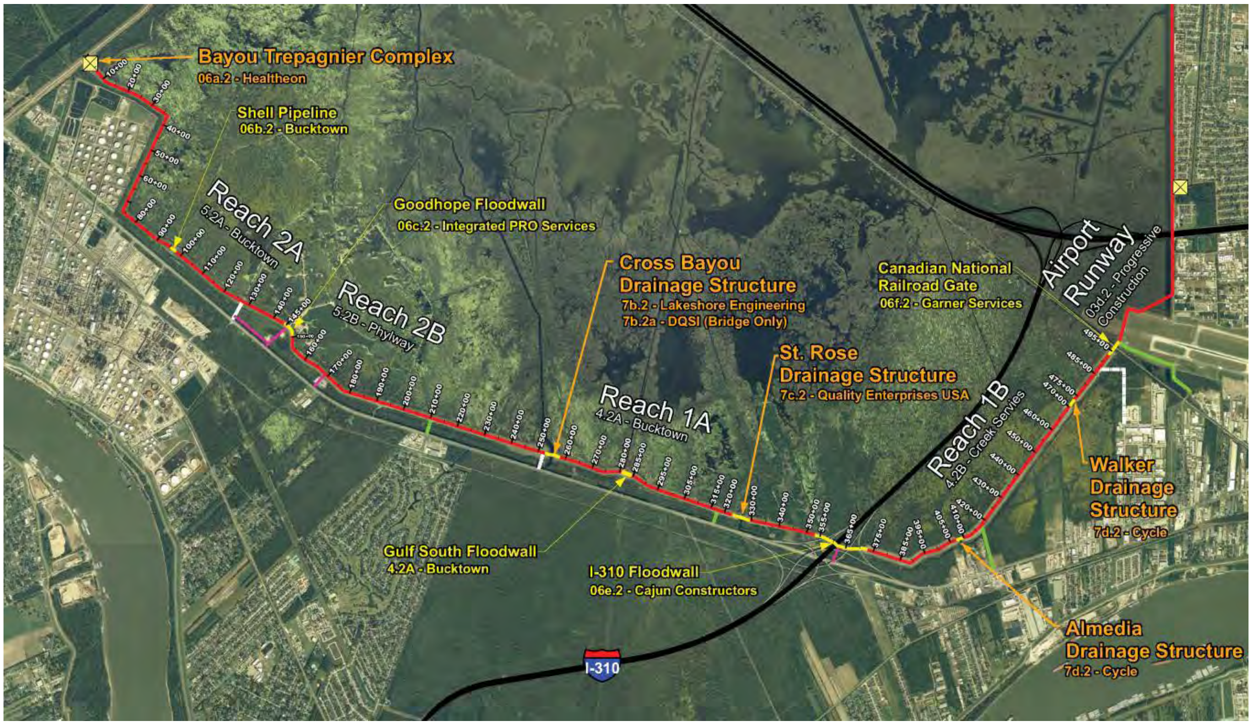

Figure 2-3: St. Charles Parish Improvements

2.3.2.2 Lakefront Levee, Jefferson Parish and Orleans Parish (IER 3 and 4)

This Jefferson Parish project is in the greater New Orleans area between the Mississippi River and Lake Pontchartrain. This portion of the risk reduction system is comprised of a 3.5-mile floodwall along the Jefferson-St. Charles Parish line from the Louis Armstrong New Orleans International Airport to Lake Pontchartrain, 10 miles of levees, floodwalls, floodgates, and fronting protection for the pump stations along the Jefferson Parish Lakefront.

Lakefront levee improvements included increasing the elevation of the levee between 16-ft to 19-ft NAVD88, depending on the reach, and a 1 vertical on 3 horizontal side slope for the protected side and a 1 vertical on 4 horizonal for the flood side (Figure 2-4).

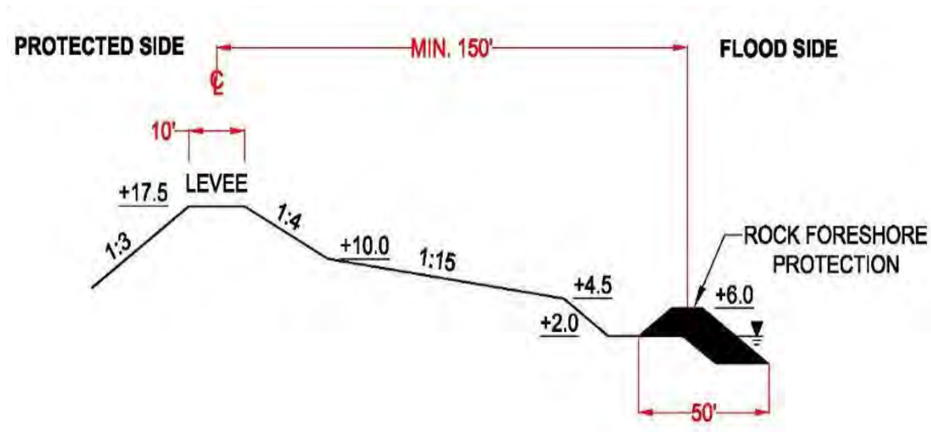

Figure 2-4: Typical Construction of Levee and Foreshore Protection

The levee system was extended across Causeway Blvd. and Causeway Blvd. was modified, beginning at 6th Street to slope up to the levee crest elevation and then back down to the elevation of the bridge abutment. The new road is supported by vertical and mechanically stabilized earth walls with sidewalks and access added to existing buildings and streets. The roadway ramp over the floodwall stretches from the Causeway peninsula to north of Sixth St. in Metairie. Tie-ins link this feature with the levee reaches.

New construction included new T-walls, I-walls and transitions points, gated structures, fronting protection, and breakwater improvements to pumping stations. Some foreshore protection included extending the wave berm of the levees by 90 feet into Lake Pontchartrain using uncompacted fill and graded stone. The wave attenuation berm extends the existing berm on a 1 vertical on 30 horizontal slope to 200-ft NAVD88 from the centerline of the levee. Foreshore protection in the form of a 50-ft NAVD88 wide graded stone dike was added on the toe of the berm (Figure 2-5).

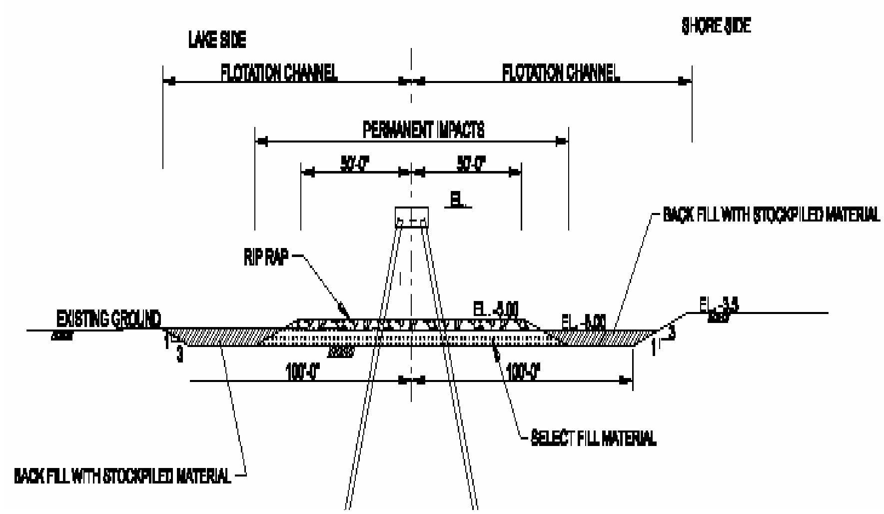

Figure 2-5: Typical Breakwater Modification (Suburban and Elmwood)

Four pumping stations (#1 Bonnabel; #2 Suburban, #3 Elmwood, #4 Duncan) were modified to include fronting protection like a concrete T-wall with a sluice or vertical lift gate to allow discharge from the pumping stations. The fronting protection was constructed to a height of approximately 17 feet NAVD88 and T-wall tie-ins were constructed to connect the fronting protection to the adjacent levee reaches at a height of 17.5 feet NAVD88. Fronting protection at pumping station No. 3 Elmwood was constructed to 21 feet NAVD88, with tie-in walls constructed to an elevation of 19 feet NAVD88. Modifications (Suburban and Elmwood) and construction of new breakwaters (Bonnabel and Duncan) were incorporated at the four pumping stations (Figure 2-2).

New Orleans Metro is defined as the east bank of Orleans Parish, west of IHNC, which is also known locally as the Industrial Canal, and a small portion of Jefferson Parish near the Mississippi River. In this area, the Corps constructed new T-wall floodwalls and vehicle floodgates; raised existing levees and roadway ramps; and modified and strengthened existing floodgates, floodwalls and the Bayou St. John sector gate. All structural features in New Orleans Metro were built to an elevation between 16 and 22 feet NAVD88.

2.3.2.3 New Orleans East, Orleans Parish (IER 6 and 7)

The perimeter system in New Orleans East stretches from the eastern end of the IHNC along Lake Pontchartrain to the northeast, continues southeast to the Gulf Intracoastal Waterway, southwest to the Michoud Slip and then ties in to the IHNC Surge Barrier. Approximately 25 miles of levee have been raised and approximately 2 miles of floodwall have been constructed around the perimeter of New Orleans East. Along the New Orleans East lakefront near the Lakefront Airport, a new concrete T-wall, and a vehicle gate at Downman Road (LPV 105) was constructed. Between the Lakefront Airport and Paris Road, the existing embankment was raised with a 2 to 4-foot-high floodwall (LPV 106) and a new T-wall and access gate were constructed at Lincoln Beach (LPV 107). Between Paris Road and Southpoint, the existing levee was raised, and T-walls were constructed at the Collins Pipeline Crossing. All features along the New Orleans East lakefront are at an elevation of between 15- and 18-feet above sea level.

On the eastern edge of New Orleans East between Southpoint and the CSX Railroad, the existing levee was raised and vehicle gates (LPV 109.02a&c) were constructed. To raise the levee expeditiously, innovative construction techniques - wick drains and a sand drainage blanket - were used to strengthen and consolidate the underlying soil. Vehicle gates were also built at Highway 90 and Highway 11, and Interstate 10 was raised where it crosses the levee (LPV 109.02b). The entire LPV 109 stretch was raised to an elevation between 16.5- and 25-feet above sea level.

At the CSX Railroad crossing, a 27.5-ft high gate (LPV 110) was constructed. Between the CSX Railroad and the Michoud Canal, the existing levee and T-wall around Drainage Pump Station 15 were raised and a floodwall to tie into the IHNC-Lake Borgne Surge Barrier (LPV 111) was constructed. To strengthen the underlying soil, deep soil mixing (a process that involves injecting a cement-water mixture deep into the native soil and mixing it with the soil) was used to strengthen the levee's foundation. The levee and floodwalls in this location were raised to an elevation between 25- and 32-feet above sea level. Further west, between the Michoud Canal and the Michoud Slip, the existing levee was raised to 19.5 feet above sea level (LPV 113).

2.3.2.4 Outfall Canals, Permanent Canal Closures and Pumps (IER 5, 27)

The three main outfall canals in the New Orleans area are critical elements of the flood damage reduction system, serving as drainage conduits for much of the city. The canals run south-to-north near the Orleans Parish lakefront between the Jefferson Parish line and the IHNC, with floodwall-topped levees lining each canal.

Figure 2-6: 17th Street Canal

The 17th Street Canal extends 13,500 feet from pump station 6 to Lake Pontchartrain along the Jefferson Parish line (figure 2-6). The Orleans Avenue Canal, between the 17th Street Canal and the London Avenue Canal, runs approximately 11,000 feet from pump station 7 to Lake Pontchartrain. The London Avenue Canal extends 15,000 feet north from pump station 3 to Lake Pontchartrain, about halfway between the Orleans Avenue Canal and the IHNC.

The permanent canal closures and pumps (PCCP) are composed of permanent gated storm surge barriers and brick façade pump stations at or near the lakefront. The pumps move rainwater out of the canals, around the gates and into Lake Pontchartrain during a tropical weather event and are equipped with stand-alone emergency power supply capacity to operate independently of any publicly provided utility. The PCCP at 17th Street consists of six 1,800 cubic feet per second (cfs) pumps and two 900 cfs pumps, and has a total pumping capacity of 12,600 cfs; the PCCP at Orleans Avenue consists of three 900 cfs pumps and has a total pumping capacity of 2,700 cfs; the PCCP at London Avenue consists of four 1,800 cfs pumps and two 900 cfs pumps and has a total pumping capacity of 9,000 cfs. The PCCP notice of construction completion was issued in May 2018 and the PCCP are fully operational.

2.3.2.5 New Orleans East Lakefront Levee to Michoud Canal (IER 7)

Portions of the New Orleans East area relies upon a series of levees, floodwalls, floodgates, and forced drainage (*i.e.*, pumps) for hurricane and storm damage risk reduction because the area is at or below sea level, and gravity drainage is not possible. There is an earthen levee constructed to a height of 13 feet to 19 feet NAVD88 between Lake Pontchartrain and the CSX railroad. Two pump stations and four drainage structures are managed by the U.S. Fish and Wildlife Service (USFWS) to control water levels and salinities within Bayou Sauvage National Wildlife Refuge (NWR). Interstate 10 (I-10), U.S. Highway 11 (US 11) and U.S. Highway 90 (US 90) cross the levee. Roller-type floodgates are located at the US 11 and US 90 crossings. The floodgate and supporting floodwalls where the CSX Railroad crosses the levee were replaced to authorized height after Hurricane Katrina but not to the 100-year LORR. An earthen levee extends from the CSX railroad gate to the GIWW and then southwest along the north bank of the GIWW to a point just east of Michoud Canal where it ties into the Michoud Canal Floodwall. A portion of the area is a T-wall located at pump station 15. The T-wall was repaired after Hurricane Katrina and raised to 22-ft NAVD88.

2.3.2.6 Bayou Bienvenu to Bayou Dupre, Chalmette Loop Levee and Caernarvon Floodwall, Orleans, St. Bernard and Plaquemines Parishes (IER 8, 9, 10)

The Chalmette Loop Levee system connects to Tier 2 Borgne structure, the Bayou Dupre Flood Gate and the Caernarvon Floodwall. A new flood control structure was construed at Bayou Dupre that consists of a steel sector gate and floodwall tie-ins to the existing levees. It was constructed adjacent to the existing structure on the flood side and a pontoon bridge was constructed on the protected side. The new flood control structure was built to an elevation of +31 feet NAVD88. T-wall floodwalls were constructed to tie into the adjacent levee reaches on each side of the bayou. The old structure was left in the open position and deauthorized. In addition, an access road was permanently constructed for reaches 145, 146, 148.02 and 149, as well as raising the LPV 149 tie-in to the MRL to approximately +24-ft NAVD88. A new floodwall to the west of Caernarvon canal was constructed to replace the existing floodwall (LPV 149) complex on the east side of the canal. The new alignment included a tie-in to the MRL system, new floodgates across Louisiana Highway 39 and the Norfolk Southern railroad, a t-wall floodwall along the east bank of the Caernarvon Freshwater Diversion Canal and a 56foot wide navigable structure to an elevation of approximately +26 feet NAVD88 across the Caernarvon Canal south of the Elevating Boats LLC sea plane hangar. (Figure 2-7)

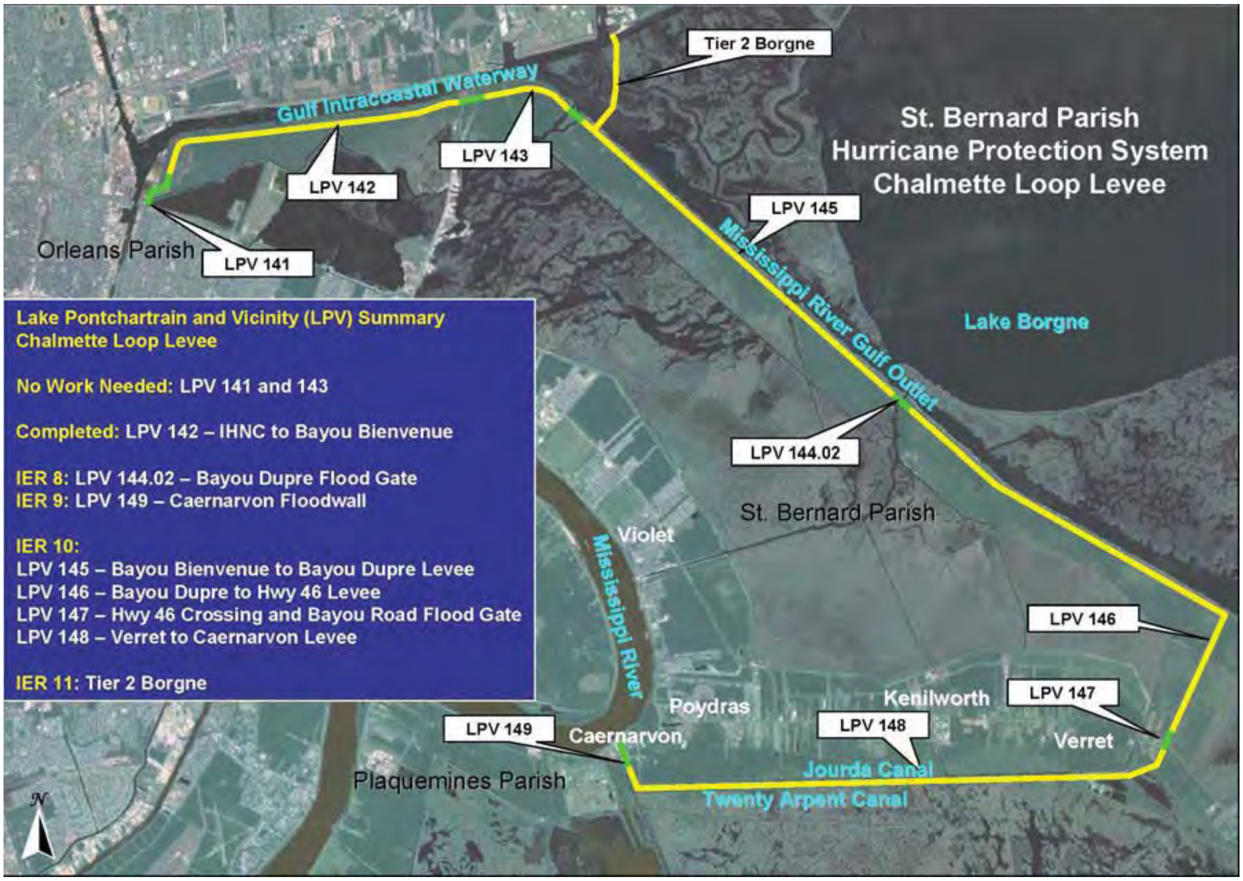

Figure 2-7: Chalmette Loop Levee LPV 141 through LPV 149

2.3.2.7 Seabrook Floodgate Complex and Inner Harbor Navigation Canal Surge Barrier (IER 11)

The Inner Harbor Navigation Canal (IHNC) surge barrier at Lake Borgne is a key feature of the HSDRRS, providing the 100-year LORR to a large portion of Orleans and St. Bernard parishes by reducing the risk of surge entering the GIWW/IHNC corridor from Lake Borgne and the Gulf of Mexico. The 1.8-mile barrier includes three gated structures and a barrier wall with a top elevation of 26-feet.

The Seabrook Floodgate Complex is in the IHNC and reduces storm surge entering from Lake Pontchartrain. Seabrook works in tandem with the IHNC Lake Borgne Surge Barrier to provide 100-year LORR to the entire IHNC corridor. Construction consisted of a sector gate and two vertical lift gates in the IHNC 540 feet south of the Senator Ted Hickey Bridge (also known as Seabrook Bridge) and the Bascule Railroad Bridge, with floodwall tie-ins to LPV 104 to the west and LPV 105 to the east. Also constructed is a 20-foot-wide vehicle gate in the eastern floodwall to provide access to Jourdan Road. (Figure 2-8)

Figure 2-8: Borgne Barrier and Seabrook Floodgate Complex

2.3.3 WESTBANK AND VICINITY

The WBV components were addressed in 21 IERs, supplements and mitigation IERs, which evaluated project features providing 100-year LORR for the St. Charles, Jefferson, Orleans, and Plaquemines parishes on the west bank. Projects consisted of earthen levees, T-wall floodwalls, roadway and railroad floodgates, sector gates, pump stations, and elevated highway and roadway ramps.

The WBV project includes improvements to or construction of 76.5 miles of levees, floodwalls, floodgates, water control structures, and other risk reduction features (Figure 2-1, 2-2). Of these 76.5 miles, 49 miles consist of primary perimeter storm surge risk reduction features (including 15 miles co-located with the MRL) and 26 miles of detention basin features along the Harvey and Algiers canals.

To make a complete and closed system, the Mississippi River and Tributaries' levee (MR&T or MRL) along the Westbank of the Mississippi River ties into the Upper Bonnet Carré Guide Levee to provide risk reduction from riverine flow flood risks. The WBV project is also co-located with the west bank of the MRL from River Mile (RM) 70 south of Oakville to RM 85.5 northeast near English Turn in the St. Bernard sub-basin. Where the WBV and MRL are co-located, additional height and soil strengthening were added to the MRL levee to meet the HSDRRS design requirements.

2.3.3.1 Belle Chasse Sub-basin, Orleans and Plaquemines Parish

The Corps constructed 13.8 miles of levees, floodwalls, floodgates, railroad gates and a pump station. Parish projects are labeled in green on figure 2-2.

2.3.3.2 Gretna-Algiers, Jefferson and Orleans Parish

The Corps constructed 13.15 miles of levees, floodwalls, detention basins, a pump station and the nation's largest sector gates and the world's largest pump station. Parish projects are labeled in brown on figure 2-2.

2.3.3.3 Harvey-Westwego Sub-basin, Jefferson Parish

The Corps constructed 20.4 miles of levees, floodwalls, and floodgates. Parish projects are labeled in blue on figure 2-2.

2.3.3.4 Lake Cataouatche Sub-basin, St. Charles Parish

The Corps constructed 13.9 miles of levees and floodwalls. Parish projects are labeled in beige on figure 2-2.

2.3.4 WBV COMPONENTS

Table 2-4 lists the WBV component IERs from east to west commencing at the WBV and MRL tie-in at the Harvey Canal, proceeding west through a portion of the U.S. Environmental Protection Agency (USEPA) Bayou aux Carpes CWA Section 404(c) wetlands area, Bayou Segnette State Park, and ending at the MRL tie-in near US 90 and Davis Pond diversion. Reference figure 2-2 for location of the WBV sub-basins

The HSDRRS WBV components reduce the level of storm risk in the communities of Ama, Waggaman, Avondale, Bridge City, Westwego, Marrero, Harvey, Gretna, Algiers, Belle Chasse, Oakville, and surrounding areas. The two major structures are the GIWW-West Closure Complex and the Bayou Segnette Complex. A brief summary of the WBV components is listed below. Maps illustrating the location of each component are in Appendix C. For detailed project specific information, refer to: https://www.mvn.usace.army.mil/HSDRRS-Projects.

2.3.4.1 WBV and MRL Co-Located Levee, Plaquemines and Orleans (IER 33)

To make a complete and closed risk reduction system, part of the WBV project is co-located with (constructed on top of the MRL) the west bank MRL between RM 70 and 85.5. The MRL serves as an integral part of the closed loop system, reducing the risk to communities from a storm surge propagating upstream from the mouth of the Mississippi River. After completing detailed storm surge modeling and overtopping analyses, it was determined that a 15.5 mile stretch of the alignment along the west bank MRL of the Mississippi River between RM 70 and 85.5 needed to be higher to meet the 1-percent LORR design elevation (USACE, 2010f). River mile (RM) 85.5 was identified as the 2011 100-year design grade crossover point. This is the point where the Mississippi River and Tributaries (MR&T) authorized design grade equals the 1-percent HSDRRS design for 2011 conditions.

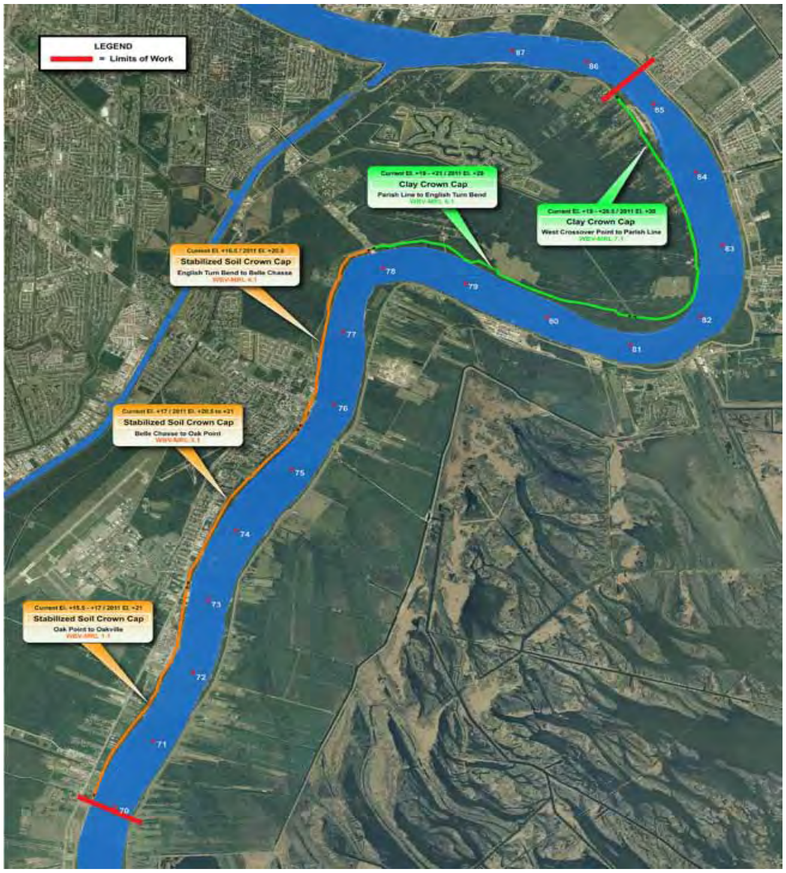

Figure 2-9: WBV-MRL Co-Located Tie-In to WBV Eastern Tie-In Contract Reaches

On the east bank of the river, there is no co-located hurricane levee constructed on top of the MRL levee because the 2011 100-year design grade crossover point is below the intersection of the MRL with the LPV tie-in to the river levee (at RM 81.5). The MRL serves as an integral part of the closed loop system between RM 81.5 to RM 127 (at the Bonnet Carré Spillway).

IER #33 assessed impacts from construction of 15.5 miles of engineered alternative measures (EAM) on the earthen levees within the existing MRL levee footprint, to provide the 100-year LORR. (Figure 2-9) Construction of WBV-MRL EAMs met the requirements for accreditation of the 100-year LORR; however, construction of Resilient Features was required to improve the resiliency and longevity of the system. The WBV-MRL resilient features included earthen levees with gentler side slopes, floodwall and gates, and armoring of earthen levees. IER #33a assessed impacts from the construction of Resilient Features.

Table 2-5: Summary of WBV HSDRRS Components

IER* #	WBV Reach	Component	Notice of Construction Completion	Map #
33/S 33a	MRL 01.2A	MRL Levee	9-28-2017	24
	MRL 01.2B	MRL Levee	9-19-2017	24
	MRL 02.2	MRL Levee	2-7-2018 11-5-2018 (2nd NCC)	24
	MRL 03.2	MRL Levee	8-15-2017	24
	MRL 04.2	MRL Levee	9-20-2017	24
	MRL 05.2	MRL Levee	10-18-2019	24
	MRL 06.1	MRL Levee	11-8-2012	24
	MRL 07.1	MRL Levee	9-11-2012	24
12/S 12/12 Addendum/ S 12a/ S 12/13	Eastern	Levee and Bayou Road realignment	4-8-2014	19
	Eastern	Closure complex	4-8-2014	19
	Eastern	Eastern FW, Waterline	4-8-2014	19
	Northern	Northern FW	12-30-2014	19
	Western, 14e.2	V-line levee shift	10-29-2012	19
	Detention Basin Improvements	Harvey Canal west bank levees 14g.2, 14a.2	10-26-2012 9-30-2015	20
	Detention Basin Improvements	Hero cutoff to Belle Chasse Hwy (east) 49.2	05-13-2016	19
	Detention Basin Improvements	Belle Chasse Tunnel and Walker Road Pits 6.2	6-19-2015	18 19
	Detention Basin Improvements	Algiers lock to Belle Chasse Hwy (west) 47.2	07-23-2016	17
14/S 14.a	14e	V-line levee	10-29-2012	19
	14d	V-line levee GWI	1-29-2013	19
	14f	LA 45 to V-line levee FW	3-15-2013	20
	14b	Orleans Village Pump Station (PS) to LA 45	07-19-2012	20
	43	Mount Kennedy PS	05-17-2012	20
	37	Ames PS	3-15-2013	20
	30	Westminster PS	7-19-2012	21
	14c	North levee	10-28-2014	21
17	16.2	Company Canal FW	12-2-2013	21
	16	Company Canal FW	12-2-2013	21

IER* #	WBV Reach	Component	Notice of Construction Completion	Map #
	22	Company Canal FW	11-28-2012	21
	16b	Company Canal FW	5-31-2013	21
	WBV-24	Company Canal FW	1-11-2013	21
15/S 15.a/ Addendum	15a.2	Pipeline and new road	5-14-2013	21
	18.2 and 15a.2	Browning-Ferris Industries, Inc. (BFI) landfill to Bayou Segnette State Park	1-10-2013 & 5-14-2013	22
	15b.2	Pump Stations No.1 & No.2 floodwall	12-13-2013	22
	17b.2	US 90 to BFI landfill	12-30-2014	22
16/S 16.a 16	76	Outer Cataouatche Canal and Levee to Bayou Verret: PS Demolition and Construction	5-31-2013	22
	16	Bayou Verret Closure Structure to Cataouatche levee	5-31-2013	22
	72a	Bayou Verret to US 90 Crossing Levee: Adding Bank Stabilization	12-13-2012	22
	74	Outer Cataouatche Canal to Bayou Verret	11-26-2013	22
	72	Outer Cataouatche Canal to Bayou Verret	12-13-2012	22
	73	US 90 Crossing Permanent Access for US 90, 9 utility crossings, raise US 90 crossing over FW	11-26-2013	23
	71	US 90 crossing to Davis Pond Diversion levee	1-10-2013	23
	71	Levee on East Side of the Davis Pond Diversion Project to MRL	1-10-2013	23
	71	Four Utility Crossings	1-10-2013	23
	71	Davis Pond Diversion to MRL	1-10-2013	23
	77	Davis Pond Diversion to MRL	5-31-2013	23

*S - Supplemental

2.3.4.2 Hero Canal Levee and Eastern Tie-in (IER 13)

This reach begins at the Hero Canal, south of the confluence of the Algiers and Harvey canals off of the GIWW (see appendix D). In Reach 1, north of Hero Canal, the existing levee was enlarged with a protected-side shift included for approximately 2.3 miles to +14-ft. Reach 2 included a new 56-ft wide stoplog closure structure (IER #13). South of the Hero Canal (Reach 2), the earthen levee was raised to 14-ft for 1,400 linear ft southward and for 1,360 linear ft eastward on the south side of the landfill until it intersects with a non-Federal levee. Improvements were made to the non-Federal levees to match the new Federal levee at a 14-ft elevation. A new 150 cfs pump station was built south and east of the landfill with a T-wall, vehicular floodgates, and a railroad gate constructed to 14-ft elevation. From the railroad to the MRL, a new earthen levee was constructed also with a 14-ft elevation.

2.3.4.3 Gulf Intracoastal Waterway – Western Closure Complex (GIWW-WCC), Harvey and Algiers Canal Levee and Floodwalls (IER 12)

The GIWW-WCC is a major feature of the HSDRRS that provides the first line of defense from storm surge entering the Harvey and Algiers Canals. The WCC consists of the nation’s largest sector gate, the world’s largest drainage pump station, floodwalls, sluice gates, foreshore protection and an earthen levee. The WCC significantly reduces the risk to a large area of the west bank by eliminating 25 miles of levee, floodwalls, floodgates and pumping stations along the canals from the direct impacts of storm surge.

Figure 2-10: Western Closure Complex

2.3.4.4 Bayou aux Carpes Clean Water Act, Section 404(c) Site

The USACE, in cooperation with the National Park Service (NPS), finalized a Supplemental Environmental Assessment (SEA) #581 that evaluated augmentation measure(s) for the Bayou aux Carpes Clean Water Act (CWA), Section 404(c) site (BAC Site). The CEMVN made a formal request, by letter dated November 4, 2008, to the Environmental Protection Agency (EPA) to modify the Section 404(c) Final Determination for Bayou aux Carpes to include a 4,200 linear foot flood wall, including a 100-foot-wide corridor as part of the WBV Western Closure Complex. The EPA subsequently issued the Modification to the 1985 CWA Section 404(c) Final Determination for the BAC site to allow construction of the “WBV 404(c) flood wall”.

As part of the modification to the Section 404(c) determination, the CEMVN committed to fully mitigate and compensate for unavoidable impacts to the BAC site. In addition to the compensatory mitigation, the EPA requested and the CEMVN committed to evaluate and consider for implementation additional ecological augmentation features that would add an extra measure of environmental benefits due to the unique status of the BAC Site.

The project includes modifying the shell plug at the Bayou aux Carpes to provide hydrologic exchange between the Gulf Intracoastal Water Way (GIWW) and the BAC Site, thereby partially restoring the historic hydrologic sheet flow regime. In addition, the project includes the removal of an earthen embankment, identified as a “plug”, which was placed where BAC intersects the Gulf Intercostal Water Way (GIWW) in 1974. Most of the work will occur within the EPA designated BAC Site on property that is managed by the NPS as part of the Jean Lafitte National Historical Park and Preserve’s (JLNHPP’s) Barataria Preserve. Other Project activities would occur in state owned water bottoms and roadways. Removal of this earthen embankment would create a sinuous connection between Bayou aux Carpes and the GIWW to partially restore hydrologic connectivity and increase wetland functions and values of the BAC Site. A Finding of No Significant Impact was signed on 1 April 2021. Construction was completed on 30 June 2021. The Notice of Construction Complete letter was signed on 9 August 2021.

2.3.4.5 Westwego to Harvey Levee, Jefferson Parish (IER 14)

The levee extends from Westwego on the western end to Harvey Canal on the eastern end and is in the vicinity of the Mississippi River to the north; Barataria Bay and the Gulf of Mexico to the south; Harvey Canal to the east; and Jean Lafitte National Historical Park and Preserve, Barataria Preserve Unit (JLNHPP) and Lakes Salvador and Cataouatche to the west. Both Lakes Salvador and Cataouatche are estuaries that connect to the Gulf of Mexico through Barataria Bay.

Most of the project was constructed within existing right-of-way (ROW) and levees within previously disturbed areas. The project was divided into five main reaches: WBV-14c, WBV14b, WBV-14f, WBV-14d, and WBV-14e. Some reaches include floodwalls for pump station protection, identified as WBV-30, WBV-37, and WBV-43. Construction included reinforced concrete floodwall tie-ins for the Westminster, Ames, and Mount Kennedy Pumping Stations. Portions of the v-line levee are floodwall and other portions are earthen levee enlargement. The v-line levee includes a 200-foot-wide by 15 feet deep interior drainage canal on the protected side of the Bayou aux Carpes 404(c) site on the flood side. The floodgate at Hwy 45 was replaced with a swing gate. The existing ramp at Hwy 3134 was raised to ensure a continuous line of protection. Within WBV-43 reach, a continuous line of flood protection was partially constructed outside of the existing ROW.

2.3.4.6 Company Canal Floodwall (Bayou Segnette Complex, IER 17)

This project is located north of the Outer Cataouatche Canal and Bayou Segnette and the community of Westwego and the Mississippi River are to the south. An elevated section of the Lapalco Boulevard crosses this reach. The project was constructed within the ROW in five reaches. Reach 1 consisted of constructing a new floodwall with a protected side expansion due to its proximity to the Outer Cataouatche Canal and waterfront cabins between the canal and the floodwall. The alignments run from the southwest end of the Bayou Segnette State Park, where the existing floodwall connects with the Lake Cataouatche levee and proceeds northeast within the Bayou Segnette State Park under the elevated Lapalco Boulevard to the Bayou Segnette Pumping Station. Reach 2 is comprised of fronting protection for the Bayou Segnette Pumping Stations (WBV 16b). This reach is limited to floodwall due to insufficient room to provide the 100-year LORR. Within reach 3, the floodwall departs from the existing alignment. Constructed in this reach is a 60-foot navigable closure structure across the Company Canal navigation channel and a new pumping station sized like the Old Westwego Pumping Station. East of Bayou Segnette, the alignment crosses the Westwego Canal and connects to a floodwall on the eastern side of Bayou Segnette, just north of Lapalco Boulevard. To accommodate the new pumping station, the navigation channel was moved to the east and channel scour protection was added.

2.3.4.7 Lake Cataouatche Levee (IER 15)

Construction of the levee consisted of three reaches. Reach 1 was constructed to a height of 15.5 feet NAVD88 from Hwy 90 to the end of the BFI Landfill. The levee had to be shifted west approximately 110 feet. To accommodate the larger levee, construction required building the toe of the levee approximately 40 feet out into the Outer Cataouatche Canal by “pushing a mud wave”. Reach 2 levee was constructed from the BFI Landfill to the Bayou Segnette State Park. The levee was shifted to the protected side entirely within the existing construction ROW and built to a height of 15.5 feet. Reach 3 consisted of the Lake Cataouatche Pump Stations No. 1 and No. 2 floodwall. Approximately 1,450 feet of T-wall floodwall was constructed to a height of 15.5 feet NAVD88.

2.3.4.8 Western Tie-in, Jefferson and St. Charles Parishes (IER 16)

The project consisted of building approximately 23,600 linear feet of levee, floodwall and closure structures to an elevation of 13.5 feet to 15.5 feet NAVD88. Originating on the western end of the Lake Cataouatche levee, the alignment began as an earthen closure of the Outer Cataouatche Canal. Discharge lines from the Highway 90 pumping station were extended and cross over the closure so that the pump station discharges on the flood side of the alignment. Proceeding westward, the alignment continues as levee south of, and parallel to, the Outer Cataouatche Canal for approximately 2,400 feet. On the eastern side of Bayou Verret, the levee transitions to a floodwall approx. 300 feet before navigation and drainage from the Outer Cataouatche Canal and Bayou Verret. An existing drainage canal that extends from the Outer Cataouatche Canal, north under Hwy. 90 was widened from approximately 20 feet to approximately 100 feet and deepened to 10 feet.

2.3.5 ENVIRONMENTAL REEVALUATIONS

In some cases, after the USACE moved into the construction phase, some small project changes were necessary to further construction. These changes were evaluated and if they did not meet the criteria for supplementation under the NEPA regulations (40 CFR 1502.9(c)), an environmental reevaluation document was prepared. Through preparation of an environmental reevaluation, the USACE ensured that all applicable laws and regulations were followed as well as conducting required agency coordination or consultation. Environmental reevaluations were discussed with the interagency team to ensure everyone agreed that the changes and associated potential impacts did not rise above the level of *de minimus* (appendix J). In most cases, the environmental reevaluations addressed changes within ROW (utility crossings, revised staging areas) or installation of ramps or fences required during construction activities. A table listing the IER reevaluations and agency consultation/coordination is included in appendix K. As of August 2020, there were 20 environmental reevaluation actions originally evaluated in various IERs.

2.3.6 FUTURE FEDERAL LEVEE LIFTS

Southeast Louisiana, including the GNO metropolitan area, is generally characterized by weak soils, general subsidence and the global incidence of sea level rise that will cause levees to require future lifts to sustain performance of the HSDRRS. The authorization for construction of the system did not authorize future levee lifts required to sustain the 1 percent LORR over the long term. Section 3017 of WRRDA 2014 authorized USACE to carry out measures necessary to address consolidation, settlement, and sea level rise if the necessary work is determined to be technically feasible, environmentally acceptable, and economically justified. The Bipartisan Budget Act of 2018 provided appropriations to conduct the General Re-evaluation Report necessary to inform this determination for both the LPV and WBV components of the HSDRRS.

Earthen levees were constructed at the 2011, 100-year LORR elevation, while hardened structures, such as floodwalls, floodgates, vertical lift gates, and sector gates, were constructed to the 2057, 100-year LORR design elevations. Levees would be "lifted" or raised as needed, if authorized and funded, to maintain their elevation at the 100-year LORR required for NFIP FEMA certification to accommodate consolidating soils, subsidence, and sea-level rise.

The general reevaluation studies were recently finalized for the LPV Project and the WBV Project. Notice of the release of the Final Integrated General Reevaluation Reports and Environmental Impact Statements for a 30-day public review was published in the Federal Register August 6, 2021 (FR volume 86, No 149). Initial rough order of magnitude estimates suggest the project would require 9 mcy of additional borrow at a cost of approximately $1.2 billion for LPV and $663 million for WBV. The final Directors Reports and Records of Decision are undergoing upper-level management review. The Directors Reports are expected to be approved within this 2021 calendar year.

The CPRAB, as the non-Federal sponsor, can construct future lifts with their own funds and is considering doing so to sustain the design heights of several reaches until 2025 through the USACE Section 408 program. Absent future construction of additional levee lifts by either the USACE or CPRAB and the local levee districts, risk associated with flooding from a tropical event in the metro New Orleans area would increase over time. Section 3.3.3 describes Section 408 additional levee lifts under consideration by the CPRAB.

2.3.7 BORROW HSDRRS COMPONENTS

The CEMVN conducted a search for an unprecedented amount of suitable clay material to rebuild and reinforce the HSDRRS in the GNO metropolitan area. The CEMVN engineers originally estimated that over 100 mcy of suitable material was required for the HSDRRS projects. Approximately 17.3 mcy of borrow material was needed to complete the construction of the levees and floodwalls, as well as other non-Federal and USACE flood risk reduction projects. It is projected that an additional amount of suitable borrow material would be required for future HSDRRS earthen levee lifts through the year 2057 to continue to provide the 100-year LORR.

The USACE implemented the following protocol when identifying potential borrow sources in descending order of priority:

1. Sites that are permitted commercial sources, authorized borrow sources for which environmental clearance and wetland and non-jurisdictional mitigation have been completed, or non-functional levees after newly constructed adjacent levees would be providing equal risk reduction

2. Areas under forced drainage that are protected from flooding by levees, and that are:
    a) non-forested (e.g., pastures, fallow fields, abandoned orchards, former urban areas) and non-wetlands;
    b) wetland forests dominated by exotic tree species (i.e., tallow) or non-forested wetlands (e.g., wet pastures), excluding marshes; and
    c) disturbed wetlands (e.g., hydrologically altered, artificially impounded).

3. Sites that are outside a forced drainage system and levees, and that are:
    a) non-forested (e.g., pastures fallow fields, abandoned orchards, former urban areas) and non-wetlands;
    b) wetland forests dominated by exotic tree species (i.e., tallow) or non-forested wetlands (e.g., wet pastures), excluding marshes; and
    c) disturbed wetlands (e.g., hydrologically altered, artificially impounded).

After applying the protocol and identifying potential mitigation locations, 2b and 2c were dropped from consideration due to the required mitigation component. Additionally, all sites with wetlands were avoided. Farmland or pasture sites were primarily used as borrow areas. Due to the amount of the material required and the paucity of suitable areas within the project area, sites outside of the forced drainage or levee system were considered.

A total of 58 borrow sites were investigated, both inside and outside the Greater New Orleans metropolitan area. There was a total of 18 government-furnished (GF) and 40 contractor-furnished (CF) borrow sites. Seventeen borrow sites were used for excavation and one for stockpiling. Table 2-5 summarizes all GF and CF borrow sites investigated. Figure 2-11 illustrates the geographical range of the borrow sites. Refer to Appendix C for specific borrow site location maps.

Table 2-6: Borrow Sites Evaluated and Used

IER	TYPE	BORROW SITE	PARISH	CY UTILIZED
GOVERNMENT-FURNISHED BORROW				
18*	CF	1418/1420, 1572, 910 Bayou Road	St. Bernard	
	GF	4001 Florissant *	St. Bernard	
	CF	Dockville	St. Bernard	
	GF	Belle Chasse Naval Air Base*	Plaquemines	
	GF	Triumph area *	Plaquemines	
	GF	Maynard area	Orleans	226,648
	GF	Cummings North	Orleans	
	GF	Churchill Farms Pit A	Jefferson	536,275
	GF	Westbank Site G area	Jefferson	
	GF	Bonnet Carré Spillway *	St. Charles	2,224,723
28*	GF	Johnson/Crovetto	St. Bernard	
	GF	Bazille*	Plaquemines	
22*	GF	Westbank N (also called Walker Road Pit)	Plaquemines	606,105
	GF	Brad Buras*	Plaquemines	
	GF	Tabony*	Plaquemines	
	GF	Westbank F	Jefferson	
	GF	Westbank I	Jefferson	
25	GF	Tac Carrere*	Plaquemines	
CONTRACTOR-FURNISHED BORROW				
19/23	CF	Pearlington Dirt Phase 1 & Phase 2 *	Hancock County, MS	1,567,828
19/29	CF	Eastover/Eastover Phase II	Orleans	2,088,221
19/31	CF	River Birch Phase 1, 2, and River Birch Landfill Expansion areas	Jefferson	1,676,018
19*	CF	The Kimble #2 *	Plaquemines	
	CF	Sylvia Guillot *	St. Bernard	
	CF	Gatien-Navy Camp Hope	St. Bernard	
	CF	DK Aggregates	St. Bernard	
	CF	St. Gabriel Redevelopment *	Iberville	
23*	CF	1025 Florissant*	St. Bernard	91,295
	CF	Myrtle Grove*	Plaquemines	
	CF	Acosta*	St. Bernard	utilized
23/32*	CF	3C Riverside/ 3C Riverside Phase 3*	St. Charles	2,102,098
25*	CF	Stumpf*	Orleans	Stockpile
	CF	Westbank D	Jefferson	
25/35	CF	Westbank E/Assumption Land Company	Jefferson	
26	CF	South Kenner	Jefferson	12,295
	CF	Willowood	Jefferson	
	CF	Frierson*	Hancock County, MS	
26/29*	CF	Willow Bend/Willow Bend Phase II*	St. John the Baptist	2,503,289
29*	CF	Tammany Holding*	St. Tammany	913,656
30*	CF	Big Shake*	St. James	117,946
	CF	Contreras	St. Bernard	884,698
	CF	Henley*	Hancock County, MS	

IER	TYPE	BORROW SITE	PARISH	CY UTILIZED
	CF	Levi*	St. Tammany	
	CF	Lilly Bayou*	East Baton Rouge	
	CF	Raceland Raw Sugars*	Jefferson	
	CF	Port Bienville*	Hancock County, MS	183,980
	CF	King Mine*	Hancock County, MS	
31*	CF	Acosta 2*	St. Bernard	utilized
31/32*	CF	Idlewild Stage 2/Idlewild Stage 1*	Plaquemines	878,803
32*	CF	Bocage*	Ascension	
	CF	Citrus Lands*	Plaquemines	10
	CF	Conoco Phillips*	Plaquemines	
	CF	Nairn*	Plaquemines	
	CF	Plaquemines Dirt and Clay*	Plaquemines	303,553
35*	CF	Assumption Land Company	Jefferson	
	CF	Houma Excavation*	Terrebonne	
	CF	RBEND II*	St. John the Baptist	
	CF	Robert Brothers Farm*	St. John the Baptist	
		Total: 58	7 Parishes; 1 county	13,554,347

* Borrow site outside of the HSDRRS Area

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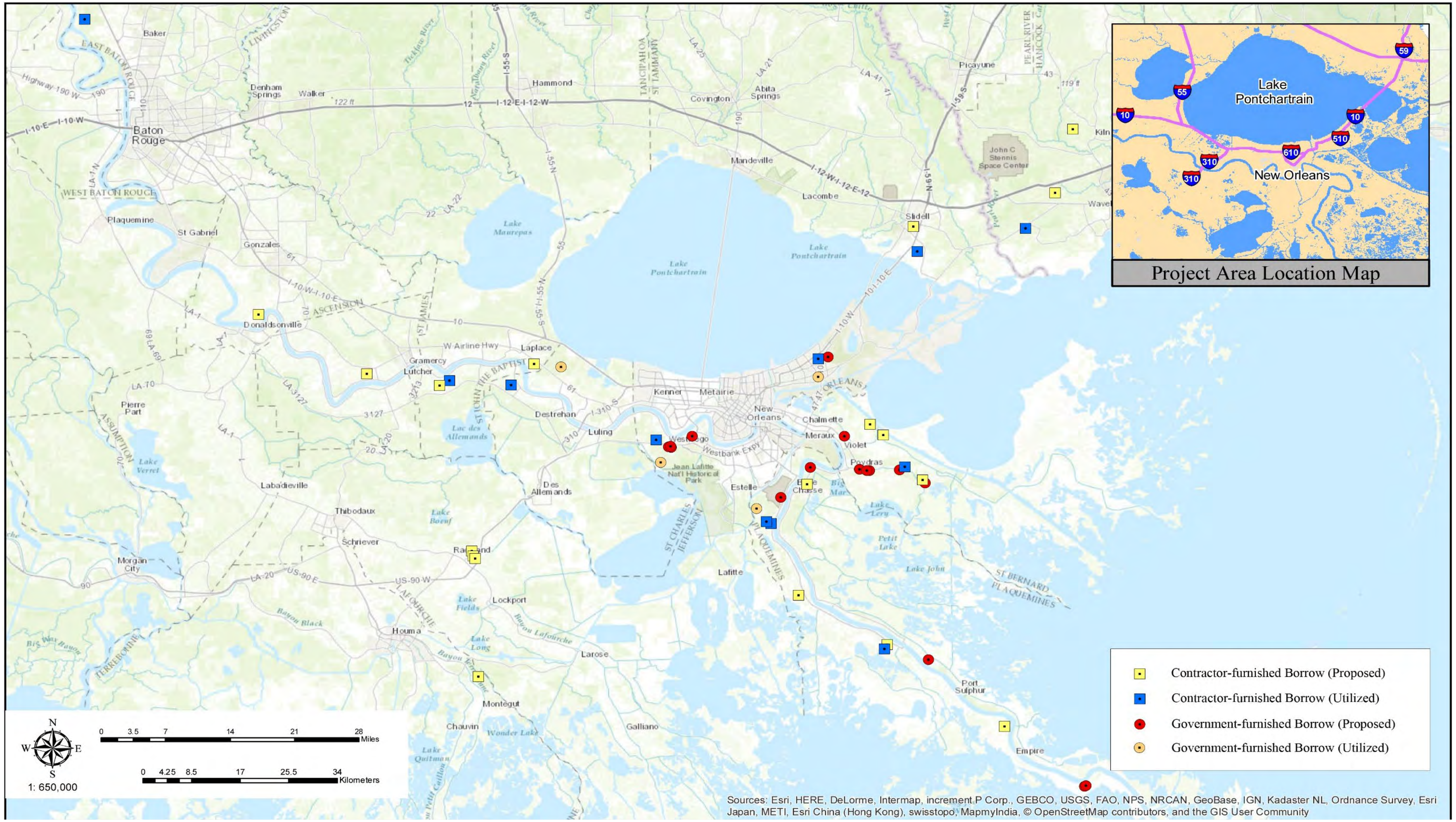

Figure 2-11: HSDRRS borrow sites evaluated

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2.3.8 MITIGATION COMPONENTS

The term “mitigation” is often used in discussing methods implemented to reduce the level of adverse impacts; it is also used when specifically discussing the reduction of impacts on wetlands and BLH. Programmatic IERs (PIER) No. 36 and No. 37 were prepared to describe the mitigation plan for the LPV and WBV components. Throughout the CED, the mitigation PIERs are collectively referred to as Wetlands and Bottomland Hardwood Mitigation IERs and the term “compensatory mitigation” is used to refer to mitigation to wetlands and BLH. Section 5.0 discusses the Mitigation Plan in detail.

Avoidance, minimization, and compensatory mitigation efforts on relevant resources were ongoing throughout the construction effort. Although impacts were avoided to the greatest extent practicable, some impacts were unavoidable. Where avoidance was not possible, the impacts were minimized to the greatest extent possible. For those impacts that could not be avoided, compensatory mitigation was required per WRDA 1986, Section 906, as amended by Section 2036 of WRDA 2007. For example, as a selection criterion for identifying suitable borrow sites, any proposed site that might impact wetlands was eliminated. Contractor-furnished borrow sites that contained BLH were required to mitigate for unavoidable impacts to BLH through the purchase of mitigation bank credits from an appropriate mitigation bank prior to using the borrow for a HSDRRS project.

Table 2-6 lists the Mitigation PIERs, documents that tiered off the programmatic document (Tiers), and supplements to the programmatic documents (SIERs) for the LPV and WBV components. Section 5 includes a complete discussion of the Mitigation Program.

Table 2-7: Compensatory Mitigation for the HSDRRS

NEPA document	Basin	Parish	Title	Decision Record/FONSI
PIER #36	LPV	Orleans, Plaquemines, St. Bernard, St. Charles, St. John The Baptist, and St. Tammany	LPV HSDRRS Mitigation	22-Nov-2013
PIER #36 Tiered IER 1	LPV	St. Tammany	Milton Island Marsh Restoration	19-Sep-2014
PIER #36 Supplement 1 (SIER 1)	LPV	St. Tammany and Orleans	Bayou Sauvage, Turtle Bayou & New Zydeco Ridge Restoration	20-Oct-2015
EA #546 SPIER 36 Supplement 1	LPV	St. Tammany and Orleans	EA Supplement PIER 36 Supplement 1 Bayou Sauvage, Turtle Bayou & New Zydeco Ridge	01-Jul-2016
PIER #37	WBV	Jefferson, Lafourche, Plaquemines, and St. Charles	WBV HSDRRS Mitigation	13-Jun-2014

NEPA document	Basin	Parish	Title	Decision Record/FONSI
PIER #37 Tiered IER 1 Joint NPS EA	WBV	Jefferson	Jean Lafitte National Historical Park and Preserve Mitigation Features	17-Dec-2015 USACE 3-Mar-2016 NPS
SPIER #37a	WBV	Jefferson	Mitigation for Protected Side BLH WBV HSDRRS	04-Mar-2016
SEA #548 Tier 1 of PIER #37 NPS Joint EA	WBV	Jefferson	WBV Lake Cataouatche Borrow Area Expansion and Access Features, JLNHPP	02-Nov-2016 USACE 20-Oct 2016 NPS
SEA #572	WBV	Lafourche	BLH-wet and swamp mitigation, Lafourche Parish	24-Jul-2019

2.3.9 ARMORING

As discussed in Section 1, following Hurricane Katrina, IPET was convened to find scientific and engineering answers to questions regarding the functioning of the New Orleans levee system during the storm. According to the IPET Report, four of the 50 major levee breaches caused by Hurricane Katrina resulted from foundation-induced failures. (Figure 2-12) The remainder were caused by a combination of overtopping and scour. "Scour" refers to the erosion of earthen levee due to wave and water friction.

Figure 2-12: Effects of Scour on a Levee and Floodwall Near the IHNC

Per the Fourth Supplemental Appropriations Act, Congress authorized and funded, the armoring of critical elements of the HSDRRS. The 'critical' elements were defined by the IPET and the ASCE External Review Panel as those elements that suffered severe erosion and/or breaching and includes levee transitions, pipeline and utility crossings, as well as the land side of levees and floodwalls. The landside of levees was defined as a 'critical element' versus the flood-side of levees as evident in the IPET quote, 'No levee breaches occurred without overtopping.' An ERDC desktop study of existing research on levee flood-side erosion potential revealed that it did not pose a significant risk of levee breaches; therefore, no armoring was recommended on flood-side slopes. The armoring of 'critical elements' in the system perimeter contributes to the resiliency of the HSDRRS, when subjected to extreme storm surges greater than a 1 percent annual chance of exceedance (a.c.e.). The erosion resistance performance was determined for overtopping waves of the 0.2 percent extreme storm surge for several potential commercially available armoring materials, with HSDRRS soil, grass, wave, and climate conditions.

Figure 2-14: Bermuda Sod

Figure 2-13: HPTRM Turf Mats

The most common and important form of armoring on earthen levees was determined to be grass. (Figure 2-13) Some additional armoring examples include riprap (large stones), high performance turf reinforcement mats (HPTRM, Figure 2-14), and concrete slabs. In some repaired areas, riprap armoring has been reinforced with grout to lock the large stones in place and solidify the protective layer.

Critical areas for scour protection include transition points where levees and floodwalls abut; where pipelines cross levee alignments; at floodwalls, particularly in densely populated areas; and where levees are directly exposed to large sections of open water (e.g. the New Orleans East and St. Bernard levees adjacent to Lake Borgne that suffered massive damage during Hurricane Katrina).

In general, the Armoring Program comprises the installation of erosion risk reduction measures on the levee crown, landside slope and a 15-foot portion of the berm. For armoring, the construction sequencing is as follows: 1) Surface prep by loosening the ground on the levee; (2) Rake the surface to further break up ground surface; (3) Place HPTRM w/anchors; (4) Place sod; (5) Irrigate; and (6) Establish turf. Armoring typical design section is included in Figure 2-13.

Currently, 77 miles of the the HSDRRS is planned for armoring. Thirty-four miles of levee were planned to go straight to armoring; of those, CEMVN has issued a notice of construction completion (NCC'd) for 34 miles. Forty-two miles of levee were planned to be lifted prior to armoring, of which 37.2 miles have been NCC'd. A total of 26 contracts have been awarded, of which 25 are complete and one is under construction. All activities and construction occurred on the levee or within the levee ROW and on existing roads, all of which were previously disturbed by construction of the HSDRRS.

The CEMVN and the CPRAB are working together to incorporate lifts prior to armoring. Figure 2-15 illustrates the armoring plan and which levees went straight to armoring and which required a levee lift prior to armoring.

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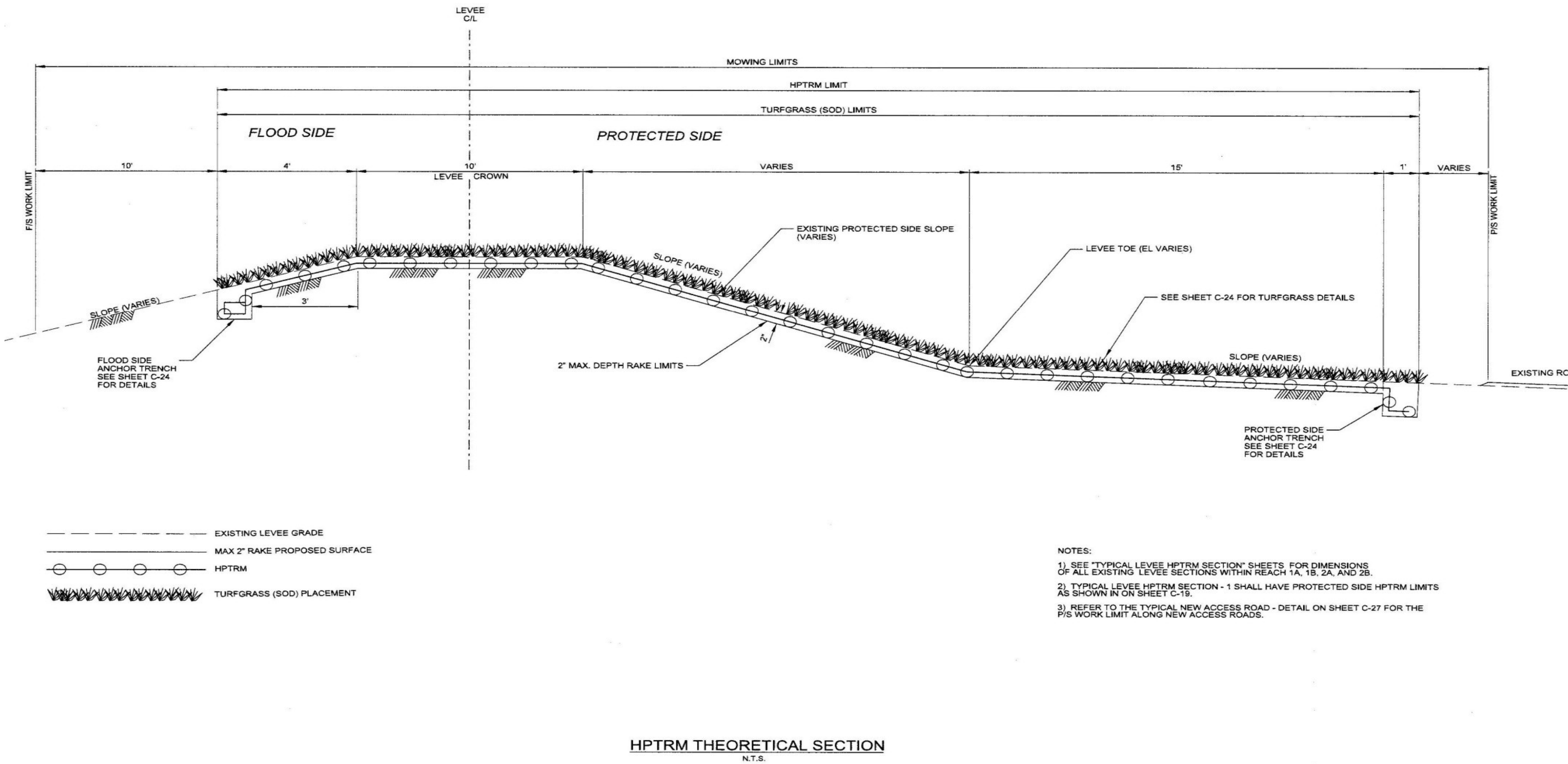

Figure 2-15: HPTRM Theoretical Section

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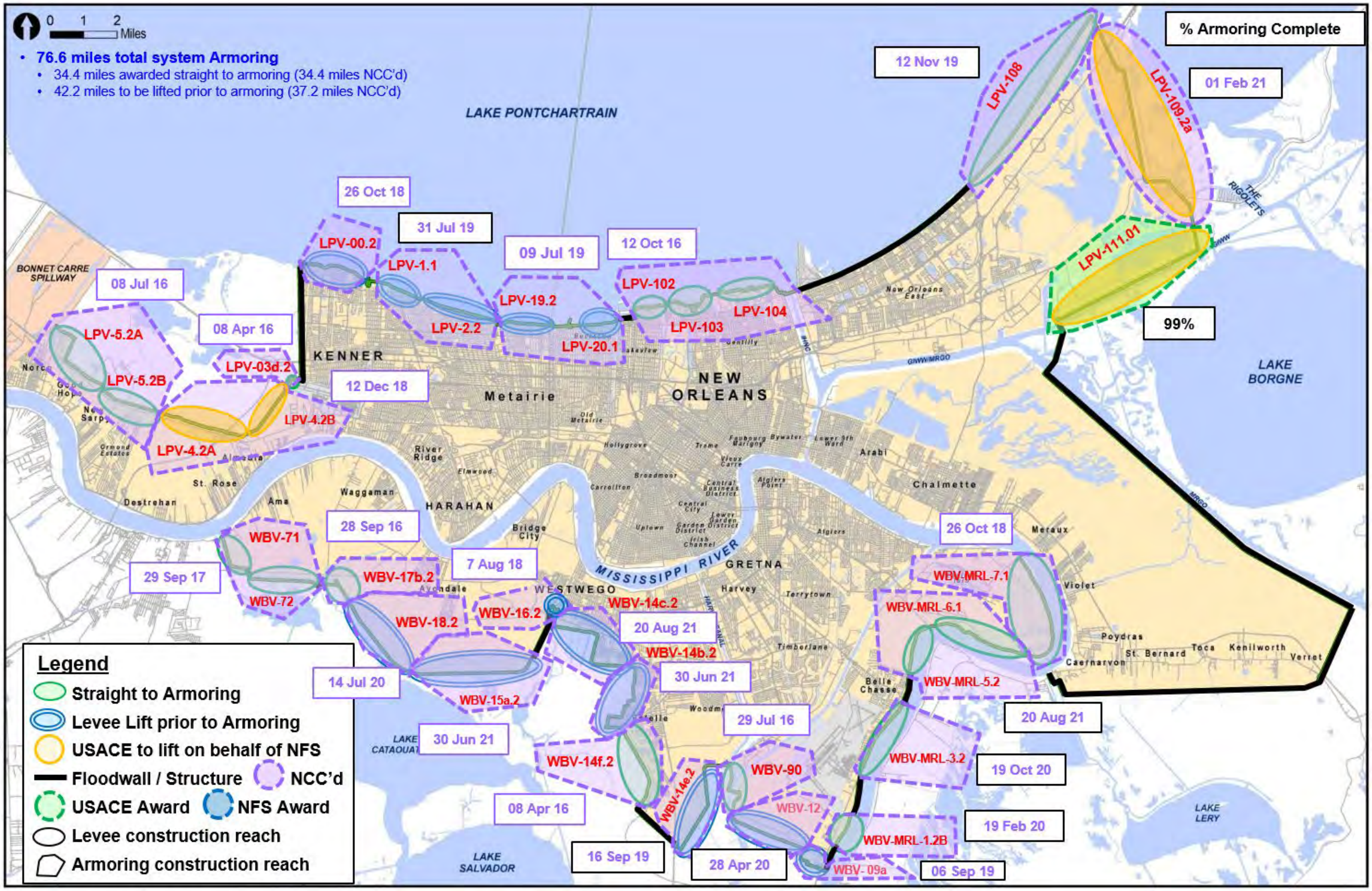

Figure 2-16: Armoring Plan per Levee Reach

SECTION 3

REGIONAL PROJECTS AND PROGRAMS

Since the 2005 hurricane season, significant resources and efforts focused on rebuilding southeast Louisiana. To quantify these regional efforts, the CEMVN canvassed a wide array of resources to bring the impacts of as much of this rebuilding effort as practicable under one overarching evaluation of cumulative impacts due to regional actions in southeast Louisiana. For the cumulative impact analysis, regional projects in southeast Louisiana were broadly addressed through the following subheadings:

Figure 3-1: Regional Projects Depicting Storm Damage Reconstruction and Coastal Restoration

- Storm Damage Reconstruction
- Redevelopment
- Coastal and Wetlands Restoration
- Flood Risk Reduction Projects
- Transportation

Appendix L provides a listing of present, ongoing, or proposed regional projects and forms the basis for the cumulative impacts' analysis of other present and future actions on relevant resources presented in section 4.0. The list of projects was developed by reviewing local, State, and Federal websites for projects that are complete, ongoing and in the planning stages within the southeast region. Additionally, local, State and Federal agencies were contacted to gather as much information about a project as possible. While the list does not describe every project within the region, it does illustrate the extensive nature of the rebuilding efforts in the area.

The Insurance Information Institute (2007) estimated that insured losses from Hurricane Katrina totaled $40.6 billion in six states. In Louisiana, insured losses were estimated at nearly $26 billion. Since Hurricane Katrina, the GNO metropolitan area has experienced a tremendous amount of reconstruction (Figure 3-1). Although it is unknown how many structures (private, public, residential, and commercial) were rebuilt within the entire

HSDRRS project area, a large-scale rebuilding effort was accomplished. In Orleans Parish alone, from August 2005 until July 2011, 343,220 building permit applications were submitted for residential and commercial storm damage reconstruction, repair, demolition, and new building (see Storm Damage Reconstruction in appendix L). FEMA provided funds to various public agencies within the five-parish HSDRRS area for rebuilding efforts, including repairs to streets, sidewalks, sewer and potable water infrastructure, and public buildings. In addition, many other Federal, State, local, and non-profit organizations came to the aid of the Gulf Coast region.

As part of the analysis, CEMVN regulatory permits issued from 2007 through 2020 for projects occurring within southeast Louisiana were broadly evaluated.

3.1 FLOOD RISK REDUCTION PROJECTS IN SOUTHEST LOUISIANA

Major risk reduction projects in the region are summarized below. These projects are illustrated in Figure 3-2.

3.1.1 Westbank & Vicinity, General Reevaluation Report (GRR) & Integrated EIS

The USACE is preparing the Westbank and Vicinity General Re-evaluation Report under the authority of Section 3017 of WRRDA 2014. Public Law 115-123 (Bipartisan Budget Act of 2018) funded the study as a new start. The study phase is 100 percent federally funded and seeks to determine if the work necessary to sustain the 1 percent level of risk reduction is technically feasible, environmentally acceptable, and economically justified. A positive determination would make construction of future levee lifts eligible for future budget requests. The alternative analysis is based on cost, economic damage reduction, life safety risk reduction and environmental and cultural resource impacts. The tentatively selected plan (TSP) is Alternative 2, which includes system levee lifts and raising floodwalls to the projected 1 percent annual exceedance probability event. The TSP consists of 52 miles of levee lifts to be constructed as needed before the combined effects of consolidation, settlement, subsidence, and sea level rise reduce the levee elevation in each levee reach below the required design elevation. The TSP also includes 0.9 miles of floodwall modifications and replacements constructed as needed prior to the combined effects of consolidation, settlement, subsidence, and sea level rise cause the design requirements to be exceeded for each structure. The TSP has a benefit-to-cost ratio of 2.4. It reduces the estimated annual economic damages to approximately $8 million and significantly reduces life safety risks. Implementation of the TSP would result in potential impacts to BLH wetland habitat. These impacts would be avoided to the maximum extent practicable but would be unavoidable in some locations due to existing infrastructure on the protected side of the levees. The proposed mitigation plan assumes 39.25 AAHUs of BLH-wet impacted by the TSP would be offset through the purchases of mitigation bank credits equal to 39.25 AAHUs. The release of the Final integrated feasibility reports and environmental impact statements for a 30-day public review was published in the Federal Register August 6, 2021 (FR volume 86, No 149). Master General Holland approved the final report XXX, 2021. The Directors report is currently under further upper-level management review. The full report is available at: https://www.mvn.usace.army.mil/WBV-GRR/

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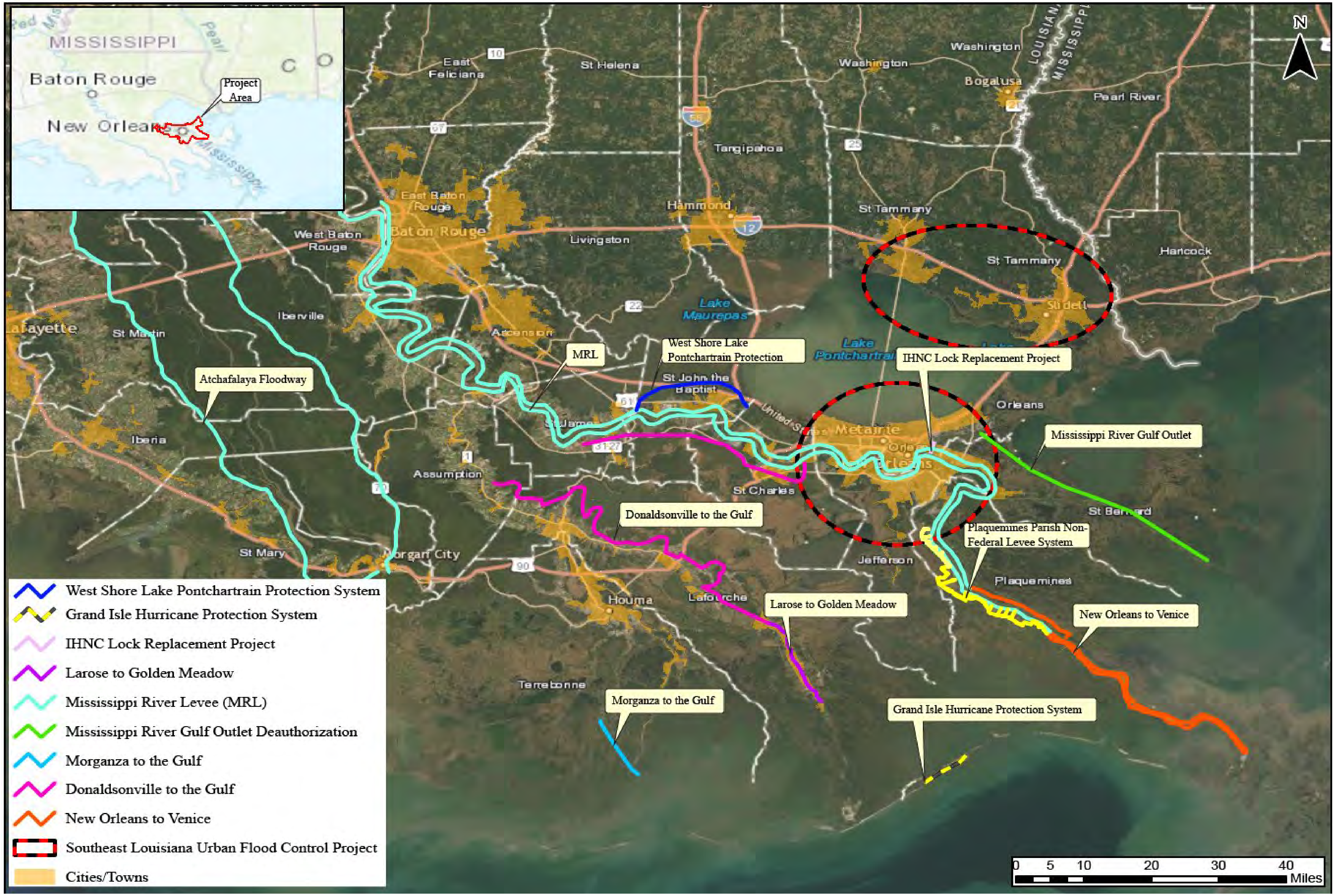

Figure 3-2: Major Flood Risk Reduction Projects in Louisiana

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3.1.2 LAKE PONTCHARTRAIN & VICINITY, GRR & INTEGRATED EIS

The USACE is preparing the Lake Pontchartrain and Vicinity General Re-evaluation Report under the authority of Section 3017 of WRRDA 2014. Public Law 115-123 (Bipartisan Budget Act of 2018) funded the study as a new start. The study phase is 100 percent federally funded. The study seeks to determine if the work necessary to sustain the 1 percent level of risk reduction is technically feasible, environmentally acceptable, and economically justified. The study considers other levels of risk reduction. A positive determination would make construction of future levee lifts eligible for future budget requests.

The TSP is Alternative 2, which includes system levee lifts and raising floodwalls to the projected 1 percent annual exceedance probability event. The TSP consists of 46.4 miles of levee lifts to be constructed as needed before the combined effects of consolidation, settlement, subsidence, and sea level rise reduce the levee elevation in each levee reach below the required design elevation. The TSP also includes 16.8 miles of floodwall modifications and replacements constructed as needed prior to the combined effects causing the design requirements to be exceeded for each structure. The TSP has a benefit-to-cost ratio of 2.5. Implementation of the TSP would result in potential impacts to BLH wetlands habitat. These impacts would be avoided to the maximum extent practicable but would be unavoidable in some locations due to existing infrastructure on the protected side of the levees. The proposed mitigation plan assumes 17.2 AAHU of BLH wetlands impacted by the TSP would be offset through the purchases of mitigation bank credits equal to 17.2 AAHUs. The notice of release of the Final General Re-evaluation Report and Integrated EIS for 30-day public review was published in the Federal Register August 6, 2021 (FR volume 86, No. 149) . The Directors Report is currently under further upper-level management review. The full report is available at: https://www.mvn.usace.army.mil/LPV-GRR/

3.1.3 NEW ORLEANS TO VENICE (NOV), FEDERAL HURRICANE PROTECTION LEVEE PLAQUEMINES PARISH, LOUISIANA

The project was initially authorized in the Flood Control Act of 1962. Prior to Hurricane Katrina in 2005, the NOV project was approximately 85 percent complete, with an estimated completion date of 2018. Since the 2005 hurricane season, the USACE has repaired most of the damage caused by Hurricane Katrina. There are currently two contracts under construction that will complete this effort. The project straddles the Mississippi River in Plaquemines Parish. On the east bank, the project extends 15 miles on the back levee from Phoenix to Bohemia, Louisiana. On the west bank, a non-Federal levee extends approximately 37 miles from St. Jude to Venice on the back levee and on the mainline levee. In the aftermath of the 2005 hurricane season, restoration and accelerated completion of the NOV project, as well as incorporation of certain non-Federal levees into NOV, were authorized and funded at $762 million in the 3rd, 4th, 6th, and 7th Supplementals passed by Congress. A supplemental EIS for the NOV project titled *Supplemental Environmental Impact Statement New Orleans to Venice Federal Hurricane Protection Levee Plaquemines Parish, Louisiana* was provided for public review and comment in Spring and Summer 2011, and the Record of Decision (ROD) was signed on October 31, 2011.

The design evaluated in the Supplemental EIS and ROD would increase the elevation of all Federal flood risk reduction structures to meet the 50-year risk reduction design grade and would stabilize those sections of levees where subsoil deficiencies or internal levee deficiencies undermine their strength. The 50-year level of risk reduction means to reduce the risk from a storm surge that has a 2 percent chance of being equaled or exceeded in any given year. Upon completion, the project will achieve storm risk reduction for Plaquemines Parish at the authorized (2 percent) level. In most levee sections, this would involve elevating the levee crest with earthen fill and expanding the levee base footprint to provide the necessary design strength. The addition of earthen fill and expansion of the levee base would be the most likely method to stabilize subsoil sections of levees requiring additional strength. Concrete T-walls would be repaired or replaced on the top of some levees where design and cost factors dictate. Existing pump station (PS) walls and floodgates would also be restored and armored to meet the authorized design criteria. This project is still under construction and anticipated to be complete in 2023.

3.1.4 NOV, LOUISIANA HURRICANE PROTECTION PROJECT: INCORPORATION OF NON-FEDERAL LEVEES (NFL) FROM OAKVILLE TO ST. JUDE PLAQUEMINES PARISH, LOUISIANA

This proposed project includes replacing or modifying certain non-Federal back levees on the west bank of the Mississippi River for incorporation into the NOV Federal levee project, described in section 3.1.1. An EIS titled *New Orleans to Venice, Louisiana, Hurricane Risk Reduction Project: Incorporation of Non-Federal Levees from Oakville to St. Jude Plaquemines Parish, Louisiana* was released for public review and comment in Spring and Summer 2011, and the ROD was signed on October 31, 2011. Several levee alignments were investigated to reduce risks to communities, businesses, and the hurricane evacuation route, and to avoid wetland impacts.

In 2013, A risk-based analysis was performed on the non-Federal levee to be incorporated into the NOV project (from Oakville to St. Jude), with an objective of “closing the gap” on the west bank and tie into the existing NOV back levees at St. Jude. Additionally, a risk-based analysis was performed on the existing west bank NOV polder from St. Jude to Venice, with an objective of identification of priority reaches for construction within available funds. These analyses included consideration of application of the Engineering Manual (EM 1110-2-1913) criteria, as requested by Plaquemines Parish.

The results of the study recommended the use of an optimized design (due to available funding limitations and constraints to design and construct within that funding) to insure a consistent/prioritized 20-25 year LORR for the remaining non-Federal levees, LaReussite to St. Jude (upper reach Oakville to LaReussite already awarded and being constructed to HSDRRS criteria). This optimized design will provide a LORR where there is currently little or none. Footprint changes occurred with these design changes and resulted in Supplemental EA No. 537, titled *New Orleans to Venice Hurricane Risk Reduction Project: Changes to the Non-Federal Levees Project, Oakville to St. Jude, Plaquemines Parish, Louisiana* and the signing of a Finding of No Significant Impact (FONSI) on March 25, 2016. For NOV, project features were optimized to focus remaining funds on the highest priority based on risk. This resulted in some changes of priority, primarily replacing back levee improvements to reaches along the MRL. Portions of the NOV/NFL levees are being constructed to 50-year LORR. A SEA #537 titled "New Orleans to Venice Hurricane Risk Reduction Project: Changes to the Non-Federal Levees Project, Oakville to St. Jude, Plaquemines Parish, LA" was prepared to assess the impacts from reverting back to Alternative B project design as assessed in the FEIS, with modifications not addressed in the FEIS. A risk analysis performed for the New Orleans to Venice/Non-Federal Levees project by the USACE Risk Management Center in August 2015 determined that changing the level of risk reduction elevation from a 50-year to approximately a 25-year/4 percent in several of the levee reaches in NFL Sections 2 - 5 would allow for the construction and incorporation of NFL into the Federal hurricane and storm risk reduction system, as recommended in the risk analysis.

3.1.5 LAROSE TO GOLDEN MEADOW, LOUISIANA, HURRICANE PROTECTION PROJECT

This project was authorized by the Flood Control Act of 1965. Project funding began in 1967 with the appropriation of $200,000 to initiate preconstruction engineering and design. Funds to initiate construction were first appropriated in 1972. To date, the first and second lifts on all levee reaches have been completed and the third and final lift has been completed on all but one reach. This existing project consists of a ring levee approximately 48 miles in length protecting the areas along the east and west banks of Bayou Lafourche, extending from Larose to just south of Golden Meadow.

Floodwalls are constructed in areas where the congested nature of improvements and limited ROW prevented the construction of levees. The project provides for the construction of navigable floodgates on Bayou Lafourche at the upper and lower limits of the project area. In lieu of the eight gravity drainage structures that were authorized as part of the project, the non-Federal sponsor would pay the additional cost for construction of PSs.

The Leon Theriot Floodgate is a component of the Larose to Golden Meadow Hurricane Protection Project. The purpose of the floodgate is to provide for navigation on Bayou Lafourche and prevent tidal flooding within the project area. Construction of the floodgate was completed in 1985; however, it is currently being converted into a lock because of increased floodgate closures resulting from sea-level rise, subsidence, and storms. Further, there has been an increase in vessel traffic since authorization of the original project (USACE 2004a). The Leon Theriot Lock was authorized in August 2005 and was completed in mid-2009 (South Lafourche Levee District 2008). State surplus funds were used for the construction of the Leon Theriot Lock. Levees are being completed based on original design conditions using the original benchmarks and risk reduction level. Currently, the South Lafourche Levee District is in the process of independently constructing levee lifts to account for the outdated benchmarks and changing environmental conditions.

Because of subsidence and sea-level rise, the completed project cannot provide the same level of risk reduction as current USACE design criteria; therefore, additional levee lifts will be needed. As the project is not currently at the authorized elevation, any additional investment in the system would reduce the risk of flood and storm damage to residences, businesses, and other infrastructure. WRDA 2007, Section 7015, requested that USACE provide Congress with a report describing the improvements and modifications necessary for raising the system to a 1 percent probability storm risk reduction level. The USACE completed its report in late fiscal year (FY) 2008 and identified the obstacles to construction of the system to the new 100-year level of risk reduction, including projected costs. The reported improvements and modifications greatly exceeded the $90 million cap over which modifications were authorized by Section 7015, should those modifications also have been feasible. Furthermore, due to the magnitude of the increase in cost and the need for detailed field data to refine the designs, a post-authorization change (PAC) study was recommended in the WRDA of 2007, Section 7015, Report to Congress. However, due to the lack of a non-federal sponsor the PAC was terminated, and a limited Level 3 economic reevaluation was completed in May 2015.

3.1.6 GRAND ISLE AND VICINITY RISK REDUCTION PROJECTS

The Grand Isle Beach Erosion and Hurricane Protection Project was authorized by resolutions of the House of Representatives and the Senate, dated September 23, 1976, and October 1, 1976, respectively, under Section 201 of the Flood Control Act of 1965 dated October 27, 1965, (Public Law (P L) 89-298, House Document No. 94-639). The project is located on the coast of the Gulf of Mexico in southern Jefferson Parish, about 50 miles south of New Orleans and 45 miles northwest of the mouth of the Mississippi River. Over the years, numerous projects have been proposed and constructed at Grand Isle. In the 1970s, the State of Louisiana constructed a 2,600-feet-long stone jetty on western Grand Isle and a sand-filled dune and berm along the shore; both were incorporated into the Federal project. The State also constructed a jetty at the east end of the island in 1964; however, it was never incorporated into the Federal project.

Figure 3-3: Grand Isle Beah Erosion Protection

By 1985, the Grand Isle Beach Erosion and Hurricane Protection Project was essentially complete (USACE 1985, 1986). However, Hurricanes Danny, Elena, and Juan struck Grand Isle in 1985, and from 1985 to 1989, the USACE went through several iterations of designs to repair the project. A cuspate bar was dredged and used to restore the beach and dune at the state park. A breakwater consisting of two small areas of biodegradable sand-filled bags was built. The west end jetty was extended 500 feet, and the east end jetty (which is not part of the authorized project) was extended 200 feet. In 1989, the Town of Grand Isle built a stabilization complex consisting of two groins, a seawall, and four segmented offshore breakwaters (USACE 1989a, 1989b). In 1991, additional nourishment of the beach and dune repair was completed. Following Hurricane Andrew in 1992, an evaluation of breakwaters was implemented to reduce the erosion rate back to the levels predicted during the original hurricane protection project design. Between December 1994 and May 1995, 23 breakwater segments were constructed. Prior to the fall of 2008, there was an ongoing construction project to repair damages to the Federal dune project caused by Hurricane Katrina. After Hurricane Gustav in 2008, the USACE conducted emergency repairs along an approximately 8,000 linear feet reach on the western end of the island on the Gulf-side levee. In 2009, the USACE completed additional rehabilitation of the Grand Isle and Vicinity project with rehabilitation of approximately 5.7 miles of the sand-covered berm along the entire Gulf-side beach by constructing geo-textile tubes and then covering those with sand. In 2010, the USACE performed additional repairs on the west-end jetty. The 2008, 2009, and 2010 work was performed in response to damage caused by Hurricane Gustav and Hurricane Ike. In 2013, as a result of damages from Hurricane Isaac, USACE completed another rehabilitation of the Grand Isle and Vicinity project with the rehabilitation of approximately 2,500 feet of the sand-covered berm at the western end of Grand Isle's gulf-side beach by repairing geo-textile tubes, reconstructing the sand crown, and the placement of stone armoring on the gulf-side face (Figure 3-3). The work performed in 2009, 2010, and 2013 was funded by FY 2009, Continuing Resolution Authority, 7th Supplemental funding. USACE investigated improvements to pedestrian and vehicle dune crossings to allow handicap accessibility to the beach and the EA No. 524 titled Restoration of Four Existing Articulated Concrete Block Vehicle Crossovers and One Wooden Pedestrian Crossover for the Grand Isle and Vicinity, Louisiana Beach Erosion and Hurricane Protection Project, Jefferson Parish, Louisiana was finalized with the signing of the FONSI on June 30, 2015. These access ramp and crossovers have been constructed.

The Bipartisan Budget Act of 2018 (BBA-18) (Public Law 115-123) provided funds for "necessary expenses to address emergency situations at Corps of Engineers projects, and to construct, and rehabilitate and repair damages caused by natural disasters, to Corps of Engineers projects." For the Grand Isle and Vicinity Project, the proposed plan for the new work was intended to stabilize the western end of Grand Isle and to provide storm damage risk reduction to the existing dune and landward infrastructure while maintaining a recreational beach. The work entailed two features: (1) Construction of five offshore stone segmented breakwaters to be located at the gulf-side western end of the island; and (2) Dune and beach nourishment approximately 1.5 miles starting at the western jetty and going eastward. The construction contract for the breakwaters was awarded in June 2019 and completed in July 2020. The non-Federal sponsor opted to complete the dune and beach nourishment portion of the BBA-18 project on their own independent of the Federal BBA-18 project. The non-Federal sponsor's construction effort was completed in January 2021.

3.1.7 MORGANZA TO THE GULF OF MEXICO, HURRICANE STORM DAMAGE RISK REDUCTION PROJECT

The Morganza to the Gulf project for coastal storm damage risk reduction was originally authorized in the WRDA of 2007 and was developed before Hurricane Katrina's devastating impact on the New Orleans levees. After Hurricane Katrina, USACE developed more robust design standards for coastal storm damage risk reduction and flood risk reduction projects. Projected application of the more robust design standards to the Morganza to the Gulf structures and other changes after authorization caused the project to exceed the allowable cost increase limit. A post-authorization change (PAC) report and programmatic EIS to seek reauthorization was completed in May 2013. The Report of the Chief of Engineers was signed July 2013 and a Record of Decision (ROD) was signed in December 2013.

The Report of the Chief of Engineers, while it recommended construction with the more robust design standards developed by USACE following Hurricane Katrina, recognized the impact to total project cost that resulted from utilizing those design standards. It therefore recommended that USACE examine and develop adaptive design criteria that would reduce cost while maintaining the authorized level of risk reduction. The project was then re-authorized by Section 7002(3)5 of the Water Resources Reform and Development Act (WRRDA) 2014.

In 2018, in coordination with the proposed non-Federal sponsors and local stakeholders, USACE began to develop adaptive design criteria in accordance with the recommendation in the 2013 Chief's Report. Concurrently, the required non-Federal sponsor, the Coastal Protection and Restoration Authority Board of Louisiana (CPRAB) proposed that it would assume one hundred percent of the cost of project construction (inclusive of future required levee lifts) that will be required following completion of initial project construction by USACE and the non-Federal sponsors (estimated to be complete in 2035). The non-Federal sponsor's assumption of 100 percent of the remaining cost of construction after completion of initial construction would extend throughout the remainder of the period of evaluation (estimated to end in 2085). The recommendations in the New Orleans District report that resulted from the coordinated evaluation of adaptive criteria and the non-Federal assumption of the Federal share of construction costs required after completion of the initial construction are presently under consideration in an Engineering Documentation Report (EDR) that will be submitted for review and approval by the Mississippi Valley Division Commander. After approval of the EDR, USACE and the non-Federal sponsor will proceed to the negotiation and execution of a Project Partnership Agreement (PPA) for the construction, operation, and maintenance of the project.

The current plan for the Morganza to the Gulf project includes the following series of coastal storm damage risk reduction measures*:*

- The construction of approximately 98 miles of levee south of Houma.

- The construction of 22 floodgates on navigable waterways, 23 environmental water control structures, 10 roadway/railroad gates and fronting protection for 5 pump stations.

- Construction of the Houma Navigation Canal (HNC) Lock Complex consisting of a 110-feet of a lock structure and floodgate complex for the HNC.

As a non-Federal initiative that proceeded without a written agreement with USACE nor an In-Kind Memorandum of Understanding, the non-Federal entities have designed and constructed approximately 47 miles of levee along the authorized levee alignment to an elevation of 12-ft NAVD88 (existing elevations range from 10.0 to 11.5 feet due to settlement) along with critical structures. (For the federally authorized project, those levees and structures may need to be raised or rebuilt and certain actions may be required in order for the non-Federal construction efforts to meet all requirements of Federal law, regulation, and policy.) The HNC floodgate (Bubba Dove) was completed in 2013.

In 2019, USACE entered into an In-Kind Memorandum of Understanding (In Kind MOU) with CPRAB and with the Terrebonne Levee and Conservation District (TLCD). Under the terms of this agreement, construction efforts (and efforts associated with such construction) for the elements described therein that are commenced by the signatory non-Federal entities, after the effective date of the In-Kind MOU, would be eligible to be evaluated as being integral to the Federal project and eligible for a credit. CPRAB is scheduled to begin construction on the HNC lock complex in 2022. Construction would take approximately 3-4 years. The lock is anticipated to be complete by May 2025. Effective with the execution of the PPA between USACE and the non-Federal sponsor, all project construction will proceed under the terms of the PPA.

The 2021 Work Plan appropriation provided over $12 million in Federal “New Start” construction funds for the Humble Canal Preload contract plus an additional $800,000 for future design and a Project Partnership Agreement. The design for the Humble Canal Floodgate Preload is underway and is scheduled to advertise in 2022 after negotiation and execution of the project PPA and the provision of an acceptable authorization for entry by the non-Federal sponsor. An Environmental Assessment was released for public review for the Humble Canal Floodgate Preload feature on August 12, 2021 and can be found at the following location: https://www.mvn.usace.army.mil/About/Projects/Morganza-to-the-Gulf/ .

Prior to construction of the other project elements, additional NEPA evaluation, including a Supplemental Environmental Impact Statement, will be prepared to supplement the 2013 Programmatic Environmental Impact Statement. The 2013 PEIS had evaluated only certain constructible features (three particular levee reaches; HNC; and Bayou Grand Caillou floodgate) and acknowledged that the other project features would require additional environmental compliance analysis and NEPA documentation. The SEIS will discuss, among other things, the design level of risk reduction for the coastal storm damage risk reduction features.

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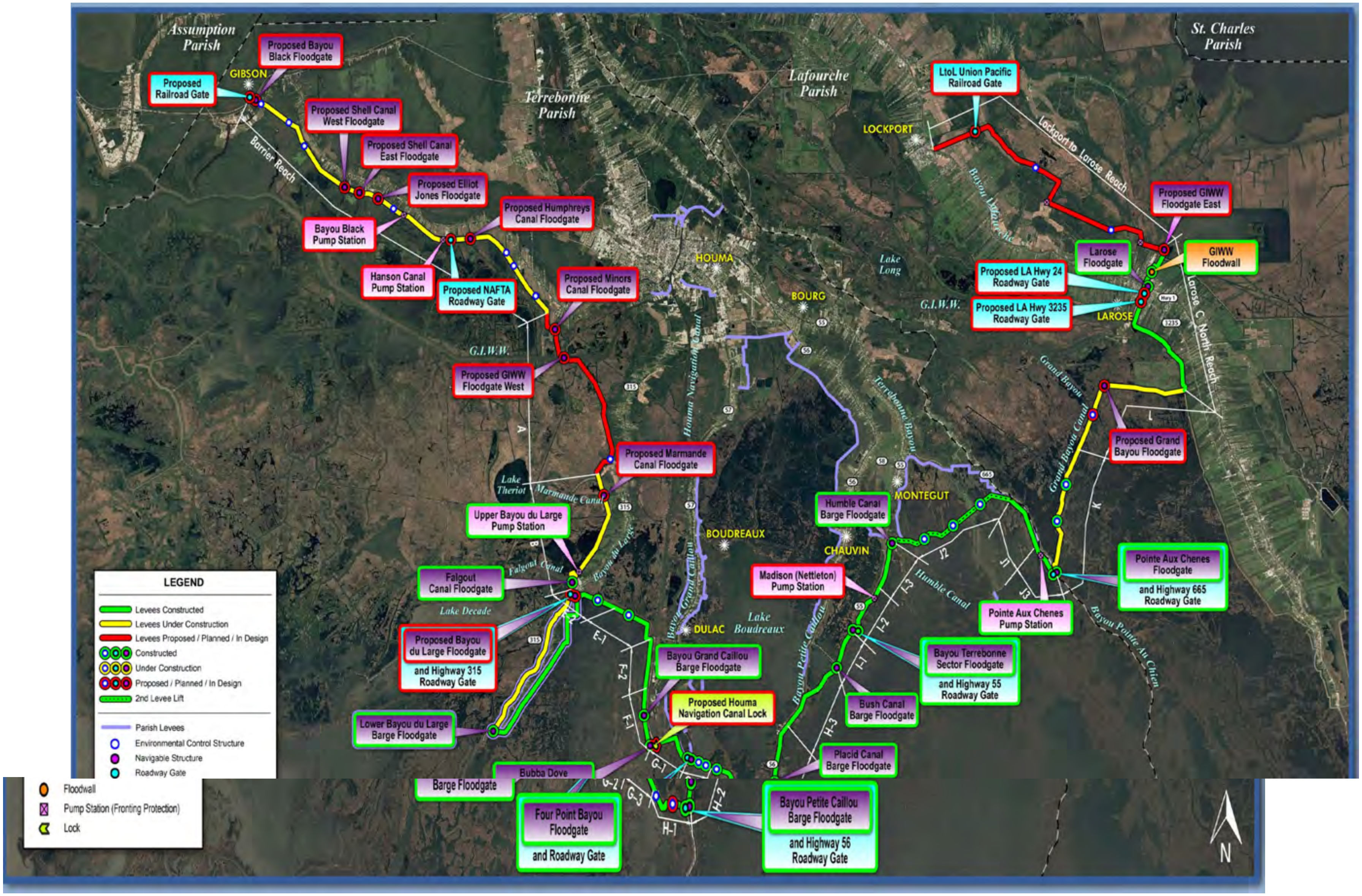
Assumption Parish
Terrebonne Parish
Lafourche Parish
St. Charles Parish
GIBSON
Proposed Railroad Gate
Proposed Bayou Black Floodgate
Proposed Shell Canal West Floodgate
Proposed Shell Canal East Floodgate
Proposed Elliot Jones Floodgate
Barrier Reach
Bayou Black Pump Station
Proposed Humphreys Canal Floodgate
Hanson Canal Pump Station
Proposed NAFTA Roadway Gate
Proposed Minors Canal Floodgate
HOUMA
G.I.W.W.
Proposed GIWW Floodgate West
LOCKPORT
LtoL Union Pacific Railroad Gate
Lockport to Larose Reach
Bayou Lafourche
Proposed GIWW Floodgate East
Larose Floodgate
GIWW Floodwall
Proposed LA Hwy 24 Roadway Gate
Proposed LA Hwy 3235 Roadway Gate
LAROSE
Larose C North Reach
Lake Long
BOURG
Houma Navigation Canal
Terrebonne Bayou
Grand Bayou
Grand Bayou Canal
Proposed Grand Bayou Floodgate
Proposed Marmande Canal Floodgate
Lake Theriot
Marmande Canal
Upper Bayou du Large Pump Station
Bayou du Large
Falgout Canal
Falgout Canal Floodgate
Lake Decade
BOUDREAUX
MONTEGUT
Humble Canal Barge Floodgate
CHAUVIN
Madison (Nettleton) Pump Station
Humble Canal
Pointe Aux Chenes Floodgate and Highway 665 Roadway Gate
Pointe Aux Chenes Pump Station
Bayou Pointe Au Chien
Proposed Bayou du Large Floodgate and Highway 315 Roadway Gate
DULAC
Lake Boudreaux
Bayou Grand Caillou
Bayou Grand Caillou Barge Floodgate
Bayou Petite Caillou
Bayou Terrebonne Sector Floodgate and Highway 55 Roadway Gate
Bush Canal Barge Floodgate
Proposed Houma Navigation Canal Lock
Lower Bayou du Large Barge Floodgate
Placid Canal Barge Floodgate
Bubba Dove Barge Floodgate
Four Point Bayou Floodgate and Roadway Gate
Bayou Petite Caillou Barge Floodgate and Highway 56 Roadway Gate
A
B
E-1
F-1
F-2
G-1
G-2
G-3
H-1
H-2
H-3
I-1
I-2
I-3
J1
J2
J3
K
L
N
LEGEND
Levees Constructed
Levees Under Construction
Levees Proposed / Planned / In Design
Constructed
Under Construction
Proposed / Planned / In Design
2nd Levee Lift
Parish Levees
Environmental Control Structure
Navigable Structure
Roadway Gate
Floodwall
Pump Station (Fronting Protection)
Lock

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3.1.8 MISSISSIPPI RIVER GULF OUTLET (MRGO) DEAUTHORIZATION

The MRGO was authorized by a March 29, 1956 Act of Congress (P L 84-456) to provide an emergency outlet from the Mississippi River and as a safer and shorter route between the Port of New Orleans and the Gulf of Mexico. Construction began in 1958 and was completed in 1968. Construction of the MRGO provided a 76-mile, 36-feet-deep draft navigation access from the Gulf of Mexico to the New Orleans port area. The channel provided access to port facilities located along the upper reaches of the MRGO and the IHNC, close to the junction of the Gulf Intracoastal waterway (GIWW) and the Mississippi River (Figure 3-5). The authorized channel width was 500 feet but, due to erosion, the channel became more than 2,000 feet wide at some locations.

Figure 3-4: MRGO

In 2006, the U.S. Congress directed the Secretary of the Army, acting through the Chief of Engineers, to develop a plan for de-authorization of deep-draft navigation for the MRGO from the Gulf of Mexico to GIWW. On June 5, 2008, the Assistant Secretary of the Army for Civil Works submitted the *Integrated Final Report to Congress and Legislative Environmental Impact Statement for the Mississippi River–Gulf Outlet Deep-Draft De-authorization Study* to Congress. This action officially de-authorized the MRGO from The GIWW to the Gulf of Mexico in accordance with the

WRDA of 2007. The portion of the MRGO channel from mile 60 at the southern bank of the GIWW to the Gulf of Mexico was de-authorized for all navigation use. As part of the plan, a total closure structure was built of rock south of the Bayou La Loutre ridge in St. Bernard Parish, Louisiana in July 2009 (USACE 2008l). However, approximately 6 miles of the MRGO channel (from miles 66 to 60 that connect the IHNC to the GIWW), the Michoud Canal Project, and the IHNC Lock Replacement Project remain authorized. Additional information is available at: https://www.MRGO.

A *MRGO Ecosystem Restoration Plan* was designed and prepared as a follow-up to the USACE's implementation of the MRGO closure, as per the 2008 de-authorization plan. The USACE has conducted a feasibility study that resulted in a comprehensive ecosystem restoration plan titled *MRGO Ecosystem Restoration Plan Draft Feasibility Report and Environmental Impact Statement* (USACE 2010a, 2011e). The ROD was signed on September 23, 2013, and the Chief's report was signed on September 28, 2012, identifying a Federal plan to restore aquatic ecosystem structure in the vicinity of the MRGO. The report was provided to Congress on September 23, 2013.

Implementation of the identified plan would require a partnership with a local sponsor and appropriation of design and construction funding from Congress. Currently, there is no non-Federal sponsor.

3.1.9 INNER HARBOR INDUSTRIAL CANAL LOCK

The current Inner Harbor Navigation Canal (IHNC) lock, built in 1921, is 640 feet long, 75 feet wide, and 31.5 feet deep and connects the Mississippi River with the IHNC and the GIWW (Figure 3-6). The current lock is obsolete and unable to efficiently accommodate modern barge tows and the current volume of navigation traffic. The lock replacement was authorized by a March 29, 1956 Act of Congress (PL 84-455) and was amended by Section 186 of the WRDA of 1976 (P L 94-587). Eight potential sites for a new lock were evaluated through planning efforts and public involvement beginning as early as 1960. WRDA of 1986 (P L 99-662) modified the project evaluation to consider locating the new lock at either the existing lock site or at the previously considered Violet site and modified the project's cost-sharing agreement. The USACE recommended a replacement lock project in 1997 that is documented in the *Final Environmental Impact Statement for the Mississippi River – Gulf Outlet New Lock and Connecting Channels* (USACE 1997). The 1997 EIS evaluated two action plans in detail. In 2006, the Federal District Court, Eastern New Orleans District, enjoined the project and required the preparation of a Supplemental EIS to describe changes in existing conditions after Hurricane Katrina, and reanalysis of impacts from the recommended plan and alternatives based on then current conditions. The plan was revised and a new supplemental NEPA document was prepared entitled *Final Supplemental Environmental Impact Statement for the Inner Harbor Navigation Canal Lock Replacement Project* (USACE 2009u). The ROD for this supplemental EIS was signed on May 20, 2009.

Figure 3-5: Location of Existing Lock and Bridges over the IHNC

On September 9, 2011, the USACE was ordered by a U.S. District Court in New Orleans to halt work on the IHNC Lock Replacement Project until the USACE drafts a second supplemental EIS addressing the effects of closing the MRGO on the alternative's analysis and the recommended deep draft lock plan. The court determined that the USACE failed to adequately consider how the closure of the MRGO may have affected the need for a deep draft lock. Subsequently, the Port of New Orleans, the non-Federal sponsor for the deep draft increment of the project, informed USACE that it no longer wished to serve as the non-Federal sponsor for the lock replacement project. The USACE is currently re-evaluating the feasibility of a shallow draft lock replacement and has identified a shallow-draft lock as the recommended plan that is both economically justified and environmentally acceptable.

A Draft EIS was issued for public review and comment in February 2017. The recommended lock replacement includes construction of a cast-in-place concrete lock and associated support structures and facilities; construction of a permanent low-level double bascule bridge north of the existing St. Claude Avenue bridge; demolition of the existing St. Claude Ave. bridge; bypass channels around the new and existing lock construction sites; disposal of dredged material suitable for aquatic disposal into the Mississippi River and disposal of material that is not suitable for aquatic disposal in an approved solid waste landfill site; and extension of the Mississippi River flood risk reduction levees and floodwalls along the banks of the IHNC to the site of the new lock. The USACE is preparing a Final EIS and is working to evaluate impacts and identify strategies that can mitigate impacts to vehicular traffic, historic properties, and the surrounding community as is required for the congressionally authorized Community Impact Mitigation Plan (Section 326 of the WRDA of 1996) and Transportation Mitigation Program (WRDA 2007 Section 5083 (2)).

3.1.10 SOUTHEAST LOUISIANA URBAN FLOOD CONTROL PROJECT (SELA)

SELA's purpose is to reduce the risk of flood damages due to rainfall flooding in Orleans, Jefferson, and St. Tammany Parishes (Figure 3-7). Since 1978, well over $1 billion in damages from rainfall has occurred in the area. There were two major rain events that contributed to that total. In November 1989, 19 inches of rainfall fell in a 24-hour period, and in May 1995, the 6-hour rainfall averaged 12-inches. In some locations, up to 28-inches of rainfall fell in a 24-hr period. The SELA Project was authorized by the Fiscal 1996 Energy and Water Development Appropriations Act (Section 108) and the WRDA of 1996 (Section 533). The improvements generally support the parishes' master drainage plans and provide flood risk reduction up to a level associated with a 10-year rainfall event. The project includes over $2 billion of improvements in Jefferson and Orleans parishes. Several NEPA documents were prepared from 1996 to 2008 to identify work to be implemented under the SELA project authority.

Construction projects began in 1998. The work is located on both the east and west banks of the Mississippi River in Orleans and Jefferson Parishes and north of Lake Pontchartrain, while in St. Tammany Parish, work is in and around the communities of Slidell, Mandeville, Covington, Madisonville, Abita Springs, and Lacombe.

A substantial amount of work has been completed in Orleans and Jefferson Parishes. All contracts funded with Hurricane Katrina supplemental funds have been awarded and are 96 percent complete. The completed portions of SELA functioned as designed during the recent rainfall events and reduced the amount of flooding in the SELA Project areas.

In Jefferson Parish, work was limited to the more densely populated northern portion of the parish. Plans included improvements to 24 drainage canals, adding additional pumping capacity for four PSs, and the construction of two new PSs. Approximately 50 contracts were awarded, and all planned work is now complete.

In Orleans Parish, plans involved improving 16 major drainage lines, adding pumping capacity to two PSs, and constructing two new PSs. The improvements support the parishes' master drainage plans and generally provide flood risk reduction on a level associated with a 10-year rainfall event, while also reducing damages for larger events. In the parish, approximately 30 contracts have been awarded, with 28 having been completed. Currently, there are two on-going contracts in Orleans Parish. In the Algiers sub-basin, the SELA 72.1 contract was awarded in FY19 and with all options now activated is scheduled for completion by the first quarter in FY26. The only remaining contract in the People's Avenue Subbasin, SELA 26 Florida Avenue, Phase IV is scheduled for completion in the fourth quarter of FY27.

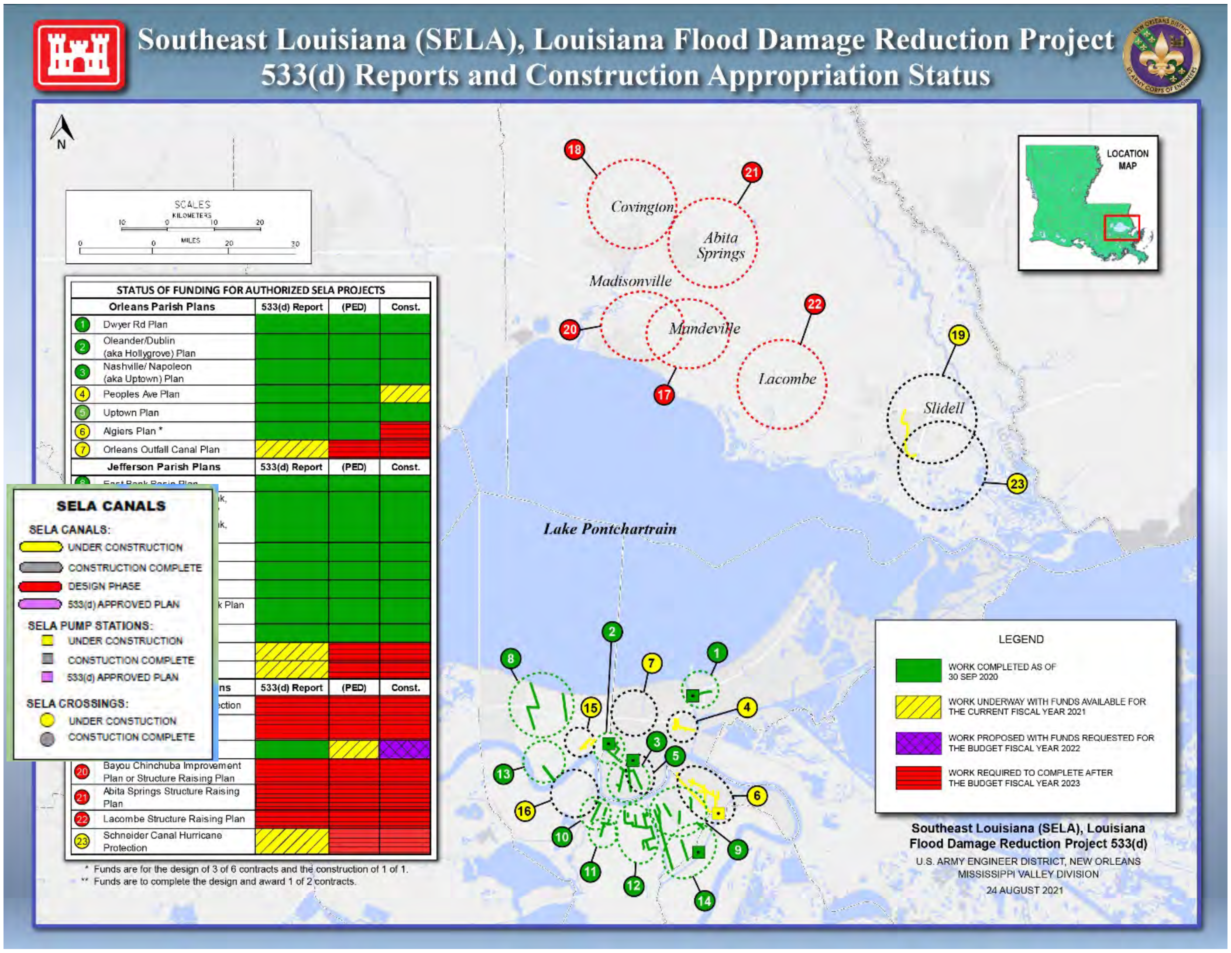


Figure 3-6: SELA Project Areas

Planned improvements in St. Tammany Parish include channel enlargements, bridge replacements, detention ponds, levees, and elevation of flood-prone structures. St. Tammany Parish plans would provide flood risk reduction for various rainfall events. The W-14 Canal Improvements study in Slidell was completed and approved in July 2012. However, there are no funds for St. Tammany Parish improvements currently.

The USACE continues a robust outreach program with the non-Federal sponsors and the public.

3.1.11 ST. TAMMANY PARISH

The St. Tammany Parish Feasibility Study in St. Tammany Parish, Louisiana was authorized by Subtitle B, Section 1201 (14) of the Water Resources Development Act of 2016, as included in the Water Infrastructure Improvements for the Nation Act (P.L. 114-322). The study was authorized in accordance with the annual reports submitted to the Congress in 2015 and 2016, pursuant to Section 7001 of the Water Resources Reform and Development Act of 2014 (33 U.S.C. 2282d). The flood risk management

(FRM) and coastal storm risk management (CSRM) study was funded by the Bipartisan Budget Act of 2018 (P.L. 115-123), Division B, Subdivision 1, Title IV. The purpose of the study is to investigate and identify reasonable flood risk reduction measures (FRM) and Coastal Storm Reduction Measure (CSRM) solutions to reduce the severity of flood damages and risk to public health and safety, caused by heavy rainfall, riverine flooding, tropical storms, and hurricanes.

The St. Tammany Feasibility Study was initiated in January 2020 with the signing of the Federal cost share agreement between the Coastal Protection and Restoration Authority Board of Louisiana and the USACE. The project is located in southeast Louisiana, north of Lake Pontchartrain. The study area extends from the eastern boarder of Louisiana to just west of where the Tchefuncte River empties into Lake Pontchartrain. Potential flood risk reduction alternatives may include dredging, snagging and clearing, conveyance channels, levees, detention ponds, floodwalls/gates, pumping stations, non-structural efforts and engineering with nature efforts.

The Draft Integrated Feasibility Report and Draft Environmental Impact Statement was released for public review on June 11, 2021.

3.1.12 MISSISSIPPI RIVER LEVEES

The Flood Control Act of 1928 authorized work that would give the various Mississippi River basins protection from Mississippi River floods. The tributary streams within the basins also caused frequent flood damage that could not be prevented by the main stem Mississippi River protective works. Later authorizations to the Flood Control Act of 1928 added protective works to tributaries and created floodways that work to control river flooding within the Mississippi River basin.

The MRL system in the New Orleans District extends along the Mississippi River west bank from the vicinity of Black Hawk, Louisiana, generally southward to the vicinity of Venice, and on the east bank from just north of Baton Rouge to Bohemia, Louisiana. The project is designed to provide risk reduction for a project flood having a flow of 3 million cfs at the latitude of Old River north of Baton Rouge. Floodways are provided at Morganza, the Atchafalaya Basin, and Bonnet Carré to remove waters in excess of the safe capacity of the main channel. The project is part of a system that includes features such as levees, floodwalls, floodgates, pumping stations, drainage structures, locks, and channel improvements. The MRL project is one of the main components for flood control on the Mississippi River.

A Record of Decision for the Final Supplement II (Final SEIS II) to the 1976 FEIS, MR&T Project, Mississippi River Mainline Levees (MRL) was signed on March 11, 2021. The Record of Decision details USACE's decisions on conducting remedial measures necessary to control seepage and/or raise and stabilize deficient sections of the existing levees and floodwalls to protect the structural integrity and stability of the MRL system, as well as measures to avoid and minimize adverse impacts and compensate for unavoidable losses to significant environmental resources. Through evaluation of information and data obtained from levee inspections, seepage analyses, research, studies, and engineering assessments, the USACE Memphis, Vicksburg and New Orleans districts collectively identified a total of 143 additional Work Items along various reaches of the Mississippi River mainline levees (MRL) feature of the MR&T project. These 143 Work Items constitute the proposed action for the Final SEIS II and are located across portions of seven states: Illinois, Missouri, Kentucky, Tennessee, Arkansas, Mississippi, and Louisiana. Work items in Louisiana include 92 projects totaling approximately 1.6 billion. The Final SEIS II supplements and, as necessary, augments the 1976 FEIS and 1998 Supplemental EIS (SEIS I) to achieve USACE's primary goals for the MR&T: (1) providing flood risk management from the Project Design Flood; and (2) being an environmentally sustainable project.

3.1.13 MISSISSIPPI RIVER SHIP CHANNEL, BATON ROUGE TO GULF, LA

The USACE prepared an integrated general reevaluation report (GRR) and Supplemental Environmental Impact Statement (SEIS) titled Mississippi River Ship Channel, Baton Rouge to the Gulf, Louisiana Final Integrated General Reevaluation Report and Supplemental Environmental Impact Statement." The purpose of the reevaluation study was to evaluate alternative plans to examine whether navigation improvements to deepen the existing Mississippi River Ship Channel from the current depth of 45-foot up to a depth of 50-foot are warranted and in the Federal interest. The Chiefs Report and the Record of Decision were signed on August 3, 2018.

The Final GRR/SEIS evaluated various alternatives that would improve deep draft navigation needs beyond the current 45-foot depth from Port of Baton Rouge, LA, beginning at River Mile (RM) 233.8 Above Head of Passes (AHP) extending to the Gulf of Mexico RM 22 Below Head of Passes (BHP). The recommended plan is the National Economic Development (NED) Plan and includes:

- Deep draft navigation to a depth of 50 feet from the Gulf of Mexico beginning at RM 22 BHP through the Port of Baton Rouge ending at RM 232.4 AHP. Specifically, the Recommended Plan includes constructing the MRSC from its current depth to a depth of 50 feet in the lower Mississippi River from RM 13.4 AHP to RM 22 BHP. Material will be removed by a combination of cutterhead and hopper dredges. Material dredged from RM 13.4 AHP to RM 19.5 BHP will be used beneficially under the Federal Standard, and it is anticipated that construction dredging in this reach will result in the creation of 1,462 acres of marsh habitat. Material dredged from RM 19.5 BHP to RM 22 BHP will be placed in the approved Southwest Pass Ocean Dredge Material Disposal Site. Once commenced, construction of this reach to the proposed depth would be complete within one year.

- Constructing the twelve regularly maintained deep draft crossings located within the Port of South Louisiana and the Port of Baton Rouge from the current depth to a depth of 50 feet. Material will be removed by dustpan dredge and placed adjacent to the crossings for natural dispersion down river. In order to remain in conformity with the emission standard of the Clean Air Act, construction of the 9 crossings located within the Port of Baton Rouge would be staggered over a three-year period.

- Maintenance of the channel to a depth of 50 feet would continue under the same dredging and disposal practices currently utilized for the project reaches at existing depths. The intent of the project is to provide deep draft navigation within the main deep draft navigation channel to a depth of 50 feet from the Gulf of Mexico beginning at RM 22 BHP to Baton Rouge ending at RM 232.4 AHP. Should existing conditions change in these reaches, such that areas of the main navigation channel that are presently deeper than 50 feet become shallower than 50 feet, it is within the authority and intent of this Report, that the U.S. Army Corps of Engineers (Corps) will conduct operation and maintenance actions to maintain the approved depth and width, subject to the possibility that additional environmental analysis may be necessary regarding those reaches.

- Construction of the Recommended Plan is expected to result in approximately 18 million cubic yards of dredge material that may be used for beneficial use, within the limits of the Federal Standard, by disposing it in existing beneficial use placement areas adjacent to the Mississippi River. During construction, the beneficial use of dredged material would result in the creation of approximately 1,462 acres (576 AAHUs) of intermediate marsh. The Recommended Plan is not anticipated to require additional maintenance dredging at a depth of 50 feet in the lower river; therefore, an incremental benefit from beneficial use of dredged material, within the limits of the Federal Standard, during annual maintenance is not anticipated. An average of 528 acres of marsh creation is expected to establish each year from annual O&M.

In March 2021, dredging of the MRSC to 50' at Southwest Pass, known as Stage 1, was completed. Several utilities with unknown depths below the sediment line are being investigated for relocation. Stage 2, which includes the Lower 9 channel crossings began in September 2021 and will continue through December 2022. Currently, the lower 3.5 crossings to RM 175 are being dredged and are expected to be completed by the end of the calendar year 2021. Stage 3, which covers Sardine Point and Redeye Crossings will occur beginning June 2023 through December 2023. Finally, Stage 4 at the Baton Rouge Front will take place beginning June 2024 through December 2024. Known utility crossings requiring relocation are being researched and addressed at Rich Bend, Philadelphia, Alhambra, and Baton Rouge Front. Please note, the future schedule will be impacted by the relocation of numerous utilities and therefore is subject to change.

3.1.14 WEST SHORE LAKE PONTCHARTRAIN (WSLP) FINAL FEASIBILITY REPORT AND EIS

The WSLP study area is in southeast Louisiana on the east bank of the Mississippi River in St. Charles, St. John the Baptist, and St James Parishes. It is located west of the Bonnet Carré' Spillway between the Mississippi River and Lakes Pontchartrain and Maurepas. Communities within the area include Laplace, Reserve, Garyville, Gramercy, Lutcher, and Grand Point. The study purpose is to provide a recommendation for Federal participation in hurricane and storm damage risk reduction for St. Charles, St. John the Baptist and St. James Parishes that would be economically and environmentally justified.

The WSLP Final Integrated Feasibility and EIS analyzed alternatives to provide hurricane and storm surge risk reduction on the east bank of the Mississippi River in St. Charles, St. John the Baptist, and St. James Parishes to nearly 18,000 residential, commercial, and industrial structures, as well as the I-10 hurricane evacuation corridor, through both structural and nonstructural measures. The Chief's report was finalized June 12, 2015, and the ROD signature was approved September 14, 2016. The approved plan is 23 miles in length with 18 miles in St. John Parish, 0.5 miles in St. Charles Parish, and 4.5 miles in St. James Parish. The project includes four pump stations (PS), one navigation gate, eight drainage structures, three gated road crossings, two railroad gates, approximately 35 utility relocations, 200+ culvert valves/gates, and raising/flood proofing of a limited number of structures. It is estimated that approximately 7 – 9 mcy of embankment material would be needed for levee construction. Habitat impacts will require compensatory mitigation for approximately 1,000 AAHUs of swamp habitat.

In St. John and St. Charles Parish, levee construction reaches have been optimized to maximize construction access. All detailed designs for the various reaches are underway and scheduled to be complete throughout 2021. There are 13 levee contracts and one PS contract in development. Construction contracts are currently scheduled to be advertised in 2021, with construction completion anticipated by early 2024. The non-Federal sponsor is working on acquiring the necessary real estate. In St. James Parish, the USACE is working with the non-Federal sponsor and the parish to investigate additional alternatives to address concerns and risks associated with the numerous flap valves and the use of Hwy. 3125 as a risk reduction levee. The number of contracts necessary to construct the St. James segment will be determined soon. The USACE will continue to coordinate with CPRA regarding design and construction of the west alignment and the State's Maurepas Diversion Project.

Information regarding the study is located at [https://www.mvn.usace.army.mil/West-Shore-Lake-Pontchartrain/.](https://www.mvn.usace.army.mil/West-Shore-Lake-Pontchartrain/)

3.1.15 OTHER LPV AND WBV RISK REDUCTION PROJECTS

Other pertinent studies, reports, and projects for the LPV and WBV risk reduction projects are discussed below.

3.1.15.1 LPV Risk Reduction Projects

- In April 2014, the USACE finalized EA No. 526, *St. Bernard Pump Station 2 & 3 Seepage Repairs.* The EA evaluated impacts associated with the repair of a seepage problem at St. Bernard PSs Guichard (2) and Bayou Villere (3) located in northeast Chalmette, St. Bernard Parish, Louisiana. Construction included constructing a new concrete T-wall system and replacement of discharge pipes on the flood side of the levee. PS 2 (Guichard) and PS 3 (Bayou Villere) are part of the local non-Federal levee and drainage system, which includes eight PSs. PS 2 and 3 benefit the communities of St. Bernard Parish by pumping water to the central wetlands during rain events. The PSs are operated based on rainfall amounts prior to and during storm events.

- In July 2014, the USACE finalized Supplemental EA No. 527 (SEA No. 527) *St. Mary Pump Station Safe House, St. Bernard Parish, Louisiana.* CEMVN prepared SEA No. 527 to IER No. 10, which described work and impacts associated with raising the existing Chalmette loop levee reaches LPV 145, LPV 146, LPV 147, and LPV 148.02 to the 100-year level of risk reduction and constructing approximately 22 miles of floodwall on top of the levee (IER No. 10, see appendix D, Location Maps No. 13 through No. 15). SEA No. 527 analyzed the impacts for constructing an emergency safe house at the St. Mary PS located approximately one mile southwest of Verret and south of the Jourda Canal on the LPV 148 levee/T-wall reach in St. Bernard Parish, Louisiana. The safe house is necessary to provide a means to shelter personnel within the pump station facility, which will allow them to access, operate, and troubleshoot pumps onsite in advance and during tropical storm events and emergencies.

  The construction includes installation of a prefabricated concrete emergency shelter building measuring approximately 32 feet by 17 feet by 8 feet. The floor elevation was set at approximately +24 feet NAVD 88. The project area encompasses approximately 4.1 previously disturbed acres within the existing ROW of LPV 148. No new ROW was required, and no wetlands were impacted.

- In April 2014, the USACE finalized EA No. 496, *Canal Remediation on the 17th Street, Outfall Canal, Orleans and Jefferson Parishes, Louisiana.* EA No. 496 occurs in the same project area as IER No. 27 and includes an assessment of the impacts for stability remediation activities on the inner western bank line of the 17th Street Outfall Canal (Appendix C, location map No. 4). The remediation extends north from Veterans Boulevard Bridge, approximately 1.5 miles (7,900 linear ft) north to the existing bank protection at the Old Hammond Hwy. Bridge. The total construction impacts within the 17th Street Outfall Canal are approximately 1.82 acres. Two staging areas were used during the construction period. Use of the lots included, but not be limited to, staging of construction equipment and materials, the placement of construction trailers, access to the canal, loading and unloading of equipment and materials into and out of the outfall canal. Approximately 3,500 trucks carried rock material into the area for the project. Appropriate traffic control measures were installed in compliance with the project Maintenance of Traffic (MOT) Plan. Hours of operation for construction activities adhered to local parish ordinances for both Orleans and Jefferson Parishes.

- In June 2009, the USACE finalized an EA No. 475, evaluating the potential impacts associated with the proposed storm proofing modifications at 21 existing drainage PSs in Jefferson Parish, Louisiana. The purpose of this project is to ensure the operability of the stations during hurricanes, storms, and high-water events. The modifications were proposed for those Jefferson Parish PSs on the east and west banks of the Mississippi River to ensure station operation during, and immediately following, large tropical storm events (USACE 2009m).

- In May 2009, the USACE finalized an EA No. 474, evaluating the potential impacts associated with the proposed storm proofing modifications at 22 Orleans Parish PSs, the Carrollton Frequency Changer Building, the Old River Intake Station, the New River Intake Station, and the Carrollton Water Plant and Power Complex. The purpose of this project is to ensure the operability of the stations during hurricanes, storms, and high-water events. The modifications were proposed for the east and west banks of urbanized areas of Orleans Parish to provide safe refuge for Orleans Parish employees responsible for the operation and maintenance of the forced drainage system during, and immediately following, large tropical storm events (USACE 2009r).

- In July 2006, the CEMVN Commander signed a FONSI for EA No. 433 titled *USACE Response to Hurricanes Katrina & Rita in Louisiana*. The document was prepared to evaluate the potential impacts associated with the actions taken by the USACE as a result of Hurricanes Katrina and Rita.

- On October 30, 1998, the CEMVN Commander signed a FONSI for EA No. 279 titled *Lake Pontchartrain Lakefront, Breakwaters, Pump Stations 2 and 3*. The report evaluates the impacts associated with providing fronting protection for outfall canals and PSs. It was determined that the action would not significantly impact resources in the immediate area.

- On October 2, 1998, the CEMVN Commander signed a FONSI for EA NO. 282 titled *LPV, Jefferson Parish Lakefront Levee, Landside Runoff Control: Alternate Borrow*. The report investigates the impacts of obtaining borrow material from an urban area in Jefferson Parish. No significant impacts on resources in the immediate area were expected.

- On July 2, 1992, the CEMVN Commander signed a FONSI for EA No. 169 titled *LPV, Hurricane Protection Project, East Jefferson Parish Levee System, Jefferson Parish, Louisiana, Gap Closure*. The report addresses the construction of a floodwall in Jefferson Parish to close a "gap" in the levee system. The area was previously leveed and under forced drainage, and it was determined that the action would not significantly impact the previously disturbed area.

- On February 22, 1991, the CEMVN Commander signed a FONSI for EA No. 164 titled *LPV Hurricane Protection – Alternate Borrow Area for the St. Charles Parish Reach*. The report addresses the impacts associated with the use of borrow material from the Mississippi River on the left descending bank in front of the Bonnet Carré Spillway Forebay for LPV construction.

- On July 2, 1991, the CEMVN Commander signed a FONSI for EA No. 133 titled *LPV Hurricane Protection – Alternate Borrow at Highway 433, Slidell, Louisiana*. The report addresses the impacts associated with the excavation of a borrow area in Slidell, for LPV construction.

- On August 30, 1990, the CEMVN Commander signed a FONSI for EA No. 163 titled *LPV Hurricane Protection – Alternate Borrow Area for Jefferson Parish Lakefront Levee, Reach III*. The report addresses the impacts associated with the use of a borrow area in Jefferson Parish for LPV construction.

- On September 12, 1990, the CEMVN Commander signed a FONSI for EA No. 105 titled *LPV Hurricane Protection – South Point to Gulf Intracoastal Waterway, A. V. Keeler and Company Alternative Borrow Site*. The report addresses the impacts associated with the excavation of a borrow area in Slidell, Louisiana, for LPV construction.

- On March 12, 1990, the CEMVN Commander signed a FONSI for EA No. 102 titled *LPV Hurricane Protection – 17th Street Canal Hurricane Protection*. The report addresses the use of alternative methods of providing flood protection for the 17th Street Outfall Canal in association with LPV activity. Impacts on resources were found to be minimal.

- On August 4, 1989, the CEMVN Commander signed a FONSI for EA No. 89 titled *LPV Hurricane Protection, High Level Plan - Alternate Borrow Site 1C-2B*. The report addresses the impacts associated with the excavation of a borrow area along Chef Menteur Highway, Orleans Parish, for LPV construction. The material was used in the construction of a levee west of the IHNC.

- On October 27, 1988, the CEMVN Commander signed a FONSI for EA No. 79 titled *LPV Hurricane Protection – London Avenue Outfall Canal*. The report investigates the impacts of strengthening hurricane damage risk reduction at the existing London Avenue Outfall Canal.

- On July 21, 1988, the CEMVN Commander signed a FONSI for EA No. 76 titled *LPV Hurricane Protection – Orleans Avenue Outfall Canal*. The report investigates the impacts of strengthening hurricane damage risk reduction at the existing Orleans Avenue Outfall Canal.

- On February 26, 1986, the CEMVN Commander signed a FONSI for EA No. 52 titled *LPV Hurricane Protection – Geohegan Canal*. The report addresses the impacts associated with the excavation of borrow material from an extension of the Geohegan Canal for LPV construction.

- Supplemental Information Report (SIR) NO. 25 titled *LPV Hurricane Protection – Chalmette Area Plan, Alternate Borrow Area 1C-2A* was signed by the USACE on June 12, 1987. The report addresses the use of an alternate contractor-furnished borrow area for LPV construction.

- SIR No. 27 titled *LPV Hurricane Protection – Alternate Borrow Site for Chalmette Area Plan* was signed by the USACE on June 12, 1987. The report addresses the use of an alternate contractor-furnished borrow area for LPV construction.

- SIR No. 28 titled *LPV Hurricane Protection – Alternate Borrow Site, Mayfield Pit* was signed by the USACE on June 12, 1987. The report addresses the use of an alternate contractor-furnished borrow area for LPV construction.

- SIR No. 29 titled *LPV Hurricane Protection – South Point to the GIWW Levee Enlargement* was signed by the USACE on June 12, 1987. The report discusses the impacts associated with the enlargement of the GIWW.

- SIR No. 30 titled *LPV Hurricane Protection Project, Jefferson Lakefront Levee* was signed by the USACE on October 7, 1987. The report investigates impacts associated with changes in Jefferson Parish LPV levee design.

- SIR No. 17 titled *LPV Hurricane Protection – New Orleans East Alternative Borrow, North of Chef Menteur Highway* was signed by the USACE on April 30, 1986. The report addresses the use of an alternate contractor-furnished borrow area for LPV construction.

- SIR No. 22 titled *LPV Hurricane Protection – Use of 17th Street Pumping Station Material for LPHP Levee* was signed by the USACE on August 5, 1986. The report investigates the impacts of moving suitable borrow material from a levee at the 17th Street Canal in the construction of a stretch of levee from the IHNC to the London Avenue Canal.

- SIR No. 10 titled *LPV Hurricane Protection, Bonnet Carré Spillway Borrow* was signed by the USACE on September 3, 1985. The report evaluated the impacts associated with using the Bonnet Carré Spillway as a borrow source for LPV construction and found “no significant adverse effect on the human and natural environment.”

- In December 1984, an SIR to complement the supplement to the final EIS on the LPV Hurricane Protection Project was filed with USEPA.

- The final EIS for the LPV Hurricane Protection Project, dated August 1974, was prepared. A Statement of Findings was signed by the USACE on December 2, 1974. Final Supplement I to the EIS, dated July 1984, was followed by a ROD, signed by the USACE on February 7, 1985. Final Supplement II to the EIS, dated

August 1994, was followed by a ROD signed by the USACE on November 3, 1994.

- A report titled *Flood Control, Mississippi River and Tributaries*, published as House Document No. 90, 70th Congress, 1st Session, submitted December 18, 1927, resulted in authorization of a project by the Flood Control Act of 1928. The project provided comprehensive flood control for the lower Mississippi Valley below Cairo, Illinois. The Flood Control Act of 1944 authorized the USACE to construct, operate, and maintain water resources development projects. The Flood Control Acts have had an important impact on water and land resources in the proposed project area.

3.1.15.2 WBV Risk Reduction Projects

- SEA No. 306c, *Installation of Permanent Pumps at the Harvey Canal Sector* Gate, Jefferson Parish, Louisiana: In August 2014, SEA No. 306c was finalized to modify the Government's approved plan analyzed in EA No. 306, SEA No. 306a, SEA No. 306b and IER No. 12 and the approved FONSIs and RODs associated with these documents. SEA No. 306c described replacing seven existing temporary pumps with seven permanent pumps to maintain water levels in the basin between the Harvey Lock and the Harvey Sector Gate below EL +2.3 NAVD88. See Appendix D, Location Map No. 20 near Lapalco Floodgate for project location. Construction also included replacing the existing platform with a new platform to hold the hydraulic units that drive the hydraulic pumps. An emergency safe house with a finished floor elevation of El +13 was also constructed to house pump station operators during tropical events. New submersible electric pumps, discharge piping and associated controls were installed to replace the existing temporary hydraulic pumps and discharge pipes. Rip rap was also added downstream of the sector gate to prevent scouring of the foundation.

- In June 2009, the USACE finalized an EA No. 475, evaluating the potential impacts associated with the proposed storm proofing modifications at 21 existing drainage PSs in Jefferson Parish, Louisiana. The purpose of this project was to ensure the operability of the stations during hurricanes, storms, and high-water events. The modifications were proposed for those Jefferson Parish pump stations on the east and west banks of the Mississippi River to ensure station operation during, and immediately following, large tropical storm events (USACE 2009m).

- In October 2007, the USACE finalized an EA No. 454, evaluating the potential impacts associated with the proposed storm proofing modifications at 12 pump stations, which at that time lacked adequate storm proofing measures in Jefferson Parish, Louisiana, to help ensure the operability of the stations during hurricanes, storms, and high-water events. The modifications were proposed for 12 existing PS on the east and west banks of the Mississippi River in Jefferson Parish (USACE 2007b).

- In July 2006, the CEMVN Commander signed a FONSI for EA No. 433 titled *USACE Response to Hurricanes Katrina and Rita in Louisiana*. The document evaluates the potential impacts associated with the actions taken by the USACE as a result of Hurricanes Katrina and Rita.

- On August 23, 2005, the CEMVN Commander signed a FONSI for EA No. 422 titled *Mississippi River Levees – West Bank Gaps, Concrete Slope Pavement Borrow Area Designation, St. Charles and Jefferson Parishes, Louisiana*. The report investigates the impacts of obtaining borrow material from various areas in Louisiana.

- On February 22, 2005, the CEMVN Commander signed a FONSI for EA No. 306A titled *West Bank Hurricane Protection Project – East of the Harvey Canal, Floodwall Realignment and Change in Method of Sector Gate*. The report discusses the impacts related to the relocation of a proposed floodwall moved because of the sector gate, as authorized by the LPV Project.

- On May 5, 2003, the CEMVN Commander signed a FONSI for EA No. 337 titled *Algiers Canal Alternative Borrow Site*.

- On June 19, 2003, the CEMVN Commander signed a FONSI for EA No. 373 titled *Lake Cataouatche Levee Enlargement*. The report discusses the impacts related to improvements to a levee from Bayou Segnette State Park to Lake Cataouatche.

- On May 16, 2002, the CEMVN Commander signed a FONSI for EA No. 306 titled *West Bank Hurricane Protection Project - Harvey Canal Sector Gate Site Relocation and Construction Method Change*. The report discusses the impacts related to the relocation of a proposed sector gate within the Harvey Canal, as authorized by the LPV Project.

- On August 30, 2000, the CEMVN Commander signed a FONSI for EA No. 320 titled *West Bank Hurricane Protection Features*. The report evaluates the impacts associated with borrow sources and construction options to complete the Westwego to Harvey Canal Hurricane Protection Project.

- The final EIS for the WBV, East of Harvey Canal, Hurricane Protection Project was completed in August 1994. A ROD was signed by the USACE in September 1998.

- The final EIS for the WBV, Lake Cataouatche, Hurricane Protection Project was completed. A ROD was signed by the USACE in September 1998.

- On August 18, 1998, the CEMVN Commander signed a FONSI for EA No. 258 titled *Mississippi River Levee Maintenance - Plaquemines West Bank Second Lift, Fort Jackson Borrow Site*.

- In December 1996, the USACE completed a PAC study titled, *Westwego to Harvey Canal, Louisiana Hurricane Protection Project Lake Cataouatche Area EIS*. The study investigated the feasibility of providing hurricane surge protection to that portion of the west bank of the Mississippi River in Jefferson Parish between Bayou Segnette and the St. Charles Parish line. A standard project hurricane (SPH) level of protection was recommended along the alignment, followed by the existing non-Federal levee. The project was authorized by Section 101 (b) of the WRDA of 1996, (PL 104-303) subject to the completion of a final report of the Chief of Engineers, which was signed on December 23, 1996.

- On January 12, 1994, the CEMVN Commander signed a FONSI for EA No. 198 titled, *West Bank of the Mississippi River in the Vicinity of New Orleans, Louisiana, Hurricane Protection Project, Westwego to Harvey Canal, Jefferson Parish, Louisiana, Proposed Alternate Borrow Sources and Construction Options*. The report evaluates the impacts associated with borrow sources and construction options to complete the Westwego to Harvey Canal Hurricane Protection Levee.

- In August 1994, the USACE completed a feasibility report titled *WBV (East of the Harvey Canal)*. The study investigated the feasibility of providing hurricane surge protection to that portion of the west bank of Metropolitan New Orleans from the Harvey Canal eastward to the Mississippi River. The final report recommended that the existing West Bank Hurricane Project, Jefferson Parish, Louisiana, authorized by the WRDA of 1986 (PL 99-662), approved November 17, 1986, be modified to provide additional hurricane damage risk reduction east of the Harvey Canal. The report also recommended that the level of protection for the area east of the Algiers Canal deviate from the National Economic Development Plan's level of protection and provide protection for the SPH. The Division Engineer's Notice was issued on September 1, 1994. The Chief of Engineer's report was issued on May 1, 1995. Pre-construction, engineering, and design was initiated in late 1994 and is continuing. The WRDA of 1996 authorized the project.

- On March 20, 1992, the CEMVN Commander signed a FONSI for EA No. 165 titled *Westwego to Harvey Canal Disposal Site*. The report evaluates the environmental impacts associated with the disposal site to stockpile excavated materials near the existing V-line levee, Estelle Pumping Station, Jefferson Parish.

- In February 1992, the USACE completed a reconnaissance study titled *West Bank Hurricane Protection, Lake Cataouatche, Louisiana*. The study investigated the feasibility of providing hurricane surge protection to that portion of the west bank of the Mississippi River in Jefferson Parish, between Bayou Segnette and the St. Charles Parish line. The study found a 100-year level of protection to be economically justified based on constructing a combination levee/sheet pile wall along the alignment, followed by the existing non-Federal levee. Due to potential impacts on the Westwego to Harvey Canal project, the study is proceeding as a PAC.

- On June 3, 1991, the CEMVN Commander signed a FONSI for EA #136 titled *West Bank Additional Borrow Site between LA 45 and Estelle Pump Station*. The report evaluated the impacts associated with design changes to the Westwego to Harvey Canal Hurricane Protection Project since EA #121.

- On March 15, 1990, the CEMVN Commander signed a FONSI for EA No. 121 titled *West Bank Westwego to Harvey Changes to EIS*. The report addresses the impacts associated with the use of borrow material from Fort Jackson for WBV construction. The material was used for constructing the second lift for the Plaquemines West Bank levee upgrade as part of WBV construction.

- In December 1986, the USACE completed a feasibility report and EIS titled *West Bank of the Mississippi River in the Vicinity of New Orleans, Louisiana*. The report investigates the feasibility of providing hurricane surge protection to that portion of the west bank of the Mississippi River in Jefferson Parish between the Harvey Canal and Westwego, and down to the vicinity of Crown Point, Louisiana. The report recommends implementing a plan that would provide SPH-level of protection to an area on the west bank between Westwego and the Harvey Canal north of Crown Point. The project was authorized by the WRDA of 1986 (PL 99-662). Construction of the project was initiated in early 1991.

3.2 COASTAL WETLANDS RESTORATION AND PROTECTION IN LOUISIANA

Major coastal wetlands restoration and protection projects in the region are listed in Appendix L and are summarized below; their locations are provided in Figure 3-8. The projects are components of a comprehensive regional planning and building effort for southeastern Louisiana.

3.2.1 COASTAL WETLANDS PLANNING, PROTECTION, AND RESTORATION ACT (CWPPRA)

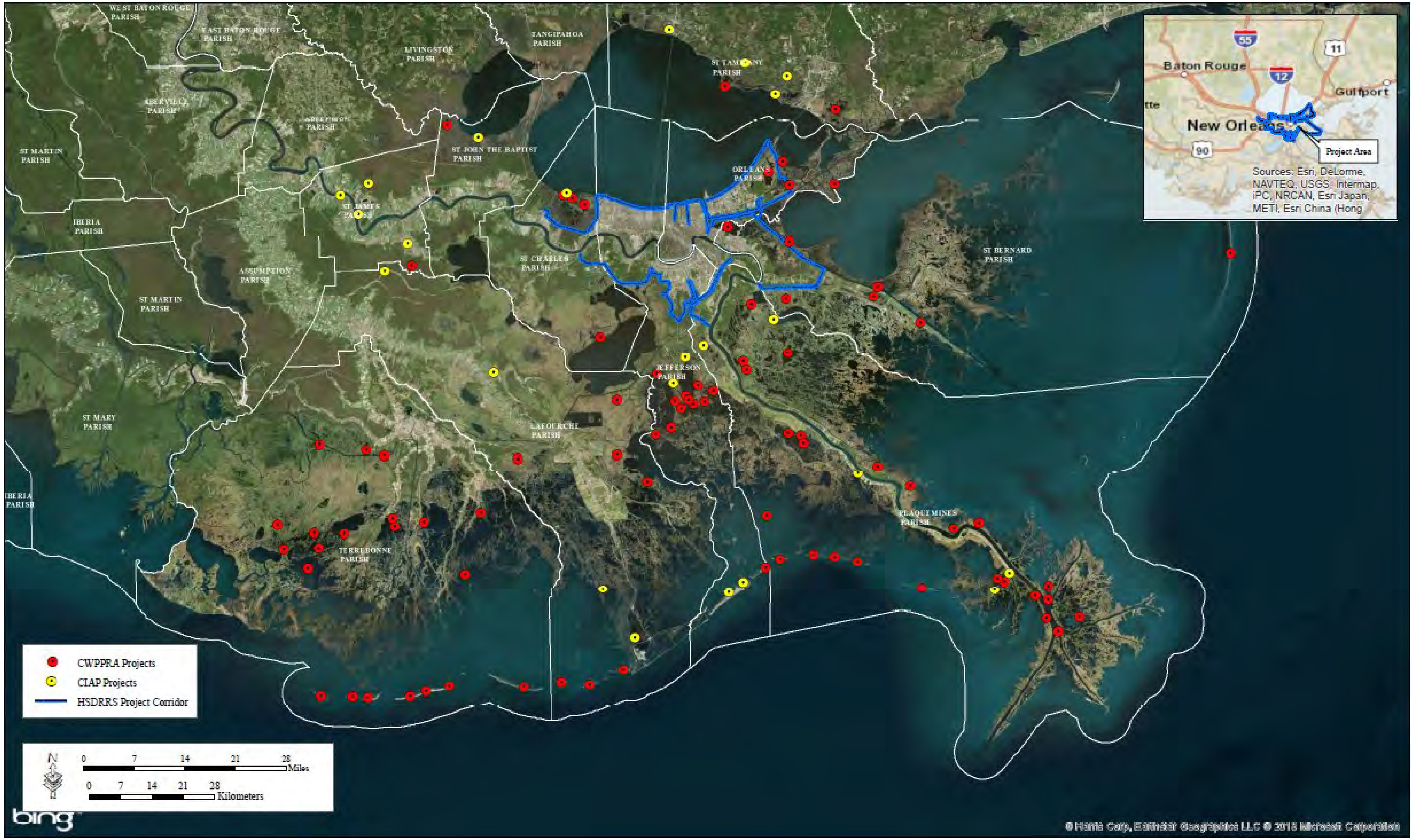
The CWPPRA was the first federal statutorily mandated restoration of Louisiana's coastal wetlands and the first stable source of Federal funds dedicated exclusively to the long-term restoration of coastal wetlands (Louisiana Coastal Wetlands Conservation and Restoration Task Force [Task Force] 2006). The CWPPRA was passed in 1990. The CWPPRA provides funds for projects targeted for the creation, protection, restoration and/or enhancement of wetlands in coastal Louisiana. The CWPPRA project planning activities are 100 percent federally funded. However, once a project is approved, the cost of the project is cost shared 85 percent Federal and 15 percent non-Federal. The non-Federal funds are usually State funds. As of October 2020, there are a total of 226 CWPPRA projects. Of those, 149 are active, six are inactive, 17 are complete, 96 are in long-term O&M, eight have been transferred and 46 have been deauthorized.

A list of CWPPRA projects, status reports and descriptions are available at https://www.lacoast.gov/. An interactive map for viewing the CWPPRA projects is located at https://www.lacoast.gov/Projects. The most recent "priority project list" is PPL29. The CWPPRA projects within the SE Louisiana region are listed in Appendix L. In general, there are nine different methods or restoration techniques that the CWPPRA projects can employ to restore or protect Louisiana coastal wetlands, namely:

- Diversion – Introduces fresh water, along with nutrients and sediments, from major rivers to wetlands or open water areas that have been deprived of fresh water and sediments, or that have been impacted by saltwater intrusion.
- Outfall management – The regulation of water levels and flow regimes to increase fresh water, nutrients, sediment dispersion, and retention time within the receiving waterway. This technique is often used with diversion projects.
- Hydrologic restoration – Modification of altered drainage patterns to mimic natural drainage patterns for habitat restoration.
- Shoreline protection – A method used to reduce or stop shoreline erosion.
- Barrier island restoration – Various techniques may be used to restore island size and configuration and include deposition of dredged material and breakwater placement, as well as fencing and plantings for beach stabilization.
- Marsh creation – Direct creation or nourishment of marsh through placement of dredged material.
- Sediment and nutrient trapping – The installation of flow control structures to promote sediment accretion and nutrient uptake.
- Vegetative planting – A technique used in conjunction with other restoration methods to create emergent marsh by planting stems or clumps of native marsh plants.
- Ridge restoration – The re-establishment of natural ridges to protect, maintain, or restore hydrologic and salinity settings. This technique also reduces wave energy into coastal wetlands complexes (LaCoast 2010).

CWPPRA Task Force is composed of the State of Louisiana and five Federal agencies: USEPA, USFWS, U.S. Department of Agriculture - Natural Resources Conservation Service (NRCS), National Oceanographic and Atmospheric Administration (NOAA) – National Marine Fisheries Service (NMFS), and USACE. The Governor's Office of Coastal Activities represents the State of Louisiana. The CWPPRA Task Force annually develops a list of priority projects to be constructed. The projects funded by CWPPRA focus on marsh creation, restoration, protection, or enhancement. As of April 2021, the CWPPRA Program has 229 authorized projects, 114 of which have been constructed. Another 17 projects are under construction, 29 are in the engineering & design phase, & 59 have been deauthorized or transferred to another program. The CWPPRA Program anticipates receiving about $93.8 million in Federal funds for FY21.The USACE administers budgetary accounting, tracks the project status of all CWPPRA projects, and constructs approved CWPPRA projects whenever it is assigned as lead agency for that project. All other projects are constructed by one of the other four Federal agencies. The CPRAB of Louisiana, formerly CPRA, is responsible for monitoring the effectiveness of the wetland restoration projects implemented under CWPPRA.

CWPPRA projects are generally small-scale and localized. To address projected future loss of coastal Louisiana, larger projects with more ecosystem-scale impacts must be constructed; however, many larger projects exceed the funding capacity and authorization period of CWPPRA. The Louisiana Coastal Area (LCA) initiative began in 2001 to fill this need and seeks future WRDA authorization and funding of large-scale coastal restoration projects in Louisiana.



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EAST BATON ROUGE PARISH
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ASSUMPTION PARISH
ST BERNARD PARISH
JEFFERSON PARISH
ST MARY PARISH
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PLAQUEMINES PARISH
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3.2.2 LOUISIANA COASTAL AREA ECOSYSTEM RESTORATION PLAN

Unless otherwise cited, the following information was extracted from the LCA, Louisiana Ecosystem Restoration Study (USACE 2004b).

In 1990, passage of the CWPPRA, (PL 101-646, Title III) provided authorization and funding for the Task Force to begin actions to curtail wetlands losses. In 1998, the State of Louisiana and the Federal agencies charged with restoring and protecting the remainder of Louisiana's valuable coastal wetlands developed the *Coast 2050: Toward a Sustainable Coastal Louisiana* report, known as the Coast 2050 Plan. The plan combines elements of all previous efforts, along with new initiatives from private citizens, local governments, State and Federal agency personnel, and the scientific community (Task Force and the Wetlands Conservation and Restoration Authority 1998).

The underlying principle of the Coast 2050 Plan is to restore or mimic the natural processes that built and maintained coastal Louisiana. This plan proposed ecosystem restoration strategies that would result in efforts larger in scale than any that had been implemented in the past. The Coast 2050 Plan was the basis for the May 1999 report, titled *Section 905(b) WRDA of 1986 Analysis Louisiana Coastal Area, Louisiana -- Ecosystem Restoration*. This reconnaissance-level effort evaluated the Coast 2050 Plan as a whole and expressed a Federal interest in proceeding to the feasibility phase. In 2000, it was envisioned that a series of feasibility reports would be prepared over a 10-year period.

The first feasibility efforts focused on the Barataria Basin and involved marsh creation and barrier shoreline restoration. However, early in FY 2002, it was recognized that it would be more efficient to develop a comprehensive coastal restoration effort that could be submitted to Congress as a blueprint for future restoration efforts. As a result, the USACE and the State of Louisiana initiated the *LCA Comprehensive Coastwide Ecosystem Restoration Study*. In FY 2004, it was determined that efforts should begin with highly cost-effective restoration features that address the most critical needs of coastal Louisiana, as well as large-scale and long-term restoration concepts.

The goal of the LCA Plan is to reverse the current trend of degradation of the coastal ecosystem. The plan maximizes the use of restoration strategies that reintroduce historic flows of river water, nutrients, and sediment to coastal wetlands and maintain the structural integrity of the coastal ecosystem.

An interagency PDT was assembled to conduct the requisite studies and analyses and develop the alternative plans and reports for the LCA Study. The PDT was composed of staff from the USACE, State of Louisiana (the non-Federal sponsor), USFWS, NMFS, USEPA, U.S. Geological Survey (USGS), and NRCS. The USACE and the State of Louisiana also enlisted the aid of over 120 scientists, engineers, and planners from across the nation to provide advice and guidance, carry out complex modeling efforts, and review results.

The LCA Plan included five near-term critical restoration features, which were recommended for specific authorization for implementation, subject to approval of feasibility-level decision documents by the Secretary:

- MRGO environmental restoration features
- Small diversion at Hope Canal
- Barataria Basin barrier shoreline restoration (Caminada Headland and Shell Island reaches)
- Small Bayou Lafourche reintroduction
- Medium diversion with dedicated dredging at Myrtle Grove

The LCA Study was released for public comment in 2004. The LCA Study made several recommendations that were ultimately authorized by the WRDA of 2007 (Title VII). In addition to the five near-term critical restoration projects, the following were added:

- Ten additional near-term critical restoration projects
- Beneficial use of dredged material
- Authority to initiate studies of modifications to existing water control structures
- Science and technology demonstration projects
- Science and technology program
- Studies on long-term restoration concepts

Implementation guidance for the LCA as authorized by the WRDA of 2007 (Title VII) was issued by the USACE on July 10, 2009. A list of LCA Plan projects can be found in appendix L. Five LCA Supplemental EISs have been completed and RODs signed for each one. The State of Louisiana has terminated the cost-share agreements for several authorized LCA projects.

3.2.3 LOUISIANA COASTAL PROTECTION AND RESTORATION (LACPR)

Before Congress could consider authorizing the LCA Plan's recommendations, Hurricanes Katrina and Rita hit Louisiana in 2005. Subsequently, the Energy and Water Development Appropriations Act (EWDAA) of 2006 [PL 109-103] passed in November 2005, and the DoD, Emergency Supplemental Appropriations to Address Hurricanes in the Gulf of Mexico, and Pandemic and Influenza Act 2006 passed on December 30, 2005, as part of the Defense Appropriations Act [PL 109-148]. These laws directed the USACE to examine, assess, and present recommendations for a comprehensive approach to coastal restoration, hurricane and storm damage reduction, and flood control. These congressional directives represent the first integration of planning to address these three enormous challenges. The combined planning will be accomplished through the LACPR effort. LACPR is not a construction project; it is a collaboration managed by the USACE that will generate a single document, a technical report, to provide guidance to Congress in its long-term decision-making regarding hurricane damage risk reduction and coastal restoration.

The purpose of the LACPR is to identify risk reduction measures that can be integrated to form a system that will provide enhanced protection of coastal communities and infrastructure, as well as restoration of coastal ecosystems. The scope of the LACPR is to address the full range of flood damage risk reduction, coastal restoration, and hurricane damage risk reduction measures available, including those needed to provide comprehensive “Category 5” protection.

The overall goals of LACPR are to:

- Conduct a comprehensive hurricane damage risk reduction analysis and design to develop and present a full range of flood damage reduction, coastal restoration, and hurricane damage risk reduction measures for south Louisiana.

- Evaluate risk reduction for a range of storms from the 100-year to the 1,000-year storm event (which encompasses a range of “Category 5” events) within the planning area.

- Conduct a transparent planning process to include independent technical review and external peer review.

- Engage the State of Louisiana and Federal agencies, stakeholders, and the general public as active partners in the planning process.

The LACPR effort has been, and will continue to be, integrated with the Mississippi Coastal Improvements Program efforts to ensure a consistent system approach to modeling storm events, data sharing, alternatives analysis, and lessons learned, as appropriate. The LACPR effort is also closely tied with the State of Louisiana’s Master Plan for coastal restoration and hurricane damage risk reduction. The LACPR team developed the following processes to facilitate comprehensive risk reduction analysis:

Risk-based Hurricane Frequency Simulation
Economic Evaluation
Cultural Resources Evaluation
Coastal Restoration Evaluation
Plan Formulation
Multi-criteria Decision Analysis
Public Stakeholder Involvement

One of the assumptions used to develop the State Master Plan, adopted by LACPR, is that hurricane damage risk reduction plans must rely on multiple lines of defense. The multiple lines of defense strategy involves using natural features, such as barrier islands, marshes, and ridges, to complement engineered structures, such as highways, levees, and raised homes. The multiple lines of defense approach avoids reliance on single risk reduction measures, which, if compromised, would leave vulnerable areas without recourse.

The LACPR team provided the National Academy of Sciences with the LACPR Draft Technical Report (USACE 2008e) for external peer review. The Final Technical Report was released in June 2009 (USACE 2009o) for review by other Federal agencies, the State of Louisiana, non-government organizations, and the public. A public meeting was held in Slidell, Louisiana, on June 16, 2009, to present the Final Technical Report to the public and local government stakeholders. The Final Technical and Comment Addendum Report (containing the Summary Report, Final Technical Report, and Comment Addendum) was completed in August 2009.

3.2.4 LOUISIANA'S COMPREHENSIVE MASTER PLAN FOR A SUSTAINABLE COAST (STATE MASTER PLAN)

Following Hurricanes Katrina and Rita in 2005, in November, the Louisiana Legislature passed Act 8, which created the Coastal Protection and Restoration Authority (CPRA) and charged it with developing a comprehensive coastal protection plan that considers both *"hurricane protection and the protection, conservation, restoration and enhancement of coastal wetlands and barrier shorelines or reefs."* The plan is updated every five years. The State's first Master Plan was approved in 2007. It was updated May 22, 2012, and again June 2, 2017. The State is in the process of developing a 2023 Master Plan. The State's master plans are available for viewing at https://coastal.la.gov/our-plan/2012-coastal-masterplan/.

In the first 5 years, the State has increased its financial commitment to the coast. Some of the dollars provided the State's match for repairs and revisions to the Greater New Orleans area levees, allowing the State to leverage over $14 billion in Federal dollars for this vital hurricane risk reduction system. In addition, the Coastal Impact Assistance Program (CIAP) provided approximately $496 million to Louisiana to mitigate impacts from Outer Continental Shelf oil and gas production. Many of the CIAP projects address coastal restoration needs through shoreline protection, marsh creation, and other strategies. Approximately 90 percent of the CIAP program's projects are underway or complete.

The State Master Plan presents a series of recommended hurricane damage risk reduction and coastal restoration measures, as well as a management strategy for implementing the measures. The measures contained in the plan can be broken down into three groups based upon the broad outcomes they deliver. These include the following three broad groups:

- Restoring Sustainability to the Mississippi River Delta - Reconnecting the Mississippi River to the wetlands through controlled diversions would restore flows of water through the wetlands so that the ecosystem can retain sediment and nutrients. Elements of this group include land-building diversions, land-sustaining diversions, marsh restoration with dredged material, use of navigation channels as water distributaries, barrier shoreline restoration, ridge restoration, shoreline stabilization, and closure of the MRGO to navigation (as described in section 3.1.7).

- Restoring Sustainability to the Atchafalaya River Delta and Chenier Plain - The Atchafalaya River Delta is the only region of coastal Louisiana that is building land naturally, and the State Master Plan seeks to take advantage of this resource. Further west in the Chenier Plain, navigation channels and canals have allowed salt water to penetrate inland, destroying fragile marsh and impinging on freshwater lakes. The Chenier Plain Freshwater and Sediment Management and Reallocation Plan, recommended in the Master Plan, would help fine-tune appropriate measures for the region. Elements of this group include managing water and sediment, marsh restoration with dredged material, barrier shoreline restoration, and lake shoreline restoration.

- Hurricane Risk Reduction - Elements to be considered by this group include consideration of the entire system, use of nonstructural elements to reduce risk, and focused structural solutions.

The 2007 Master Plan established the foundation for the States strategy, particularly its emphasis on improving protection from storm flooding and creating a sustainable ecosystem. The 2007 Master Plan's comprehensive approach was reflected in its objectives, principles, and conceptual project ideas. The State built on this foundation for the 2012 Master Plan, which was developed using extensive scientific analysis. The master plan reflects what has been learned in conversations with coastal residents and local leaders. The 2017 plan reflected in depth technical inquiry informed by an ongoing conversation with the citizens of Louisiana.

The 2017 Master Plan included 124 projects that build or maintain more than 800 square miles of land and reduce expected damage by $8.3 billion annually by year 50, which equates to more than $150 billion over 50 years. The 2017 Master Plan included the following:

- The plan dedicated nearly $18 billion to marsh creation using dredged material, $5 billion to sediment diversion, and more than $2 billion to other types of restoration projects, providing land building benefits of more than 800 square miles, compared to a future without action.

- The plan dedicated $19 billion for structural protection and $6 billion for nonstructural risk reduction; these projects would reduce expected annual damage by $8.3 billion by year 50, as compared to a future without action.

- The plan included a combination of structural and nonstructural risk reduction projects estimated to reduce the expected annual damage the State would face from storm surge by more than 75 percent for the Houma, Slidell, Franklin, Charenton, Edgard, Kenner, Metairie and Garyville regions and more than 90 percent for the Ama, Laplace, Reserve, Hahnville, Luling, Montz, Donaldsonville, Convent, Vacherie, Larose and Golden Meadow, Morgan City, Abbeville and Delcambre and Iberia regions.

The 2023 Coastal Master Plan would build upon previous master plan efforts and strive to ensure the collective effects of project investments reduce storm surge-based flood risk to communities, provide habitats to support an array of commercial and recreation activities and support infrastructure critical to the working coast. This would be achieved by harnessing natural processes, focusing protection on key assets and adapting to changing coastal conditions.

3.3 THE STATE OF LOUISIANA'S ANNUAL PLAN FOR 2020

The CPRA Board, with the assistance of the CPRA, is required by Act 523 of the 2009 Regular Legislative Session, amended by Act 604, to produce an Annual Plan that inventories projects, presents implementation schedules for these projects and identifies funding schedules and budgets. The Fiscal Year 2020 Annual Plan provides an update on the State's efforts to protect and restore its coast and describes the short-term and long-term results that citizens can expect to see. As stated in the FY2020 Annual Plan, there are approximately 108 active projects underway in various stages – 58 projects are in construction, 44 are in engineering and design and six are in planning. Within the southeast region of Louisiana, there are 30 projects in construction, 28 in engineering and design, and four in planning. Refer to the following website for more details: http://coastal.la.gov/wp-content/uploads/2019/01/CPRA-FY2020-Annual-Plan-3.22.19-Web.pdf

3.3.1 LOUISIANA COASTAL IMPACT ASSISTANCE PROGRAM (CIAP)

The Energy Policy Act of 2005 (PL 109-58) was signed into law in August 2005. Section 384 of the act established the CIAP, which authorized the distribution of funds to Outer Continental Shelf (OCS) oil- and gas-producing states to mitigate the impacts from OCS oil and gas exploration, development, and production activities.

Under CIAP, the Secretary of the Interior is authorized to distribute $250 million per FY to the producing states and coastal political subdivisions for FY 2007 through FY 2011. The CIAP funds are shared between Alabama, Alaska, California, Louisiana, Mississippi, and Texas based upon allocation formulas prescribed by the act. Pursuant to the act, a producing State or coastal political subdivision shall use the CIAP funds for one or more of the following purposes (Minerals Management Service [MMS] 2008):

- Projects and activities for the conservation, protection, or restoration of coastal areas, including wetlands
- Mitigation of damage to fish, wildlife, or natural resources
- Planning assistance and the administrative costs of complying with this section
- Implementation of a Federally approved marine, coastal, or comprehensive conservation management plan

- Mitigation of the impact of OCS activities through funding of onshore infrastructure projects and public service needs

On June 1, 2007, Louisiana submitted a CIAP plan for funding consideration to the MMS, now known as Bureau of Ocean Energy Management, Regulation, and Enforcement (BOEMRE). It was approved by MMS on November 29, 2007. Louisiana was the first State to receive CIAP grants and received a total of 49 in early 2008 (CPRA 2009).

The goals of the Louisiana CIAP are to:

1) implement, support, and accelerate effective and timely coastal conservation and restoration projects; and

2) implement, support, and accelerate coastal infrastructure projects that mitigate onshore impacts within the OCS.

The conservation and restoration objectives of the Louisiana CIAP are to implement Coast 2050, CWPPRA projects, and LCA Plan features that can be initiated in the near term and to implement a coastal forest conservation and restoration initiative. Additionally, CIAP would support projects to benefit wetlands and aquatic habitats in inland portions of coastal parishes and conduct monitoring and related science-support activities. The objectives of the infrastructure portion of the Louisiana CIAP are to implement and support projects that would protect the coastal communities and infrastructure involved in and impacted by OCS-related activities, as well as to implement and support onshore projects that address other infrastructure needs associated with and impacted by OCS-related activities (Louisiana Department of Natural Resources [LDNR] and Office of Coastal Restoration and Management 2007).

Most state CIAP restoration projects have had some level of work initiated. As of August 2020, 88 percent of all CIAP projects in Louisiana were under design, in construction, or completed (CPRA 2011a). Appendix L includes a list of CIAP projects and their status.

3.4 OTHER PROJECTS IN SOUTHEAST LOUISIANA

3.4.1 REGULATORY PROGRAM

The USACE has regulated certain activities in the nation's waters since 1890. The regulatory authorities and responsibilities of the Corps' Regulatory Program are based on the following laws:

- Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. 403) prohibits the obstruction or alteration of navigable waters of the United States without a permit from the Corps.

- Section 404 of the Clean Water Act (33 U.S.C. 1344). Section 301 of this act prohibits the discharge of dredged or fill material into waters of the United States without a permit from the Corps.

- Section 103 of the Marine Protection, Research, and Sanctuaries Act of 1972, as amended (33 U.S.C. 1413), authorizes the Corps to issue permits for the transportation of dredged material for the purpose of dumping it into ocean waters.

Other regulations/laws may also affect the processing of applications for Corps permits. Among these are 33 USC Section 408, NEPA, the Coastal Zone Management Act, the Fish and Wildlife Coordination Act, the Endangered Species Act, the National Historic Preservation Act, the Deepwater Port Act, the Federal Power Act, the Marine Mammal Protection Act, the Wild and Scenic Rivers Act, and the National Fishing Enhancement Act of 1984.

USACE Regulatory issues three types of permits: standard, general and letters of permission as described below:

- Standard permits - This involves an evaluation of an individual proposed project in a four-step process: pre-application consultation (optional), formal permit application review, decision making and monitoring/enforcement. The decision to issue an individual permit is based on an evaluation of the proposal's probable impacts on the public interest and, for proposals to fill waters and wetlands, whether the project complies with the USEPA's CWA Section 404(b)(1) guidelines. The individual permit process allows for the consideration of potentially less environmentally damaging alternatives to accomplish the project purpose and an evaluation of measures to reduce the impacts of the project on natural resources.

- General permits – This is the most common type of permit issued by USACE. General permits are issued on a national, regional or statewide basis. They are usually issued quickly because they cover projects that have minimal impact on the aquatic environment. Approximately 95 percent of all USACE regulatory activities are authorized by general permits. Approximately 84 percent of general permit verifications were issued within 60 days of receipt of a complete application. There are three types of General Permits:

    - Nationwide - Regulations governing Nationwide General permits are found at 33 CFR 330. There are currently 54 Nationwide General permits (2 reserved) with 32 general conditions. The Nationwide General permits became effective March 19, 2017 and expire on March 18, 2022.

    - Programmatic General Permits that compliment certain other Federal, State, or local agency programs to avoid duplicative requirements for the same activity where the environmental consequences of the activity would be individually and cumulatively minimal (e.g., CEMVN Programmatic General Permit Coastal Zone). There are 15 General Permits for use in CEMVN.

- o Regional General Permits – Permits issued regionally for a category or categories of activities that cause only minimal individual and cumulative adverse impacts. There are nine general Regional Conditions for the State of Louisiana for all Nationwide permits and then there are regional conditions for specific nationwide permits.

A total of 4532 permits were issued between 2011 and December 2020 by the CEMVN Regulatory Program Office

The standard permits issued within the five HSDRRS parishes are in Appendix L under the specific type of regional project that best described the permit project action. Information regarding the CEMVN Regulatory Program is available at this location: https://www.mvn.usace.army.mil/Missions/Regulatory/

3.4.2 BRITISH PETROLEUM DEEPWATER HORIZON OIL SPILL

On April 20, 2010, the British Petroleum Private Limited Company (BP) oil spill occurred off the coast of Louisiana, approximately 50 miles southwest of the Mississippi Delta in the Gulf of Mexico. The BP Deepwater Horizon drilling rig exploded, killing 11 workers and releasing crude oil during a 3-month period. The spill caused extensive damage to marine and wildlife species and associated habitats, including wetlands, severely affected the fishing and tourism industry, and became the largest environmental disaster in U.S. history. The broken wellhead released approximately 4.9 million barrels (205.8 million gallons) of oil into the Gulf of Mexico (Hoch 2010). By September 19, 2010, the relief well process was successfully completed, and the well was considered capped. Efforts to contain the oil on the surface away from sensitive areas, to dilute and disperse the oil to less sensitive areas, and to remove it from the water consisted of developing miles of containment boom, releasing chemical dispersants into the water, and removing the oil by burning, filtering, and collecting.

In April 2011, BP agreed to provide $1 billion toward early restoration projects in the Gulf of Mexico. These early restoration funds are part of the natural resource damage assessment process, and the natural resource trustees (which are the States of Alabama, Florida, Louisiana, Mississippi, and Texas, the Department of Interior, and the NOAA) will direct the money toward the restoration projects and continue the natural resource damage assessment process to determine the full extent of required compensation to the public for the entire injury. Of the $1 billion, each State will select and implement $100 million in projects, the Department of Interior and NOAA will each select and implement $100 million in projects, and the remaining $300 million will be used for projects selected by the Department of Interior and NOAA from proposals submitted by State trustees (Restore The Gulf 2011).

On July 2, 2015, an agreement was reached to settle the 2010 Deepwater Horizon oil spill disaster and after public review, the Department of Justice finalized the Consent Decree agreement. In the settlement with BP, it outlines how much funding would go to each program, with approximately $5 billion to be spent in Louisiana. In March 2016, a ROD was signed on the *Deepwater Horizon Oil Spill: Final Programmatic Damage Assessment and Restoration Plan and Final Programmatic Environmental Impact Statement* that provided information and analysis for a programmatic approach for restoring and conserving habitat. The recommended plan provides a higher level of guidance for identifying, evaluating, and selecting future restoration projects. There are multiple restoration programs to restore 13 different habitat types, water quality, replenishing and protecting living coastal and marine resources, providing and enhancing recreational opportunities, and monitoring, adaptive management and administrative oversight by Federal and State agencies designated as natural resource trustees and funded by the deep-water horizon spill (http://www.gulfofmexicoalliance.org/learn-more/gulf-restoration/). All future projects funded as part of the natural resource damage assessment process are not known at this time, but it is likely that numerous ecosystem restoration projects throughout the Gulf of Mexico will be funded as a result. One such project, the proposed Mid-Barataria Sediment Diversion is currently undergoing CEMVN review for a Department of the Army Section 10/404/408 permit/permission. The diversion would be located on the west bank of the Mississippi River above Ironton in Plaquemines Parish. The Draft EIS was released for public review in March 2021 and the permit decision is expected in 2022.

3.4.3 SECTION 408 PERMISSIONS

Section 14 of the Rivers and Harbors Act of 1899 and codified in 33 USC 408 (commonly referred to as “Section 408”), authorizes the Secretary of the Army, on the recommendation of the Chief of Engineers of the USACE, to grant permission for the alteration or occupation or use of a USACE civil works project if the Secretary determines that the activity will not be injurious to the public interest and will not impair the usefulness of the project.

On September 10, 2018, USACE issued Engineer Circular (EC) 1165-2-220, Policy and Procedural Guidance for Processing Requests to Alter U.S. Army Corps of Engineers Civil Works Projects Pursuant to 33 USC 408. The EC provides the policies and procedural guidance for an overall review process that can be tailored to the scope, scale, and complexity of individual proposed alternations, and provides infrastructure specific considerations for dams, levees, floodwalls, flood risk management channels, and navigation projects.

Each individual Section 408 request is reviewed for NEPA compliance. For common types of activities where the impacts are typically limited in scope, CEMVN developed a series of evaluation categories and then considered the potential project impacts of each category. This analysis was captured in a programmatic EA entitled, *Programmatic Environmental Assessment, Categorical Permissions to Alter U.S. Army Corps of Engineers Civil Works Projects Pursuant to 33 USC 408*. This analysis culminated in the August 30, 2018 issuance of categorical permission review authority for alterations that would not, for any reason, adversely affect the integrity or function of a civil works structure or be injurious to the public interest (Table 3-2). Information regarding the USACE MVN Section 408 program is available at this location https://www.mvn.usace.army.mil/Missions/Section-408/.

Table 3-1: Section 408 Categorical Permission Groupings

Categories	
1	Pipeline crossings including horizontal directional drills, open cuts, ramp overs, and floodwall penetration.
2	Utility lines including fiber optic, water, natural gas, and electricity, both aerial and underground, including associated structures and support poles.
3	Bulk material conveyor systems.
4	Culverts, drainage pipes, and drainage ditches.
5	Vehicle and pedestrian bridges.
6	Bank stabilization and erosion control features.
7	Bulkheads, docks, wharfs, mooring pilings and dolphins.
8	Barge fleeting operations in channels with existing barge fleeting operations.
9	Cattle guards, fences, and other ranching and farming activities on easement lands.
10	Trails, sign age, lighting, and other similar operational, recreational, and decorative features.
11	Soil investigations and seismic surveys, including borings, piezometers, and inclinometers.
12	Levee ramps and crossings.
13	Alterations that meet engineering requirements and environmental conditions.
14	Maintenance, repair, and rehabilitation of prior approved alterations; provided, such maintenance, repair or rehabilitation does no more than restore a previously approved improvement, structure, element, component or feature is authorized, preexisting dimensions, character or condition.

Between 2007 and 2016, letters of no objection were issued for projects seeking authorization to use, occupy or alter a USACE project in the New Orleans District under 33 USC Section 408. In 2016, CEMVN began processing Section 408 permission requests under new procedures in addition to issuing letters of no objection, which, when authorization was granted, resulted in a Section 408 Permission. Between 2016 and 2020, a total of 114 Section 408 Permissions were issued by the CEMVN

Operations Division. Of the issued Permissions, 55 projects were in the five-parish HSDRRS project area, a majority of which were evaluated as Categorical Permissions or Categorical Exclusions (n=31). Table 3.2 represents the approved Permissions per HSDRRS parish and level of NEPA impact documentation.

Table 3-2: Section 408 Permissions Granted by CEMVN in the HSDRRS Area

Parish	Categorical Permissions/ Categorical Exclusion	Standard Permissions (EA/EIS)	Total
St. Charles	4	3	7
Jefferson	6	9	15
Orleans	3	4	7
St. Bernard	2	0	2
Plaquemines	16	8	24

All Section 408 Permissions are co-located with federal projects; therefore, almost all of the permissions are crossing or impacting either the HSDRRS or MR&T projects. However, the negative impacts are generally limited. The most substantial series of projects affecting the HSDRRS are the planned levee lifts discussed below.

3.4.3.1 Section 408 Levee Lifts

The HSDRRS was designed to provide 1% LORR based on a 50-year period of analysis (from 2007 to 2057) and was constructed to this 2011 design elevation. Future levee "lifts" to increase levee elevations will be necessary as earthen levees settle over time due to compaction, subsidence and sea-level rise. While future levee lifts will be necessary to maintain the 1% LORR relative to changes caused by subsidence and sea-level rise, such lifts are not currently federally authorized. CPRA, as a non-Federal sponsor, is required to operate and maintain the earthen levees to the 2011 design elevations. It is seeking authorization through Section 14 of the Rivers and Harbors Act of 1899 (33 U.S.C. 408, referred to as Section 408 from this point forward) to raise certain levees with a series of lifts until 2057. The non-Federal sponsor is responsible for ensuring Operation Maintenance Restore Repair & Rehabilitation (OMRR&R) construction activities for these additional levee lifts comply with all Federal, State and local environmental laws and regulations, in addition to environmental commitments specific to the HSDRRS. As a result, levee lifts approved under the Section 408 authority are considered reasonably foreseeable and are described as HSDRRS 2057 construction throughout the CED.

SECTION 4

AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This section presents a summary of the affected environment and the environmental consequences of implementing the HSDRRS projects. The focus is on those resources described as important by laws, executive orders, regulations, and other standards of national, state, or regional agencies, and technical or scientific agencies.

Construction of the HSDRRS risk reduction features is complete. Some outstanding projects include construction and monitoring of some LPV and WBV mitigation sites and construction of the Bayou aux Carpes augmentation features. Therefore, the Proposed Actions as described in the NEPA documents are considered constructed except for the outstanding projects as stated. The IERs, Supplements and EAs as well as the CED phase I are incorporated by reference. Refer to these documents for detailed discussions regarding the specific actions evaluated in the respective IERs, Supplements and EAs.

The CEQ regulations (40 CFR §§ 1500 -1508 (1978))[1] for implementing the NEPA of 1969, as amended (42 U.S.C. §§ 4321 *et seq.*) require federal agencies to consider not only the direct and indirect impacts of a proposed action, but also the cumulative impacts of the action (40 CFR §1508.8). Direct impacts are those that are caused by the action and occur at the same time and place (40 CFR §1508.8(a)). Indirect impacts are those that are caused by the action and are later in time or further removed in distance but are still reasonably foreseeable (40 CFR §1508.8(b)). A NEPA analyses must assess cumulative impacts, which are the impact on the environment resulting from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions (32 CFR § 651.16(a)). Cumulative impacts are defined as:

> *"… the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.* (40 CFR §1508.7).

Impacts are defined as any adverse or beneficial consequences on the human or natural environment caused by the implementation of an action and include any

[1] References to CEQ NEPA regulations are to CEQ's NEPA-implementing regulations promulgated in 1978, as amended in 1986 and 2005, which were in effect throughout the time of the Emergency Alternative Arrangements.

irreversible and irretrievable commitments of resources should the action be implemented. “Effects” and “impacts” as used in the CEQ NEPA-implementing regulations (40 CFR 1508.8(b)) are synonymous and include ecological (such as the effects on natural resources and on the components, structures, and functioning of affected ecosystems), aesthetic, historic, cultural, economic, social, or health, whether direct, indirect, or cumulative.

The terms “adverse” and “beneficial” are defined as the following:

- Adverse – is a negative impact on the human, natural, and/or physical environment.
- Beneficial – is a positive impact on the human, natural and/or physical environment.

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

- Negligible: A resource was not affected, or the effects were at or below the level of detection; changes were not of any measurable or perceptible consequence.
- Minor: Effects on a resource were detectable, although the effects were localized, small, and of little consequence to the sustainability of the resource.
- Moderate: Effects on a resource were readily detectable, long-term, localized, and measurable.
- Major: Effects on a resource were obvious, long-term, and had substantial consequences on a regional scale.
- Significant – a substantial, or potentially substantial, adverse change in any of the physical conditions within the area affected by the project, including land, air, water, minerals, flora, fauna, ambient noise, and/or objects of historic or aesthetic value.

Future levee lifts are analyzed as proposed future 2057 construction. A general reevaluation study for LPV and WBV is under way currently to determine whether there is a federal interest in funding future levee lifts of the HSDRRS. Refer to these reports regarding current information on future levee work. It is estimated that the future levee lifts to provide the 100-year LORR would need approximately 9 million cubic yards (cy) of borrow through 2057. Required borrow material would come from available borrow sources in the region and further environmental analyses assessing the potential impacts of removing soil from borrow areas would be conducted at that time. For the purposes of this cumulative impact analysis, all borrow sources identified for future levee lifts would be designed and constructed in accordance with the design guidelines for borrow areas, which can be found in the USACE 1986, Report 4.

4.1 REGIONAL ENVIRONMENTAL SETTING

4.1.1 STUDY AREA

The study area is located on both the east bank and the west bank of the Mississippi River within five sub-basins (Figure 1-1).

The LPV HSDRRS component is located on the east bank of the Mississippi River south of Lake Pontchartrain within St. Charles, Jefferson, Orleans, and St. Bernard Parishes in southeast Louisiana. The western end abuts the Bonnet Carré spillway. The eastern end is in the Bayou Sauvage National Wildlife Refuge and along the now deauthorized Mississippi River Gulf Outlet (MRGO). The study area includes the communities of New Orleans, Norco, Kenner, Elmwood, Metairie, Chalmette, Poydras, and St. Bernard (Table 4-1). Numerous canals and waterways dissect the area. Several sensitive environmental resources are located near the area including Bayou Sauvage National Wildlife Refuge, Lake Pontchartrain, Lake Borgne, the central wetlands area, the Gulf of Mexico, and the Mississippi River. In general, these environmental resources are largely comprised of bottomland hardwood forests, cypress-tupelo swamps, and various marsh and, scrub-shrub habitats.

Table 4-1: LPV Overview

Sub-basin	Parish	Sub-Basin (acres)	Cities and Areas of Interest
St. Charles	St. Charles	13,064	Norco, Destrehan
Jefferson East Bank	Jefferson	28,529	Kenner, River Ridge, Elmwood, Harahan, Metairie
Orleans East Bank	Jefferson, Orleans	27,935	New Orleans, Metairie, Port of New Orleans
New Orleans East	Orleans	35,322	Bayou Sauvage NWR
Chalmette Loop	Orleans, St. Bernard	49,295	Lower Ninth Ward, Arabi, Chalmette, Meraux, Violet, Poydras, St. Bernard, central wetlands area
TOTAL		154,145	

The WBV HSDRRS component (Figure 1-1) is located on the west bank of the Mississippi River within St. Charles, Jefferson and St. Bernard Parishes in southeast Louisiana. The western end abuts the Bonnet Carré spillway. It includes the communities of Algiers, Ama, Avondale, Belle Chasse, Bridge City, Gretna, Harvey, Marrero, Terrytown, Timberlane, Westwego and Waggaman (Table 4-2). The area is part of the Barataria Basin. Lake Salvador and Lake Cataouatche are estuary areas to the south that connect to the Gulf of Mexico through Barataria Bay. The area is dissected by numerous canals and waterways and numerous sensitive environmental resources including the Bayou aux Carpes Clean Water Act (CWA) Section 404(c) area, Barataria Bay, Gulf of Mexico, and the Mississippi River. In general, these environmental resources are largely comprised of bottomland hardwood forests, cypress-tupelo swamps, and various marsh and scrub-shrub habitats.

Table 4-2: WBV Overview

Sub-basin	Parish	Sub-Basin (acres)	Cities and Areas of Interest
Belle Chasse	Orleans, Jefferson, Plaquemines	17,855	Belle Chase
Gretna- Algiers	Orleans, Jefferson, Plaquemines	19,355	Algiers, Gretna, Harvey, Terrytown, Timberlane
Harvey- Westwego	Jefferson	15,353	Ama, Waggaman; Bridge City, Westwego, Marrero Bayou Aux Carpes CWA Section 404(c) Area
Lake Cataouatche	Jefferson, St. Charles	24,883	Ama, Waggaman. Avondale
TOTAL		77,446	

4.1.2 GEOGRAPHY

Located on the northeastern flank of the Deltaic portion of the Mississippi River Alluvial Plain, elevations vary from 31-feet NAVD88 on levees and floodwalls to near sea level in the back swamp and lake areas to below sea level in many of the urbanized areas that are under forced drainage.

The LPV is located on the southern edge of the Pontchartrain Basin on the eastern side of the Mississippi River between RM 82 to 127 above Head of Passes. The Pontchartrain Basin is a shallow depression that lies between the alluvial ridge of the Mississippi River and the gulfward-sloping uplands on the north and west. The area is of extremely low relief with land elevations highest adjacent to the Mississippi River

The WBV is located on the northern edge of the Barataria Basin on the western side of the Mississippi River between RM 82 to 127 above Head of Passes. The Barataria Basin is an interdistributary basin dominated by features which include natural levee ridges, crevasse-splay deposits, marsh, lakes, and swamps. The eastern and northern edge of the basin is defined by the natural levee ridge of the Mississippi River and the western edge of the basin is defined by the Bayou Lafourche natural levee ridge. The Gulf of Mexico constitutes the southern boundary.

Land Use

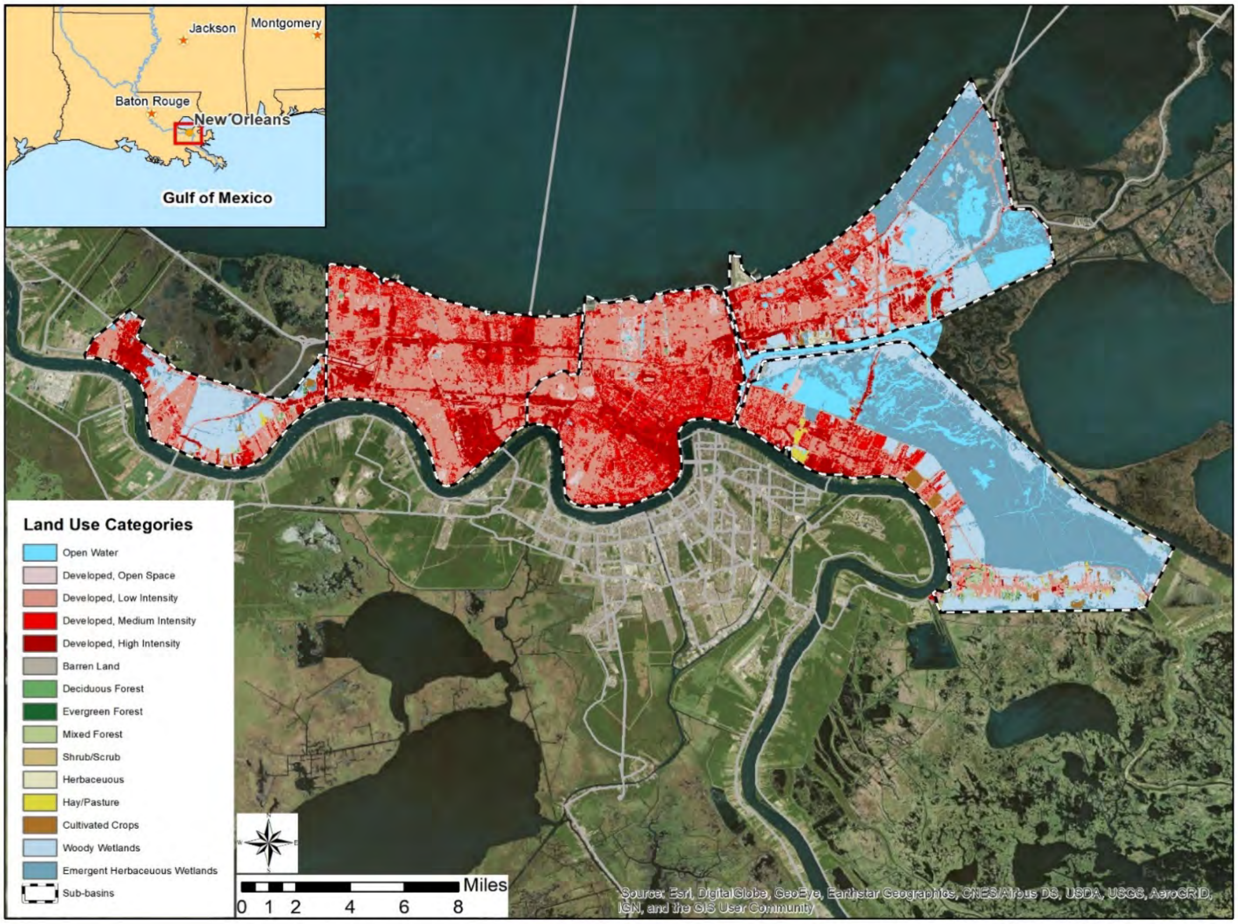
The 2011 National Land Cover Database includes the most up-to-date data concerning the study area. Table 4-3 and 4-4 and Figure 4-1 and 4-2 identify various land uses within the LPV and WBV components.

Table 4-3: LPV Land Use by Sub-basin

Land Use	St. Charles	Jefferson	Orleans East Bank	New Orleans East	Chalmette Loop	Study Area Total
Open Water	64	72	241	4,375	5,319	10,071 (6.6%)
Developed	7,538	28,324	27,478	13,726	11,650	88,716 (57.9%)
Barren Land	107	37	0	744	554	1,442 (0.9%)
Deciduous Forest	50	30	23	24	120	247 (0.2%)
Evergreen Forest	22	0	1	0	69	92 (0.1%)
Mixed Forest	20	1	2	0	438	461 (0.3%)
Shrub/Scrub	48	8	6	29	195	286 (0.2%)
Herbaceous	35	9	0	144	99	287 (0.2%)
Hay/Pasture	79	10	3	43	360	495 (0.3%)
Cultivated Crops	123	0	0	116	544	783 (0.5%)
Woody Wetlands	4,358	13	3	6,342	9,594	20,310 (13.3%)
Emergent Herbaceous Wetlands	601	20	0	9,105	20,255	29,981 (19.6%)

Table 4-4: WBV Land Use by Sub-basin

Land Use	Belle Chasse (acres)	Gretna-Algiers (acres)	Harvey Westwego (acres)	Lake Cataouatche (acres)	Total Acres in Study Area
Open Water	140	212	231	304	887 (1.15%)
Developed	5,579	17,496	10,593	6,611	40,279 (52.01%)
Barren Land	64	2	71	1,367	1,504 (1.94%)
Deciduous Forest	181	9	12	81	283 (0.37%)
Evergreen Forest	36	1	8	14	59 (0.08%)
Mixed Forest	1,092	25	10	85	1,212 (1.56%)
Shrub/Scrub	166	19	7	49	241 (0.31%)
Herbaceous	76	19	17	89	201 (0.26%)
Hay/Pasture	546	170	280	1,473	2,469 (3.19%)
Cultivated Crops	859	5	181	1,610	2,655 (3.43%)
Woody Wetlands	8,304	1,379	3,469	11,121	24,273 (31.34%)
Emergent Herbaceous Wetlands	812	18	474	2,079	3,383 (4.37%)
Total Acres	17,855	19,355	15,353	24,883	77,446 (100.00%)


Jackson
Montgomery
Baton Rouge
New Orleans
Gulf of Mexico
Land Use Categories
Open Water
Developed, Open Space
Developed, Low Intensity
Developed, Medium Intensity
Developed, High Intensity
Barren Land
Deciduous Forest
Evergreen Forest
Mixed Forest
Shrub/Scrub
Herbaceuous
Hay/Pasture
Cultivated Crops
Woody Wetlands
Emergent Herbaceuous Wetlands
Sub-basins
Miles
0 1 2 4 6 8

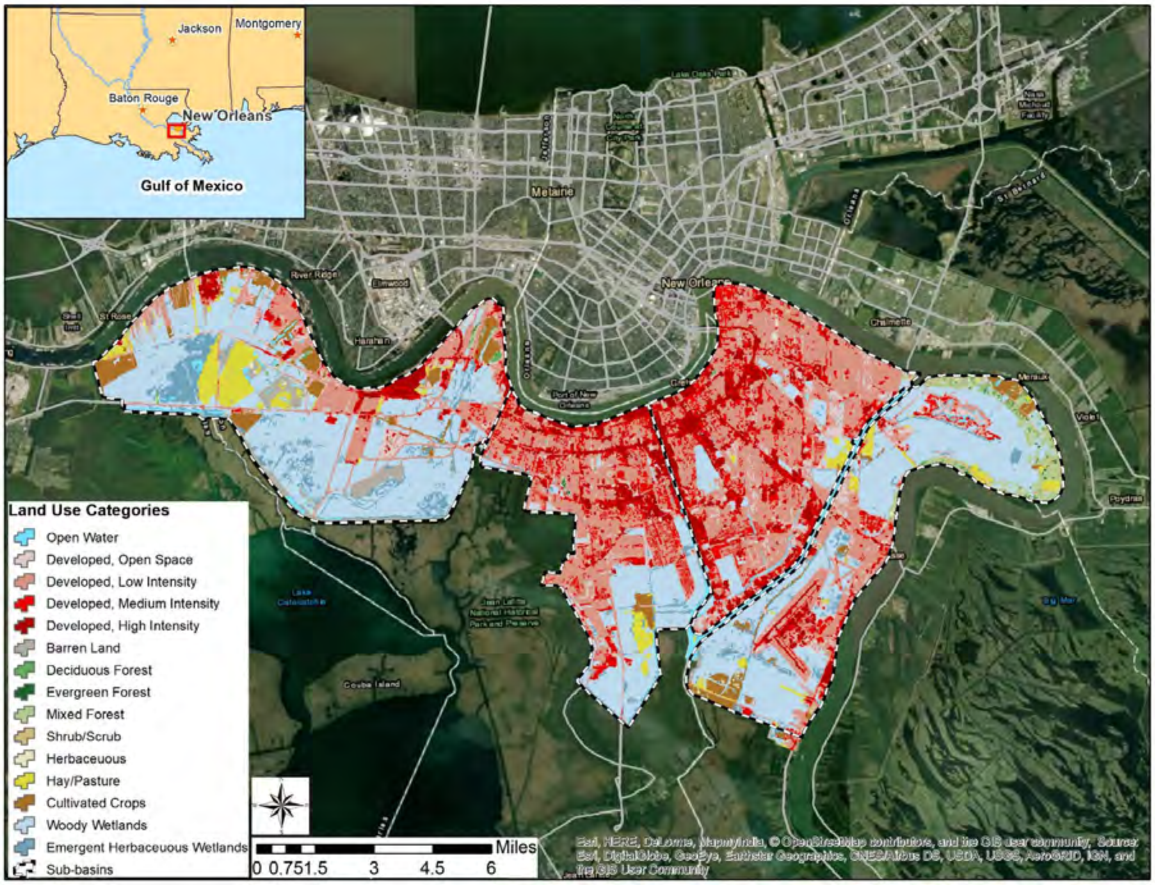


Figure 4-1: WBV Land Use Categories

4.1.3 CLIMATE

Regional climate is subtropical, with tropical air masses dominating the weather during the spring and summer, and cold continental frontal passages causing substantial temperature changes during the fall and winter.

Precipitation and Temperature

The climate is influenced by the many water surfaces of the lakes, streams, and the Gulf of Mexico. Precipitation generally is heavy in two rainy periods. Summer showers last from mid-June to mid-September, and heavy winter rains generally occur from mid-December to mid-March. Table 4-5 provides a summary of weather averages.

Table 4-5: Climate Averages at New Orleans

Weather Variable	Average
Annual High Temperature	77.1°F
Annual Low Temperature	62.3°F
Average Annual Temperature	69.7°F
Average Annual Precipitation – Rainfall	63.5 inches

https://www.usclimatedata.com/cli3mate/new-orleans/louisiana/united-states/usla0338. Accessed 8 January 2019

Wind

New Orleans experiences seasonal variation in average wind speed and direction through the year. The windiest months occur between September and May with an average wind speed estimated at 8.9 miles per hour. Southerly winds often occur from February through July while northerly winds are most common from November to February (https://weatherspark.com/y/11799/Average-Weather-in-New-Orleans-Louisiana-United-States-Year-Round. Accessed January 9, 2019)

Tropical Storms and Hurricanes

Tropical storm and hurricane events occur between June and November with the greatest frequency of hurricanes occurring between August and October (National Hurricane Center 2007). Tropical storm events typically produce the highest wind speeds and greatest rainfall events along the Gulf Coast. High winds are characteristically accompanied by massive storm surge, and in the case of the most powerful storms, these surges can be as high as 28-feet when they strike the Louisiana Coast (NOAA, Storm Surge Overview, 2019). Heavy rains and flooding are the primary problem associated with tropical storms.

Category 5 hurricanes, such as Hurricane Camille, which made landfall just east of New Orleans on August 17, 1969, generated the highest sustained wind speeds in the region (greater than 155 miles per hour). Between 2000 and 2020, a total of 28 tropical or subtropical cyclones affected Louisiana (Hydrometeorological Prediction Center (HPC)). A tropical cyclone makes landfall along the coastline about two times every three years and a hurricane makes landfall once every 2.8 years. The most intense storm to affect the state in terms of barometric pressure is Hurricane Katrina of 2005, which also caused the most fatalities and damage with 1,833 total deaths and over $100 billion in total damages. Katrina is also tied with Hurricane Harvey of 2017 as the costliest hurricane in the Atlantic basin. Table 4-6 presents the storms of record between 2002 and 2020.

Table 4-6: Storms of Record

Storm	Date	Landfall location	Sustained Winds (mph)	Storm Surge (feet)
Lili	3 Oct 2002	Vermilion Parish, LA	92	11
Katrina	29 Aug 2005	New Orleans, LA	125	24-28
Rita	24 Sep 2005	SW Louisiana	115	14
Ike	7 Sep 2008	Galveston, TX	110	22
Gustav	1 Sep 2008	Cocadrie, LA	105	9-13
Harvey	24 Aug 2017	SE TX, SW LA	130	6
Laura	27 Aug 2020	Cameron, LA	150	17

http://www.hurricanescience.org/history/2000s

Storm Surge

Storm surge associated with hurricanes occurs when winds push water up onto the land. Storm surge flooding across southeast Louisiana is greater than surrounding areas due to its orientation of being a "corner" along the coast. This means that the approximate angle made by the Mississippi Delta with the Gulf Coast to the east is ninety degrees, which would amplify the piling up of water.

Existing Infrastructure

The physical and topographic characteristics have created the need for levees, drainage canals, and pumping stations. In the early days of establishment, development occurred along the banks and natural ridges of the distributaries of the Mississippi River. As the communities expanded, development gradually moved further away from the river and into lower more vulnerable areas resulting in a need for levees, drainage canals, and pumping stations. As a result, both Federal and non-Federal projects providing flood risk reduction, hurricane and storm damage risk reduction, and navigation became necessary.

4.1.4 GEOLOGY

The geologic history since the end of the Pleistocene Epoch is pertinent to the study area. At the close of the Pleistocene, sea level was approximately 360 to 400 feet below the present sea level and the Mississippi River was entrenched into the older Pleistocene sediments. As sea level rose to its present stand, the entrenched valley was filled with sediment by the Mississippi River, resulting in an increase in meandering and channel migration. This meandering and channel migration resulted in a series of deltas extending into the Gulf of Mexico. Seven Holocene deltas are recognized in the lower Mississippi River Valley. Overall, development of the deltas experienced gradual degradation through subsidence and shoreline retreat.

The near-surface geology surrounding the HSDRRS can best be explained as the result of a subsiding Mississippi River delta lobe that has been drained, diked, and filled with various types and vintages of dredged material derived from nearby water bodies (e.g., Lake Pontchartrain, Mississippi River) and adjacent drainage canals. The deepest formations investigated are Pleistocene deposits, consisting of somewhat hardened fluvial sands, silts, and mud at a depth of 40 to 60-feet below the ground surface to depths around 180-feet below the ground surface. These sediments were exposed and weathered during low sea-level stands as a result of Pleistocene glaciation, resulting in relatively higher cohesive strengths than would normally be expected. Holocene deposits found above the Pleistocene deposits are the result of gradual deposition of organic peat mixed with fluvial silt and mud deposited as overbank deposits and interdistributary bay deposits of the Mississippi River in cypress swamps around Lake Pontchartrain (Kolb et al. 1975).

The high-water content and plasticity of surface soils translates into materials that are easily compressed. Soils in the Pleistocene formation (deeper formations) are of greater strength than those of the overlying Holocene (Kolb et al. 1975). Therefore, when compression occurs on the surface, such as pile driving or movement of large machinery, soil movement can only be lateral.

Much of the area was formerly wetlands (cypress swamps and marshes). As the GNO Metropolitan Area grew and the constructed levees were built ever higher, water was drained from swamps and marshes by canals, and pumped and dredged material, including peat and mud, were used to elevate the area for habitation. Resulting surface soils are classified as dredged material or muck. Land inside the levees is continually subsiding due to dewatering of peat deposits, often resulting in surface elevations below sea level. Water content in the soils is generally high and increases with depth. The near-surface groundwater table is connected to the water level in Lake Pontchartrain; hence, the need for numerous drainage canals and pumps to remove constant groundwater inflow.

Seismicity is generally not a factor in southeast Louisiana. There are numerous small normal growth faults located beneath the City of New Orleans and Lake Pontchartrain, but sudden failure of these faults is not likely. Instead, a gradual slippage has been documented, resulting in general land subsidence on the downside (Gulf of Mexico side) of the faults (Louisiana Geological Survey 2001). Additionally, surface water and groundwater quantity are also not a resource of issue in southeast Louisiana. There is adequate surface water quantity available for all uses in the region, primarily because surface water for drinking, commercial, and industrial uses is derived from the Mississippi River and its tributaries. Groundwater is typically not extracted in any substantial quantities for residential or commercial use. Although water quantity is not a resource issue in the region, water quality is a relevant resource and is described in detail in section 4.2.

4.2 RELEVENT RESOURCES

The affected environment and environmental consequences sections are summaries organized by sub-basin, when possible (see Figure 1-1), and when not possible, the resource is discussed by parish/county. For some select resources, such as threatened and endangered species, the affected environment and environmental consequences are discussed by resource to reduce redundant discussions by sub-basin and parish. Important natural resources evaluated include air, water, and sediment quality with their associated natural resources including fisheries, essential fish habitat, wetlands, wildlife, and threatened and endangered species. Other relevant resources include the aesthetic and recreational value of project areas and potential and existing cultural resources. Impacts due to noise and to transportation are also evaluated.

The construction of the HSDRRS comprising approximately 213 miles of levees, floodwalls, floodgates, and other structures primarily occurred within their existing footprints, however there were cases where construction expanded beyond the existing footprint. Table 4-7 provides a summary of those changes, as described by the IER, supplements and EAs. The projects described in IER 11 occur in both the New Orleans East and Chalmette Loop sub-basins. Impacts discussions of the Borgne barrier (IER 11) are included in the New Orleans East sub-basin.

Table 4-7: Increased Project HSDRRS Footprint

IER*	Sub-basins	Footprint Change or Expanded ROW
IER 1	St. Charles	Increase footprint 50 ft on flood side for 2,540 ft; increase ROW 100-250 ft on both sides
IERS 1	St. Charles	Shift of levee to flood side
IERS* 1b	St. Charles	Relocated portions of the 1,400 ft Fox Lane access road 15 – 50 ft outside ROW to the west and shifting an adjacent drainage ditch 10 – 20 ft west.
IER 2	Jefferson, Orleans	Move T-wall 35 ft to flood side
IERS 2	Jefferson, Orleans	Move T-wall 35 ft to flood side
IERS* 2.a	Jefferson, Orleans	Installation of a 24 to 36-inch drain line and four transfer lines and tying into the existing City of Kenner drainage system. Installation of the transfer lines required the temporary rerouting of traffic on those streets for approximately four months.
IER 3	Jefferson East	Raising the levee from current height to 17.5 ft, widen crown of levee from 7 ft to 10 ft, slight flood-side shift could be incorporated as needed, adding foreshore protection +6 ft at 150 ft from the centerline on the floodside
IERS 3.a	Jefferson East	Construction of wave attenuation berms and foreshore along lake front and T-wall, overpass bridge, and traffic detour land bridge spans as the abutment
IER 4	Orleans	Rebuilding and/or modifying earthen levees and floodwalls to an elevation of 16 ft on top of existing levee, replacing or adding new floodgates, modifying the gate structure, rebuilding roadway ramps to an elevation of 21.1 ft.
IER 5	Jefferson, Orleans	Total permanent ROW acquisition of 79 acres of land and water for all three proposed stations. Six acres of temporary ROW acquisition for the London Avenue Canal Proposed Action.
IERS* 5.a	Jefferson, Orleans	Total permanent and temporary ROW acquisition for all three outfall canals is approximately 18.43 acres for the unloading and staging, parking, utility corridors for power, water, sewage, and road access to the permanent pump stations.
IER 6	New Orleans East	34 ft of floodwall and 28 ft of levee in new locations
IERS 6	New Orleans East	Realign floodwall 300 ft south of current floodwall
IER 7	New Orleans East	Some levees in LPV-109 were shifted 61 ft toward protected side
IERS 7	New Orleans East	Temporary traffic control bridges off I-10. A required footprint for the earthen ramp would by widened by ~ 50-100 ft on each side of the highway and new easement between ramp toe and limits would be built.
IER 8	Chalmette Loop	Flow control structure on the flood side and adjacent to an existing structure at an elevation of + 31 ft
IER 9	Chalmette Loop	New floodwall alignment to replace the existing floodwall at an elevation of +26 ft., a 300-ft wide corridor, permanent ROW of ~ 10 acres
IER 10	Chalmette Loop	Eight pipelines moved due to T-wall caps
IERS* 8,9,10.a	Chalmette Loop	Impacts from construction took place along a previously disturbed corridor of levee/turf grass within ROW on the protected side of LPV 144-149. The total area permanently impacted by the access road is approximately 270.6 acres (LPV 145 = 70, LPV

IER*	Sub-basins	Footprint Change or Expanded ROW
		146 = 90, LPV 148.02 = 110, LPV 149 = 7); of this total area to be disturbed by excavation, grading, borrow, and fill is approximately 237.8 acres (LPV 145 = 55, LPV 146 = 85, LPV 148.02 = 85, LPV 149 = 12.9).
IER 11 Tier 1	Inner Harbor Navigation Canal	Tier 1 is a programmatic document; see Tier 2 documents for project footprint changes
IER 11 Tier 2 Borgne	New Orleans East	Construct an approximately 2-mile-long floodwall/gated system from the north side of the GIWW to the west side of the MRGO. An approximately 350 ft wide channel would be dredged through the marsh for the floodwall construction.
IERS 11.a Tier 2 Borgne	New Orleans East	Raise the protected side ground surface
IERS* 11.b Tier 2 Borgne	Orleans East Bank, New Orleans East, Chalmette Loop	Restoring and reinforcing portions of levees and floodwalls along the IHNC all took place within existing ROW. However, the permanent and temporary impacts within ROW for construction totaled approximately 82.6 acres and 3.4 acres for staging areas.
IERS* 11.c Tier 2 Borgne	New Orleans East	The project footprint increased impacting approximately 22 additional acres of wetlands (brackish marsh and brackish water) because of the expanded size of the access channel due to erosion of the bank line. The total wetland impact for the Borgne Barrier was approximately 80,84 acres.
IERS 11 Tier 2 Pontchartrain	New Orleans East	14 acres of permanent easement and 12 acres for temporary easement
IER 12	Gretna-Algiers	Constructing ~ 3 miles of levee and floodwall that would be shifted 58 ft to the protected side of the centerline of the existing levee. Earthen levee enlargement with a protected side shift that is partially outside the existing ROW. Additional 125 ft of permanent ROW along V-line levee. Relocation of drainage canal 200 ft to the protected side.
IERS* 12 Addendum	Gretna-Algiers	Utilizing the Westbank Site N borrow pit. The new design and alignment was within the existing right of way for the IER #12 project.
IERS 12	Gretna-Algiers	Access road to golf course
IERS* 12.a	Gretna-Algiers	Protected side shift WBV 14.e2 levee would be reduced, no need for a new ROW
IERS*12/13	Belle Chasse	Installation of a 16,000 linear ft, 12-inch diameter waterline.
IER 13/13. a*	Belle Chasse	Protected side shift, enlargement of the levee on the protected side
IER 14	Harvey Westwego	New ROW of 40 - 50 ft required on protected side, ROW of 10-20 ft needed on flood side
IERS 14.a	Harvey Westwego	New ROW of 100 ft on flood side
IER 15	Lake Cataouatche	Flood-side shift of the levee west 110 ft. The construction of 6.84 miles of uniform-design, protected-side shift of levee. The construction of 1,450 ft of t-wall floodwall to +15.5 ft.
IERS* 15.a/ S 15.a Addendum	Lake Cataouatche	Relocation of a 24-inch natural gas pipeline, new access road, and bridge. Construction required 35.7 acres of temporary ROW for access road, channel dredging and stockpile.
IER 16	Lake Cataouatche	ROW expanded to 1,100 ft along levee on west side of Bayou Verret closure, ROW expanded by 100 ft on flood-side portion length 9,600 ft, ROW expanded to 700 ft on side around Bayou Verret closure
IERS 16.a	Lake Cataouatche	Additional ROW 5 acres for temporary work, 0.7 and 2.6 acres of ROW for Mississippi River Levee

IER*	Sub-basins	Footprint Change or Expanded ROW
IER 17	Lake Cataouatche	ROW shift of 200 ft to 300 ft toward flood side along Reach 1 south of Lapalco Blvd, ROW expansion north of Lapalco Blvd (absorbed 12 parking spaces), new ROW around Bayou Segnette 40 acres
IER 18	New Orleans East, Chalmette Loop, Belle Chasse, Lake Cataouatche	Potentially excavating all suitable material from 12 proposed borrow sites. Including a total of 17.8 acres of access corridor.
IER 19	New Orleans East, Chalmette Loop, Lake Cataouatche	Potentially excavating all suitable material from nine proposed borrow sites
IER 22	Belle Chasse, Lake Cataouatche	Potentially excavating all suitable material from five proposed borrow sites. Including a total of 10.3 acres of access corridor.
IER 23	St. Bernard, St. Charles, Plaquemines Parishes, Hancock County, MS	Potentially excavating all suitable material from five proposed borrow sites
IER 25	Orleans, Jefferson, Plaquemines Parishes	Potentially excavating all suitable material from four proposed borrow sites. Including a total of 19.45 acres of access corridor.
IERS* 25.a	Orleans, Jefferson, Plaquemines Parishes	Approximately 14.48 acres of new ROW land was cleared and utilized for placement of Recycled Embankment Material. And an additional 7.93 acres of ROW originally cleared for borrow in IER #25 was utilized for placement of embankment.
IER 26	Jefferson, Plaquemines, St. John the Baptist Parishes, Hancock County, MS	Potentially excavating all suitable material from five proposed borrow sites
IER 27	Orleans East Bank	All restoration/reinforcement methods will be conducted with approximately the same footprint, within existing right of way
IERS* 27.a	Orleans East Bank	Approximately 4 acres of temporary ROW acquired for additional staging and access for construction activities.
IER 28	Plaquemines, St. Bernard, Jefferson Parishes	Potentially excavating all suitable material from three proposed borrow sites, 0.29 acre of access corridor
IER 29	St. John the Baptist, St. Tammany Parishes	Potentially excavating all suitable material from three proposed borrow sites
IER 30	St. Bernard, St. James Parishes	Potentially excavating all suitable material from three proposed borrow sites
IER 31	East Baton Rouge, Lafourche, Plaquemines, St. Bernard, St. Tammany Parishes, Hancock County, MS	Potentially excavating all suitable material from 10 proposed borrow sites
IER 32	Ascension, Plaquemines, St. Charles Parishes	Potentially excavating all suitable material from seven proposed borrow sites

IER*	Sub-basins	Footprint Change or Expanded ROW
IER* 33	Belle Chasse	Construction of Engineered Alternative Measures consisted of earthen clay/stabilized soil cap added to levee within ROW. No new ROW acquired.
IERS* 33.a	Belle Chasse	Construction of Resilient Features included floodwalls and earthen levees with a mix of flood and protected side shifts within existing MRL alignment. No new ROW acquired.
IER* 35	St. John the Baptist, Jefferson Parishes	Potentially excavating all suitable material from four proposed borrow sites

***** IER, Supplement or EA completed after November 2010.
Values/acreages are approximated. Refer to IER for specific information

Table 4-8 summarizes the intensity of the permanent adverse impacts by sub-basin. Table 4-9 summarizes the intensity of permanent adverse impacts of borrow excavation for sites excavated by October 2015 (most construction was complete by October 2015). Most of the impacts are considered negligible and minor. Often, resources impacts were limited to the period of construction. These impacts were temporary and short-term. In general, most resources were able to bounce back and return or nearly return to their pre-construction conditions once construction activities ceased. There were some moderate impacts to resources resulting from transportation, impacts to water quality and permanent impacts to wetlands. Cumulatively, future impacts to soils that may include prime farmland from borrow excavation could be significant. None the less, some resources (wetlands, BLH) were permanently impacted and require compensatory mitigation.

A summary of the existing conditions and environmental consequences are described below.

4.2.1 SOILS

4.2.1.1 AFFECTED ENVIRONMENT

The Natural Resource Conservation Service (NRCS) is the responsible agency for identifying and classifying soils in the U.S. As such, they publish soil surveys that identify soil properties and classifications designed to assist property owners and government officials in determining the best use of soils for a project. All physical and chemical properties of soils are identified, as well as the best use of those soils, including agricultural uses.

Prime farmlands are identified by the NRCS as those farmland soils that have the best combination of physical and chemical properties to be able to produce fiber, feed, or food, and are available for these uses. Unique farmland is defined as land other than prime farmland that is used for producing specific high-value food and fiber crops. The Farmland Protection Policy Act (FPPA), administered by the NRCS, requires Federal agencies to evaluate the effects (direct and indirect) of their activities before taking any action that could result in the conversion of designated prime or unique farmland, or farmland of statewide and local importance, for nonagricultural purposes. If an action would adversely affect farmland preservation, alternative actions that could avoid or lessen adverse effects must be considered. Determination of the level of impact of a project on prime and unique farmland or farmland of statewide and local importance is accomplished by the lead Federal agency (proponent) through an inventory of farmlands affected by the proposed action and completion of a Farmland Conversion Impact Rating for each alternative. In consultation with the proponent, the NRCS completes the rating evaluation and determines the level of consideration required for protection of farmlands under the FPPA (NRCS 2010b).

Farmlands subject to FPPA requirements do not have to be in use for crop production. The land can be in use as pasture or cropland, forest land, or other wildlife habitat. Areas of water, wetlands, or urbanized land are not considered subject to FPPA requirements. Farmlands previously impacted by development or other hard structures, such that they are no longer viable for crop production, are not regulated under the FPPA.

Existing Conditions

Soils within the HSDRRS were generally formed from Mississippi River sediments deposited as river floodwaters spread over the riverbanks during flood events. Soils in the project areas varied. In some areas they were fine-grained sand, silt, and clay and contain abundant organic material. As such, the soils in rural project areas supported crop production, and many were classified as prime farmland soils as indicated in figure 4-3.

The fine-grained composition and high clay content of soils in other project areas made most soils suitable for levee construction, and most existing levees were constructed using soils that were excavated from borrow areas.

Reference table 4-10 for a list of soils found within the project area, including the borrow and mitigation sites.

Table 4-8: Intensity of Permanent Adverse Impacts by Sub-basin

Resource	Negligible Impacts									Minor Impacts									Moderate Impacts									Major Impacts									Significant							
	St. Charles	Jefferson East	Orleans East	New Orleans E	Chalmette Loop	Belle Chasse	Gretna-Algiers	Harvey Westwego	Lake Cataouatche	St. Charles	Jefferson East	Orleans East	New Orleans E	Chalmette Loop	Belle Chasse	Gretna-Algiers	Harvey Westwego	Lake Cataouatche	St. Charles	Jefferson East	Orleans East	New Orleans E	Chalmette Loop	Belle Chasse	Gretna-Algiers	Harvey Westwego	Lake Cataouatche	St. Charles	Jefferson East	Orleans East	New Orleans E	Chalmette Loop	Belle Chasse	Gretna-Algiers	Harvey Westwego	Lake Cataouatche	St. Charles	Jefferson East	New Orleans E	Chalmette Loop	Belle Chasse	Gretna-Algiers	Harvey-Westwego	Lake Cataouatche
Soils		X	X				X	X		X			X	X	X			X																										
Water Quality			X								X								X			X	X	X	X	X	X																	
Wetlands			X																X	X		X	X	X	X	X	X																	
Uplands	X	X	X					X					X	X	X	X		X																										
Fisheries							X	X		X		X		X	X	X	X	X		X																								
Wildlife		X		X						X		X			X	X	X	X					X																					
EFH	X	X				X	X	X	X			X		X								X																						
T&E Species	X	X	X	X	X	X	X	X	X																																			
Cultural	X	X	X	X	X	X	X	X	X																																			
Recreational	X				X	X	X				X	X	X				X	X																										
Aesthetics										X	X		X	X	X		X				X				X		X																	
Air Quality	X	X	X	X	X	X	X	X	X																																			
Noise	X	X	X	X	X	X	X	X	X																																			
Transportation																			X	X	X	X	X	X	X	X	X																	
Socioeconomic	X	X	X	X	X	X	X	X	X																																			
HTRW	X	X	X	X	X	X	X	X	X																																			

Note: Within the CED, Cultural Resources, Socioeconomics, EJ, and Air Quality were presented by parishes within the HSDRRS project area.
1 For HSDRRS actions described by IERs and Supplemental IERs, and construction contracts implemented by October 2015.

Table 4-9: Intensity of the Permanent Adverse Impacts outside the HSDRRS Project Area (Borrow and Mitigation Sites)

Resource	Negligible Impacts											Minor Impacts											Moderate Impacts											Major Impacts											Significant Impacts										
	Ascension	East Baton Rouge	Iberville	Lafourche	Plaquemines	St. Bernard	St. Charles	St. James	St. John the Baptist	St. Tammany	Hancock, MS	Ascension	East Baton Rouge	Iberville	Lafourche	Plaquemines	St. Bernard	St. Charles	St. James	St. John the Baptist	St. Tammany	Hancock, MS	Ascension	East Baton Rouge	Iberville	Lafourche	Plaquemines	St. Bernard	St. Charles	St. James	St. John the Baptist	St. Tammany	Hancock, MS	Ascension	East Baton Rouge	Iberville	Lafourche	Plaquemines	St. Bernard	St. Charles	St. James	St. John the Baptist	St. Tammany	Hancock, MS	Ascension	East Baton Rouge	Iberville	Lafourche	Plaquemines	St. Bernard	St. Charles	St. James	St. John the Baptist	St. Tammany	Hancock, MS
Soils	X	X		X			X							X		X	X		X	X	X	X																																	
Water Quality	X	X	X	X	X	X	X	X	X		X										X																																		
Wetlands	X	X	X	X	X	X	X	X	X	X	X																																												
Uplands	X	X	X	X												X	X	X	X	X	X	X																																	
Fisheries	X	X	X	X	X	X	X	X	X	X	X																																												
Wildlife	X	X	X	X		X	X		X	X						X			X			X																																	
EFH	X	X	X	X	X	X	X	X	X	X	X																																												
T&E Species	X	X	X	X	X	X	X	X	X	X	X																																												
Cultural	X	X	X	X	X	X	X	X	X	X	X																																												
Recreational	X	X	X	X	X	X	X	X	X	X	X																																												
Aesthetics	X	X	X	X	X	X	X	X	X	X	X																																												
Air Quality	X	X	X	X	X	X	X	X	X	X	X																																												
Noise	X	X	X	X	X	X	X	X	X	X	X																																												
Transportation	X	X	X	X																							X	X	X	X	X	X	X																						
Socioeconomic	X	X	X	X	X	X	X	X	X	X	X																																												
HTRW	X	X	X	X	X	X	X	X	X	X	X																																												

[1] For HSDRRS actions described by IERs and Supplemental IERs, and construction contracts implemented by October 2015

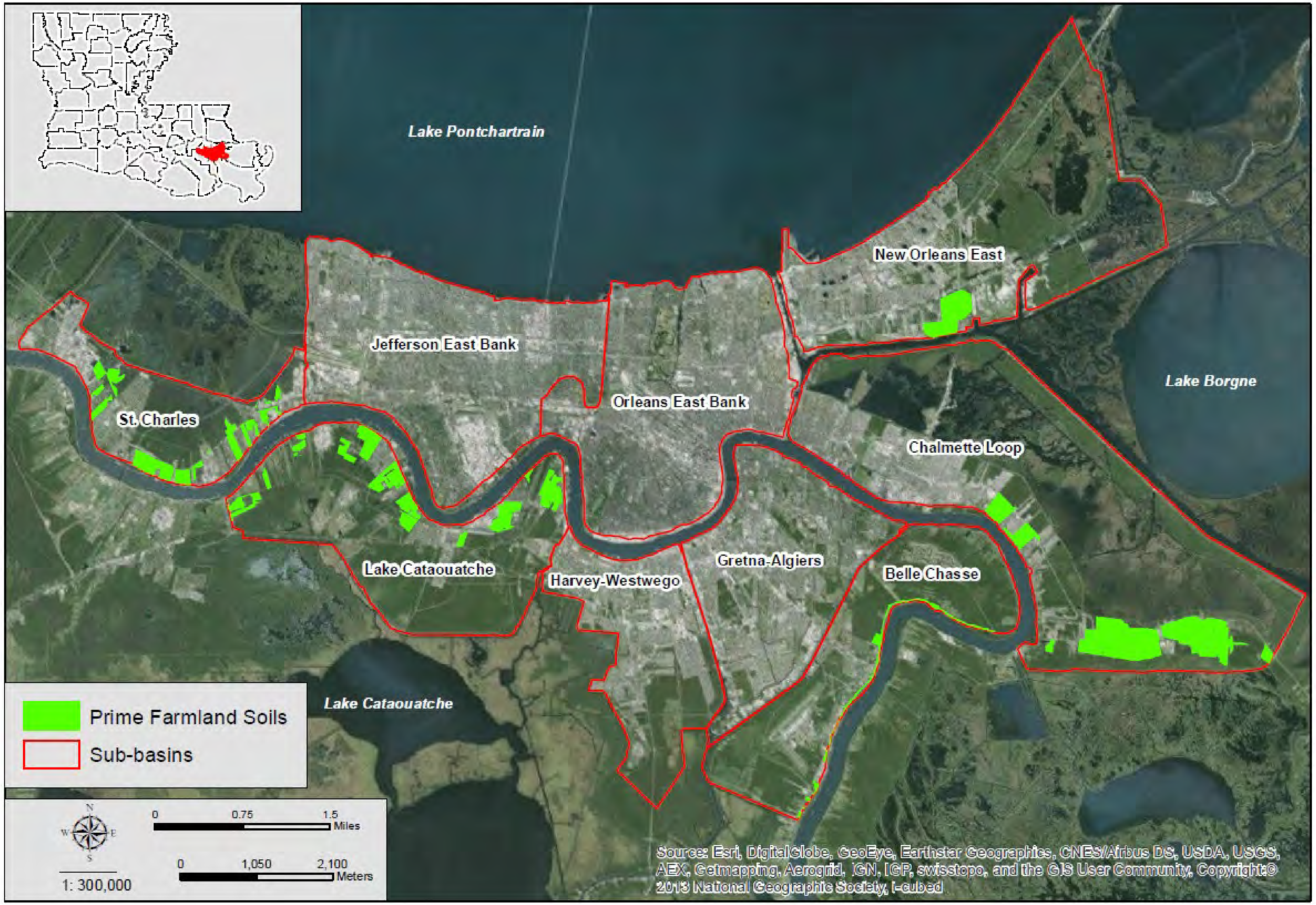


Figure 4-2: Prime Farmland within the HSDRRS Sub-basins

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Table 4-10: Soils Series Found within the HSDRRS Project Area1

Soil Series	Soil Properties
Allemands	• Clayey, smectitic, euic, hyperthermic Terric Haplosaprists • Very deep, very poorly drained • Rapidly permeable in the organic materials and very slowly permeable in the underlying clay horizons • Slopes are less than 1 percent • Located on the landward side of low coastal freshwater marshes and formed in decomposed herbaceous material over alluvial sediments.
Barbary	• Very fine, smectitic, nonacid, hyperthermic Typic Hydraquents • Very deep, very poorly drained • Very slowly permeable • Slopes are less than 1 percent • These soils formed in recent, slightly fluid to very fluid clayey sediments that have been deposited in water and are continuously saturated and flooded. These soils are mainly on low, broad, ponded back swamps of the lower Mississippi River Alluvial Plain.
Cancienne	• **Prime farmland soils** • Fine-silty, mixed, superactive, nonacid, hyperthermic Fluvaquentic Epiaquepts • Mineral soils • Very deep, level to gently undulating, somewhat poorly drained • Moderately slowly permeable • Slopes range from 0 to 3 percent • These soils formed in loamy and clayey alluvium. They are on high and intermediate positions on natural levees and deltaic fans of the Mississippi River and its distributaries.
Carville	• **Prime farmland soils** • Coarse-silty, mixed, superactive, calcareous, hyperthermic Fluventic Endoaquepts • Formed in recent loamy alluvium • Very deep, somewhat poorly drained • Moderately permeable soils • Slopes range from 0 to 2 percent • These soils are on nearly level to very gently sloping natural levee positions on flood plains, mainly along the Mississippi River and its distributaries.
Clovelly	• Clayey, smectitic, euic, hyperthermic Terric Haplosaprists • Very deep, very poorly drained • Very slowly permeable soils • Slopes are less than 1 percent • These soils formed in moderately thick accumulations of herbaceous organic material overlying very fluid clayey alluvial sediments. These soils are on broad coastal marshes that are nearly continuously flooded with brackish water.
Fausse	• Very fine, smectitic, nonacid, hyperthermic Vertic Endoaquepts • Formed in clayey alluvium • Very deep, very poorly drained • Very slowly permeable soils • Slopes are less than 1 percent • These soils are in low, ponded back swamp areas of the lower Mississippi River alluvial plain.

Soil Series	Soil Properties
Gentilly	• Fine, smectitic, nonacid, hyperthermic Typic Hydraquents • Slightly to moderately saline soils • Very deep, very poorly drained • Very slowly permeable • Slopes are less than 1 percent • These soils formed in thin accumulations of herbaceous plant remains and semi-fluid clayey alluvium over consolidated clayey deposits.
Gramercy	• **Prime farmland soils** • Fine, smectitic, hyperthermic Chromic Epiaquerts • Very deep, poorly drained • Very slowly permeable • Slope is predominantly less than 0.5 percent, but ranges to 3 percent • These soils formed in clayey over fine-silty alluvium and are on alluvial flats and on the lower parts of natural levees on the alluvial plain of the Mississippi River and its distributaries.
Harahan	• **Prime farmland soils** • Very fine, smectitic, nonacid, hyperthermic Vertic Endoaquepts • Very deep, poorly drained • Very slowly permeable soils • Slopes range from 0 to 1 percent • They formed in moderately thick firm clayey alluvium overlying fluid clayey sediments. These soils are on broad back swamp positions on the lower Mississippi River flood plain. • These soils are protected from flooding by levees and are artificially drained by pumps.
Kenner	• Euic, hyperthermic Fluvaquentic Haplosaprists • Organic soils • Very deep, very poorly drained • Very slowly permeable • Slopes are less than 1 percent • These soils formed in herbaceous plant remains stratified with clayey alluvium. They are in freshwater marshes along the Gulf of Mexico.
Lafitte	• Euic, hyperthermic Typic Haplosaprists • Organic soils • Formed in herbaceous plant remains over mineral sediments • Very deep, very poorly drained • Moderately rapidly permeable • Slopes are less than 1 percent • These soils are in intermediate and brackish marshes in the extreme lower Mississippi River Delta and coastal areas.
Larose	• Very fine, smectitic, nonacid, hyperthermic Typic Hydraquents • Formed in fluid clayey sediments in freshwater coastal marshes • Very deep, very poorly drained • Very slowly permeable • Slopes are less than 1 percent • The sediments were deposited under water and have never air-dried and consolidated. These soils are subject to flooding by runoff and tides.

Soil Series	Soil Properties
Schriever	• **Prime farmland soils** • Very fine, smectitic, hyperthermic Chromic Epiaquerts • Formed in clayey alluvium • Very deep, poorly drained • Very slowly permeable soils • Slope is predominantly less than 1 percent, but ranges up to 3 percent • These soils are located on the lower parts of natural levees and in back swamp positions on the lower Mississippi River alluvial plain.
Rita	• Very fine, smectitic, nonacid, hyperthermic Vertic Endoaquepts • Found in freshwater coastal marshes that have been protected from flooding by a system of levees and pumps • Very deep, poorly drained, • Very slowly permeable soils • Slopes are less than 1 percent • These soils formed in a thin layer of herbaceous organic material overlying semi-fluid clayey sediments that dried and consolidated in the upper part as the result of artificial drainage. Most of the organic material has oxidized since drainage.
Thibaut	• **Prime farmland soils** • Clayey over loamy, smectitic, superactive, nonacid, hyperthermic Vertic Epiaquepts • Formed in clayey alluvium over fine-silty alluvium • Very deep, poorly drained • Very slowly permeable soils • Slope is dominantly less than 0.5 percent, but ranges up to 3 percent • These soils are on the alluvial flats and on the lower parts of natural levees on the alluvial plain of the Mississippi River and its distributaries.
Vacherie	• **Prime farmland soils** • Coarse-silty over clayey, mixed over smectitic, superactive, nonacid, thermic Aeric Fluvaquents • Formed in silty and clayey alluvium • Deep, somewhat poorly drained • Very slowly permeable soils • Slopes range from 0 to 3 percent • These soils are on nearly level to very gently sloping flood plains of the Mississippi River.
Westwego	• Very-fine, smectitic, nonacid, thermic, cracked Thapto-Histic Fluvaquents • Deep, poorly drained • Very slowly permeable soils • Slopes are less than 1 percent • They formed in semi-fluid clayey alluvium and organic material that dried and shrank irreversibly in the upper part as the result of artificial drainage. These soils are on broad, drained former swamps along the lower Mississippi River and its tributaries. These soils are protected from flooding by a system of levees and are artificially drained by pumps.

Source: NCRS 2010a.
[1] The portion of the HSDRRS described by NEPA Alternative Arrangements both physically inside the HSDRRS area and sites like borrow and mitigation that are located outside the boundaries of the HSDRRS.

4.2.2 ENVIRONMENTAL CONSEQUENCES

4.2.2.1 HSDRRS CONSTRUCTION IMPACTS

Soil impacts are generally defined as the change in land use such that the soils are no longer suitable for their best use, or the construction of facilities or structures on soils that cannot support the facilities or structures due to soil instability. The urban areas affected contain soils that were impacted by development, constructed levees, and other risk reduction structures. HSDRRS impacts on prime farmland soils, which are relatively undisturbed, were both adverse due to a permanent loss of the soils and beneficial due to a reduction in risk of future flooding.

The impacts due to construction of additional risk reduction structures and expansion of existing levees in these urban areas had little adverse effect on previously disturbed soils. Areas within the HSDRRS that are designated prime farmland soils are beneficially impacted, as the land used as farmland, rangeland, forestland, and wildlife habitat has a reduced risk of flooding.

All borrow sites, except for the Maynard site in the New Orleans East sub-basin, were in rural areas and often at agricultural land use sites. A total of 48 borrow sites contain prime farmland soils, as classified by the NRCS. Of these, 17 borrow sites, —one in the New Orleans East sub-basin, 10 in the Chalmette Loop sub-basin, and six in the Lake Cataouatche sub-basin—were located within the HSDRRS project area.

The third column of Table 4-11 identifies the acreage of prime farmland soils within each sub-basin estimated as impacted by the risk reduction projects, shown by sub-basin. The impacts on prime farmland soils were much greater from potential borrow site excavation (as much as 910.59 acres; this total amount is estimated from the Borrow IERs and records of excavated borrow pits) than from construction of risk reduction projects (approximately 165.3 acres). The construction of HSDRRS risk reduction projects and associated borrow resulted in a minor impact to prime farmland soils in the St. Charles, New Orleans East, Chalmette Loop, and Lake Cataouatche sub-basins. The Jefferson East Bank, Orleans East Bank, Harvey-Westwego, and Gretna-Algiers sub-basins are predominately urban, and soils classified as prime farmland soils are heavily developed resulting in a lack of useable prime farmland soils for agricultural use. Impacts to prime farmlands in these sub-basins is negligible.

A higher percentage of soils identified as prime farmland were impacted in the Belle Chasse sub-basin and could be considered a somewhat more significant impact, but the areas where these soils are located are not currently under cultivation or used for other agricultural purposes. When considered within the context of impacts to prime farmland soils throughout the region and the total acreage of prime farmland soils in the Belle Chasses sub-basin, the impacts are negligible. The use of borrow sites and other activities outside of the HSDRRS risk reduction sub-basins resulted in minor impacts to prime farmland soils. Removing soils from borrow areas resulted in a permanent loss of prime farmland soils, and the areas are no longer available for pasture or farmland use. Upon completion of excavation activities, borrow areas typically naturally fill with water and are converted to ponds or small lakes. Excavated borrow areas that are currently retaining water are not expected to be used again to produce crops or provide forage for herbivores, such as deer, rabbits, or cattle.

The loss of as much as 1,075.89 acres of prime farmland soils is considered a minor impact for southeast Louisiana and the region (see table 4-3) and constitutes a loss of less than 1.0 percent of prime farmland soils (see table 4-3) in the region. The loss of these prime farmland soils is permanent and results in a reduction in the available productive farmland regionally, however the cumulative loss of prime farmland soils associated with the HSDRRS risk reduction projects and required borrow is a less than 1.0 percent and does not represent a significant impact to prime farmlands throughout the region.

However, in evaluating the impacts on soils regulated under the FPPA, consideration is given to the relative value of the impacted soils as agricultural land versus the alternative end use. Of the 48 borrow sites that contain prime farmland soils, only 25 have been used for pasture, farmland, or timber production. The use of the excavated prime farmland soils from borrow sites provides a benefit to the GNO Metropolitan Area by providing a reduction in risk of flooding undisturbed farmlands within the HSDRRS.

Table 4-11: Prime Farmland Soils Impacted by Sub-basin

Sub-basin	Total Prime Farmland Soils inside HSDRRS Sub-basin[1] (acres)	Prime Farmland Soils impacted from HSDRRS Risk Reduction Projects (acres)	Prime Farmland Soils impacted from Borrow Projects (acres)	Total impacted from HSDRRS Projects (acres)	Percent of impacted
St. Charles	1,731.71	0.0	0.0	0.0	0.0
Jefferson East Bank	0	0.0	0.0	0.0	0.0
Orleans East Bank	0	0.0	0.0	0.0	0.0
New Orleans East	1,015.73	3.1	59.2	62.3	6.1
Chalmette Loop	4,693.05	11.2	34.63	45.83	0.98
Belle Chasse	410.89	117	0.0	117	28.5
Gretna-Algiers	0	0.0	0.0	0.0	0.0
Harvey-Westwego	0	0.0	0.0	0.0	0.0
Lake Cataouatche	2,809.30	34.0	40.86	74.86	2.7
Total inside HSDRRS Sub-basin	10,660.68	165.3	134.69	299.99	5.6
Total Outside HSDRRS Sub-basin[2]	99,412.79	N/A	775.9	775.9	0.8
TOTAL[3]	**110,073.47**	**165.3**	**910.59**	**1,075.89**	**<1.0**

[1]Quantifications for Total Prime Farmlands Soils in HSDRRS sub-basins (acres) include all soils that are classified as NRCS prime farmland soils and farmland of statewide importance regardless of current use or development. The acreage identified represents undeveloped prime farmland soils in each sub-basin.
[2]Impacted acres of prime farmland from borrow site excavation outside the sub-basins were quantified in IERs #18, #19, #22, #23, #25, #26, #28, and #30, and totaled approximately 2,144.69 acres. IERs #29, #31, #32, and #35 did not quantify impacted acres of prime farmland from borrow site excavation activities, but did state prime farmland would be impacted at the Acosta 2, Idlewild Stage 2, Scarsdale, Kings Mine, Port Bienville, Lilly Bayou, Raceland Raw Sugar, River Birch Landfill Expansion, Willow Bend Phase II, Tammany Holding Corporation, Bocage, Citrus Lands, Conoco Phillips, Idlewild Stage 1, Narin, Plaquemines Dirt & Clay, 3C Riverside Phase 3, Assumption Land Company, Houma Excavation, RBEND II, and Robert Brothers Farm sites. Prime farmland soils that were potentially impacted at these borrow sites were quantified using NRCS prime and unique farmland soils mapping; approximately 3,289.66 acres of farmland outside the sub-basins could be impacted from the borrow site excavation activities described in IERs #29, #31, #32, and #35. Also included in totals for outside the HSDRRS sub-basin are prime farmland soils in proposed mitigation areas discussed in IER's #36 and #37.
[3]The total percent of prime farmland soils impacted was quantified using the total acres impacted and the total acres of prime and unique farmland soils both within and outside the sub-basins. The percent of all prime and unique farmland soils impacted within each sub-basin was quantified using the total acres impacted and the total area of prime and unique farmland soils specific to each sub-basin. Thus, the total percent impacted does not equal the total sum of the percent impacted within each sub-basin.

4.2.2.2 HSDRRS 2057 IMPACTS

Short-term construction-related impacts due to future levee lifts, armoring, and soil stabilization would include soil loss through water and wind erosion, compaction, and loss of biological productivity. Exposed soil during construction would be unstable and susceptible to wind and water erosion. Eroded soils from construction sites could damage adjacent vegetation by coating leaf surfaces and limiting transpiration and photosynthesis and disturb adjacent wetlands communities through increased suspended solids in the water column, which reduces light penetration and decreases overall water quality. These impacts would be minimized by implementing BMPs as described by Stormwater Pollution Prevention Plans (SWPPP) at the levee lift construction sites.

After construction, the disturbed soils would stabilize and revegetate. Soils would also be impacted by compaction at the construction sites and loss of biological productivity. Structurally, levee soils must be compacted to provide adequate support against the pressure produced by high floodwaters. Compacted soils are less productive than aerated, loamy soils, so the vegetation available on levees following construction may not be the same species that are available at preferred wildlife habitats. It is likely that some soils designated as prime farmland soils would be used for future levee lifts. Due to the volume of prime farmland soils already removed for HSDRRS construction, the removal of prime farmland soils from borrow areas regionally would be a significant impact and a significant loss of prime farmland soils.

4.2.2.2.1 Cumulative Impacts

There would be significant permanent, cumulative impacts on soils that may include prime farmland soils, from the construction of risk reduction efforts and the removal of borrow materials. The magnitude of cumulative impacts on soils would be greater for the borrow sites than for construction of HSDRRS components. Soils removed from borrow sites for HSDRRS construction and for future levee lifts occur primarily in rural areas and could result in thousands of acres of additional prime farmland soils that are no longer suitable for agricultural uses. Adverse cumulative impacts are greatest in Jefferson, Plaquemines, and St. Bernard parishes, as there are eight borrow areas containing prime farmland soils in Jefferson Parish, 12 in Plaquemines Parish, and 13 in St. Bernard Parish.

Long-term cumulative beneficial impacts on soils would result from the implementation and maintenance of the HSDRRS. All soils within the HSDRRS would have a lower risk of inundation from storm events, including prime farmland soils, which could continue to be used for agricultural production during major storm events. Further, with the reduced risk of storm surge, it would be less likely for crop destruction to occur from flooding or brackish water inundation.

The HSDRRS could also have a minor adverse cumulative impact on soils due to the potential for induced development in the project area as flooding risk for properties is reduced. Development pressures often result in encroachment into rural agricultural lands, and with more development comes an increase in the use of impervious surfaces such as roads, homes, and parking areas. Impervious surfaces increase the flow of migrating rainwater and increase the erosion of exposed soils. Increased development in the HSDRRS project area would remove soils from biological productivity, and permanently remove prime farmland soils from agricultural production.

Other regional present and future actions would continue to change land use patterns and would contribute to the cumulative loss of prime farmland soils in southeastern Louisiana. Appendix L to this document provides a listing of proposed and ongoing projects within the region and forms the basis for analyzing cumulative impacts of present and future regional actions to prime and unique farmland soils. Chapter 3 provides a comprehensive discussion of future and ongoing projects in the region that could contribute to cumulative impacts to prime farmland soils. Projects like the New Orleans to Venice/Non-Federal Levees, West Bank and Vicinity Co-Located Resilient Features, West Shore Lake Pontchartrain, the Southeast Louisiana Urban Flood Control Project (SELA), as well as other local, state and federal flood risk reduction, coastal/wetlands restoration, and transportation and developments projects would cumulatively add to impacts and loss of prime farmland soils in the region. Over the past 300 years, portions of southeastern Louisiana have been reclaimed using levees, floodwalls, and forced drainage. Areas containing prime farmland soils in southeastern Louisiana have historically been affected by conversion from residential, commercial, and industrial development in a significant portion of the leveed areas in the region, and it is anticipated that this historical trend would continue to impact prime farmland soils in the region. As more flood risk reduction projects are implemented regionally, additional borrow would be required to increase levee heights, expand levee lengths, and provide a higher level of risk reduction.

4.2.2.2.2 *Storm Damage Reconstruction*

Most reconstruction projects occur within the footprints of former structures and, therefore, would have no cumulative impact on soils. Further, where reconstruction occurs beyond the footprint of original structures, it typically only impacts highly modified or previously disturbed soils in urban areas.

4.2.2.2.3 Redevelopment

Most redevelopment projects in urbanized areas of southeast Louisiana would have no cumulative impacts on soils due to the previously disturbed nature of these areas. However, redevelopment in rural areas would cause a cumulative adverse impact on soils, especially through the additional loss of prime farmland soils. Risk reduction provided by the HSDRRS could induce development on rural farmland, causing a minor indirect impact on soils.

4.2.2.2.4 Coastal and Wetlands Restoration

Generally, the soils associated with coastal and wetlands restoration projects (either at the location of restoration, or in areas where soils are removed for beneficial uses) would not be classified as prime farmland soils, and the introduction of any soils to raise the elevation of open water habitats to create and restore wetlands would provide beneficial effects on soils. Therefore, no cumulative adverse impacts would occur on soils from restoration projects regionally.

4.2.2.2.5 Flood Risk Reduction Projects

Flood risk reduction projects have direct impacts through loss of biological productivity of soils under the footprint of new structures and from the removal of soils as borrow material, some of which would likely include prime farmland soils in the region. Long-term maintenance of levees through additional lifts would further impact soils in borrow areas. It is reasonable to anticipate that borrow material would be needed for most of these projects, and prime farmland soils would likely be impacted during construction. Removal of soils for levee construction projects contribute to the overall loss of farmland soils in southeastern Louisiana. Flood risk reduction efforts have a beneficial impact on the area's farmland soils as well. Further, risk reduction projects like the HSDRRS reduce the likelihood of soil and nutrient enrichment from seasonal flooding. Without soil enrichment from natural flooding, subsidence occurs in alluvial areas.

4.2.2.2.6 *Summary of Cumulative Impacts*

Cumulatively, past, ongoing, and future projects in the region would result in the loss of biological productivity of soils and the potential for cumulative indirect impacts on soils through erosion and stormwater runoff as the area of impermeable surfaces increases. A major cumulative impact on prime farmland soils in the region is anticipated as borrow sites are utilized for flood risk reduction projects, and proposed and on-going flood risk reduction, restoration, development and other projects continue to convert agricultural lands and contribute to the prime farmland soils.

Beneficial cumulative impacts on soils would occur from coastal and wetlands restoration projects as healthier marsh and forested wetlands are created and protected and to some degree are able to trap sediments, sustain vegetation, and build new rich organic soils. Additionally, healthier marshes would act as a buffer for storm surge and could provide beneficial impacts on prime farmland soils further inland. Flood risk reduction projects would also provide beneficial impacts due to the reduction of storm surge inundation through increased hurricane surge protection.

4.2.3 WATER QUALITY

4.2.3.1 AFFECTED ENVIRONMENT

The Clean Water Act established a process for states to assess water quality. Section 305(b) of the Act requires states to develop a surface water quality monitoring program, and a report describing the water quality status of its waterbodies with respect to support of designated uses. Section 303(d) of the Act requires states to develop and list Total Maximum Daily Loads (TMDLs) for impaired waterbodies (waterbodies with water quality unsupportive of one or more designated uses). A TMDL is the maximum amount of the pollutant(s) contributing to an impairment that can enter a waterbody from all sources (including nonpoint sources) and still meet water quality criteria. LDEQ implements a watershed-based approach to reduce pollutant loads in the waterbodies where TMDLs have been established, through the Louisiana Pollutant Discharge Elimination System (LPDES) and Louisiana Nonpoint Source (NPS) programs. For the purpose of state water quality assessment, Louisiana is divided into twelve major basins, which are further divided into waterbodies known as subsegments. The *Louisiana Water Quality Inventory Report: Integrated Report* is the biennial publication prepared by the Louisiana Department of Environmental Quality (LDEQ) describing the status of Louisiana waters in accordance with Sections 305(b) and 303(d) (LDEQ 2013).

Designated Uses - Louisiana Surface Water Quality Standards (*LAC 33:IX.11*) include eight designated uses for surface waters: Primary Contact Recreation (PCR), Secondary Contact Recreation (SCR), Fish and Wildlife Propagation (FWP), Drinking Water Supply (DWS), Outstanding Natural Resource (ONR), Oyster Propagation (OYS), Agriculture (AGR), and Limited Aquatic Life and Wildlife (LAL). Designated uses for each waterbody, and water quality criteria for each designated use, are included in the standards. For definitions regarding the designated uses refer to https://deq.louisiana.gov/page/water-quality

If a designated use is not fully supported, support for the designated use is impaired, and suspected causes and sources of impairment are identified. A suspected cause of impairment is a water quality criteria violation associated with impairment (e.g., low dissolved oxygen, non-native aquatic plants), while a suspected source of impairment is an activity, event, or condition associated with a suspected cause of impairment (e.g., agriculture, chemical spills, natural conditions).

Water Quality Criteria **-** Water quality criteria are elements of state water quality standards expressed as constituent concentrations, levels, or narrative statements representing the quality of surface waters supporting a designated use. When all criteria are met for a designated use, surface water quality is expected to support the designated use. Louisiana has both general and numeric criteria (*LAC 33:IX.1113*). General criteria are expressed in a narrative form, and include aesthetics, color, suspended solids, taste and odor, toxic substances (in general), oil and grease, foam, nutrients, turbidity, flow, radioactive materials, and biological and aquatic community integrity. Numeric criteria are generally expressed as concentrations or scientific units, and include pH, chloride, sulfate, total dissolved solids, dissolved oxygen, temperature, bacteria, and specific toxic substances.

Louisiana Pollutant Discharge Elimination System - The LPDES Program administers permitted wastewater discharges into state surface waters, allowing the state to control the amounts and types of wastewaters discharged into its waters in order to meet water quality standards. The program began in 1996, when LDEQ adopted responsibility for administering the permitting, compliance, and enforcement activities of the National Pollutant Discharge Elimination System (NPDES) from the EPA.

Louisiana Nonpoint Source Program **-**The Louisiana NPS Program administers nonpoint source pollution management in accordance with Section 319(h)(11) of the Clean Water Act, as another measure for meeting water quality standards. It includes partnering with stakeholders and other statewide nonpoint source pollution management programs for the development and execution of watershed implementation plans for reducing nonpoint source pollution, as well as educational outreach with the same objective (LDEQ 2014).

A full description of the water quality analysis is in Appendix S and is incorporated by reference.

Existing Conditions

The LPV and WBV is dissected by the Mississippi River (Figure 4-6), the largest watershed in the U.S., draining 41% of the land area of the lower 48 states. Natural erosion and weathering of land surface materials influences river water quality, by releasing dissolved solids along with small amounts of metals, nutrients, and organic materials. Human activities in the basin affect both river water quality and quantity, and include industry, development, natural resource extraction, agriculture, and river engineering. Human-induced changes to river water quality are related to population increases within the river's watershed and development practices, including the adoption of agricultural soil conservation practices beginning in the 1930s; the construction of major river engineering works throughout the 20th century; increasing use of fertilizers and pesticides, particularly for industrial farming; and inadequate regulation of point source pollution prior to effective enforcement of the Clean Water Act.

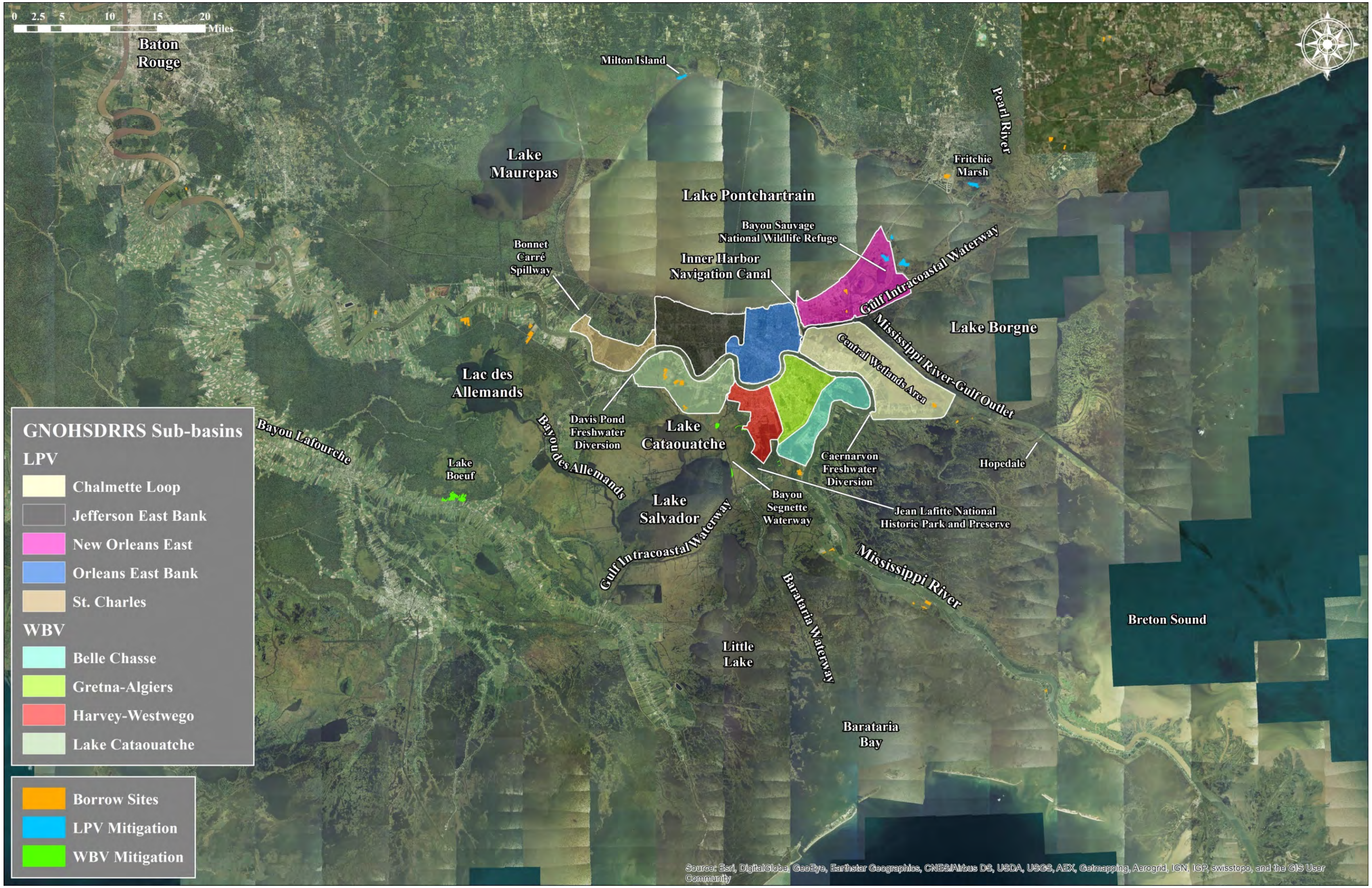
Fertilizer and pesticide application under post-World War II industrial farming practices has been correlated with increases in river and tributary nitrate concentrations, and the presence of pesticides in these waterbodies. During the latter half of the 20th century, nitrate concentrations in the lower river increased from 0.56 to 1.45 mg/L, correlating strongly with a shift to intensive farming of corn and soybeans in the basin, especially in the Midwest (NSTC/CENR 2000, Broussard 2008). Atrazine, developed in the 1950s and therefore previously nonexistent in river water, is now present in river water at concentrations ranging from 0.1-1.4 µg/L (Demcheck and Swarzenski 2003). The combination of elevated nitrate and atrazine in the river is linked to wetland losses in areas of coastal Louisiana receiving chronic river water inflows (Swarzenski et al. 2005). Additionally, there is evidence that farming practices have led to increasing river discharge: precipitation and bicarbonate load: river discharge relationships, suggesting that agricultural activities may also affect river discharge and alkalinity, and loadings of major ions and agricultural pollutants in addition to nitrate and atrazine (Raymond et al. 2008).

River water quality has been impacted by inflows of industrial and municipal effluent, as well as unpermitted point source discharges. Inadequate regulation of point source pollution until the late 20th century contributed to water quality problems related to organic enrichment, thermal pollution, and the introduction of synthetic organic compounds and heavy metals. The passing of the Clean Water Act and improved regulation of point sources of pollution has reduced or eliminated many of the water quality problems in the river. However, nonpoint source pollution within the watershed—primarily agricultural runoff—continues to generate water quality problems (COMRACWA 2008).

The HSDRRS is located within the Pontchartrain and Barataria Estuaries (Appendix S, Figure 4-6). Surface waters in these estuaries include shallow open water habitat and wetland communities reflective of adjacent surface water salinities, which decrease inland and with proximity to riverine inflows (Linscombe and Hartley 2011). The estuaries include several large, shallow embayment's which ultimately drain into bay systems through passes and bayous, as well as abandoned distributaries of the Mississippi River and their associated natural levees (Conner et al. 1987, McCorquodale et al. 2009). Marsh areas become progressively fragmented gulfward (towards the Gulf of Mexico) as a result of increasing tidal energy gulfward. Reference appendix S for a detailed description of the Pontchartrain and Barataria estuaries.

To assess historical and existing water quality, Louisiana Water Quality Inventory Report: Integrated Report data for the 2002-2014 reporting periods was summarized for all project area subsegments (see Appendix S Tables 4-11 and 4-12 for subsegment information and CED IER/ EA-subsegment relationships, and Figures 4-7, 4-8, or 4-9 for subsegment locations). To depict water quality, an average designated use support value spatially and temporally for each subsegment was calculated and mapped, using 2002-2014 data, 2002-2006 data only, and 2008-2014 data only.

HSDRRS construction began in July 2007 and most of the construction ended before or by October 2015; therefore, the 2002-2006 reporting periods were used to evaluate designated use support prior to HSDRRS construction, while the 2008-2014 reporting periods were used to evaluate designated use support during HSDRRS construction. Possible support values for each combination of subsegment, reporting period, and designated use included 0 (no support), 0.25 (support threatened), 0.5 (partial support), and 1 (full support). The average support value calculated for each subsegment serves as a metric for subsegment water quality with respect to designated uses (i.e., lower values indicate relatively poor water quality while higher values indicate relatively good water quality). Data for the 1998 and 2000 reporting periods were not used for this assessment due to use of a different method for determining designated use support during these reporting periods. Counts of suspected causes and sources of impairment were tabulated by reporting period, in order to summarize historical causes and sources of impairment.



0 2.5 5 10 15 20 Miles
Baton Rouge
Milton Island
Pearl River
Lake Maurepas
Fritchie Marsh
Lake Pontchartrain
Bayou Sauvage National Wildlife Refuge
Bonnet Carré Spillway
Inner Harbor Navigation Canal
Gulf Intracoastal Waterway
Lake Borgne
Mississippi River-Gulf Outlet
Central Wetlands Area
Lac des Allemands
Davis Pond Freshwater Diversion
Lake Cataouatche
Bayou Lafourche
Bayou des Allemands
Lake Boeuf
Caernarvon Freshwater Diversion
Hopedale
Bayou Segnette Waterway
Jean Lafitte National Historic Park and Preserve
Lake Salvador
Gulf Intracoastal Waterway
Mississippi River
Barataria Waterway
Breton Sound
Little Lake
Barataria Bay
GNOHSDRRS Sub-basins
LPV
Chalmette Loop
Jefferson East Bank
New Orleans East
Orleans East Bank
St. Charles
WBV
Belle Chasse
Gretna-Algiers
Harvey-Westwego
Lake Cataouatche
Borrow Sites
LPV Mitigation
WBV Mitigation
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

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Designated use support and average support values are listed in Appendix S, Table 4-13. According to Appendix S Table 4-6, Fish and Wildlife Propagation is the most impaired designated use for the project area, followed by Primary Contact Recreation. Average support values for the 2002-2014 reporting periods reveal some spatial patterns (Appendix S Table 4-6 and Figure 4-3). Subsegments that include the Mississippi River, Lake Pontchartrain and several of its connecting waterbodies, most of the Chalmette Loop sub-basin, the marsh area bordering the western lobe of Lake Borgne, the MRGO, east of Bayou Terre Aux Boeufs, the Caernarvon Freshwater Diversion receiving area, and marsh areas south of the WBV sub-basins are generally supportive of their designated uses, with 2002-2014 average support values greater than 0.75.

Designated use support is generally fair to poor for subsegments in the Jefferson and Orleans East Bank and New Orleans East sub-basins, adjacent to the Mississippi River East Bank from the Baton Rouge area to the St. Charles sub-basin, along the north shore of Lake Pontchartrain, in the southern portion of the Chalmette Loop sub-basin, southwest of the Caernarvon Freshwater Diversion receiving area, the majority of project area subsegments in the Barataria Basin, and along Bayou Petit Calliou in the Terrebonne Estuary, with 2002-2014 average support values between 0 and 0.75. Designated use support was not assessed for subsegment 041809 during any of the reporting periods evaluated.

4.2.4 ENVIRONMENTAL CONSEQUENCES

4.2.4.1 HSDRRS CONSTRUCTION IMPACTS

In general, several water quality impacts occurred that were common to all sub-basins. Where wetland and open water fill occurred, filling of this habitat permanently eliminated habitat capable of water quality functions, causing a major permanent impact on water quality.

Fill material used for levee construction was determined in advance to be free of contaminants that would adversely affect water quality. The major indirect impacts on water quality from placement of fill and construction materials in aquatic habitat included local increases in suspended sediment and turbidity and hydromodification. To help minimize indirect water quality impacts during construction, contractors employed BMPs (such as silt fences and curtains) and SWPPPs (which are required for construction projects with a footprint greater than one acre). In general, any water quality-related impacts associated with utilities relocations were assessed by contractors and are not a part of this assessment.

Construction activities modified surface hydrology, both temporarily and permanently; temporarily increased suspended sediment, turbidity, biochemical oxygen demand, and water temperature, and decreased dissolved oxygen concentrations in adjacent aquatic habitat; and altered or eliminated aquatic habitat and associated water quality functions. As part of the LPDES permit process, a General Stormwater Permit, which included a site-specific Stormwater Pollution Prevention Plan (SWPPP) and Notice of Intent, was required prior to each construction activity. Temporary water quality impacts generally included stormwater runoff from construction sites and staging areas; excavation and dredging; and placement of dredged, fill, and construction materials in aquatic habitat. Although SWPPPs were prepared for all HSDRRS construction activities, they were not prepared for borrow site use; instead, they were, along with implementation of BMPs, the responsibility of the construction contractors, who were required to follow all local, state, and federal regulations for stormwater discharges.

All USACE contractors were required to prepare and administer a site-specific Spill Prevention, Control, and Countermeasure Plan (SPCCP). During construction activities, several small spills occurred that involved regulated waste (petroleum products) and hydraulic grade vegetable oil. In March 2011, an unknown but small amount of diesel fuel was discharged into the Keyhole Canal at Pump Station Westwego #2 in Jefferson Parish. The spill reportedly dispersed, and no water quality impacts from the spill were observed. In February 2011, approximately 2 gallons of hydraulic grade vegetable oil were discharged into the Algiers Canal near the Planters Pump Station in Plaquemines Parish. In August 2013, approximately 20 gallons of diesel fuel were spilled at the fuel farm area of the Western Closure Complex in Plaquemines Parish. In July and December 2013, spills of 120 gallons of hydraulic oil, 47 gallons of fuel, and 50 gallons of hydraulic oil occurred at the 17th Street temporary pump station in Orleans Parish. In October 2014, a spill of approximately 60 gallons of hydraulic fluid occurred at the London Avenue Canal temporary pump station in Orleans Parish. In addition, two minor spills were reported during construction of LPV-144 and LPV-146 in St. Bernard Parish that involved hydraulic grade vegetable oil. Except for the spill at Pump Station Westwego #2 (which was reported to have dispersed), all spills were contained using oil booms when necessary and were cleaned up.

Construction activities with permanent water quality impacts included alteration and elimination of aquatic habitat (conversion of aquatic habitat to upland habitat from placement of dredged, fill, and construction materials; and construction of wetlands in open water habitat from placement of dredged or fill material) and hydromodification.

Specific impacts are listed in Table 4-9. This information was compiled from IERs, supplementals and EAs, and associated Clean Water Act (CWS) Section 404(b)(1) evaluations. Water quality certification as required by CWA Section 401 was obtained for each IER and EA. For all activities involving placement of dredged or fill material in the aquatic environment, actions to minimize adverse effects as described in §230.70-230.77 of the CWA Section 404(b)(1) guidelines were implemented when appropriate and practicable. Any specific BMPs that were implemented are discussed in Section 5.

It should be noted that many of the impacts described are based on anticipated impacts as described in IERs, supplementals and EAs, and that actual impacts may differ if the contractor made any project modifications and associated water quality management practices that CEMVN was not aware occurred.

4.2.4.1.1 Areas Outside of the HSDRRS Project Area

Jefferson Parish
Excavation and placement of dredged and/or fill material for construction of the Jean Lafitte Flood-Side Freshwater Marsh, Bottomland Hardwoods- Wet, and Swamp Restoration projects resulted in temporary, construction-related impacts to water quality due to excavation and placement of dredged and/or fill material in aquatic habitat and construction site runoff. Excavation and placement of dredged and/or fill material generated localized, temporary increases in suspended sediment and turbidity of adjacent waters. Material used for wetlands platform construction were derived from Lake Salvador. Establishment of wetlands habitat are expected to provide localized water quality benefits. Approximately 53 acres of wetland habitat were created as a result of these projects. Placement of water bottom sediments converted 53 acres of open water and fragmented marsh to 20.4 acres of marsh, 20.5 acres of swamp, and 12.2 acres of bottomland hardwood forest-wet habitat.

Lafourche Parish
Approximately 133 acres of agricultural land was converted to BLH-Wet habitat and/or 287 acres to swamp habitat results in direct, indirect, and cumulative Impacts to wetland habitat. Water quality was not directly impacted by construction of this project but would be indirectly impacted beneficially. Degrading the existing berms around the proposed project area resulted in an indirect beneficial impact to the surrounding wetlands as the hydrology is returned to a condition that more closely resembles the historic condition.

Orleans Parish
Hydraulic dredging of water bottom sediments from Lake Pontchartrain, temporary flotation access channel construction, and use of a pipeline access corridor for hydraulic placement of dredged material for construction of the Bayou Sauvage Flood-Side Brackish Marsh, Turtle Bayou Protected-Side Intermediate Marsh, the New Zydeco Ridge Bottomland Hardwoods-Wet and Brackish Marsh, and Milton Island Intermediate Marsh projects resulted in temporary, construction-related impact to water quality due to excavation and placement of dredged material in aquatic habitat (PIER #36, PIER #36 Supplement 1 and PIER #36TIER 1). Construction activities generated localized, temporary increases in suspended sediment and turbidity of adjacent waters. Available sediment chemistry data for samples collected in proximity to the borrow area for the projects did not suggest the presence of elevated contaminant concentrations relative to NOAA sediment screening benchmarks, and available 10-day sediment toxicity testing results reveal high survival rates for bottom-dwelling organisms exposed to sediment (*A. abdita*; Buchman 2008), suggesting that placement of material for marsh creation would not result in long-term adverse effects to bottom-dwelling organisms. Water quality impacts were moderated using retention features during construction of the marsh platforms.

Borrow Areas (Plaquemines, St. Bernard, St. Charles, St. James, St. John the Baptist, St. Tammany Parishes, LA and Hancock County, MS)
Excavation of borrow areas, as well as drainage of the borrow areas using sump pumps, caused local, temporary increases in suspended sediment and turbidity in

adjacent surface waters receiving borrow area runoff. Borrow area construction locally altered hydrology by creating ponds in previously upland areas and deepening drainage canals and may have modified flooding and drainage patterns of any adjacent wetlands. Any impacts to hydrology may have locally affected long-term surface water quality. Reference table 2-1 for a list of borrow sites and their associated parishes/county.

4.2.4.1.2 HSDRRS 2057 Impacts

Impacts to water quality from future maintenance and improvement of the HSDRRS would be like those described for HSDRRS construction impacts and would be minimized by adopting BMPs and SWPPPs. One factor which may influence differences between recent and future water quality impacts is there would likely be less wetland habitat and more open water adjacent to the HSDRRS in 2057. As a result, proportionally less wetland habitat and more open water habitat are expected to be eliminated during future maintenance and improvements. In addition, there would be less habitat present capable of ameliorating water quality impacts of HSDRRS 2057 construction activities.

4.2.4.1.3 Cumulative Impacts

Cumulative impacts would be a recurrence of impacts described for HSDRRS construction impacts as described above. Collectively, other present and future projects would have cumulative short-term moderate adverse impacts on water quality in the region due to stormwater runoff from construction sites, excavation, and placement of dredged, fill, and construction materials in aquatic habitat, and hydromodification. Cumulative long-term moderate adverse impacts on water quality would occur due to an increase in impermeable surfaces. Impacts of other ongoing and future regional actions are similar in many of the sub-basins and parishes affected by the HSDRRS.

Table 4-12: Water Quality Impacts Summary

Sub-basin / Parish (LA) / County (MS)	Sub-basin / Parish / County Name	IER/EA	Summary of Activities with Water Quality Impacts	Water Quality Impacts	Magnitude of Permanent Impacts
Sub-basin	Belle Chasse	IER #13; IER #22 (Westbank N Borrow Area); IER #33; IERS #12/13 Waterline; IERS #33.a	Construction stormwater runoff; excavation/placement of dredged/fill/construction materials in aquatic habitat; elimination of wetlands habitat	Stormwater runoff of sediment and miscellaneous construction discharges; suspended sediment/turbidity from excavation/placement of dredged/fill/construction materials in aquatic habitat; elimination of habitat capable of providing water quality benefits	Moderate
	Chalmette Loop	IER #8; IER #9; IER #10; IER #19 (DK Aggregates Borrow Area); IER #30 (Contreras Dirt Borrow Area); IERS #8, 9, 10.a; EA #526	Construction stormwater runoff; excavation/placement of dredged/fill/construction materials in aquatic habitat; temporary hydromodification; elimination of wetland habitat	Stormwater runoff of sediment and miscellaneous construction discharges; suspended sediment/turbidity from excavation/placement of dredged/fill/construction materials in aquatic habitat; temporary hydromodification-induced water quality changes; elimination of habitat capable of providing water quality benefits	Moderate
	Gretna-Algiers	IER #12	Construction stormwater runoff; excavation/placement of dredged/fill/construction materials in aquatic habitat; temporary and permanent hydromodification; elimination of wetland habitat	Stormwater runoff of sediment and miscellaneous construction discharges; suspended sediment/turbidity from excavation/placement of dredged/fill/construction materials; temporary and permanent hydromodification-induced water quality changes; elimination of habitat capable of providing water quality benefits	Moderate
	Harvey Westwego	IER #14; IERS #14.a; IERS #12.a; SEA #306.c	Construction stormwater runoff; placement of fill/construction materials in aquatic habitat; elimination of wetland habitat	Stormwater runoff of sediment and miscellaneous construction discharges; suspended sediment/turbidity from placement of fill/construction materials in aquatic habitat; elimination of habitat capable of providing water quality benefits	Moderate
	Jefferson East Bank	IER #2; IER #3; IER #5 (ongoing); IERS #2; IERS #3.a; IERS #5.a (17th Street Canal; ongoing); EA #496	Construction stormwater runoff; excavation/placement of dredged/fill/construction materials in aquatic habitat; elimination of wetland habitat	Stormwater runoff of sediment and miscellaneous construction discharges; suspended sediment/turbidity from excavation/placement of dredged/fill/construction materials in aquatic habitat; elimination of habitat capable of providing water quality benefits	Minor
	Lake Cataouatche	IER #15; IER #16; IER #17; IER #18 (Churchill Farms Borrow Area); IER #19 (River Birch Phases 1 and 2 Borrow Areas); IER #25 (Westbank D Borrow Area); IER #26 (South Kenner Borrow Area); IER #31 (River Birch Landfill Expansion); IER #35 (Assumption Land Company Borrow Area); IERS #15.a; IERS #15.b; IERS #16.a; IERS #16.b	Construction stormwater runoff; excavation/placement of dredged/fill/construction materials in aquatic habitat; temporary and permanent hydromodification; elimination of wetland habitat	Stormwater runoff of sediment and miscellaneous construction discharges; suspended sediment/turbidity/biochemical oxygen demand from excavation/placement of dredged/fill/construction materials in aquatic habitat; temporary and permanent hydromodification-induced water quality changes; elimination of habitat capable of providing water quality benefits	Moderate
	New Orleans East	IER #6; IER #7; IER #18 (Manyard Borrow Area); IER #19 (Eastover Phase 1 Borrow Area); IERS #6; IERS #7; PIER #36; PIER #36 Supplement 1 (Turtle Bayou Protected-Side Intermediate Marsh; to be constructed)	Construction stormwater runoff; excavation/placement of dredged/fill/construction materials in aquatic habitat; construction/elimination of wetland habitat	Stormwater runoff of sediment and miscellaneous construction discharges; suspended sediment/turbidity from excavation/placement of dredged/fill/construction materials in aquatic habitat; construction/elimination of habitat capable of providing water quality benefits	Moderate
	Orleans East Bank	IER #4; IER #5 (ongoing); IERS #5.a (Orleans and London Avenue Canals; ongoing); EA #496	Construction stormwater runoff; placement of dredged/fill/construction materials in aquatic habitat	Stormwater runoff of sediment and miscellaneous construction discharges; suspended sediment/turbidity from excavation/placement of dredged/fill/construction materials in aquatic habitat	Negligible
	St. Charles	IER #1; IERS #1; IERS #1.b	Construction stormwater runoff; excavation/placement of dredged/fill/construction materials in aquatic habitat; temporary and permanent hydromodification; elimination of wetland habitat	Stormwater runoff of sediment and miscellaneous construction discharges; suspended sediment/turbidity from excavation/placement of dredged/fill/construction materials in aquatic habitat; temporary and permanent hydromodification-induced water quality changes; elimination of habitat capable of providing water quality benefits	Moderate
Parish	Jefferson	PIER #37 (Jean Lafitte Flood-Side Freshwater Marsh, Bottomland Hardwoods-Wet, and Swamp; to be constructed)	Construction stormwater runoff; excavation/placement of dredged/fill material in aquatic habitat; herbicide application; construction of wetlands habitat	Stormwater runoff of sediment and miscellaneous construction discharges; suspended sediment/turbidity from excavation/placement of dredged/fill material in aquatic habitat; runoff of herbicides; construction of habitat capable of providing water quality benefits	Minor[1]
	Lafourche	PIER #37 (Lake Boeuf Flood-Side Bottomland Hardwoods-Wet and Swamp)	Construction stormwater runoff; excavation/land clearing/dredging; dredged/fill material placement in surface waterbodies; herbicide application; construction of wetlands habitat	Stormwater runoff of sediment and miscellaneous construction discharges; suspended sediment/turbidity from excavation/land clearing/dreding and dredged/fill material placement; runoff of herbicides; construction of habitat capable of providing water quality benefits	Minor[1]
	Orleans	IER #11; IER #11 Tier 2 Borgne; IER #11 Tier 2 Pontchartrain; IERS #11 Tier 2 Borgne; IERS #11.d Tier 2 Pontchartrain; PIER #36; PIER #36 Supplement 1 (Bayou Sauvage Flood-Side Brackish Marsh; to be constructed)	Construction stormwater runoff; excavation/placement of dredged/fill/construction materials in aquatic habitat; temporary and permanent hydromodification; construction/elimination of wetland habitat	Stormwater runoff of sediment and miscellaneous construction discharges; suspended sediment/turbidity from excavation/placement of dredged/fill/construction materials in aquatic habitat; temporary and permanent hydromodification-induced water quality changes; construction/elimination of habitat capable of providing water quality benefits	Moderate
	Plaquemines	IER #22 (Westbank N Borrow Area); IER #23 (Myrtle Grove Borrow Area); IER #31 (Idlewild Stage 1); IER #32 (Citrus Lands, Idlewild Stage 2, and Plaquemines Dirt and Clay Borrow Areas)	Construction stormwater runoff	Stormwater runoff of sediment and miscellaneous construction discharges	Negligible

Sub-basin / Parish (LA) / County (MS)	Sub-basin / Parish / County Name	IER/EA	Summary of Activities with Water Quality Impacts	Water Quality Impacts	Magnitude of Permanent Impacts
Parish	St. Bernard	IER #23 (1025 Florissant and Acosta Borrow Areas)	Construction stormwater runoff	Stormwater runoff of sediment and miscellaneous construction discharges	Negligible
	St. Charles	IER #18 (Bonnet Carré North Borrow Area); IER #23 (3C Riverside Phases 1 and 2 Borrow Areas)	Construction stormwater runoff	Stormwater runoff of sediment and miscellaneous construction discharges	Negligible
	St. James	IER #30 (Big Shake Borrow Area)	Construction stormwater runoff	Stormwater runoff of sediment and miscellaneous construction discharges	Negligible
	St. John the Baptist	IER #26 (Willow Bend Phase 1 Borrow Area); IER #29 (Willow Bend Phase 2 Borrow Area)	Construction stormwater runoff	Stormwater runoff of sediment and miscellaneous construction discharges	Negligible
	St. Tammany	IER #29 (Tammany Holding Borrow Area); PIER #36; PIER #36 Supplement 1; PIER #36 Tier 1 (New Zydeco Ridge Bottomland Hardwoods-Wet and Brackish Marsh, Milton Island Intermediate Marsh; to be constructed)	Construction stormwater runoff; excavation/placement of dredged material in aquatic habitat; construction of wetlands habitat	Stormwater runoff of sediment and miscellaneous construction discharges; suspended sediment/turbidity from excavation/placement of dredged material in aquatic habitat; construction of habitat capable of providing water quality benefits	Minor
County	Hancock	IER #19 (Pearlington Dirt Phase 1 Borrow Area); IER #23 (Pearlington Dirt Phase 2 Borrow Area); IER #31 (Port Bienville Borrow Area)	Construction stormwater runoff	Stormwater runoff of sediment and miscellaneous construction discharges	Negligible

[1]Permanent water quality impacts are associated with wetlands creation projects, and are therefore expected to be beneficial

4.2.4.1.4 Storm Damage Reconstruction

Where storm damage reconstruction projects are constructed within the current structural project footprint on previously disturbed upland areas, they would disturb very little soil and would have minor direct impacts on water quality. Water quality would return to pre-construction conditions when reconstruction activities have been completed. However, reconstruction projects that occur in water bodies, such as rebuilding of bridges and reconstruction of marinas and harbors, have the potential to directly impact water quality from stormwater runoff and from spills during construction activities. These projects would result in cumulative adverse impacts on water quality. Sewage and drainage treatment infrastructure enhancement would improve water quality by capturing, controlling, and filtering tertiary runoff.

4.2.4.1.5 Redevelopment

Agricultural and urban land use in the watersheds of the Mississippi River and Pontchartrain and Barataria Estuaries is expected to continue, along with industrial activities affecting the study area.

The quality of Mississippi River water inflows to estuaries, which is heavily influenced by basin agricultural practices, will continue to vary depending on factors mentioned in Section 4.2.2.1. Recent analysis of long-term (1980-2010) data suggests that the trend of increasing nitrate concentrations and loads in the river may continue at a decreasing rate (Murphy et al. 2013). Atrazine application in the continental U.S. decreased between 1992 and 2009 (Thelin and Stone 2013); riverine atrazine concentrations may decrease as a result of decreasing atrazine use. Suspended sediment concentration data show relatively stable annual average concentration from 1967-2007; this trend may continue. In general, it appears that river water quality as impacted by agriculture in the basin will not change significantly.

Improvement of the HSDRRS is expected to encourage an increase in development within the area. Development activities may influence the quality of drainage waters discharged to adjacent estuaries, introducing elevated levels of sediments and contaminants. Development activities encroaching rural or more natural and undisturbed environments could result in direct water quality impacts as open water and wetlands are filled and converted into industrial, residential, or commercial land use, eliminating habitat capable of providing water quality benefits or associated with good water quality. Clearing BLH forest, dredging pipeline canals, rebuilding camps and boat houses, replacing pilings, repairing sewer lines, and constructing bridges and roads would have long-term cumulative impacts on water quality through increased impermeable surfaces and a higher probability of spills of contaminants.

Industrial activities, including accidental spills, would continue to affect study area water quality. Although unanticipated, environmental catastrophes such as the 2011 BP oil spill can have widespread impacts on study area water quality. The high density of industrial activities in the study area vicinity and previous events suggests the possibility of future major spills, especially considering the vulnerability of the area to tropical activity.

4.2.4.1.6 Coastal and Wetlands Restoration

The water quality management programs described in this assessment are expected to generate future improvements in study area water quality. For example, improved regulation of point sources of pollution may help reduce the magnitude of water quality issues such as elevated fecal coliform densities in the Pontchartrain Estuary. However, many of the water quality problems are due to either natural conditions or nonpoint source pollution which is not adequately regulated or managed and are expected to continue. This includes elevated salinities and low pH in the study area due to episodic droughts, low dissolved oxygen levels and non-native aquatic plants in the Barataria Estuary north of the GIWW due to natural conditions and agricultural runoff, runoff from mixed land use areas affecting water quality in Lakes Pontchartrain and Borgne, and low dissolved oxygen levels and elevated mercury concentrations in nearshore Gulf of Mexico waters. In addition, comprehensive management plans specifically addressing Pontchartrain and Barataria Estuary water quality have been developed and may aid in the improvement of study area water quality (LPBF 2014, BTNEP 2013).

Programs such as the EPA's Mississippi River Gulf of Mexico Watershed Nutrient Task Force would continue efforts to reduce nutrient loading from the Mississippi River watershed to the Gulf of Mexico and the study area (USEPA 2014). However, inadequate nonpoint source pollution management and regulation in the watershed continues to prevent nutrient load reductions (COMRACWA 2008). There are currently no anticipated changes in nonpoint source pollution management and regulation that would significantly reduce associated chemical loadings in the river, including loadings of agricultural pollutants such as nutrients. As a result, the formation of annual Gulf of Mexico hypoxic zone is expected to continue, while river water inflows to study area estuaries would continue to generate water quality impacts.

Operation of existing freshwater diversions in both the Pontchartrain and Barataria Estuaries is expected to continue, affecting estuary water quality, salinity, aquatic vegetation and phytoplankton community dynamics, and bioaccumulation rates. Because higher salinity waters promote improvements in estuary water quality, continued diversion inflows may reinforce reduced water quality in areas where salinities are suppressed by river water. Conversely, during episodic droughts in the study area, it may be possible to use the diversions to locally reduce salinity and increase pH, which may locally reduce the severity of brown marsh and forested wetland tree mortality (LDNR 2015, Hoeppner et al. 2008). Diversion operation is limited to time periods where river stages are higher than estuary stages, which may limit their utility for this purpose. Also, brown marsh has previously occurred in the lower estuary, which is generally removed from the areas influenced by diversions.

In addition, long-term river water inflows may negatively affect the biogeochemistry of estuary wetlands. Chronic inflows of alkaline river water containing sulfate, pesticides, and elevated nitrate concentrations may contribute to the decomposition of wetlands belowground matter, leading to wetlands loss during events which generate significant wave energy, such as tropical storms and hurricanes (Swarzenski et al. 2005). Changes in wetlands biogeochemistry and subsequent wetlands loss from long-term river water inflows may have already occurred in the Breton Estuary, where wetlands losses of approximately 40 square miles have occurred in the area hydrologically influenced by the CFD since 2004

Other coastal environmental project types that would affect these estuaries include wetlands creation and nourishment, ridge rehabilitation, shoreline protection, oyster reef creation, and other types of hydrologic modification. Projects of these types within the Pontchartrain and Barataria Estuaries are described in section 3.2. These projects share a common goal of improving the natural environment within the estuaries, which would be expected to improve water quality conditions. For example, wetlands creation and nourishment will result in additional or improved habitat capable of serving as a water quality filter for constituents. Shoreline protection would be expected to aid in minimizing the loss of adjacent wetlands through erosion. New oyster reef habitat would also serve as a natural water quality filter. Other types of hydromodification for environmentally beneficial purposes would ideally create hydrologic conditions supportive of healthy wetlands vegetation and promote water circulation. A majority of the major coastal environmental projects studied to-date have not been implemented, and this trend is expected to continue.

4.2.4.1.7 Flood Risk Reduction Projects

Flood protection projects adjacent to the HSDRRS are also expected to affect project area water quality, through impacts like those described for HSDRRS construction activities. In addition, the diversion of Mississippi River water into Lake Pontchartrain during river floods would continue, temporarily altering Pontchartrain estuary and Mississippi Sound water quality, salinity, and phytoplankton community dynamics.

4.2.4.1.8 Transportation

Repairs to highway and road infrastructure and new road and highway alignments would have little to no cumulative effects on water quality since most of the projects are being constructed in previously disturbed areas and are short-term construction activities. Even for those projects that could be constructed along undeveloped corridors, impacts on water quality are expected to be short-term and localized, and reduced through the implementation of BMPs. Most of the impacts would be from construction site runoff and typical roadway pollutant runoff. Implementation of mitigation measures and BMPs are expected to minimize water quality impacts from transportation infrastructure and related construction activities.

4.2.4.1.9 Summary of Cumulative Impacts

HSDRRS construction and 2057 impacts combined with other present and future actions and natural conditions are overall expected to lead to decreasing water quality. Despite some possible water quality improvements from state and federal water quality management programs and coastal environmental projects, the trends of increasing wetland loss and development and its watersheds suggest the continued introduction of pollutants into aquatic habitat and a decrease in habitat capable of mitigating pollution of surface waters.

4.2.5 WETLANDS

4.2.5.1 AFFECTED ENVIRONMENT

A large portion of the study area constitutes wetland, or previously drained wetland habitats retaining various characteristics. Wetlands provide plant detritus to adjacent coastal waters contributing to the production of commercially and recreationally important fishes and shellfishes. Wetlands provide valuable water quality functions including reduction of excessive dissolved nutrient levels, waterborne contaminant filtration, and suspended sediment removal. In addition, coastal wetlands buffer storm surges and reduce damaging effects on human-made infrastructure within the coastal area (USFWS, 2008). Table 4-11 describes the wetland habitats.

Table 4-13: Wetland Habitat Types

Wetland Habitat Type	Description	Common Plant Species Include:	
		Common Name	**Scientific Name**
Bottomland Hardwood Forest	Forested alluvial wetlands typically occupying floodplain regions of large flooding water bodies and rivers	Overcup Oak Nuttal Oak Water Oak Sweetgum Red Maple Green Ash Water Hickory Hackberry American Elm	*Quercus lyrata* *Q. nuttall* *Q. nigra* *Liquidambar styraciflua* *Acer rubrum* *Fraxinus pennsylvanica* *Carya aquatic* *Celtis laevigata Ulmus americana*
Cypress-Tupelo Swamp	Type of forested wetland that is nearly always inundated over the entire growing season	Bald Cypress Tupelo Gum Dwarf Palmetto Swamp Red Maple	*Taxodium distichum* *Nyssa aquatic* *Sabal minor Acer rubrum var. drummonndii*
Freshwater Marsh	Marsh type dominated by herbaceous vegetation	Maiden cane Alligator Weed Sedges Rushes	*Panicum hemitomon* *Alternanthera philoxeroides*
Flotant (Floating) Marsh	Type of freshwater or intermediate marsh type composed of thick, floating mats of vegetation with open water beneath	Maiden cane Peat	*Panicum hemitomon*
Shrub-Scrub Swamp	A low, flat freshwater swamp with large shrubs and small trees less than 35 feet in height; often associated with newly accreted lands and partially drained wetlands	Wax myrtle Buttonbush	*Myrica cerifera* *Cephalanthus occidentalis*
Brackish Marsh	Experiences irregular tidal flooding and dominated by salt-tolerant grasses. Located in the unprotected and undeveloped areas near the GIWW and within the Bayou aux Carpes CWA Section 404(c) area	Wire Grass	*Spartina patens*

Open Water	Lakes, borrow ditches on either side of the levees, the GIWW, the Mississippi River, and smaller bayous	Submersed aquatic vegetation including: Wild celery Widgeon Grass Slender Pondweed	*Vallisneria Americana* *Rubbia maritime* *Potamogeton perfroliatus*

Sources: USACE (2009); http://www.wlf.louisiana.gov/sites/default/files/pdf/factsheetcommunity/32326-Freshwater%20Marsh/freshwatermarsh.pdf; http://www.wlf.louisiana.gov/sites/default/files/pdf/document/0-cypress-tupelo-blackgum-swamp/cypress-tupelo-blackgumswamps.pdf; http://www.wlf.louisiana.gov/sites/default/files/pdf/factsheetcommunity/32333-Scrub/Shrub%20Swamp/scrubshrubswamp.pdf; http://www.wlf.louisiana.gov/sites/default/files/pdf/document/32862-b forest/bottomlandhardwoodforest.pdf accessed on 10 Jan 2019

Louisiana land loss has averaged approximately 22 square miles per year since 1932 (Couvillion, Beck, Schoolmaster, & Fischer, 2017). From 1932 to 2016, approximately 1,866 square miles of land was lost in coastal Louisiana, representing a decrease of approximately 25 percent (Couvillion, Beck, Schoolmaster, & Fischer, 2017).

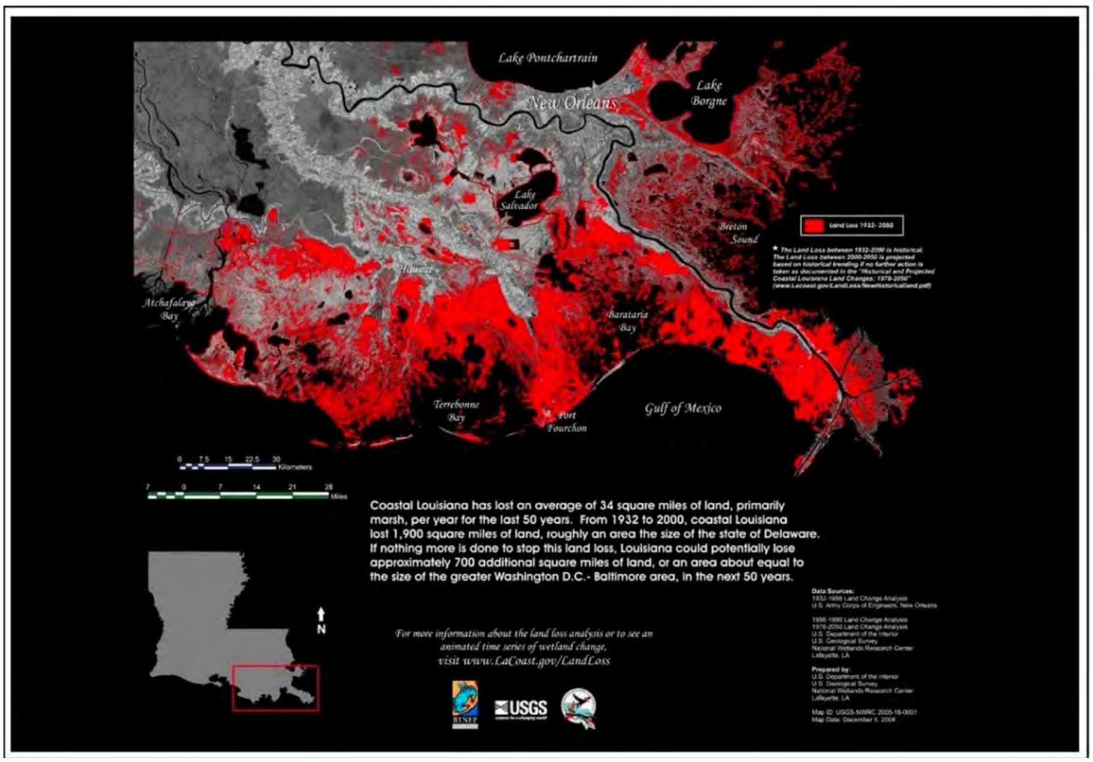

Figure 4-3. Historical and Projected Land Loss for Southeast Coastal Louisiana

Existing Conditions.

The project area is at the confluence between the urban, developed portions of the GMNO Area and the surrounding coastal wetlands and estuaries. Large wetlands areas include the Bayou Sauvage National Wildlife Refuge (NWR) in New Orleans East, the Central Wetlands Area in the Lower Ninth Ward of Orleans Parish and St. Bernard Parish, the Labranche Wetlands in St. Charles Parish, and wetlands in the Bayou aux Carpes Clean Water Act 404(c) area and in the JLNHPP. Pockets of BLH forest are located on the west bank north of Lake Cataouatche and in the Harvey/Belle Chasse areas. The Bayou aux Carpes Clean Water Act 404(c) area's origins begin with the Harvey Canal-Bayou Barataria Levee Project, authorized in the 1960s, located south of the V-line levee southwest of Belle Chasse. The Harvey Canal-Bayou Barataria Levee Project included draining over 3,000 acres of the Bayou aux Carpes wetlands for development. In October 1985, the EPA exercised its veto authority under Section 404c of the Clean Water Act, and with three specific exceptions, prohibited discharges of dredged or fill material to wetlands in the Bayou aux Carpes site. The Bayou aux Carpes site is bounded by the existing V-line levee, the Old Estelle Outfall Canal, Bayou Barataria, Bayou des Families, and the Lafitte-Larose Hwy. The Federal District Court for the Eastern District of Louisiana subsequently found that the EPA veto was consistent with the law and was supported by the agency's administrative record. The prohibitions on discharges of dredged or fill material in the Bayou aux Carpes site remains in effect. Reference Figure 4-11 for wetland habitat types in the area.

Figure 4-11. Wetlands within and adjacent to the Project Area

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4.2.5.2 ENVIRONMENTAL CONSEQUENCES

4.2.5.2.1 HSDRRS Construction Impacts

Impacts to wetland habitat were analyzed using the wetland value assessment (WVA) method. The WVA method was originally developed for wetland restoration and planning projects in coastal Louisiana and east Texas, and is a tool used to evaluate potential changes in ecosystem benefits. It directly applies the Habitat Evaluation Procedures (HEP), which was developed by the USFWS and other agencies to evaluate the impacts of development projects on fish and wildlife resources and is now also used to evaluate the benefits of ecosystem restoration projects. While HEP more traditionally uses species specific models, the WVA uses a community-level approach. The WVA models are community-based models developed for several types of wetlands and other habitats found in coastal Louisiana, including fresh-intermediate, brackish, and saline marshes; barrier islands and headlands; swamp; bottomland hardwood wetlands; and forested coastal ridges (e.g., coastal chenier/ridges). They are planning models that were originally developed for use in determining habitat benefits for proposed projects submitted for funding under CWPPRA but are now widely used by USACE to assess impacts and mitigation requirements. Reference the “Model Review of the WVA Index models” report prepared by Battelle, August 31.2010 (https://WVA_Model_Review_Report.pdf).

Mitigation for impacts to open water habitats and the use of WVA models to evaluate such impacts followed guidelines developed cooperatively between CEMVN, NMFS, and USFWS (Appendix S). In general, mitigation for impacts to open water habitats were limited to any fill that would permanently affect open water habitats classified as essential fish habitat (EFH) or containing submerged aquatic vegetation (SAV); any excavation impact on open water habitats containing SAV, or designated as EFH where excavation would create permanent anoxic conditions in the affected area; any fill or excavation impact on open water habitat containing seagrasses; or any fill or excavation in open water habitat that is designated as oyster seed grounds by LDWF. Mitigation for impacts to open water habitat was not required for dredging in open water areas where SAV is not present (even if the affected area is designated EFH), for filling of an open water area such that the area would not be converted to non-aquatic habitat, or where the impact to open water habitats would be less than one acre within a single open water area.

A direct, permanent loss of wetlands occurred on freshwater marsh, intermediate marsh, brackish/scrub-shrub marsh, saline marsh, BLH, and cypress-tupelo swamp habitats, and was a moderate permanent impact in all sub-basins, except in the Orleans East Bank sub-basin, where only negligible permanent impacts on wetlands occurred. . Construction-related impacts to wetlands included filling of wetlands, damage to wetland vegetation, disturbance of wetlands through increased sedimentation, increased turbidity in tidal channels, and sedimentation in the adjacent drainage channels. After construction, wetlands that were not filled were expected to stabilize, allowing for suspended sediments to settle and vegetation to recolonize the area. Construction-related impacts also adversely affected open water habitat such as lake bottoms, canal bottoms, drainage ways, and bayous. Direct impacts from dredging included temporary increased turbidity, disruption of water bottoms from access channels and material stockpiles, and destruction of SAV. No direct impacts on wetlands occurred at the borrow sites.

In addition to direct impacts, indirect impacts also occurred. Some areas experienced longer inundation periods than initial expected and higher than normal tides, which contributed to vegetation shifts and/or conversion to shallow open water.

In regard to areas such as the IHNC at Seabrook or construction areas near the Bayou Bienvenue lift gate, temporary placement of cofferdams and the closure the MRGO at Bayou La Loutre compounded impacts by reducing salinity. Changes in salinity resulted in a definitive vegetation shift that cannot be easily quantified. Other indirect impacts include increased compaction of wetlands soils, which leads to less percolation and flood storage due to trapped water at the surface, which in turn reduces water flow and water quality. Construction activities within the ROW resulted in temporary minor indirect impacts from increased turbidity and sedimentation within the waterways. Construction-related runoff was managed to the extent practicable through the BMPs, such as structural erosion controls, and adherence to regulations governing storm water runoff at constructions sites, which minimized the effects on the water and coastal resources. Construction activities in some areas resulted in temporary changes in hydrology and inundation levels, which could result in marsh loss through alterations such as changes in salinity and nutrient load.

Wetland impacts were revisited through an analysis based on 95-100 percent project plans and as-builts. As a result, actual acres impacted may be differ from what was initial assessed in the applicable IER. Table 4-12 list the wetland impacts based on this reanalysis by IER and sub-basin for wetland habitat on protected and flood side of the levee/floodwall.

The estimated loss of wetlands from HSDRRS actions assessed in 66 IERs, supplementals and EAs is approximately 1,608.35 acres (798.57 AAHUs).

<u>St. Charles</u> - There were no BLH impacts and swamp impacts were reduced from what was assessed in the IERs. The closure of the canal west of Bayou Trepagnier, as described in IER 1 and IERS 1, reduced the amount of surface water that flows into the wetlands. However, no indirect wetland impacts resulted from actions described in IERS 1b.

<u>Jefferson East Bank</u> - Brackish marsh impacts were reduced; however, impacts to swamp habitat increased. Wetland impact analysis associated with work described in IER 2 and supplements concludes that on the flood side, brackish marsh and swamp were impacted. No impacts were reported on the protected side.

Indirect impacts consisted of construction related site runoff causing increased turbidity on the wetland areas surrounding the project. The area affected was small relative to the size of the adjacent wetlands and BMPs were employed to manage runoff.

Orleans East Bank - There were no impacts within this sub-basin.

New Orleans East - Wetland impact analysis associated with work described in IER 7 and supplements concludes that on the protected side, fresh and intermediate marsh and BLH were impacted. On the flood side, brackish marsh and BLH were impacted. Brackish marsh was impacted as a result of work described in IER 11 and supplementals.

With the additional shoreline protection constructed as described in IERS 11c Tier 2 Borgne, the placement of dredged material during construction created shallower water and increased sedimentation in open water areas. However, impacts to wetlands adjacent to the GIWW and Bayou Bienvenue were avoided offsetting any temporary indirect impacts.

The construction described in IERS 11.b occurred entirely within existing ROW and had no direct impacts to the IHNC or GIWW. However, increasing the ROW for IERS 11.c resulted in impacts to brackish marsh. Because wetlands adjacent to the GIWW and Bayou Bienvenue were not be impacted, the construction associated with the Borgne Barrier resulted in no net wetland loss. None the less even with the reduction of the footprint, AAHUs required for mitigation increased due to impacting a higher quality of habitat.

Chalmette Loop - Fresh/intermediate and brackish marsh as well BLH were impacted in the sub-basin requiring compensatory mitigation. Based on the reanalysis, overall, actual wetland impacts were reduced on both the protected and flood side from those reported in the IERs. Wetland impact analysis associated with work described in IER 9 and supplements concludes that on the flood side, fresh/intermediate marsh and BLH were impacted.

Belle Chase - Floodside swamp and BLH as well as protected side BLH were impacted within the Belle Chase sub-basin. Based on the reanalysis, wetland impacts were reduced to swamp on the flood side and impacts to BLH on the protected side increased.

In the Belle Chase sub-basin, indirect impacts to wetlands identified in IER 13 had only temporary effects to the wetland's habitats adjacent to the areas directly impacted by the HSDRRS construction. There were no indirect impacts to wetlands for the construction described in IERS 12/13, IERS 13a, and IER 33. For IERS 33a, indirect impacts to wetlands resulting from implementation of the WBV-MRL construction included relocation of motile organisms to nearby habitats along with the localized noise, vibration, and deterioration in water quality associated with construction.

Table 4-14: Reassessment of Wetland impacts

LPV IER*	Sub-Basin	Parish	Protected Side: Fresh/ Intermediate Marsh		Brackish Marsh		Swamp		BLH wet		BLH dry		Flood Side: Fresh/ Intermediate Marsh		Brackish Marsh		Swamp		BLH wet		BLH dry		Open Water	TOTAL***	
			Acre	AAHU	Acre	AAHU	Acre	AAHU	Acre	AAHU	Acre	AAHU	Acre	AAHU	Acre	AAHU	Acre	AAHU	Acre	AAHU	Acre	AAHU	Acre	Acre	AAHU
1	St. Charles	St. Charles	0	0	0	0	104	49.99	0	0	0	0	0	0	0	0	82.68	52.66	0	0	0	0	22.72	186.7	102.65
2	Jefferson EB	St. Charles; Jefferson	0	0	0	0	0	0	0	0	0	0	0	0	19.6	8.58	10.65	5.36	0	0	0	0	12	30.25	13.94
3	Jefferson EB	Jefferson	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0*	0	0
4	Orleans EB	Orleans	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	Orleans EB	Orleans	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0*	0	0
6	New Orleans E	Orleans	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	New Orleans E	Orleans	89.5	42.5	0	0	0	0	167.4	85.17	0	0	0	0	52.27	18.95	0	0	32.65	13.36	0	0	0*	341.85	159.98
8	Chalmette Loop	St. Bernard	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0*	0	0
9	Chalmette Loop	St. Bernard	0	0	0	0	0	0	0	0	0	0	2.05	0.33	0	0	0	0	1.21	0.69	8.75	2.3	0	12.01	3.32
10	Chalmette Loop	St. Bernard	89.02	40.92	0	0	0	0	32.76	14.06	0	0	5.93	3.24	98.45	64.62	0	0	26.56	11.66	0	0	0*	252.72	134.5
11	New Orleans	Orleans	0	0	0	0	0	0	0	0	2.46	0.41	0	0	80.74	34.7	0	0	0	0	9.48	1.59	119.02	92.68	36.7
18 Maynard											44.74	14.65												44.75	14.65
27	Orleans EB	Jefferson, Orleans	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total			178.52	83.42	0	0	104	49.99	200.2	99.23	47.2	15.06	7.98	3.57	251.06	126.85	93.33	58.02	60.42	25.71	18.23	3.89	153.74	960.95	465.74

WBV IER*	Sub-Basin		Protected Side: Fresh/ Intermediate Marsh		Brackish Marsh		Swamp		BLH wet		BLH dry		Flood Side: Fresh/ Intermediate Marsh		Brackish Marsh		Swamp		BLH wet		BLH dry		Open Water	TOTAL***	
			Acre	AAHU	Acre	AAHU	Acre	AAHU	Acre	AAHU	Acre	AAHU	Acre	AAHU	Acre	AAHU	Acre	AAHU	Acre	AAHU	Acre	AAHU	Acre	Acre	AAHUs
12	Gretna-Algiers	Jefferson, Orleans, Plaquemines	0	0	0	0	0	0	0	0	181.31	121.47	0	0	0	0	32.93	15.39	2.38	1.98	0	0	0	216.62	138.84
13	Belle Chasse	Plaquemines	0	0	0	0	0	0	0.76	0.18	16.96	10.37	0	0	0	0	31.59	10	8.85	3.66	0	0	0	58.16	24.21
14	Harvey-Westwego	Jefferson	0	0	0	0	0	0	3.64	2.41	0	0	0	0	0	0	85.3	49.54	11.4	9.08	0	0	0	100.34	61.03
15	Lake Cataouatche	Jefferson	0	0	0	0	0	0	5.98	4.06	8.56	2.21	14.5	3.2	0	0	0	0	3.95	2.64	0	0	0	32.99	12.11
16**	Lake Cataouatche	Jefferson	0	0	0	0	0	0	0	0	0	0	132.9	65.92	0	0	0	0	86.78	42.27	0	0	0	219.7	108.19
17	Lake Cataouatche	Jefferson	0	0	0	0	0	0	5.77	2.76	0	0	0	0	0	0	17.77	16.07	0	0	0	0	0	23.54	18.83
33+	Belle Chasse	Orleans, Plaquemines	0	0	0	0	0	0	0	0	80	48.93	0	0	0	0	0	0	82	50.13	0	0	0	162	99.06
18 (Church ill Farms)			0	0	0	0	0	0			29.9	10.62	0	0	0	0	0	0	0	0	0	0	0	29.9	10.62
TOTAL			*0*	*0*	*0*	*0*	*0*	*0*	*16.15*	*9.41*	*316.73*	*193.6*	*147.4*	*69.12*	*0*	*0*	*167.59*	*91*	*195.36*	*109.76*	*0*	*0*	*0*	*843.25*	*472.89*

* *Includes IERs and supplements except for IER16 which does not include impacts from IERS16.a

+IER33 design has not been updated so the current impacts are the same as those described in the IER.
#Mitigation for open water impacts for IERs 3, 5, 7, 8 and 10 would be quantified from the as-built drawings and mitigated for later.

***Total does not include impacts to open water as stated in this table.

Gretna-Algiers - Wetland impact analysis for actions described in IER 12 and supplements concluded that impacts to FS swamp and BLH occurred. The reanalysis resulted in a reduction of FS impacts to swamp and BLH-wet. Construction related impacts occurred to PS BLH-dry.

Harvey-Westwego - Levee, floodwall, and fronting protection construction detailed in IER 14 and IERS 14a resulted in PS BLH impacts. On the FS, swamp and BLH were impacted. Actions described in EA 306c did not result in any additional wetland impacts. The reanalysis determined that BLH impacts were reduced on both the PS and FS, while impacts to swamp habitat increased. No indirect impacts were associated with the construction described in EA 306c.

Lake Cataouatche - Construction of the features assessed in IER 15, 16, 17 and supplements impacted freshwater marsh, intermediate marsh, swamp and BLH.

Reanalysis determined that impacts were reduced from those reported in the IERs. Complete results of impacts to wetlands in the Lake Cataouatche sub-basin are provided in Table 4-12.

Within the Lake Cataouatche sub-basin, the previously discussed water exchange structure minimized the effects of indirect impacts to wetlands by preventing water isolation to the 63-acre wetland area adjacent to DPEGL.

4.2.5.3 AREAS OUTSIDE HSDRRS SUB-BASINS

No direct or indirect impacts to wetlands occurred at the borrow sites approved for the HSDRRS.

4.2.5.3.1 HSDRRS 2057 Impacts

Moderate, permanent impacts to wetlands would occur from expansion of future levee lifts within HSDRRS project reaches. The permanent impacts on wetlands are estimated since the change in footprints for future levee lifts are unknown at this time. Wetlands are located immediately adjacent to levees thus expanding the levee footprints would impact these wetlands due to development on the protected side of the levee or open water on the flood side of the levee. It is estimated that approximately 154 additional acres of wetlands would be impacted by future levee lifts.

If the foreshore protection addressed in IERs #6 and #7 were implemented by the year 2057 within the New Orleans East sub-basin, then approximately 4 acres of impacts on wetlands would occur.

Short-term disturbance from additional levee lifts would include damage to adjacent wetlands vegetation and the potential for increased turbidity and sedimentation. As with current construction, the use of BMPs would minimize the potential for indirect adverse effects from soil erosion, runoff, and sediment transport as a result of construction-related activities and the placement of materials in staging areas.

4.2.5.3.2 Cumulative Impacts

Approximately 1,421.95 acres (725.12 AAHUs) of wetlands were lost (Table 4-12) and approximately an additional 154 acres of wetlands may be impacted by future levee lifts. The WVA analysis considers not only the direct loss of wetland habitats, but also the temporal loss of function between the time of impact and the time in which habitat is replaced. Therefore, with the implementation of wetlands mitigation, the direct cumulative impacts on wetlands would be moderate.

Indirect impacts from sedimentation and vegetation disturbance occurred during construction activities and are anticipated to continue periodically through 2057, as additional levee lifts and maintenance activities are implemented. The cumulative indirect impacts on wetlands are minor, because these are short-term disturbances to low-functioning wetlands located on the fringe of existing risk reduction structures.

Changes in floodgate operations or more frequent closures due to increased storm frequencies at any gated structure in the HSDRRS could be required in the future due to sea-level rise or changes in climate patterns. These changes cannot be predicted at this time and may never be severe enough to force an operational change. However, any increase in the duration of HSDRRS floodgate closures would increase the depth and duration of flooding of the marsh, adversely impacting plant health and causing wetland loss.

Impacts of other ongoing and future regional actions are similar to those impacts described in many of the sub-basins and parishes affected by the HSDRRS. Specific conditions are listed by sub-basins and parishes below.

4.2.5.3.3 Storm Damage Reconstruction

Projects would have little to no direct effects to wetlands as most of the projects would be constructed within the current structural project footprints or in previously disturbed upland areas. Additionally, it is not anticipated that indirect impacts would occur on wetlands from reconstruction projects because most of the work would occur in upland areas behind risk reduction structures.

4.2.5.3.4 Redevelopment

Ongoing and future redevelopment projects that occur in urban areas (e.g., City of New Orleans, LADOTD, parish government projects), where the land has already been highly modified and disturbed, are not likely to impact wetlands due to the urban setting. Redevelopment projects that expand into more natural and undisturbed environments, such as harbors, marinas, pilings, camps, oil and gas pipelines, and water and sewer lines, could result in the direct loss of wetlands and non-jurisdictional BLH habitat. The 933 standard permits issued by CEMVN between July 2007 and June 2011 included projects that potentially impacted 1,299.2 acres of jurisdictional waters of the U.S. Loss of wetlands habitat as permitted by CEMVN Regulating Branch would require full compliance with the CWA and implementation of mitigation, where applicable. Indirect impacts due to redevelopment projects would include impacts like those mentioned in storm damage reconstruction.

4.2.5.3.5 Coastal and Wetlands Restoration

Restoration projects provide benefits to wetland habitats regionally. The following are summaries of beneficial impacts on wetlands from restoration projects proposed in the HSDRRS area.

St. Charles sub-basin - The Bonnet Carré Freshwater Diversion project, which is currently on hold pending an agreement between the states of Louisiana and Mississippi on an acceptable plan, would improve wetlands in the region by reducing saltwater intrusion and increasing the production of local fisheries such as oyster, white shrimp, blue crab, Atlantic croaker, and Gulf menhaden. It is estimated that 10,500 acres of marsh and swamps adjacent to Lake Maurepas and Lake Pontchartrain would be saved over the 50-year period of analysis (USACE 2011b).

Jefferson East Bank and Orleans East Bank sub-basins - The MRGO closure and associated ecosystem restoration project would positively impact wetlands and habitat within Lake Pontchartrain by helping prevent high salinity waters from entering Lake Pontchartrain via the IHNC. The proposed restoration project would restore and protect 58,861 acres of habitat in the study area, including 13,950 acres of fresh/intermediate marsh, 33,966 acres of brackish marsh, 10,340 acres of cypress swamp, 455 acres of saline marsh, and 48 acres of ridge habitat. In addition, the proposed restoration includes 70 miles of shoreline protection in the MRGO, Lake Borgne, and Biloxi Marsh (USACE 2010a). This project is authorized but is not supported by a sponsor.

New Orleans East sub-basin - The Bayou Sauvage NWR Hydrologic Restoration project Phase 1 and Phase 2 is complete and resulted in 2,830 acres (1,104 AAHUs) of created, restored, or protected wetlands (CWPPRA 2011).

Chalmette Loop sub-basin - The Violet Canal Freshwater Diversion is expected to have a significant beneficial effect on the water quality conditions of Central Wetlands area by diverting approximately 4,000 cfs of freshwater into the area and creating 49 acres (38 AAHUs) of marsh in shallow open water, in addition to protecting 207 acres of wetlands. It is expected to increase fine sediment transport and deposition into the marshes located between the Mississippi River and MRGO, thereby lowering the salinity in the Central Wetlands Area. The reduction in salinity may allow vegetation adapted to brackish conditions to expand its range and promote a transition of the wetlands back toward their natural, less saline condition. In addition, the project would include beneficial use of all excavated earth material to create marsh in shallow open water within the project area. The Caernarvon Diversion Outfall Management project would aid in the restoration of former ecological conditions by controlling salinity and supplementing nutrients and sediments to the area. This project could potentially prevent 95 percent of the marsh loss predicted for the next 50 years within Breton Sound (LCWCRTF and Wetlands Conservation and Restoration Authority 1998).

Approximately 802 acres (504 AAHUs) of wetlands would be created or restored. Both proposed projects are in the planning stages.

CWPPRA projects would create, restore, or protect 3,528 acres of barrier island habitat and 7,662 acres of marsh habitat. In addition, marsh would be created, restored, or protected through CWPPRA freshwater diversion projects (5,918 acres) and hydrologic restoration projects (5,601 acres) (CWPPRA 2011). Shoreline protection, outfall management, terracing, and herbivory control projects would contribute additional benefits to area wetlands.

4.2.5.3.6 <u>Flood Risk Reduction Projects</u>

Flood risk reduction projects would contribute to additional loss of wetlands through the filling of wetlands due to levee and floodwall expansion. Some projects may have long-term positive effects, such as reducing the likelihood of storm surges converting marsh into open water. Storms can erode fragile, floating marshes, and storm surges can push salt water into fresh marshes, killing the vegetation and thus converting marsh habitat into open water. In general, the loss of wetlands habitat due to ongoing and future flood risk reduction projects is a small fraction of the wetland habitat in Louisiana, but any permanent loss is considered significant. All direct and indirect impacts on wetlands would be mitigated as required by Section 404 of the CWA. Construction-related surface water runoff would increase turbidity and sedimentation in streams, canals, drainage ways, and lakes in the vicinity of the projects, but most of these impacts would be temporary during the length of construction and would be minimized with the use of BMPs. Present and future regional flood risk reduction projects include the following:

<u>Plaquemines Parish New Orleans to Venice Federal Levee System</u> - This project would result in direct, permanent loss of 366.51 acres of wetlands, 146.62 acres of waters of the U.S., and 10.87 acres of other waters in the project area (USACE 2011d). In addition, the levee improvements would result in short-term water quality impacts, such as increased turbidity and sedimentation.

<u>Larose to Golden Meadow, Louisiana Hurricane Protection Project</u> - Originally, it was estimated that approximately 2,750 acres of marsh habitat would be permanently impacted by this project (USACE 1973). Wetlands would be drained and marsh vegetation, SAV, and wildlife (*e.g.*, shellfish, benthic organisms, and fish) would be destroyed. In addition, the area could no longer be utilized for breeding, foraging, or nursing habitat for a variety of aquatic species and birds. In 1990, Section D-North was proposed for realignment, resulting in additional impacts on 179 acres of marsh, drained marsh, and levee forest (USACE 1991).

<u>Morganza to the Gulf</u> - This project would directly affect 4,112 acres of wetlands, and compensatory mitigation would be necessary for the direct loss 1,352 acres of fresh (211 AAHUs), brackish, and saline marshes (804 AAHUs) (USACE 2002b). Approximately 15 of the 72 miles of proposed levee would cross estuaries that are

currently open to estuarine exchange, but several water control structures in the levees would allow hydrologic exchange.

Grand Isle - It was originally assumed that 700 acres of nearshore bottoms would be adversely impacted as a result of this project, and that a loss of 400 acres would occur over 6.5 years (USACE 1979). Temporary impacts included increased turbidity in the water during dredging and construction. Dredging could result in damage to SAV and destroy non-mobile aquatic benthic organisms. Stockpiling of sand and clay would impact beach habitat, intertidal flats, and shallow estuarine waters.

SELA - Wetlands impacts from this project would include temporary loss of established benthic habitats either through dredging or by replacing natural substrates with cement. Sediments would settle over time and provide some habitat, even on man-made substrates. Vegetation removal in canals and canal edges would cause temporary impacts on wetlands habitats by increasing water temperatures, decreasing available DO in the water, and by decreasing the amount and quality of available terrestrial wetland habitat surrounding the canals. Riprap placed on the canal banks may hinder vegetation growth. Mobile aquatic species would be displaced but would recolonize after construction is complete.

IHNC Lock Replacement - Environmental impacts from this project would include the loss of 25 acres of freshwater marsh that would require compensatory mitigation. In addition, low-quality wetlands, upland scrub/shrub habitat, and as much as 2.8 acres of drained, wooded land would be impacted for use as a disposal site or construction of a detour road, but these habitats would not require compensatory mitigation.

4.2.5.3.7 Transportation

Projects would result in minor cumulative effects to wetlands, primarily since most of the projects are being constructed in previously disturbed areas. Further, if unavoidable impacts should arise, CWA Section 404 evaluations, permitting activities, and implementation of mitigation measures (avoidance, minimization, and compensation) would minimize long-term cumulative impacts on wetlands.

I-49 Construction - A total of 578.9 acres of wetlands, including BLH, cypress/tupelo swamp, wet pasture, marsh, and scrub/shrub habitat, would be impacted by the development of I-49. Impacts would be on hydrology (*e.g.*, leveed, pumped or artificially constricted) and vegetation (*e.g.*, logged or cleared). Elevated roadways would shade wetlands areas and would not support trees. The construction of I-49 would generate typical roadway pollutants that could flow into drainage ways. Construction could also result in increased turbidity in local waters (LADOTD 2007).

Huey P. Long Bridge Widening - This impacted 1.57 acres of wetland habitat due to placement of new piers. The wetlands were removed for the construction of the piers, but most has naturally revegetated.

I-10 Twin Span Bridge over Lake Pontchartrain - This project would impact 4.6 acres of wetlands; 3.7 acres of estuarine intertidal scrub/shrub brackish marsh on the south shore in Orleans Parish, and 0.9 acre of freshwater forest scrub/shrub marsh on the north shore in St. Tammany Parish (Federal Highway Administration [FHWA] 2006).

Florida Avenue Bridge over IHNC - This planned LADOTD project would impact 1.99 acres of wetlands and 49.45 acres of other waters of the U.S., of which 1.28 acres are within the Florida Walk Canal. Impacts on wetlands would be negligible because the roadway would be elevated and no changes to present hydrological conditions are planned. Wetlands vegetation would reestablish along and under the bridge once construction is complete.

I-12 to Bush, Louisiana - This planned LADOTD Louisiana Highway (LA) 3241 from the LA 40/41 intersection in Bush, St. Tammany Parish, Louisiana, to Interstate 12 (I-12) could impact between approximately 586 and 862 acres of wetlands and pine flatwoods based on the alternative alignment chosen.

4.2.5.3.8 *Summary of Cumulative Impacts.*

The loss of wetlands in southeastern Louisiana is primarily caused by large-scale flood risk reduction and navigation projects. Channelization and levee establishment have altered the course of the Mississippi River and its ability to flood coastal marshes and estuaries with sediment-rich waters. Additionally, regional, large-scale flood risk reduction projects that continue to be constructed contribute to coastal wetland loss. The cumulative impact on wetlands from past, ongoing, and future projects in the region is both major and significant, and only through mitigation measures such as BMPs can these impacts be reduced. Coastal and wetlands restoration creation projects have provided some measures for combating the loss of wetlands. However, the size of these restoration projects has been small relative to the scale of projects that have contributed to wetland loss. Future large-scale restoration projects proposed by state and Federal governments would cumulatively provide a potential major benefit to wetlands in the region but are not likely to fully offset the cumulative adverse impacts of historic flood risk reduction projects.

Indirect cumulative impacts include alterations to habitats and hydrology, which could result in changes to salinity and nutrient loads in local wetlands, leading to additional wetlands loss. Flood risk reduction projects and other regional projects occurring near wetlands would cause damage to adjacent wetlands vegetation (including SAV) and increase turbidity and sedimentation in the adjacent wetland habitat and drainage canals.

4.2.6 UPLANDS AND BOTTOMLAND HARDWOODS-DRY

4.2.6.1 AFFECTED ENVIRONMENT

Uplands are lands that do not contain wetlands or open water and consist of dry bottomland hardwood (BLH dry) communities, scrub/shrub communities, as well as natural and artificial levee high ground. which are not regulated under Section 404 of the CWA but require mitigation per WRDA 2007. These communities consist of dry bottomland hardwood (BLH-dry), scrub/shrub communities, as well as natural and artificial levee high ground.

BLH-dry communities lack one of the three characteristics that define wetlands (wetland hydrology, hydrophytic vegetation, or hydric soils). BLH-dry dominant tree species include water oak, nuttal oak, overcup, hackberry, sweet gum, green, American elm, swamp dogwood, swamp privet, and buttonbush. Scrub/shrub communities contain woody vegetation that is less than 20-feet tall and covers more than 20 percent of the given area (NOAA 1995). Scrub/shrub uplands develop in disturbed areas, openings in BLH, in areas that have experienced storm damage or disease disturbances, as part of BLH, and in areas of urban decay. Similar species of woody vegetation can be found in scrub/shrub habitat as is found in BLH, such as southern dewberry, eastern baccharis, wax myrtle, red mulberry, pepper-vine, and giant ragweed. The invasive species, Chinese tallow, is commonly found in this area (Louisiana Natural Heritage Program [LNHP] 2009).

HSDRRS levee regulations require levees to be turf-covered and maintained (mowed) to prevent tree growth and within an easement (or ROW) on either side of the levee of at least 15-feet. This is also called a “vegetation free zone”. These regulations allow for stability of levee soils and ease of inspection for safety purposes. The maintenance regulations along with patterns of development and urbanization have facilitated further isolation of uplands, including the associated natural habitat, in southeastern Louisiana. The following sections discuss upland and BLH dry resources within the study area.

<u>Existing Conditions</u> - Isolated areas of BLH dry as well as drained marsh communities exist within the HSDRRS and outside the vegetation free zone. Upland areas develop adjacent to the levee ROW if it is not cleared for agriculture or maintained by mowing. Overtime these upland areas transition into scrub/shrub or old field habitat that is characterized by disturbance-tolerant species. Limited BLH forested and scrub/shrub habitats provide habitat such as breeding and nesting areas for resident passerine birds and essential resting or perching areas for many migratory songbirds. The HSDRRS and MRL levee corridors are predominantly maintained turf grasses with occasional pockets of natural vegetation along the interface between the maintained levee and wetlands areas.

Table 4-15: Upland and BLH-dry Impacts
(Appendix N and Appendix U)[1]

Sub-basin	IER	BLH dry Permanent Impacts (acres)	BLH dry AAHUs (100% Design)	Upland Permanent Direct Impacts (acres)	Temporary Direct Impacts (acres)
St. Charles	1, S 1, S 1.b	0	0	0	0
Jefferson EB	2, S 2, 2.b, 3, S 3.a	0	0	0	0

Sub-basin	IER	BLH dry Permanent Impacts (acres)	BLH dry AAHUs (100% Design)	Upland Permanent Direct Impacts (acres)	Temporary Direct Impacts (acres)
Orleans EB	4,5, S 5.a, S 11.b Tier 2 Borgne, 27, S 27.a	0	0	6.6	12.8
New Orleans East	6, S 6.a, 7, S 7, 11, 11 Tier 2 Pontchartrain, 11 Tier 2 Borgne, S 11.a Tier 2 Borgne, S 11.b Tier 2 Borgne, S 11.c Tier 2 Borgne, S 11.d Tier 2 Pontchartrain	11.94	2	69.46	77
Chalmette Loop	8, 9, 10, S 8,9,10.a	8.75	2.3	1.25	1,081
Belle Chasse	13, S 12/13, S 13.a, 33, S 33.a	96.96	59.3	196.04	120.34
Gretna-Algiers	12, S 12, S 12.a	181.31	121.47	42.89	0
Harvey-Westwego	IER 14, IERS 14.a	0	0	0	0
Lake Cataouatche	15, S 15.a, 16, S 16.a, 17	8.56	2.21	0	8.29
Totals		**307.52**	**187.28**	**309.64**	**1299.43**

[1]Impacts occurred primarily to scrub/shrub habitats on the periphery of existing levees and to turf grass on existing levees. However, for some IERs and IERS, impacts on uplands that comprised the existing levee footprint were not described separately or specifically. Therefore, this acreage is approximate and to determine the Upland/Pasture impacts, the 95 to 100% designs were assessed for impacts to BLH dry, this acreage was subtracted from total acreage impacts disclosed in IER and IERS to estimate the acreage of impact for Upland/Pasture. No mitigation is required for Upland/Pasture or temporary impacts. Section 5.0 HSDRRS Mitigation quantifies mitigation required for permanent impacts to BLH-dry.

Table 4-16: Borrow Site Excavation Impacts by IER

IER	Borrow Sites	Parish/ County	Total Direct Impacts (acres)	AAHUs	BLH Dry Direct Impacts Acres	Upland Permanent Direct Impacts (acres)
Government Furnished						
18	Maynard	Orleans	44.74	14.65	44.74 (14.65)	0
18	Churchill Farms Pit A	Jefferson	29.9	10.62	29.9 (10.62)	0
18	Bonnet Carré Spillway	St. Charles	0	0	0	680
22	Westbank N (Walker Road)	Plaquemines	0	0	0	76
25/ S25.a	Stumpf	Orleans	22.41	6.19	22.41 (6.19)	0
Contractor Furnished						
19	River Birch Phase 1 and 2	Jefferson	0	0	0	89.1
19/23	Pearlington Dirt Phase 1 and 2	Hancock County, MS	0	0	0	207.9

IER	Borrow Sites	Parish/ County	Total Direct Impacts (acres)	AAHUs	BLH Dry Direct Impacts Acres	Upland Permanent Direct Impacts (acres)
19/29	Eastover/Eastover Phase II	Orleans	43.2	6.5	1.56 (0.33)	106.4
23/31	Acosta/ Acosta 2	St. Bernard	1.1	0.45	0	32.9
23/32	3C Riverside /3C Riverside Phase 3	St. Charles	174.6	84.6	0	342.4
26	South Kenner	Jefferson	0	0	0	240
26/29	Willow Bend/ Phase II	St. John the Baptist	76.2	42.1	10.79 (5.96)	483.8
29	Tammany Holding	St. Tammany	0	0	0	291
30/ 19	Contreras Dirt/ DK Aggregates	St. Bernard	225	189.4	0	96.5
31	Port Bienville	Hancock County, MS	89	55.72	0	588 (pine cleared land)
31	River Birch Landfill Expansion	Jefferson	0	0	0	196
31/32	Idlewild Stage 1/2	Plaquemines	83.3	56.49	0	153.7
32	Citrus Lands	Plaquemines	0.00	0	0	353
23	Florissant	St. Bernard	0	0	0	3
32	Plaquemines Dirt and Clay	Plaquemines	0	0	0	321
30	Big Shake	St. James	0	0	0	441
Totals	**20 Pit Areas**	**8 Parishes & 1 County**	**788.71**	**466.71**	**109.4 (37.75)**	**4701.7**

[1]Impacts described for uplands and BLH dry occurred primarily to scrub/shrub habitats, agriculture and pasture lands as result of borrow pit excavation. However, for some IERs and IERS, impacts on uplands and BLH dry were not separated or specifically described. To address this data gap an additional analysis was completed utilizing Digital Orthophoto Quarter Quadrangle (DOQQ) and National Agriculture Imagery Program (NAIP) aerial photographs for the years 2008, 2010, 2012, 2013, and 2015. The images were compared in ESRI ArcMap using shapefiles delineating the boundaries of existing Contractor and Government Furnished Borrow sites, and areas of actual excavation within the borrow sites were identified by comparing the locations of the borrow sites over the temporal period of the imagery." Areas that were excavated were digitized to create shapefiles for "borrow sites actual" and compared with habitat data to determine impacts to bottomland hardwoods and approximate actual acreages of impacts. Removal of BLH-dry were only identified at the Willow Bend, Eastover, and Stumpf borrow sites. To determine the Upland/Pasture impacts, the BLH-dry acreage was subtracted from total acreage impacts. Mitigation is not required for impacts to Upland/Pasture habitat. Section 5.0 HSDRRS Mitigation quantifies mitigation required for permanent impacts to BLH-dry

4.2.6.2 ENVIRONMENTAL CONSEQUENCES

4.2.6.2.1 HSDRRS Construction Impacts

Permanent and temporary direct impacts total approximately 6727.69 acres (table 4-13 and 4-14). These impacts are considered minor when compared to the total acres of uplands existing within the study area.

Impacts resulted from clearing, grubbing, excavation, and placement of fill. Minor temporary impacts resulted from construction of staging areas and access roads in previously disturbed areas outside the construction footprint (e.g., nearby upland field or parking lot). Table 4-13 list the total impacts by sub-basin.

Temporary impacts occurred within the Orleans East Bank, New Orleans East, Chalmette Loop, Belle Chasse, and Lake Cataouatche sub-basins (table 4-13). Permanent direct impacts from excavating borrow pits occurred primarily to scrub/shrub habitats, agriculture, and pasture lands (table 4-14). For some IERs, construction impacts were not broken out for uplands and BLH-dry, therefore, an additional assessment was conducted to quantify impacts to these habitat types separately (see [1] in Table 4-13).

St. Charles **-** Temporary impacts occurred resulting from staging and equipment access that were located outside the HSDRRS ROW (e.g., nearby upland field or parking lot), and where floodwalls were constructed within the ROW in an area that was already disturbed. Levees that were raised (which increased the footprint) were also in existing, previously disturbed ROWs, and impacts on uplands were negligible. Further, this land revegetated once construction was complete. In a few cases, vegetation in the upland areas was removed, and stands of trees or scrub/shrub were forfeited to the project. No additional impacts occurred for actions described in St. Charles Sub-basin (IERS 1.b). Permanent direct impacts occurred from excavation of Bonnet Carré Spillway, and 3C Riverside and 3C Riverside Phase 3 borrow site.

Jefferson East Bank **-** Impacts are similar to what is described for the St. Charles sub-basin. Construction resulted in impacts to uplands and BLH dry. No additional impacts occurred for actions described in the Jefferson East Bank Sub-basin (IERS 2.a) aside from what was described in the CED phase I.

Orleans East Bank **-** No impacts occurred. There were minor temporary and permanent impacts from construction due to ground clearing and grading for equipment transport. All impacts occurred within existing ROW. There were no impacts to BLH dry resulting from construction and borrow.

New Orleans East – Minor permanent impacts occurred to maintained turf grass and developed uplands and BLH-dry to construct and remediate levees, floodwalls, and floodgates. Total temporary impacts occurred to maintained turf on levee slopes.

IERS 11.b actions permanently and temporarily impacted upland habitat for the restoration or reinforcement of levees and floodwalls within existing ROW. Upland habitat was temporarily impacted outside of ROW for staging areas. Upon construction completion, the site was returned to pre-construction conditions. No indirect or cumulative impacts occurred from IERS 11.b actions.

Permanent impacts occurred to BLH-dry from borrow pit excavation at Maynard, Eastover and staging site construction for actions described in IERs 18, 19, 25, 25.a, and 29.

Chalmette Loop **-** Minor permanent construction impacts occurred to natural levee ridges as described in IER 9. Additionally, temporary impacts occurred on uplands as described in IERs 8, 9, and 10. These impacts were comprised of pasture/turf grass, scrub/shrub, and upland habitats.

There were temporary and permanent upland impacts for the actions described in Supplemental IER 8,9,10.a for the T-wall and access road along the Chalmette Loop (LPV 145-149) disturbed by excavation, grading, borrow and fill for the access road construction. The levee berm has naturally revegetated reducing the gravel access road to only 15 ft wide, and the remaining berm area is maintained and mowed turf grass.

There were no impacts to uplands and BLH-dry as result of actions described in EA #526 or EA #527.

Belle Chasse **–** Permanent impacts occurred on pasture, upland levee and turf grass, and BLH dry. IER 22 impacted pastureland as result of excavating the Westbank N borrow site (see Table 4-14). IERS 12 and the addendum resulted in direct impacts to upland resources located beneath the LA 23 Bridge as result of the Barriere Golf Course access road relocation. In Figure 2-18, the Bayou Barrier Golf Course road relocation shown in red impacted upland habitat that is included in Table 4-13. These resources were located within existing LADOTD and utility ROW in an urban and developed area. The design and alignment were within the project ROW identified in IER 12.

IER 33 temporarily impacted maintained turf grass within the existing ROW. There were temporary direct effects to terrestrial and upland habitat adjacent to the floodside toe of the levee specifically in areas where material was staged for either truck transportation or protection of cultural resources. The material was removed upon construction completion and the area returned to pre-project conditions within one growing season. Direct effects to terrestrial and upland habitat as a result of constructing the levee were consistent with the extent of previous disturbance and previous levee construction activities along the entire project. Indirect effects of construction (e.g., noise, fugitive dust, etc.) had only temporary effects to the terrestrial habitat near active construction areas. Construction activities coincided with IER #13 Hero Canal Levee and Eastern Terminus construction, and cumulatively there was temporary construction-related disturbance of noise and dust impacting nearby terrestrial habitat. IER Supplemental 33.a construction permanently and directly impacted non-wet BLH habitat by clearing, grubbing, filling, or converting to open water within the construction ROW.

Gretna-Algiers **-** There were direct impacts to upland resources as result of constructing the WBV 14e.2 levee reach and the V-Line levee canal. In addition to impacts to the V-line levee within the existing ROW, previously cleared upland habitat in the Jefferson Parish Drainage District (JPDD) Canal-C was permanently impacted with construction of the access road.

IERS 12 permanently impacted uplands as result of paving an access road.

<u>Harvey-Westwego</u> **-** Construction impacts resulted in impacts to uplands and BLH dry. Impacts were similar what is described for the St. Charles sub-basin.

<u>Lake Cataouatche</u> **-** The IERS 15.a temporary access road and staging area impacted a previously cleared area and BLH dry consisting mostly of the invasive species, Chinese Tallow and low-quality species such as black willow. According to the Summary of WBV HSDRRS Construction Impacts as documented in IERs Memorandum for IER 15 and Supplements BLH dry habitat was temporarily impacted (Appendix U). Indirect impacts from the access road consisted of construction-related effects from increased turbidity on the wetland areas surrounding the project area from the construction site runoff.

<u>Borrow Sites and Areas Outside of the HSDRRS Sub-basins</u> **-** IERS 25.a described the permanent impacts to BLH dry as result of use of areas adjacent to the Stumpf Phase I borrow area (figures 2-27, 2-28 and table 4-14). Permanent impact to BLH dry occurred as result clearing the area and placement of recycled embankment material (REM). Because of the placement of this REM, re-colonization of vegetation and woody plants did not occur because it acts like a cap of gravel and concrete to the soil below. The permanent impacts to BLH dry as result of IERS 25.a actions were mitigated with the purchase of credits from a mitigation bank.

IER #35 Contractor Furnished Borrow Material #8 investigated borrow in Jefferson, Terrebonne, and St. John the Baptist Parishes outside the HSDRRS project area. IER 35 assessed the environmental impacts and determined that the excavating some of the pits would result in unavoidable impacts to BLH dry and require mitigation (table 4-15). Use of the proposed RBEND II and Houma Excavation contractor-furnished borrow area would cause unavoidable impacts to BLH dry on the site. No direct, indirect, or cumulative impacts to uplands or BLH dry would occur with use of Assumption Land Company and Robert Brothers Farm sites because the sites do not contain any non-jurisdictional BLH. Use of the proposed Assumption Land Company and Robert Brothers Rams sites do not contain any BLH habitat. As of October 2015, none of the borrow pits described in IER #35 were excavated for the HSDRRS work but future levee lifts may have need of this material.

Table 4-17: IER #35 Acres of Excavation and impacts to BLH-dry

Borrow Area	Acres Proposed for Excavation	Acres BLH dry
Assumption Land Company Site	77	0
Houma Excavation Site	171	3.75
RBEND II Site	52	7.39
Robert Brothers Farm	232	0
Total	**362**	**11.14**

Cumulative impacts to BLH dry would continue, because there are approximately 55 approved potential borrow areas in southeastern Louisiana and southwestern Mississippi that may be utilized for future construction, some of which have BLH dry present. BLH dry habitat has historically been affected by residential, commercial, and industrial development. Land has been converted for residential, commercial, and industrial uses in a significant portion of leveed areas in the region. It is expected that this historical trend would continue to impact BLH dry habitat in the region.

The LPV PIER 36 and WBV PIER 37 projects impact BLH-dry habitat. Reference section 5 mitigation planning for further details.

An assessment of the contractor furnished borrow excavation as described in Table 4-14 resulted in a total of 109.4 acres (37.75 AAHUs) BLH-dry impacts. These impacts were mitigated separately by borrow contractors. The LPV and WBV mitigation projects mitigated impacts to uplands and BLH-dry through the purchase of mitigation bank credits.

Most construction impacts to uplands and BLH-dry occurred from the excavation of borrow areas. Borrow areas consist primarily of agricultural lands (e.g., sugarcane fields, pasture), fallow agricultural lands, pine plantations, dry BLH, existing borrow sites, and formerly developed land (e.g., golf course at Eastover). The excavation of the land for borrow removed all vegetation and habitat for upland species and, in many cases, converted uplands to open water, but was a minor impact on uplands regionally. This construction removed all cover for wildlife, as well as herbaceous plants that herbivores use for food. Some borrow sites may not fill in with water, and these areas, as well as the disturbed edges of the new water features, have the potential for scrub/shrub species to develop from the existing seed bank or introduction of seed from wind or other common introduction methods (e.g., animals, construction machinery). The indirect adverse effect was the potential for unchecked growth of Chinese tallow and other invasive plant species.

There were no specific mitigation measures for the direct impacts on uplands (other than BLH dry habitat) from the HSDRRS construction. Mitigation for BLH dry impacts to the government furnished borrow pits Maynard, Churchill Farms, Bonnet Carré Spillway, and Westbank N (also called Walker Road) is described in detail in section 5.0 HSDRRS Mitigation. If the borrow pits that were analyzed for impacts in an IER and were not excavated for the HSDRRS as of October 2015, then these impacts are considered negligible and will not occur. For the contractor-furnished borrow pit areas that were excavated as shown in table 4-14, mitigation for any impacts to BLH dry was the responsibility of contractor. Mitigation efforts implemented by the USACE to minimize upland and non-wetland BLH impacts are discussed in section 5.0 HSDRRS Mitigation.

4.2.6.2.2 <u>HSDRRS 2057 Impacts</u>

Approximately 9 million cy of suitable borrow material would be needed for future levee lifts. Most of the impacts from removing this volume of material at borrow sites would likely occur within upland habitats and would be a minor permanent impact on uplands when compared to the millions of acres of upland and BLH dry habitat available in Louisiana and the southeastern United States (http://www.stateconservation.org/Louisiana/state-wide/Forest-Resources-and-Bottomland-Hardwoods/). Any new borrow areas would be cleared of existing vegetation, excavated, and most likely converted to open water habitat, reducing forage and breeding habitat for wildlife. However, due to limitations associated with authorization, NEPA compliance, and real estate acquisition requirements, the borrow sites cleared for HSDRRS construction would not necessarily be used for future levee lifts. Until borrow areas are selected, exact impacts on upland resources cannot be analyzed. No substantial impacts on upland habitats are anticipated within the footprint of levees because enlargements will be restricted to the base of levees already impacted by recent HSDRRS construction by future levee lifts and HSDRRS structural maintenance activities.

4.2.6.2.3 <u>Cumulative Impacts</u>

The HSDRRS construction and future levee lifts, including the excavation of borrow material, and larger footprints for levee and floodwall construction would have moderate adverse, long-term cumulative impacts on upland and BLH dry resources that exist along the HSDRRS. It is anticipated that most of the staging and stockpile areas used for the 2011 HSDRRS construction would be used along some of HSDRRS levee reaches requiring future levee lifts and impacts from future HSDRRS staging and stockpiling activities would be negligible.

Upland areas were cleared of existing vegetation, excavated, or filled, and converted into risk reduction structures and ponds or small lakes at many borrow sites. Cumulatively, the upland areas no longer provide foraging areas for herbivores, and the thick scrub/shrub vegetation that provided cover for wildlife is permanently lost.

Storm Damage Reconstruction

Storm damage reconstruction projects generally occur in the previously disturbed project footprints. As such, these projects result in negligible impacts on uplands or the representative upland species.

Redevelopment

In portions of the HSDRRS project area that are urban and industrial, such as New Orleans East Bank and Jefferson East Bank, impacts on upland resources from redevelopment projects would be negligible. However, in areas where development is limited, such as Chalmette Loop and borrow areas in Plaquemines Parish outside the sub-basins, new residential and industrial development would impact uplands by removing uplands that provide biological production and wildlife foraging and breeding habitat and converting them to infrastructure.

Coastal and Wetlands Restoration

Restoration of coastal and wetland habitats would stabilize upland areas along the banks of water bodies and provide protection from wave erosion. In general, uplands would not be adversely impacted by these projects, as open water habitats are restored to wetlands. With the protection provided by restored coastlines and wetlands, uplands would indirectly benefit, as the threat of saltwater inundation and erosion would be reduced.

Flood Risk Reduction Projects

Upland habitats would be impacted by projects that create new flood risk reduction structures (levees and floodwalls) in a manner like the impacts found in the HSDRRS projects. Increased footprints of larger structures would occur on adjacent uplands, changing the habitat to levee or floodwall. Beneficial impacts on uplands would occur with a reduced risk of inundation from storm events when such projects are complete. Borrow material needed for levee construction would permanently convert uplands to open water habitats. Uplands would also be temporarily impacted during the construction phase by temporary roads and staging grounds covering upland habitats. With the completion of flood risk reduction projects, uplands would be indirectly impacted by increased development due to the reduced flood risk.

Transportation

Most transportation improvement projects would occur in previously disturbed corridors; therefore, only minor impacts on upland habitats would occur. Projects that are being constructed where uplands have not been previously disturbed would have adverse impacts on the resource. As with flood risk reduction projects, construction footprints would permanently disturb upland habitats. Temporary impacts from access roads and staging areas would occur during construction.

Summary of Cumulative Impacts

Even though minimal in size when compared to the regional extent of forested and grassland habitats directly and indirectly affected by previous development activities, the excavation and use of borrow material in the project area, in combination with other past, present, and future large-scale construction projects, would cumulatively lead to the loss of upland habitats within southeast Louisiana. Based on historical human activities and land use trends in the area, it is reasonable to anticipate that future activities would further contribute to cumulative degradation of the land resources and, ultimately, upland habitats. In southeast Louisiana, most development occurs in the upland areas, which compose a relatively small portion of the surface area of the region. Most of southeast Louisiana is composed of wetlands, open water, and estuarine habitats, and undeveloped and undisturbed upland areas are relatively rare. Therefore, the cumulative loss of upland area that functions as habitat for wildlife and provides forested resources is a long-term, moderate cumulative impact.

4.2.7 FISHERIES

4.2.7.1 AFFECTED ENVIRONMENT

Freshwater fisheries are highly valued by sport fishermen who pursue freshwater species such as largemouth bass, alligator gar, channel catfish, white crappie, black crappie, various species of sunfish, blue catfish, flathead catfish, spotted gar, and red swamp crawfish.

Lake Borgne and Lake Pontchartrain are brackish estuaries and provide habitat to a wide variety of economically important invertebrates such as brown shrimp, pink shrimp, white shrimp, blue crab, and oyster. Estuarine fish such as red drum, black drum, *sheepshead,* speckled trout, and Atlantic croaker also inhabit the brackish water habitat. Additionally, estuarine habitat produces many species of fish that are not harvested for recreation or as commercial seafood but contribute to the food web by serving as prey species for predators along the coast and offshore. These prey species include rainwater killifish, naked goby, Gulf pipefish, clown goby, pinfish, bay, speckled worm eel, striped mullet, Gulf menhaden, and Gulf killifish.

Bay anchovy are the most abundant fish in Lake Pontchartrain and serve an important ecological function as a prey species for many commercial fisheries (O'Connell et al. 2004). The diversity of aquatic species makes the protection of Lake Pontchartrain fisheries important to Louisiana's economic future. Due to the extensive decline of Louisiana's coastal marsh, protection of fragile aquatic habitat is a concern for all large construction activities.

South and southwest of the project area in environments such as Lake Cataouatche, Lake Salvador, and adjacent marsh and tributaries, the surface waters are seasonally brackish with some aquatic inhabitants tolerant of both fresh and saline environments (osmoregulators). Observations by biologists indicate that marine fish such as bay anchovy, striped mullet, threadfin shad, tidewater silverside, and blue crab have been found in the main body of water in Lake Cataouatche. Freshwater fish such as sunfish, channel catfish, and largemouth bass were observed in swamp and marsh habitats, where the surface water contains an abundance of aquatic vegetation (Shultz 2006, Swarzenski et al. 2004).

4.2.7.2 ENVIRONMENTAL CONSEQUENCES

4.2.7.2.1 <u>HSDRRS Construction Impacts</u>

Construction activities associated with dredging, placement of fill, stockpiling material, hydrologic modifications of waterways and water displacement adversely impacted fisheries and their associated habitats. Impacts include effects on migratory movements, active/passive transport of eggs and larvae, nursery habitat recruitment of larvae and juveniles, changes in water characteristics (e.g., temperature, salinity, turbidity, and DO), organism access to biotic water quality habitats (e.g., protection from predators and food availability), and hydrology and velocity.

Stormwater runoff from construction sites increased turbidity and sedimentation of waterways. Alterations in water quality from sediment loading likely impacted fisheries by lowering dissolved oxygen and increasing water temperature. Direct/indirect adverse impacts on fisheries and other aquatic organisms from sediment suspension and siltation include clogged gills, reduced growth rates, and disruption of egg and larval development (USEPA 2003).

The removal of emergent and overhead vegetative cover providing shade for fisheries and aquatic organisms resulted in a degradation of aquatic habitat by increasing water temperatures, exposing aquatic species to predation and the loss of juvenile and larval fish that depend on edge habitat for survival.

4.2.7.2.2 HSDRRS 2057 Impacts

Temporary construction-related fisheries impacts from the future levee lifts would include damage to adjacent wetlands vegetation utilized as fish habitat, disturbance to sediments, and increased turbidity and sedimentation in the adjacent fish habitat and drainage canals. After construction, the habitats would stabilize, allowing for suspended sediments to settle and vegetation to recolonize the area. Construction-related impacts would also affect other habitats utilized by fisheries, including lake bottoms, canal bottoms, drainage waterways, and open water. Direct impacts from dredging include increased turbidity during dredging, disruption of water bottoms from access channels and material stockpiles, and destruction of SAV.

The removal of fish habitat associated with an expanded ROW that could be needed for levee lifts would be detrimental to juvenile and larval fish that depend on edge and shallow habitat for survival. Impacts would likely result from increased turbidity in wetlands and open water surrounding the project area. Suspended materials would result in clogging of fish gills, lower growth rates, and impacts on egg and larval development. However, it is assumed that resident motile organisms would attempt to avoid construction activities and seek refuge in adjacent and suitable habitat. Likewise, impacts on fisheries from expanded ROW construction activities would be minimized using BMPs (reducing potential for indirect adverse effects from soil erosion, runoff, and sediment transport) as described in the project's SWPPP.

Potential future impacts on fisheries and fish habitat associated with the specific levee lift projects are similar to the complete HSDRRS construction impacts and, overall, would be minor.

Although foreshore protection was proposed for IERs #6 and #7, this was not completed under the HSDRRS 2011 work. It is anticipated that it may be performed in the future. Construction activities associated with raising foreshore protection would temporarily impact approximately 61.1 acres of Lake Pontchartrain lake bottom by causing a short-term loss of forage habitat for finfish and shrimp. Approximately 6.9 acres of Lake Pontchartrain would be permanently filled, causing a loss of forage habitat for finfish (IER #6). Dredging activities associated with raising the existing foreshore protection would temporarily impact 118.1 acres of lake bottom and permanently fill 7.2 acres of shallow water habitat. These activities would cause a loss of forage habitat for finfish. However, permanently submerged portions of the riprap that would be placed would result in a beneficial impact by providing habitat for small forage fishes such as killifish and gobies.

Although some additional wetlands loss from construction activities may affect local and regional fisheries (and prey) species through the direct loss of fish habitat and temporary water quality degradation, impacts on fisheries and fish habitat would be considered temporary and minor as a result of the future HSDRRS projects. Impacts from the future excavation of borrow material on fisheries and aquatic habitat would be like those described for the HSDRRS 2011 work and would be negligible.

4.2.7.2.3 Cumulative Impacts

Cumulatively, valuable aquatic shelter and foraging habitat for fish and prey species have been and would be adversely impacted due to the direct loss of fish habitats resulting from the HSDRRS.

The direct cumulative HSDRRS impacts on fisheries and fish habitat are primarily associated with the actual construction activities, the associated dredge, fill, and material stockpiling activities, water body displacement, and hydrologic modifications of waterways and ecosystems. The indirect cumulative HSDRRS impacts on fisheries and their habitats could include adverse effects on fish migratory movements; active/passive transport of fish eggs and larvae; nursery habitat and recruitment of fish larvae and juveniles; water characteristics and organism access to abiotic water quality habitats (e.g., temperature, salinity, turbidity, and DO); organism access to biotic water quality habitats (e.g., protection from predators and food availability); and hydrology and water velocity.

Indirect cumulative impacts on fisheries could result from changes in hydrology, salinity, DO, and other biotic and abiotic water quality characteristics. CEMVN conducted monitoring to obtain DO and salinity data to assess the long-term cumulative impacts of the Borgne barrier and Seabrook gate complex. The data collected suggested that impacts to DO and salinity were temporal in nature and had no significant impact on fisheries.

The cumulative HSDRRS construction activities would also cause sedimentation and contamination of waterways from stormwater runoff during rain events. Alterations in water quality from sediment loading adversely impact fisheries by lowering DO and increasing water temperature. Additional adverse impacts on fish and other aquatic organisms from sediment suspension and siltation in waters adjacent to the HSDRRS area include clogged gills, reduced growth rates, and disruption of egg and larval development.

Construction-related damages to open water habitats classified as EFH or containing SAV and wetlands habitat will be fully mitigated through formal mitigation planning. Cumulative impacts of HSDRRS projects on fisheries and fish habitat are anticipated to result in minor impacts as previously described within each of the sub-basins.

The cumulative impacts on fisheries and fish habitat would be similar in nature to many of the previously identified impacts occurring within the region's sub-basins and parishes. Those impacts are addressed in the following categories.

Storm Damage Reconstruction

Present and future regional storm damage reconstruction projects would have little to no direct effect on fisheries or fish habitat. Minor indirect adverse impacts from reconstruction project activities could cause sedimentation and contamination of waterways from stormwater runoff during rain events. Alterations in water quality from sediment loading adversely impact fisheries by lowering DO and increasing water temperature. Additional adverse impacts on fish and other aquatic organisms from alterations in water quality (sediment suspension, siltation, and turbidity) in waters adjacent to the regional storm damage reconstruction projects would include clogged gills, reduced growth rates, and disruption of egg and larval development. Potential impacts on fisheries from the regional storm damage reconstruction projects would be minimized through the use of general construction BMPs (reducing potential for indirect adverse effects from soil erosion, runoff, and sediment transport). However, present, and future regional storm damage reconstruction projects are not anticipated to significantly contribute to the cumulative impacts on fisheries or fish habitat and are thus considered minor.

Some storm damage reconstruction projects could result in beneficial impacts on fisheries and fish habitat. Reconstruction of coastal parks and interpretive trails would encourage fisheries education and conservation. Renovation and creation of commercial and public boat launch facilities would provide greater opportunities for fishermen to supply fisheries landing data. These data would be critical to measuring the impacts and recovery of recreational and commercial fisheries in Louisiana waters.

Redevelopment

Most present and future redevelopment projects would occur in urban areas. Some projects would temporarily impact local drainage during construction. Large-scale development projects would have a permanent impact on fisheries when wetlands utilized as fish habitat would be filled, and expansive impervious parking areas potentially constructed. Those activities would require federal permits with impacts being addressed in the accompanying NEPA documents.

Impacts on fisheries could occur from an increase in impervious land use that would result in increased water quality degradation from non-point source pollutants in the local water bodies. These potential impacts on fisheries from the redevelopment projects would be minimized using BMPs (reducing potential for indirect adverse effects from soil erosion, runoff, and sediment transport) and project SWPPPs. Present and future regional redevelopment projects are not anticipated to significantly contribute to the cumulative impacts on fisheries or fish habitat.

Coastal and Wetlands Restoration

Restoration projects improve wetlands quality by collecting and filtering sediment and nutrients, and by reducing soil erosion. In addition, coastal and wetlands restoration projects would increase plant biodiversity and provide improved fish habitat. Coastal and wetlands restoration and creation projects (e.g. CWPPRA) would provide cumulative benefits to fisheries in southeast Louisiana through the creation of habitat and forage areas. The State of Louisiana has initiated a series of programs and projects designed to offset the loss of wetlands and EFH. State and Federal projects are anticipated to slow and reduce the continued loss of wetlands and quality fish habitat within coastal Louisiana.

Flood Risk Reduction Projects

Flood risk reduction projects would contribute to additional loss of fish habitat through the filling of wetlands due to levee and floodwall expansion. Some projects may result in long-term minor beneficial impacts, such as reducing the likelihood of storm surges eroding marsh and converting wetlands into open water. However, in general, the permanent loss of wetlands and fish habitat due to other past, present, and future flood risk reduction projects is a significant impact. Direct and indirect impacts on fisheries and fish habitat from the flood risk reduction projects would typically be minimized using BMPs (reducing potential for indirect adverse effects from soil erosion, runoff, and sediment transport) as described in the project's SWPPP. Present and future regional flood risk reduction projects include the following:

Based on historical anthropogenic activities and land use trends in Louisiana, it is assumed that future flood risk reduction projects would have a cumulative adverse effect on water quality and the availability of quality fish habitat, thus adversely impacting fisheries. Cumulatively, all flood risk reduction projects would contribute to wetlands and fish habitat loss and would adversely impact fisheries nursery grounds, migration, and spawning.

However, once flood risk reduction infrastructure is in place, additional benefits to fisheries from reduced erosion would occur. Long-term effects of flood risk reduction infrastructure would slow the erosion of valuable fish habitat by reducing the potential of marsh fragmentation due to high-energy storm surge. Additionally, flood risk reduction infrastructure would provide for improved operations of the overall system in the region. Flood risk reduction projects in Lake Pontchartrain and Breton Sound would result in lower salinity marshes, which could provide a long-term benefit to fisheries by promoting a higher biodiversity of species that may be able to thrive in the lower salinity environment.

Wetlands loss, hydro-modifications, and water quality impacts from construction activities would affect local and regional fisheries (and prey) species through the direct loss of fish habitat, modification of channels used for larval fish movement, and overall degraded habitat water quality. The cumulative impacts on fisheries and fish habitat resulting from the present and future regional flood risk reduction projects would be considered moderate.

Transportation

Present and future transportation projects in the region are anticipated to have little to no cumulative impacts on fisheries or fish habitat, since most of the projects are proposed for construction in previously disturbed areas. Transportation projects in the area may cause minor indirect impacts on fisheries by increasing the amount of impervious ground surface in the region. This causes an increased rate of flow of stormwater through the system and could cause channel, bed, and bank erosion, as well as scouring of stream banks. Transportation projects, particularly bridge projects, would likely impact fisheries by removing open water habitat. However, rock and fill utilized for transportation projects in and over water bodies may, over time, benefit fisheries by providing additional fish habitat for smaller prey species. The cumulative impacts on fisheries and fish habitat resulting from the present and future regional transportation projects would be considered minor.

4.2.7.2.4 <u>Summary of Cumulative Impacts</u>

Direct cumulative impacts on fisheries and fish habitat are associated with the actual construction activities, the associated dredge, fill, and material stockpiling activities, water body displacement, and hydrologic modifications to waterways and ecosystems. Indirect cumulative impacts on fisheries and their habitats include adverse effects on fish migratory movements, active/passive transport of fish eggs and larvae, nursery habitat and recruitment of fish larvae and juveniles, water characteristics and organism access to abiotic water quality habitats (e.g., temperature, salinity, turbidity, and DO), organism access to biotic water quality habitats (e.g., protection from predictors and food availability), and hydrology and water velocity.

Storm damage reconstruction and transportation projects within the HSDRRS project area are anticipated to result in insignificant cumulative impacts on fisheries or fish habitat, since most of the projects proposed are either limited to upland construction or occur in previously disturbed areas. Flood risk reduction projects often alter existing nearshore habitats and impact interior marshes by impacting the natural processes of hydrology, erosion, subsidence, and saltwater intrusion. Water flow and important fish habitats between the protected side and the flood side of levees often become further fragmented.

Flood risk reduction projects, combined with other regional coastal and marsh restoration projects, would result in fish habitat with greater diversity in structure and interspersion and lower salinity levels. Flood risk reduction projects would also provide beneficial impacts on fish habitat through the reduction of storm surge inundation via increased hurricane protection. Future regional projects also provide opportunities for dredged material from the access channels to be used for marsh rebuilding, and thus fish habitat creation or nourishment.

The cumulative direct and indirect impacts from regional projects that result in the temporary degradation of water quality or the permanent loss of wetlands that serve as quality fish habitat, combined with the current trend of water quality and habitat degradation in southeastern Louisiana, would result in cumulative minor impacts on fisheries and fish habitat within the HSDRRS project area.

4.2.8 ESSENTIAL FISH HABITAT

4.2.8.1 AFFECTED ENVIRONMENT

The Magnuson-Stevens Fishery Conservation and Management Act, which was reauthorized and amended in 1996 by the Sustainable Fisheries Act, requires the eight regional fishery management councils to describe and identify EFH in their respective regions, to specify actions to conserve and enhance that EFH, and to minimize the adverse effects of fishing on EFH. Congress defined EFH as “those waters and substrate necessary to marine fish for spawning, breeding, feeding, or growth to maturity” (P L 94-265, as amended P L 109-479). The Magnuson-Stevens Fishery Conservation and Management Act requires the NMFS to assist the regional fishery management councils in the implementation of EFH in their respective Fishery Management Plans (FMP). The EFH descriptions and identifications for Gulf of Mexico FMPs were approved on February 8, 1999, for 26 selected species and coral complexes. Today the Gulf of Mexico Fisheries Management Council (GMFMC) manages EFH for 28 species of marine fish and invertebrates within their respective FMPs.

Much of the HSDRRS project area is surrounded by brackish estuary systems that are designated as EFH. Aquatic organisms that inhabit this highly diverse ecosystem are generally tolerant of a wide range of salinities. The landward boundary of estuarine EFH is the limit of permanent freshwater bottom and the seaward limits are the terminus of the U.S. exclusive economic zone. EFH includes all waters and habitats or substrates within these estuarine boundaries. The habitats are water bodies where Federally managed fish, and the organisms they prey upon, live during the various stages of their life history. Specific categories of EFH include all estuarine waters and their mud, sand, shell, and rock substrate. Artificial reefs, oyster beds, and the associated biological communities, SAV, and adjacent intertidal vegetation (marshes and mangroves) are considered EFH. The EFH designation does not generally extend into the freshwater portions of rivers discharging to the estuarine system (GMFMC 1998). Vegetated areas are emphasized because of their importance to fish production and because of their vulnerability to human’s activities. Marsh, oyster shell, SAV, and unvegetated bottom habitats that constitute EFH are found in the HSDRRS project area. Table 4-16 presents a list of water bodies designated as EFH located in the project area.

Table 4-18: EFH Designated Water Bodies in the Project Area

Flood Side of Levee	Protected Side of Levee
Bayou Verret	Bayou Bienvenue*
Bayou Segnette	Violet Canal
GIWW	Terre Beau Bayou
MRGO	Pirogue Bayou
IHNC	Bayou Dupre*
Lake Pontchartrain	Bushman Bayou

Lake Borgne	Bayou Sauvage*
Lake Cataouatche	Bayou LaBranche

*Portions of this water body occur on both sides of the levee

The affected environment was adequately described in the CED phase I and has not appreciably changed. However, additional artificial reefs have been added in Lake Pontchartrain since the CED Phase I was released in 2013. The location of the reefs is listed in Table 4-17 below prepared by the Louisiana Department of Wildlife and Fisheries in March 2013.

Table 4-19: Louisiana Artificial Reef Program Inshore Reefs

Reef Site Name	Water Body	Donor/Partner	Structure	Latitude/Longitude NAD83	
Lake Front	Lake Pontchartrain	Lake Pontchartrain Basin Foundation	Limestone	30˚ 03.521’	89˚ 59.608’
Orleans	Lake Pontchartrain	Lake Pontchartrain Basin Foundation	Reef Balls	30˚ 07.455’	90˚ 04.703’
South Twin Span	Lake Pontchartrain	NOAA Disaster Grant, DOTD, & CCA	Bridge Rubble	30˚ 10.169’	89˚ 50.744’
North Shore	Lake Pontchartrain	Lake Pontchartrain Basin Foundation	Reef Balls	30˚ 16.296’	90˚ 03.753’
North Twin Span	Lake Pontchartrain	NOAA Disaster Grant, DOTD, & CCA	Bridge Rubble	30˚ 11.618’	89˚ 50.219’
St. Tammany (east)	Lake Pontchartrain	Lake Pontchartrain Basin Foundation	Reef Balls	30˚ 13.456’	89˚ 56.838’
St. Tammany (west)	Lake Pontchartrain	Lake Pontchartrain Basin Foundation	Reef Balls	30˚ 18.348’	90˚ 09.000’
St. Tammany Pier	Lake Pontchartrain	Coastal Conservation Association	Bridge Rubble	30˚ 12.408’	89˚ 48.961’
St. Charles	Lake Pontchartrain	Lake Pontchartrain Basin Foundation	Reef Balls	30˚ 08.077’	90˚ 19.048’

LDWF, March 25, 2013
Source: http://www.wlf.louisiana.gov/sites/default/files/pdf/page_fishing/32430-Artificial%20Reef%20Program/ldwf_inshore_reefs.pdf

4.1.5.1 Environmental Consequences

4.1.5.1.1 HSDRRS Construction Impacts

A general discussion of impacts on essential fish habitat (EFH) resulting from construction activities; associated dredge, fill, and material stockpiling activities; water body displacement; and/or hydrologic modifications of waterways and ecosystems within the HSDRRS area was included in the CED Phase I and is incorporated here by reference. A quantitative summary of the adverse impacts on EFH associated with the HSDRRS activities is listed for each sub-basin in table 4-18. In order to minimize impacts on EFH, the USACE implemented mitigation efforts that are similar to those that were implemented for fisheries impacts, and which are discussed in section 5.0. HSDRRS impacts on EFH which have occurred are discussed below.

St. Charles - The forested wetland areas adjacent to the project area are hydrologically connected to the EFH of the Lake Pontchartrain Estuary. However, the wetlands areas (primarily cypress swamp) that were affected by the HSDRRS action were not likely to be suitable habitat for any of the Lake Pontchartrain estuary-managed species (shrimp and red drum) and impacts from the project on EFH of Lake Pontchartrain were unlikely. Therefore, EFH was not evaluated further as a potentially impacted resource (IER #1, 1a, 1b).

Jefferson East Bank - EFH impact discussions were based on projects captured in IERs #2, #3, IERS #2, IERS #3, and IERS #3.a. Permanent impacts on EFH were moderate. Construction of the floodwall along the new alignment for LPV-03a and -03c impacted 3 acres of aquatic habitat (open water and water bottom) and resulted in mortality of the immobile and less motile species in the filled area.

Approximately 34 acres of high-quality wetlands habitat were impacted by the floodwall realignment near the airport. These wetlands are designated EFH (IER Supplemental #2). Temporary dredging impacts for access impacted up to 59 acres of soft bottom EFH. This access canal was filled upon completion of the project.

Impacts from construction activities on sessile benthic populations, such as rangia clams, were short-term, lasting approximately 2 to 2.5 years in duration, with turbidity effects potentially lasting up to several months after construction completion. The existing aquatic and wetlands habitat destroyed were replaced by mostly hard rock surfaces that are suitable for colonization by periphyton and other sessile organisms. This new habitat provided protective cover for various species of shellfish and finfish, providing a more productive aquatic community.

Construction activities related to LPV-13 occurred entirely within the existing alignment and were set back from the shoreline of Lake Pontchartrain. No EFH was permanently impacted by these construction activities.

A total of 61 acres of permanent impacts on lake bottom along LPV-00, -01, -02, -19, and -20 occurred from the placement of wave attenuation berms and foreshore protection.Approximately 200 acres of temporary impacts were associated with the dredging of access canals and placement of the foreshore protection. The dredging temporarily displaced and possibly destroyed the benthic organisms (including clams). Turbidity resulting from dredging and construction was temporary in nature. Most motile species likely avoided the areas temporarily impacted by dredging, as well as shoreline areas that were permanently lost due to filling. Impacts on less motile benthic species from these activities likely occurred, but were short-term, approximately 1.5 years lasting until the areas stabilized (IER Supplemental #3.a).

EFH that was destroyed during construction was replaced by earthen fill and a rocky foreshore suitable for colonization by periphyton and sessile organisms. Thus, the construction created new habitat that was uncommon in Lake Pontchartrain and potentially more productive than the more common mud bottoms.

Additional lake bottom (3.5 acres) was impacted at LPV-09 and LPV-12 with the placement of additional rock armoring. The EFH removed as a result of this additional armoring was a very small area relative to the extent of similar habitat within Lake Pontchartrain (IER Supplemental #3.a).

Temporary impacts on lake bottom, totaling 10.5 acres, were associated with dredging for barge access and stockpiling along LPV-17. Turbidity curtains were used to minimize impacts on water quality and marine organisms during construction. All materials were removed during creation of the access channels and returned to their original location upon project completion. The disturbance and loss of lake bottom from construction activities affected EFH through the direct loss of fish habitat. Impacts on E t Bank sub-basin projects were permanent and moderate.

Orleans East Bank - Much of the construction activity occurred on developed land within the Orleans East Bank sub- basin and did not directly impact EFH (IER #27). Permanent minor impacts on EFH occurred from fill of open water and increased impermeable surfaces. For LPV-101, LPV-103, and LPV- 104, impacts on EFH were indirect and temporary due to construction-related increased turbidity associated with stormwater runoff from staging areas. Once construction was completed, it was likely that EFH returned to pre-construction abundance. No impacts on EFH occurred with construction along LPV-102 (IER #4).

Temporary impacts on water turbidity, DO, and BOD during construction and storm events had the potential to temporarily displace fish species. Approximately 3.3 acres of open water/mud bottom habitat in Lake Pontchartrain would be lost with the construction of breakwaters at the mouth of the 17th Street and Orleans Avenue canals (IER #5). However, these breakwaters potentially would result in a beneficial indirect impact by providing substrate for sessile organisms that provide food for other aquatic species. Therefore, impacts on EFH as a result of East Bank sub-basin projects were negligible.

New Orleans East - The construction of a new floodgate, floodwalls, and levee along LPV-105, LPV-106, and LPV- 107 resulted in temporary increases in suspended sediments discharged to adjacent water bodies during construction activities and minor permanent impacts. Once construction was completed, these temporary impacts were eliminated. The artificial reef located 3 miles offshore of the project area was not impacted by construction activities (IER #6).

Along LPV-109, 101 acres of wetlands, mostly intertidal marsh, on the flood side of the levee were permanently lost. The increase in the levee footprint along LPV-111 directly impacted EFH through the loss of approximately 5 acres of brackish marsh on the flood side of LPV-111. Dewatering of the discharge basin at Pump Station No. 15 temporarily impacted 0.4 acre of EFH. Several of the less motile Federally managed species occurring in the GIWW, such as shrimp, were directly impacted by dewatering activities through mortality. Other more motile species were likely not directly affected; however, their habitat, such as water bottom and marsh interface, and some of their prey species had the potential to be directly affected by increased ity during dewatering activities (IER #7).

Table 4-20: Construction Activity and Impacts on EFH*

Sub-basin	IER#***	Activity	EFH	Summary of Impact
St. Charles	1, 1a,1b	The St. Charles sub-basin and associated IERs are not located near EFH; therefore, construction activities related to the HSDRRS activity did not impact EFH.		
Jefferson East Bank	2, 2a, 3, 3a,	Dredging activities, levee expansion, and construction stormwater runoff	SAV, emergent marsh, unconsolidated water bottom, shell and soft bottom	• Levee realignment permanently impacted 100 acres of lake bottom and brackish marsh. • Dredging and materials stockpiling • permanently impacted 61 acres of lake bottom and another 200 acres of lake bottom • experienced temporary minor impacts from dredging and material stockpiling. • Temporary impacts on EFH occurred from • construction activities.
Orleans East Bank	4, 5, 5a, 27, 27a, EAs 496 and 306c	Construction stormwater runoff, levee expansion	SAV, emergent marsh, unconsolidated water bottom, shell and soft bottom	• Breakwater construction would permanently impact 3.3 acres of lake bottom and brackish marsh. • Temporary impacts on EFH occurred from construction activities.
New Orleans East	6, S 6, 7, S 7 11 Tier 2 Borgne, 11 S Tier 2 Borgne, 11 Tier 2 Pontchartrain, 11b, 11c, 11d, 18, 19, 25, 29	Hydro-modification, levee expansion, dredging activities, construction stormwater runoff, impervious surfaces	SAV, Rangia clams, oyster reefs, emergent marsh, unconsolidated water bottom, shell and soft bottom	• Levee realignment and Borgne barrier permanently impacted 374 acres of lake bottom and brackish marsh. • Dredging and materials stockpiling temporarily impacted 178 acres** of lake bottom. • Temporary impacts on EFH occurred from construction activities. • 10.15 acres of small open water ponds would be affected. • Longer IHNC closure
Chalmette Loop	8, 9, 10, 10a 18, 19, 28, 30, EA 526	Construction stormwater runoff and levee expansion	Emergent marsh, unconsolidated water bottom, shell and soft bottom	• Levee realignment permanently impacted 195.3 acres of water bottom and brackish marsh. • Temporary impacts on EFH occurred from construction activities. • Seepage repair impacted 0.25 acres of EFH

LPV and WBV	PIER #36, PIER 36 TIER 1, PIER #36 SIER 1, EA #546, SPIER 36 S1, PIER #37, PIER #37 TIER 1 SPIER #37a SEA 548 of TIER 1	Mitigation	SAV, emergent marsh, unconsolidated water bottom, shell and soft bottom	• The New Zydeco Ridge (NZR) project WVA assessed a loss of approximately 21.2 AAHUs of EFH, therefore, 66.25 acres south of the BLH-Wet restoration footprint would be restored to intermediate/brackish marsh habitat • Milton Island fills 152 acres and impacts a 115-acre borrow source for fill material in Lake Pontchartrain. • Dufrene Ponds would lower 927 acres of lake water bottom from an elevation of -8 feet to -20 feet but would continue to provide EFH. It would also convert approximately 573 acres of EFH to uplands • Plaquemines Option 2 230 acres of Mississippi River water bottom would be deepened to an elevation of -85 feet but would continue to provide EFH. • Jean Lafitte projects would permanently replace open water with approx. 88 acres of new marsh in Yankee Pond (JL1B5) and impact 50.4 acres of existing marsh enhanced to provide greater fisheries access at the geocrib (JL15). Approximately 42 acres of Lake Cataouatche water bottom would be deepened by an average of 10 ft for borrow acquisition. Negative impacts to this existing EFH would be offset by the creation estuarine emergent wetlands since the support functions of the created marsh is greater than the support functions of the existing open water. Excavation of borrow from Lake Salvador would deepen estuarine water column and may expose a different bottom substrate.
Belle Chasse	13, 18, 22, 30	The Belle Chasse sub-basin and associated IERs are not located near EFH; therefore, construction activities related to the HSDRRS activity did not impact EFH.		
Gretna-Algiers	12, 12 S	The Gretna-Algiers sub-basin and associated IERs are not located near EFH; therefore, construction activities related to the HSDRRS activity did not impact EFH.		

Harvey-Westwego	14, S 14.a	The Harvey-Westwego sub-basin and associated IERs are not located near EFH; therefore, construction activities related to the HSDRRS activity did not impact EFH.
Lake Cataouatche	15, 16, S 16.a, 17, 18, 22, 25, 26, 28	The Lake Cataouatche sub-basin and associated IERs are not located near EFH; therefore, construction activities related to the HSDRRS activity did not impact EFH.
Areas Outside of the HSDRRS Sub-basins	18, 19, 22, 23, 25, 26, 28, 29, 30, 31, 32	HDSRRS borrow areas outside of the sub-basins are not located near EFH; therefore, activities related to these IERs did not impact EFH.
WBV and Mississippi River Co-Located Levees	33, 33a	No impacts to EFH resources are expected as a result of the construction activities at the Walker Road borrow complex or staging/work areas.

* The impact values shown are from the final IERs – final compensatory mitigation values are shown in appendix N.

** IERs #6 and 7 dredging work (178 acres of impacts) did not occur for the HSDRRS 2011 but would potentially occur with the HSDRRS 2057 work.

***S – Supplemental

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The temporary increase in suspended solids due to dredging potentially had temporary impacts on SAV due to the decrease in light penetration. In addition, dredging can suspend fertilizers and pesticides associated with sediments. These elements are detrimental to the managed species, as well as their prey species. Dredging disturbs benthic organisms such as rangia clams by direct removal or by burying them with sediments. Due to the high salinities in the project area, the rangia clam populations along this project reach were small and impacts were minor.

The additional raising and relocation of pump stations at LPV-109 and LPV-111, along with provisions for temporary pumps during construction, resulted in direct impacts on wetlands and waters of the U.S., which indirectly impacted EFH by further reducing the availability of habitat for fish prey items, potential spawning sites, and areas for juvenile fish to hide from predators (IER Supplemental #7). USFWS determined that the levee construction and upgrades associated with LPV-109 and LPV-111 levee reaches directly impacted an additional 119 acres of fresh/intermediate marsh and 126 acres of brackish marsh (EFH) (FWCAR-IER #7).

Construction and installation of a sector gate and two vertical lift gates in the IHNC resulted in temporary impacts on 2.5 acres of open water in the vicinity of the project area during construction, and 6.9 acres of open water and water bottoms (EFH) in the IHNC were permanently lost to the new structures and associated ROW (IER #11 Tier 2 Pontchartrain).

Construction resulted in the loss of deep-water habitat; however, there were potential beneficial impacts related to improved DO concentrations in the scour hole. Permanent impacts occurred due to changes in hydrology (salinity, DO, and velocity) and potential negative impacts on larval fish recruitment due to the Borgne barrier and the GIWW gate. USACE’s ERDC predicted bottom DO levels will fall below the 4.0 mg/l standard with the HSDRRS structures in place (USACE 2008n); however, DO levels are historically seasonally low in the IHNC, GIWW, and MRGO proximate to the structures. ERDC further predicted that the salinity of ambient waters will be several parts per thousand lower with the HSDRRS structures in place. Salinity and DO are being monitored by CEMVN, and those data are presented in appendix G. Final results of the monitoring effort are anticipated to be completed in 2013. The purpose of IER Supplement 11d was to assess the closure of the IHNC for longer than addressed in IER 11 Tier 2 Pontchartrain. The extended closure of the IHNC conduit to Lake Pontchartrain caused positive and negative impacts to EFH including breeding, transport/migration, and growth to maturity. The constructed action did not have any direct impacts to submerged aquatic vegetation (SAV), but the 12-month extended closure of the IHNC could have shown impacts to the life cycles to certain aquatic species for an additional breeding season.

The Borgne barrier crossed the GIWW, Bayou Bienvenue, the deauthorized MRGO, and the Golden Triangle marsh. Direct impacts on EFH occurred due to changes in estuarine substrate, including sand/shell, mud bottom, and open water within the footprints of the floodwall and other structures. Approximately 125.3 acres of wetlands and open water (bottoms and water surface area) were permanently impacted by the construction of the floodwall/gated system.

However, beneficial use of the project-related dredge material could enhance 205 acres of open water east of the site (IER #11 Tier 2 Borgne). Analysis of pre- and post-placement aerial photography showed a net gain of approximately 14 acres of emergent marsh within the beneficial use area.

Construction of the Borgne barrier across the Golden Triangle marsh and associated waterways adversely impacted EFH by fragmentation of the emergent marsh habitat and altering natural hydrologic sheet flow, sedimentation processes, and recruitment and migration of important estuarine aquatic species needed to sustain the fisheries food web. Incidental mortality of some fishes and aquatic/benthic species likely occurred from burial during dredging and placement of disposal material. However, four 48-inch culverts within the Bayou Bienvenue cofferdam were installed during construction of the gate structure to allow for hydrologic exchange. Most of the more motile Federally managed species were expected to relocate until construction activities were complete. USFWS determined that the floodwall and other structures directly impacted 77 acres of fresh/intermediate marsh and 45 acres of brackish marsh (FWCAR-IER #11).

As described previously in section 4.2.5.2.1, hydrologic modeling predicted that surface velocities in the MRGO and the GIWW were expected to have minor increases, and those velocity increases were restricted to areas within and near the new structures (USACE 2010d).

During very infrequent events, such as the combination of a strong spring tide and a frontal passage, velocities in Bayou Bienvenue at the new structure are estimated to be greater than 2.6 ft/s, which can inhibit fish passage while causing greater adverse impacts on less motile species. However, these velocities would rarely occur in the structure, have been determined to be manageable for fish greater than 50 millimeters in length (USACE 2008u), and have only a minor long-term impact on EFH. Prior to HSDRRS construction, in tidal passes such as the Rigolets, Chef Menteur, or Seabrook, velocities greater than 2.6 ft/second regularly occurred during tidal exchange (USACE 2010l, USACE 2008u, USACE 2010g). Further, a particle transport model that analyzed the movement of particles that were assigned larval fish behavior characteristics determined that the completion of construction of the Seabrook gate complex and Borgne barrier would have a minor impact on larval fish recruitment in Lake Pontchartrain (USACE 2010l).

Habitat loss, hydro-modifications, and water quality impacts from construction activities affected local and regional fisheries (and prey) species through the direct loss of EFH, modification of fish navigation, and changes to the salinity profiles of the waterways. These impacts on EFH as a result of the New Orleans East sub-basin projects were moderate and permanent.

<u>Chalmette Loop</u> - Moderate permanent impacts occurred on EFH; EFH impact discussions within the Chalmette Loop sub-basin were based on the HSDRRS projects

captured in IERs #8, #9, and #10. Construction of a new flood control structure with steel sector gates and floodwall tie-ins, constructed on the flood side of and adjacent to the existing structure, resulted in impacts on EFH within the Chalmette Loop sub-basin. Up to 2 acres of aquatic habitat in Bayou Dupre was disturbed during construction, and approximately 0.3 acre was permanently occupied post- construction. During construction, reduced tidal exchanges likely occurred over 40,000 acres of marsh and open water habitat (FWCAR-IER #8). Alterations in water quality from sediment loading associated with construction adversely impacts EFH by lowering DO and increasing water temperature. Connectivity was maintained during cofferdam construction and use between Bayou Dupre and the Central Wetlands Area, and managed species were not expected to be adversely impacted (IER #8).

Construction within the Caernarvon Canal resulted in up to 0.3 acre of EFH (canal bottom) lost post-construction (IER #9).

Additional construction within the Chalmette Loop sub-basin included a T-wall on top of existing levee reaches (LPV-145, 146, and 148) and the Bayou Road floodgate (LPV-147). These construction projects resulted in an estimated loss of 42 acres of EFH (open water habitat) (IER #10).

Indirect impacts on EFH and EFH species likely occurred during construction due to changes in water characteristics. Stormwater runoff potentially resulted in increased nutrient loads or sedimentation to aquatic systems, depending on the types and concentrations of constituents associated with the suspended materials. In addition, resuspension of soil particles increased turbidity, resulting in impacts on both sessile and motile aquatic species. Settling of soil particles over existing bottom sediments (if significant) potentially resulted in minor loss of habitat for sessile species of invertebrates and plants and also disrupted oxygen transport mechanisms for many species. Effects, such as those from construction activities, were minimized by the use of BMPs to control sediment transport.

Construction activities resulted in the loss of EFH, the majority of which was open water habitat. This habitat is abundant in the project area, and t permanent, as a result of the Chalmette Loop sub-basin projects.

Construction of the repairs to fix the seepage issue at two pump stations on the Non-Federal back levee in St. Bernard as described in EA #526 had direct impacts on 0.2 acres of EFH, which was enclosed within cofferdams during the 12-month construction period; EFH surrounding the project areas experienced temporary, localized and minor impacts during the construction period. The construction occurred within the existing ROW of the non-Federal back levee or adjacent to the pump station discharge basin and required the excavation and re-filling of approximately 0.2 acres of shallow (< 2 ft) open water habitat for replacement of existing discharge pipes and rock riprap located within Pump Station (PS) #2 and PS #3 ROW. There were permanent impacts to 0.2 acres EFH and EFH species as the result of project construction. The cofferdams temporarily blocked hydrologic exchange and access of EFH species to these areas of the PS #2 and PS #3 discharge basins. In addition, approximately 0.05 acres of fringe fresh/intermediate marsh and shrub habitat located at the shoreline and unmaintained levee toe was temporarily impacted by the seepage repair. No SAV is present in the project area and therefore was not be impacted. Floating vegetation was temporarily dispersed and colonized surrounding ponds outside the cofferdam during construction. The amount and quality of EFH within the discharge basins that may be temporarily impacted represents a negligible amount of the extensive, similar or higher-quality estuarine habitat in the CWA.

In total, the seepage repair impacted approximately 0.25 acres of EFH. The area of the replacement levee toe is not regularly mowed/maintained, therefore, after construction similar species re-vegetated. Therefore, no permanent impacts to this 0.05 acres of fringe wetland vegetation on the levee occurred. The re-establishment of this vegetated edge provides for replacement of the EFH lost and should help to protect the flood side levee toe and discharge pipes from future erosion. Once the seepage repairs were completed, PS #2 and PS #3, operate for storm and rain events and pump fresh storm water into the discharge basin and the CWA. Construction within the pump station discharge basins, as well as in adjacent levee/upland areas, may have caused indirect impacts such as increases in nutrient loads, turbidity and sedimentation within the EFH of the CWA, however a Stormwater Pollution Prevention Plan (SWPP) was in place and followed. Thus, reducing significant concentrations of nutrients or sediments that can cause decreases in survival, growth and reproduction of aquatic organisms receiving sufficient exposure. Construction-related runoff and erosion of soil into the discharge basins was prevented or minimized through implementation of BMPs and a SWPPP, which minimized the potential for indirect impacts from construction on EFH. The area of impaired habitat was negligible when compared to the remaining similar habitat in the CWA and these indirect impacts were temporary or short-term. Most organisms relocated from areas with unfavorable conditions until construction activities were complete.

Potential cumulative impacts on EFH and EFH species within the CWA from the constructed action involved the combined effects from the HSDRRS specifically the Chalmette Loop levee/T-wall, CWPPRA projects, wetland restoration and shoreline protection; the Violet freshwater diversion project; MRGO deep-draft deauthorization; and local community wetland restoration projects which could reduce potential adverse cumulative impacts by positively affecting the EFH within and around CWA. While restoration projects would help to offset habitat loss, the combined effects of other projects; specifically, the closure of the MRGO at Bayou La Loutre, and the Violet Diversion will result in altered hydrology resulting in freshening water characteristics of the CWA. This could lead to long term cumulative impacts to EFH and EFH species throughout the area. Once PS #2 and PS #3 came online with the other PS in St. Bernard Parish, EFH was impacted by the infrequent, relatively short-term pumping during storm and rain events as the PSs function as designed. Species utilizing the EFH in the project area would be unlikely to be directly impacted by the pumping because mobile species would most likely vacate the area, sessile species if present, may be more directly affected, but should adapt to these conditions given the area is the discharge basin of a pump station.

Belle Chasse - The Gulf of Mexico Fishery Management Council lists the brown shrimp and white shrimp as being potentially found within the Mississippi River estuary downstream from, but not within the project area during their juvenile life stage (NOAA, 2009). Specific categories of EFH downstream from the project area include estuarine water column, non-vegetated, mud substrates, and intertidal wetlands.

Adjacent fish and wildlife resources, including EFH adjacent to the existing Mississippi River Levee (MRL), could have been temporarily indirectly affected as a result of the construction activities if sediment-laden runoff from active construction areas flowed into adjacent habitat. With best management practices (e.g., silt fencing) in place during construction, the indirect effects fish and wildlife were isolated to the immediate vicinity of active construction and were of short duration. No impacts to EFH resources are expected as a result of the construction activities at the Walker Road borrow complex or staging/work areas.

Gretna-Algiers, Harvey-Westwego and Lake Cataouatche - No impacts to Fisheries or EFH identified within these sub-basins.

Impacts from Borrow Within and Outside the HSDRRS - Overall, no impacts on EFH occurred from excavating material from HSDRRS borrow sites.

Mitigation - PIER 36 and its supplements evaluate the comprehensive mitigation plan developed to compensate for impacts to habitat resulting from the LPV HSDRRS. PIER 37 and its supplements evaluated the comprehensive mitigation plan developed to compensate for impacts to habitat resulting from the WBV HSDRRS.

Purchasing of mitigation bank credits are part of the mitigation plan in both LPV and WBV. Since the purchase of mitigation bank credits occurred at an existing approved bank and since permitted banks exist as reasonably foreseeable projects in the FWOP conditions, no new direct, indirect or cumulative impacts to EFH were incurred from the purchase of these credits for the HSDRRS mitigation.

PIER #36, TIER 1 (Milton Island) - The Milton Island mitigation project is located within an area identified as EFH for post larval/juvenile brown shrimp, white shrimp, and red drum and adult red drum. The 2005 generic amendment of the Fishery Management Plan (FMP) for the Gulf of Mexico, prepared by the Gulf of Mexico FMC, identifies EFH in the project area to be estuarine intertidal wetlands, submerged aquatic vegetation, estuarine water column, and mud substrates.

The existing EFH at the marsh restoration site includes estuarine water bottom, estuarine water column, and submerged aquatic vegetation. These habitats would be largely converted to another type of EFH – estuarine intertidal herbaceous wetlands (marsh). Benthic resources within the borrow site will be lost until they can re-colonize the borrow area which should take no more than a year or so following project construction. The borrow area will not be excavated more than 10 feet below the adjacent lake bottom thereby minimizing the possibility of anoxic conditions forming.

Fisheries access to the marsh mitigation area would be extremely limited during the initial 3-5 years of the project life while the pumped-in sediments are dewatering and subside. This area was once a functional marsh system that provided nursery and feeding habitat to local fisheries. Over time, the project would result in a net gain of functional marsh and associated shallow water habitat thereby accomplishing the required level of mitigation and offsetting adverse impacts to certain categories of EFH.

The net gain in habitat value is realized only when the mitigation project is considered in isolation from the overall impacts of the LPV HSDRRS project. The adverse impacts to EFH that result from the construction may affect, but should not adversely affect, managed species considering the small acreage involved relative to Lake Pontchartrain, plus the project provides long-term benefit to the managed species by providing intertidal wetlands, a valuable type of essential fish habitat.

Indirect impacts to managed species include increased turbidity and disturbance of Lake Pontchartrain in the vicinity of the borrow area. These species may be temporarily displaced. Cumulative impacts to fresh and intermediate marsh EFH resulting from construction of the LPV HSDRRS were considered and found to be adequately offset by the resulting increase in habitat quality from the mitigation construction. The project was designed to improve to EFH habitat to offset adverse impacts to fresh and intermediate marsh EFH and open water designated as essential fish habitat from the LPV HSDRRS construction projects as well as the construction of this proposed mitigation project. The other LPV HSDRRS mitigation projects recommended in PIER 36 was evaluated and found to have inconsequential cumulative impacts to EFH as the overall objective of the LPV HSDRRS mitigation is to achieve a minimum of no net loss of EFH within the Lake Pontchartrain Basin. No additional Corps activities that would impact similar open water EFH were identified in the project vicinity.

<u>Supplement to PIER #36 (Supersedes PIER #36)</u> - The project is located within the area identified above in PIER #36 TIER 1 as EFH. To mitigate for the permanent impacts to approximately 159 acres of EFH from construction of the New Zydeco Ridge (NZR) project, a WVA was conducted to determine the habitat unit loss from conversion of open water and submerged aquatic vegetation to non-tidally influenced BLH-Wetland habitat. The WVA assessed a loss of approximately 21.2 AAHUs of EFH, therefore, approximately 66.25 acres south of the BLH-Wet restoration footprint would be restored to intermediate/brackish marsh habitat (mitigation potential of 0.32 AAHU/acre) on the refuge where the impacts occurred (first priority of the USFWS). The NZR marsh feature would fully compensate for the unavoidable impacts to EFH by converting relatively low quality shallow open water found in abundance in Lake Pontchartrain to emergent intermediate/brackish marsh habitat (also a type of EFH).

The adverse impacts to EFH that would result from the NZR mitigation project may affect, but should not adversely affect, managed species considering the small acreage utilized for borrow activities relative to the size of Lake Pontchartrain, plus the project would provide long-term benefit to the managed species by providing intertidal wetlands, a valuable type of EFH. This conversion of shallow open water to intermediate/brackish marsh EFH would offset the loss of open water EFH by the creation of 66.25 acres of brackish marsh adjacent to the BLH-Wet creation area. To address USFWS/NMFS(?) concerns, water quality monitoring within the borrow areas would be conducted from March through November for a minimum of three years post dredging to verify the conductance, temperature, dissolved oxygen, and pH from the bottom to surface in five feet profiles. Samples would be collected monthly during March, April. September, October, November. During the hotter months of May, June, July and August, sampling should be conducted every two weeks

PIER #37: Bayou Segnette Protected Side (PS) BLH-Dry & BLH-Wet Enhancement Project - There would be no impacts to EFH.

Dufrene Ponds PS BLH-Wet Restoration Project - This project would directly and permanently convert approximately 573 acres of coastal migratory pelagic, red drum, reef fish, and shrimp EFH to uplands. Compensatory mitigation for these losses of EFH would be required per the draft guidelines for when impacts to open water would require mitigation. Approximately 927 acres of lake water bottom would go from an elevation of -8 feet to -20 feet but would continue to provide EFH for multiple managed species.

There could be a temporary indirect impact to EFH due to increases in turbidity and increased sedimentation rates adjacent to the placement and dredge area. These areas would return to normal once the construction ends. There would be an overall loss of EFH in the WBV basin, but no permanent cumulative impacts are anticipated because of the required mitigation.

Hwy 307 PS BLH-Dry & BLH-Wet Restoration Project - There would be no impacts to EFH.

Plaquemines Option 2 PS BLH-Wet Restoration Project - There would be no direct impacts to EFH at the placement site due to the construction of this project since the area does not contain EFH. Approximately 230 acres of Mississippi River water bottom would be deepened to an elevation of -85 feet but would continue to provide EFH for multiple managed species.

There could be a short-term indirect impact to EFH due to temporary increases in turbidity and increased sedimentation rates adjacent to the placement area. These areas would return to normal once the construction ends. There would be a minor temporal loss of EFH in the WBV basin, but no permanent cumulative impacts are anticipated.

PIER #37, TIER 1 (Supersedes PIER #37 for Activities on Park Service Property) - Of the WBV Jean Lafitte mitigation projects only the JL1B5 and JL1B4 projects and their borrow area were identified as EFH for coastal migratory pelagic, red drum, reef fish, and shrimp. Several types of EFH associated with open water would be permanently replaced with estuarine emergent marsh and other associated EFH. Negative impacts to the existing EFH would be more than offset by the creation estuarine emergent wetlands since the support functions of the created marsh is greater than the support functions of the existing open water. Excavation of borrow from Lake Salvador would deepen estuarine water column and may expose a different bottom substrate, which could impact managed species by reducing available cover and foraging habitat. Though the JL15 project area is not considered EFH, with the addition of fish dips in the existing dike and with future subsidence of the area, it would become EFH over time. No impacts to EFH would be incurred from the construction of the swamp (JL7) and BLH-Wet (JL14A) projects.

4.2.8.1.1 HSDRRS 2057 Impacts

Temporary EFH impacts from future construction would include damage to SAV, adjacent marsh vegetation utilized as EFH, disturbance to sediments, and increased turbidity and sedimentation in and adjacent to EFH. After construction, the habitats would stabilize, allowing for suspended sediments to settle and vegetation to recolonize the area, and permanent impacts on EFH would be minor. Construction-related impacts would also affect other habitats utilized by fisheries, including lake bottoms, canal bottoms, drainage waterways, and open water. Direct impacts from dredging would be minor and include increased turbidity during dredging, disruption of water bottoms from access channels and material stockpiles, and destruction of SAV.

The removal of EFH associated with expanded ROW construction, if necessary, for HSDRRS levee lifts would be detrimental to managed species that depend on open water, edge, and shallow habitat for survival. Impacts would likely result from increased turbidity on the wetlands and open water areas surrounding the project area. However, it is assumed that resident motile organisms would attempt to avoid construction activities and seek refuge in adjacent and suitable habitat. Likewise, impacts on EFH from the expanded ROW construction activities would be minimized using BMPs (reducing potential for indirect adverse effects from soil erosion, runoff, and sediment transport) as described in the project's SWPPP.

The future impacts from foreshore protection detailed in IERs #6 and #7 did not occur, as the foreshore protection was not performed for completed HSDRRS construction but may be done in the future (through year 2057). Construction activities associated with raising foreshore protection along LPV-105, LPV-106, and LPV-107 would temporarily impact approximately 61.1 acres of lake bottom for construction of temporary access channels. These channels would be refilled to their prior grade following the completion of the project. This impact would cause a temporary loss of forage habitat for finfish and shrimp, and permanently impact 4 acres of marsh habitat, causing a permanent loss of EFH (FWCAR-IER #6).

Dredging of access channels and placement of foreshore protection along LPV-108 in Lake Pontchartrain would disturb 118.1 acres of lake bottom and permanently impact 7.2 acres of shallow lake bottom habitat (IER #7). Several of the less motile Federally managed species occurring in Lake Pontchartrain, such as shrimp, would have the potential to be directly impacted by dredging activities through the loss of individuals. Dredging activities frequently result in anoxic conditions around a site; however, some of the managed species, such as red drum, are capable of navigating away from these areas. These species have the potential to be impacted by the loss of habitat, such as SAV, as some of their prey species would potentially not be motile enough to avoid direct impacts. Temporary access canals would be filled in to previously existing grade upon completion of the project. This would allow for recolonization by SAV and benthic organisms.

4.2.8.1.2 <u>Cumulative Impacts</u>

Cumulatively, valuable aquatic shelter and foraging habitat for managed species and their prey species have and will be adversely impacted due to the direct loss of EFH as a result of the HSDRRS. The direct cumulative HSDRRS impacts on EFH are minor due to the abundance of EFH in the region and the amount of EFH beneficial mitigation to be constructed. The impacts identified are associated with construction such as dredge, fill, and material stockpiling activities, water body displacement, and hydrologic modifications of waterways and ecosystems. Floodgate operations could alter the hydrology within marshes, adversely impacting plant health and thereby reducing available fish habitat, forage, and nursery habitat. The indirect cumulative HSDRRS impacts on EFH include adverse effects on fish migratory movements; active/passive transport of fish eggs and larvae; nursery habitat and recruitment of fish larvae and juveniles; water characteristics and organism access to abiotic water quality habitats (e.g., temperature, salinity, turbidity, and DO); organism access to biotic water quality habitats (e.g., protection from predictors and food availability); and hydrology and water velocity.

The cumulative construction activities are projected to cause sedimentation and contamination of waterways from stormwater runoff during rain events. Alterations in water quality from sediment loading adversely impact fisheries by lowering DO and increasing water temperature. Additional adverse impacts on fish and other aquatic organisms from sediment suspension and siltation in waters adjacent to the HSDRRS area include clogged gills, reduced growth rates, and disruption of egg and larval development.

The mitigation proposed in PIER 36 and PIER 37 was designed to offset the damages to EFH from HSDRRS. The proposed mitigation plans will be fully implemented over the coming years.

Storm Damage Reconstruction

Present and future regional storm damage reconstruction projects would have little to no direct effect on EFH because most projects would be limited to disturbed areas. Indirect adverse impacts from reconstruction project activities could cause sedimentation and contamination of waterways from stormwater runoff during rain events. Alterations in water quality from sediment loading could adversely impact EFH by lowering DO and increasing water temperature. Additional adverse impacts on managed species and other aquatic organisms from alterations in water quality (sediment suspension, siltation, and turbidity) in waters adjacent to the regional storm damage reconstruction projects would include clogged gills, reduced growth rates, and disruption of egg and larval development. Potential impacts on EFH from the regional storm damage reconstruction projects would be minimized using BMPs (reducing potential for indirect adverse effects from soil erosion, runoff, and sediment transport). However, present, and future regional storm damage reconstruction projects are not anticipated to significantly contribute to the cumulative impacts on EFH and are thus considered negligible.

Redevelopment

Large-scale development projects along the shore of Lake Pontchartrain would have a permanent impact on EFH when aquatic features are incorporated into the development plans (e.g., docks, marinas). Local and regional zoning regulations and permitting requirements may serve to minimize adverse EFH impacts. Impacts on EFH could potentially occur from an increase in impervious land use that would result in increased water quality degradation from non-point source pollutants in the local water bodies. Present and future regional redevelopment projects are not anticipated to significantly contribute to the cumulative impacts on EFH, and thus are considered negligible.

Coastal and Wetlands Restoration

Coastal and wetlands restoration projects aim to mimic or restore natural hydrology and sediment processes that build and maintain wetland habitats. Restoration projects improve wetlands quality by collecting and filtering sediment and nutrients and by reducing soil erosion. In addition, coastal and wetlands restoration projects would increase plant biodiversity and provide improved fish habitat. Coastal and wetlands restoration projects would provide cumulative benefits to EFH and fisheries in southeast Louisiana through the creation of habitat and forage areas. The State of Louisiana has initiated a series of programs and projects designed to offset the loss of wetlands and EFH, including projects previously described in the Fisheries Resources section.

Flood Risk Reduction Projects

Flood risk reduction projects in many of the HSDRRS sub-basins would contribute to additional loss of EFH and other fish habitat through the filling of wetlands due to levee and floodwall expansion. Some projects may result in long-term beneficial impacts, such as reducing the likelihood of storm surges converting marsh into open water. Storms can erode fragile, floating marshes, and storm surges can push saltwater into fresh marshes, killing the vegetation and thus converting marsh habitat into open water. In general, the loss of EFH, wetlands, and other fish habitats due to the HSDRRS and other present and future flood risk reduction projects is a small fraction of the wetland habitat in Louisiana, but any permanent loss is considered significant. All direct and indirect impacts on EFH from USACE flood risk reduction projects would be minimized using BMPs (reducing potential for indirect adverse effects from soil erosion, runoff, and sediment transport) as described in the project's SWPPP. The loss of wetlands and open water habitats from specific flood risk reduction project have been described in previous resources section, and these habitat losses constitute a loss of EFH.

Based on historical anthropogenic activities and land use trends in Louisiana, it is assumed that future flood risk reduction projects would have a cumulative adverse effect on water quality, which would adversely impact EFH. Cumulatively, all flood risk reduction projects would contribute to wetlands and fish habitat loss and would adversely impact EFH, migration, and spawning.

Once flood risk reduction infrastructure is in place, additional benefits for EFH and fisheries from improved hydrology and reduced erosion would also occur. Long-term effects of flood risk reduction infrastructure would slow the erosion of valuable habitat by reducing the potential for marsh fragmentation due to high-energy storm surge. Storm risk reduction infrastructure would provide for improved control of the release of floodwaters after storm events regionally. Flood risk reduction projects in Lake Pontchartrain and Breton Sound would result in lower salinity marshes, which could provide a long-term benefit to fisheries, as a higher biodiversity of species may be able to thrive in the lower salinity environment.

Wetlands and open water loss, hydro-modifications, and water quality impacts from construction activities would affect local and regional fisheries (and prey) species through the direct loss of fish habitat, modification of fish navigation, and overall degraded habitat water quality. The cumulative impacts on EFH resulting from the present and future regional flood risk reduction projects would be considered moderate.

Transportation

Other present and future projects in the area include repairs to highway and road infrastructure and new road and highway alignments, including widening. These projects may have temporary impacts but should have little to no cumulative effects on EFH since most of the projects are being constructed in previously disturbed areas.

4.2.8.1.3 Summary of All Cumulative Impacts

The combination of the HSDRRS and other regional projects (e.g., storm damage reconstruction flood risk reduction projects and redevelopment, and transportation) would contribute to cumulative loss of EFH in the project area. Regional projects would adversely impact EFH by causing direct habitat loss through the filling of waterways and marshes and the dredging of water bottoms.

Indirect cumulative impacts include alterations of habitats and hydrology, which could result in changes in salinity and nutrient loads in EFH leading to further degradation of EFH. Past, present, and future flood risk reduction projects and other regional projects occurring near EFH would cause damage to EFH (including SAV), adjacent wetlands vegetation, disturbance of fisheries and sediments, and would increase turbidity and sedimentation in the adjacent aquatic habitat and drainage canals.

Risk reduction projects directly alter existing shoreline habitat and hydrologically impact marshes by impacting the natural processes of erosion, subsidence, and saltwater intrusion. The historic construction of flood risk reduction projects in southeast Louisiana is responsible for limiting water flow between the protected side of the levee and the flood side of the levee, altering freshwater and sediment input into estuaries, and contributing to wetland fragmentation and loss. Future flood and storm risk reduction projects cumulatively add to these impacts on EFH. Large-scale coastal and wetlands restoration projects are anticipated to restore these habitats in the future and will offset some of these historic losses of EFH. However, the cumulative impacts of flood risk reduction projects, including the proposed mitigation, on EFH are moderate.

4.2.9 WILDLIFE

4.2.9.1 AFFECTED ENVIRONMENT

The natural landscape consists of marsh, forest, wetlands, rivers, bayous, lakes, and natural water bodies, such as the Mississippi River, Lake Pontchartrain, Lake Cataouatche, and Lake Borgne (LDEQ 2010a). The Mississippi River significantly affects the Louisiana coastal plain where the deltaic cycles have distributed sediment to coastal lands for over 5,000 years (LaCOAST 2010).

The diversity and abundance of wildlife are dependent on the quality and extent of suitable habitat present. Much of the project area is in urban areas. Areas along the current floodwalls, canals, and along the shoreline and inshore area of the lakes would present a different habitat for wildlife as compared to previously disturbed urban areas and borrow sites.

Wildlife habitats present include:

- Cypress-tupelo swamp
- BLH
- Freshwater marsh
- Intermediate marsh
- Brackish marsh
- Saline marsh
- Open water
- Shoreline/beaches
- Upland forested
- Upland pasture
- Urban/developed

Table 4-15 describes the habitat types found in the project areas across the sub-basins. These habitats are shown in figure 4-13.

4.2.9.2 ENVIRONMENTAL CONSEQUENCES

4.2.9.2.1 <u>HSDRRS Construction Impacts</u>

<u>Jefferson East Bank</u> - Construction activities temporarily impacted nesting of songbirds, fishing and flyways; however, these impacts were temporary and localized. Species located within the project footprint were temporary dispersal during construction, but likely returned after completion of the project. Temporary impacts to fisheries, wildlife

and some avian species, in the form of displacement occurred as a result of construction activities during other IER projects. Fish and wildlife species were expected to return to these areas upon completion of these projects.

Impacts on wildlife resulting from IER #2a were minor in nature and like those described in IER #2 in CED Phase 1 and are incorporated here by reference.

Orleans East Bank - IER #27a continues into this sub-basin, but the effects on wildlife are like those found in the Jefferson East Bank Sub-basin above.

The greatest potential for effects on wildlife resulting from activities addressed in IER #5a occur during the initial clearing and grubbing. The presence of construction-related activity, machinery, and noise caused most wildlife to avoid the area during the construction period. Impacts from construction disturbed wildlife, but most of these impacts were short-term. Adjacent habitat stabilized after the construction allowing species to return. Most wildlife within the adjacent wetland habitats returned with the cessation of noise and activity associated with relocation. A small number of less mobile and wetland dependent species (i.e. mice, reptiles, amphibians) may have been lost during construction, however, most wildlife species likely avoided the vicinity of the proposed action during the construction period and some that were not dependent on the habitats likely returned following the completion of construction.

Recently disturbed areas on the protected side utilized for construction had little to no wildlife habitat function. Direct effects to wildlife within the footprint of disturbance was minimal. As such, constructing the project likely had a minor, temporary effect to wildlife. Wetland impacts were minimal and temporary, thus the loss of habitat during construction resulted in a relatively minor reduction in potential future nesting area for birds and foraging area for birds and other wildlife. In order to minimize the potential for the proposed action to disturb colonial-nesting wading birds, procedures recommended by FWS were followed. Prior to construction, the project area was inspected by qualified personnel for the presence of nesting colonies or Bald Eagle nests. Construction-related activities that would occur within 1,000 ft of a colony or 660-ft of a nest was restricted to the non-nesting period. Coordination with the U.S. Fish and Wildlife Service (USFWS) indicated that no significant effects to fish and wildlife were expected to occur from implementing the proposed action. As such, the responsibilities of the CEMVN to protect migratory birds under Executive Order (EO) 13186 and the Migratory Bird Treaty Act (16 USC 703 et seq.) were met.

Indirect effects to wildlife species due to construction activities (e.g., noise, vibration) within adjacent wetlands or aquatic habitat were short term and temporary. Mobile species likely found refuge in other areas until the construction disturbance was over.

Potential cumulative impacts on wildlife from the action involve the combined effects of habitat loss and displacement of wildlife populations from the multiple WBV projects in the area. The displacement of most of the wildlife was short-term during the construction period, and the displaced individuals likely returned following project completion.

Movement of the limited numbers of wildlife that currently inhabit the project area's terrestrial and aquatic habitats into surrounding, unimpacted habitats did not result in exceedances of the carrying capacity of the extensive, adjacent habitats. Thus, the potential cumulative impacts on wildlife from the action in conjunction with other projects in the region affected relatively small populations and habitat areas, and the extensive habitats remaining in the region have the capacity to accommodate those populations.

Construction activities evaluated in EA 496 may have temporarily impacted nesting, fishing and flyways; however, these impacts were temporary and localized and did not impact the habitat or activities of the area wildlife. Species located within the project footprint may have temporarily dispersed during construction, but likely returned after completion of the project.

Cumulative impacts would occur along the southern shoreline of Lake Pontchartrain, particularly in those areas encompassed by the proposed action, and discussed in IERs #5, #27 and #27.a. Temporary impacts to wildlife, in the form of displacement, could have occurred as a result of construction activities during other HSDRRS projects. Wildlife species would be expected to return to these areas upon completion of these projects.

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Table 4-21: Wildlife Habitat Type Description and Sub-basin Location

Habitat Type	Wildlife found in habitat type	Sub-basin								
		St. Charles	Jefferson EB	Orleans East	New Orleans EB	Chalmette Loop	Belle Chasse	Gretna-Algiers	Harvey Westwego	Lake Cataouatche
Cypress-Tupelo Swamp	Common wildlife species include southern dusky salamander, alligator snapping turtle, wood stork, bald eagle, and mammals such as the southeastern shrew, southeastern myotis, Louisiana black bear, and long-tailed weasel (Louisiana Comprehensive Wildlife Conservation Strategy 2005).	X			X		X	X	X	X
BLH	The BLH forested wetlands within the HSDRRS project area provide feeding, resting, nesting, and escape habitat to numerous species of game and non-game mammals and commercially important furbearers, as well as songbirds, raptors, migratory and resident waterfowl, wading birds, woodpeckers, and species of amphibians and reptiles.	X		X	X	X	X	X	X	X
Freshwater Marsh	This marsh type provides important nesting and foraging habitat for wintering waterfowl, alligator, wading birds, and fish.		X	X	X			X	X	X
Brackish Marsh	Shrimp, crab, redfish, seatrout, and menhaden all use brackish marshes for nursery areas, and like freshwater marshes, brackish marshes are important habitat for waterfowl, shorebirds, and wading birds.	X	X	X	X	X		X	X	X
Saline Marsh	Saline marshes act as a nursery area for many species of fish and crustaceans like freshwater and brackish marshes. Other wildlife common in saline marsh include wading birds, shorebirds, small mammals, and polychaetes.		X	X	X	X				
Open Water	Marine mammals and brown pelican are known to occur in the inshore bays and estuaries. Within Barataria Bay, many of the interior canals are dominated by low water quality tolerant fish species (USACE 1996). Sea turtles with the potential to occur in this habitat are protected species. Brown pelicans feed in shallow estuarine waters and use sand spits and offshore sand bars as resting and roosting areas. The diversity of species increases in larger canals such as the Outer Cataouatche Canal and Bayou Segnette due to their moderately improved water quality, allowing for a mixture of fresh and saltwater species.	X	X	X	X	X	X	X	X	X
Shoreline/ Beaches	Shorelines and beaches in the HSDRRS project area provide limited habitat for wildlife and are primarily utilized as a resting and foraging area for wading birds.		X	X	X					

Habitat Type	Wildlife found in habitat type	Sub-basin								
		St. Charles	Jefferson EB	Orleans East	New Orleans EB	Chalmette Loop	Belle Chasse	Gretna-Algiers	Harvey Westwego	Lake Cataouatche
Upland Forest	This habitat provides vital breeding, wintering, and migratory habitat for many migratory non-game bird species. Both game and non-game mammals utilize managed upland forests. Predators of small mammals such as gray fox also utilize upland forest habitat (Allen et al. 1996). Small mammals may include harvest mouse, hispid cotton rat (*Sigmodon hispidus*), oldfield mouse, and striped skunk.				X					
Upland Pasture	Pasture areas are not high-quality habitat for wildlife, but they do support a variety of herbivorous species (e.g., deer, rabbit, mice, rats, turkey, quail and their predators (e.g., coyote). Many bird species (e.g., cattle egret) also forage on seeds and insects in the pasture areas. Pasture areas provide excellent habitat for quail, doves and rabbits. Amphibians are abundant in ditches, tanks, or wherever water pools.			X	X	X		X	X	X
Developed or Disturbed Area and Urban Habitat	Common amphibians and reptiles include eastern garter snake (*Thamnophis sirtalis sirtalis*), Fowler's toad (*Bufo woodhousii fowleri*) and Gulf coast toad (*Bufo valliceps*). Mammals common to developed or urban habitats include raccoon (*Procyon lotor*), Virginia opossum (*Didelphis virginiana*), nine-banded armadillo (*Dasypus novemcinctus*), rabbits, grey squirrels (*Sciurus carolinensis*), mice, rats, and feral dogs and cats. Birds in this habitat type include the American crow (*Corvus brachyrhynchos*), songbirds, pigeons, and raptors.	X	X	X	X	X	X	X	X	X

Source: Conant and Collins 1998, Whitaker 1998, Moore et al. 1993, Dunn and Alderfer 2006, Moore et al. 1992, Whitaker 1998, Wigley and Lancia 1998, Felley 1992, NOAA 2008, Abadie et al. 2000, Allen et al. 1996

Figure 4-4. Wildlife Habitat Types within and adjacent to the HSDRRS Project Area

New Orleans East - The action evaluated in IER Supplemental #11.b Tier 2 was found compatible with the conditions for wildlife that exist today, as the features that resulted from the action were like current features in the project area. All construction took place within existing ROW, which is regularly mowed and maintained. This habitat was of relatively low quality for wildlife, and very few species permanently inhabit the area. Similarly, most of the staging areas were in upland areas of low-quality habitat. Although not all segments of the HSDRRS have the same proposed restoration/reinforcement methods, the impacts of each proposed method would be similar and are discussed together for all sites. It is unlikely that the action contributed to permanent indirect or cumulative wildlife impacts in the project area. Any potential impacts occurred during construction and were temporary, adding an incremental temporary impact to the disturbances caused to wildlife by construction throughout the project area.

Construction of the action evaluated in IER Supplemental #11.c Tier 2 directly impacted an additional 22 acres of wetlands (11.78 acres brackish marsh and 10.15 acres open water). This likely had an additional incremental negative impact to the wildlife in the form of loss of wildlife habitat and displacement of wildlife populations within the project footprint to what was described in IER #11 Tier 2 Borgne. Approximately 185,000 cyd of material dredged from the channel was deposited in the Beneficial Use disposal area for marsh nourishment and added sediment to the 205-acre pond within the subsiding Golden Triangle marsh which positively impacted wildlife habitat by nourishing eroding and subsiding marsh. Wildlife habitat impacts from this and other LPV flood control projects will be mitigated through wetland creation and enhancement activities designed to minimize cumulative habitat losses in the project area and the region. As a result, the action would contribute negligibly to the cumulative impacts on wildlife occurring in the region.

No additional effects to wildlife were identified for the action evaluated in IER #11d.

Chalmette Loop - Terrestrial wildlife habitat within the footprint of the project evaluated in IERs #8, 9 and 10a consists mostly of turf grass and a 70-85 ft wide by 22.5-mile gravel road. Impacts would be similar but less than what was described in IERs 8, 9, and 10, however, during construction of the Bayou Bienvenue bridge, reduction to the 15 ft wide access road, and the MRL tie-in there increased noise, traffic, and lighting levels temporarily affected wildlife species in the surrounding area potentially increasing stress to those species.

Some smaller, less mobile wildlife, such as small mammals, amphibians and reptiles, likely experience direct mortality during clearing and grading activities. Other wildlife, such as birds and larger mammals, likely left the immediate construction area, perhaps relocating to the nearby forested or marsh areas to the east of the proposed project area, which would have provided suitable temporary habitat during construction.

Construction of the permanent bridge across Bayou Bienvenue enabled direct access to LPV 145 and quick closure of the wildlife access gates on this reach before storm events. Because of this accessibility these gates would then be open most of the time and only closed for storm events. These wildlife gates facilitate access for terrestrial animals to the flood and protected side of the LPV 145 levee/T-wall.

Potential indirect impacts on wildlife from the action involved the displacement of wildlife populations, predominantly birds or small mammals, which utilize the expanses of turf grass in the immediate project area. Movement of the limited numbers of wildlife that currently inhabit the existing levee into nearby habitats in the CWA and did not put added pressure on these large terrestrial and aquatic habitats. Therefore, the small populations and actual habitat impacted as well as the amount of adjacent, extensive surrounding habitat minimized the potential indirect impacts associated with the proposed action.

Potential cumulative impacts on wildlife within the project area from the action involved the combined effects from the multiple LPV reaches within the Chalmette Loop HSDRRS as well as other HSDRRS projects throughout the area. The displacement of most of the terrestrial wildlife was temporary during construction activities and most displaced wildlife returned following project completion. Most of the upland habitat impacted is frequently mowed turf grass of the ROWs along the HSDRRS throughout the area. The proposed action of building the Bayou Bienvenue Bridge would allow quick operability of the wildlife access gates on LPV 145 so they could be kept open and only closed for storm events, thus facilitating the movement of terrestrial wildlife or aid in the movement of terrestrial wildlife through the wildlife openings . The extensive amount of available habitat adjacent to the action also minimized impacts by providing ample habitat to support terrestrial wildlife that might be displaced.

The action evaluated in EA # 526 includes 3.17 acres at PS #2 and 3.04 acres of existing levee and pump station ROW for a total of approximately 6.21 acres. This area is not considered prime wildlife habitat, but wildlife species do inhabit the surrounding CWA and the fringe fresh/intermediate marsh on the unmaintained toe of the levee. Wildlife present in the footprint as well as in the vicinity were temporarily impacted during construction. Increases in noise, traffic, and lighting levels temporarily affected wildlife species in the area potentially increasing stress to these species. Some smaller, less mobile wildlife, such as small mammals, amphibians and reptiles, likely experienced direct mortality during clearing and grading activities. Other wildlife, such as birds and larger mammals, likely left the immediate construction area and relocate to the nearby shrub or marsh areas, which provided suitable temporary habitat during construction.

The T-wall structure does not pose an impenetrable barrier to wildlife movement in the project area because it is at the same elevation (+10 ft NAVD 88) as the existing non-Federal back levee. The existing I-wall which is at approximately +16 ft NAVD 88 was removed, so this seepage repair enables terrestrial wildlife to cross and access habitat on either side of the levee/T-wall.

Potential indirect impacts on wildlife involve the displacement of wildlife populations, predominantly birds or small mammals, which utilize the expanses of turf grass that comprise the levee in the immediate project area. Movement of the limited numbers of wildlife that inhabited the existing levee into nearby habitats, including the CWA and shrub habitat of the levee toe, did not put added pressure on these large terrestrial and aquatic habitats. Therefore, the small populations and actual habitat impacted as well as the amount of adjacent, extensive surrounding habitat minimized the potential indirect impacts associated with the action.

Potential cumulative impacts on wildlife within the project area from the action involve the combined effects from the HSDRRS specifically the Chalmette Loop levee/T-wall. CWPPRA projects, wetland restoration and shoreline protection; the Violet freshwater diversion project; MRGO deep draft deauthorization; and local community wetland restoration projects would reduce potential adverse cumulative impacts by positively affecting wildlife within and around CWA. The displacement of most of the terrestrial wildlife was temporary during construction activities and most displaced wildlife likely returned following project completion. Most of the upland habitat impacted is frequently mowed turf grass of the ROWs along the non-Federal back levee. No permanent obstacles to the movement of terrestrial wildlife occurred by removing the existing 16 ft I-wall and replacing with a 10 ft T-wall, access will be created. No permanent impacts, only the temporary displacement of terrestrial wildlife during construction activities occurred. Wildlife returned to the area following project completion.

The footprint of the safe house construction area evaluated in EA #527 encompassed approximately 4.1 acres of existing pump station, levee and T-wall ROW. This area is not considered prime wildlife habitat, but wildlife species do inhabit the surrounding CWA and Breton Sound Basin. Wildlife present in the vicinity was temporarily impacted during construction by increases in noise, dust and traffic potentially increasing stress to these species. The construction of the safe house occurred on a concrete paved and gravel area. Earthwork, grading, and excavation activities necessary to relocate the drain line could have directly impact small, less mobile invertebrates and wildlife, such as small mammals, amphibians and reptiles by causing mortality. The noise created by driving four piles for the safe house construction likely temporarily disrupted wildlife in the area. However mobile wildlife, such as birds and larger mammals, likely left the immediate construction area and relocated to the nearby bottomland hardwood, swamp and marsh areas, which provided more suitable habitat during construction. Direct impacts to Bald Eagles and colonial nesting water birds were avoided in accordance with the Bald and Golden Eagle Protection Act and Migratory Bird Treaty Act using best management practices (BMPs) and recommendations from USFWS. Nesting birds would not be impacted as no known nests exist in the area.

Potential indirect impacts on wildlife from the proposed action involved the displacement of wildlife populations, predominantly invertebrates, birds or small mammals, which utilize the expanses of turf grass that comprise the levee in the immediate project area. Movement of the limited numbers of wildlife that currently inhabit the existing levee and T-wall into nearby habitats, including the CWA and the Breton Sound Basin, did not put added pressure on these large terrestrial and aquatic habitats. Therefore, indirect impacts to the affected small wildlife populations and upland levee habitat would be minimal considering the extensive more suitable surrounding habitat.

Potential cumulative impacts on wildlife within the project area from the action would include the combined effects from the HSDRRS specifically the Chalmette Loop levee and T-wall, as well as Coastal Wetland Planning Protection Restoration Act (CWPPRA) projects such as wetland restoration; the Violet freshwater diversion project; Caernarvon freshwater diversion; and local community wetland restoration projects would reduce potential adverse cumulative impacts by positively affecting wildlife within and around the CWA and the Breton Sound Basin. The displacement of any wildlife was temporary during construction activities and most displaced wildlife returned following project completion.

Belle Chasse - Construction of the action in IERS 12/13 had minimal impacts to wildlife due to the removal of approximately 14,900 ft^2 of wooded habitat at the end of Bergeron Drive. The habitat provided no significant wildlife benefits; however, motile species present simply relocated to similar adjacent habitat and non-mobile species were destroyed.

Indirect impacts on wildlife involve the displacement of wildlife populations, predominantly birds or small mammals to adjacent areas during construction. Given the small size of the area impacted, it is unlikely that the action had any appreciable cumulative impact to the wildlife in the Belle Chasse Sub-basin.

No additional effects to wildlife were identified in the evaluation of the action proposed in SIER 13a. Reference IER #13 in CED Phase 1 for additional information.

IER 33 evaluated clearing, grubbing, construction, and re-grading for all levee reaches which likely caused some temporary, construction-related degradation of wildlife habitat, but caused no long-term impacts. Temporary effects to forage habitat in areas where material was placed in the floodside maintenance corridor for truck hauling or protection of cultural resources may have occurred. However, no long-term adverse impacts to wildlife were identified since any material placed during construction was removed upon completion of the project, and the area returned to pre-project conditions within a growing season. No direct impacts to wildlife resources were identified as a result of the activities at the Walker Road stabilized soil mixing sites.

Indirect effects wildlife species due to construction activities (e.g., noise, vibration) within adjacent wetlands or aquatic habitat were short term and temporary. With best management practices (e.g., silt fencing) in place during construction, the indirect effects adjacent wildlife habitat was minimized

Completed coordination and consultation with the U.S. Fish and Wildlife Service (USFWS) determined that no significant effects to fish or wildlife are expected to occur and that no fish and wildlife mitigation is warranted. The Corps has complied with executive order 13186 which establishes coordination requirements with the USFWS if an agency's actions are likely to have a measurable adverse effect on migratory bird populations. The USFWS has provided a Coordination Act Report, as required by the Fish and Wildlife Coordination Act.

IER #33a evaluated direct and permanent effects to wildlife habitat which resulted from the clearing, grubbing and placement of earthen material. Construction of the project required approximately 37 acres of new right-of-way, approximately 82 acres of forested wetlands and 80 acres of non-wet forested habitat would be cleared, grubbed, and filled or converted to open water and approximately 74 acres of mowed marsh habitat would be temporarily disturbed during construction. Temporary direct effects to wildlife that may forage in areas where material was placed in the 40-foot vegetation free (maintenance) corridor for either truck hauling or protection of cultural resources likely occurred.

Indirect effects wildlife species due to construction activities (e.g., noise, vibration) within adjacent wetlands or aquatic habitat were short term and temporary. The area of disturbance is a relatively small part of the local aquatic ecosystem and mobile species could find refuge in other areas until the construction disturbance is over.

Completed coordination and consultation with the U.S. Fish and Wildlife Service (USFWS) determined that no significant effects to fish or wildlife were expected to occur and that no fish and wildlife mitigation is warranted. CEMVN has complied with executive order 13186 which establishes coordination requirements with the USFWS if an agency's actions are likely to have a measurable adverse effect on migratory bird populations. The USFWS has provided a final Coordination Act Report dated January 9, 2012, as required by the Fish and Wildlife Coordination Act

<u>Gretna-</u>Algiers - The WCC activities directly impacted wetlands habitat used by local wildlife. Wildlife in wetlands were potentially dispersed to adjacent habitat; therefore, minor permanent impacts on wildlife occurred. The greatest effect on wildlife was associated with construction activities (e.g., noise and machinery movement), which occurred for approximately 4 years.

Levees did not act as a barrier for most of the native species; however, floodwall construction hindered migration of native species and, over time, will impair the genetic drift between populations. Less mobile and wetlands-dependent species (i.e., mice, reptiles, and amphibians) were lost during construction; however, most species avoided the construction sites. The western earthen levee enlargement had short-term, localized impacts on wildlife during the filling of the canal. There were negligible impacts on wildlife with the northern levee floodwall cap and water control structure construction, as the project area provided low-quality habitat and wildlife relocated to nearby habitat.

Other impacts associated with noise and vibration, gate structure operation, dredging, hydrological augmentations, water quality, and loss of wetlands were like those previously discussed in other sub-basins. Dredged material from the Algiers Canal was placed into JLNHPP Lake Salvador geocrib to create wetlands habitat.

The USACE, prior to construction of all reaches within the Gretna-Algiers sub-basin, conducted coordination and surveys for nesting colonies of birds in conjunction with the USFWS. No impacts on nesting colonies or bald eagles occurred in this sub-basin, as they were not documented in the project vicinity.

The project evaluated in IER #12a resulted in the WBV 14e.2 Levee being enlarged to reach the 100-year level proposed of risk reduction with an ultimate design elevation of approximately 14 feet. The design included additional overbuild material as needed to allow for settlement to reach the proposed elevation. Instead of shifting the centerline of the existing levee 58 feet, as originally discussed in IER #12, it was determined that a centerline shift of 0-30 feet (or possibly more) to the protected side would be sufficient. All work on the levee was conducted within the existing ROW. Accordingly, the anticipated BLH impacts discussed in IER #12 did not occur, preserving that potential habitat for wildlife.

To access the levee reaches, the USACE Contractor constructed an access road that impacted approximately 4 acres of grassy ROW, the habitat value of the area is low and the impacts to wildlife were minimal. A modular, shallow draft, pontoon style bridge, and riprap placed along the east bank line of Reach 3B of the V-Line Levee Canal within the WBV 14e.2 project site had minimal impacts to wildlife.

No indirect impacts were identified. Cumulative impacts to the sub-basin were reduced reducing impacts to BLH from IER #12.

<u>Harvey Westwego (IER 14, IERS 14.a)</u> - Impacts on Wildlife resulting from IER #14a activities were like those identified in IER #14 in CED Phase I and are incorporated by reference. No additional impacts to wildlife identified.

<u>Lake Cataouatche (IER 15, IERS 15a)</u> - Impacts on Wildlife resulting from IER #15a activities were like those respectively identified in IER #15 in CED Phase I and are incorporated by reference.

<u>Impacts Outside of the HSDRRS</u> - Many borrow actions had similar impacts due to the ability of most wildlife species to avoid disturbed areas. However, many species would frequent the project areas while foraging or migrating to other areas.

Impacts on wildlife occurred at all borrow areas outside the HSDRRS sub-basins from the loading and unloading of material and increased traffic along associated roads leading to the borrow sites. Borrow sites displaced wildlife when the areas were cleared and excavated. Impacts on wildlife at these sites were like those identified for borrow sites in CED Phase 1.

Specifically, direct impacts from wildlife displacement occurred when the proposed Assumption Land Company, Houma Excavation, RBEND II, and Robert Brothers Farm contractor-furnished borrow areas were cleared and excavated. Non-mobile wildlife was destroyed. Wildlife relocated as trees, uplands, and other habitat was removed due to excavation. Many of the excavated sites would hold water during rain events and create some aquatic habitat. Any additional potential direct and indirect impacts to wildlife and wildlife habitat is dependents on how the landowners utilize the land excavation.

The excavated borrow areas may be converted to ponds and small lakes, which could add to wildlife habitat in the vicinity. Aquatic vegetation may colonize the shallow littoral edge of the area, and wildlife (alligators, raccoons, wading birds, and ducks) adapted to an aquatic environment would be expected to expand their range into the new waterbodies. A variety of plant species colonize adjacent to the water that provide important wildlife habitat utilized for nesting, feeding, and cover. Any areas that remain dry would colonize vegetation and woody plants, which provide habitat to wildlife. The dense vegetation could attract a variety of wildlife including birds, reptiles, amphibians, and small mammals.

4.2.9.2.2 HSDRRS 2057 Impacts

Wildlife could be directly impacted due to the loss of habitat and foraging areas from future levee lifts expanding into adjacent undisturbed areas, and indirectly impacted by construction-related noise and vibrations, and the potential for a reduction in water quality. An additional 9million cy of fill would be required for future levee lifts, which would result in additional wildlife habitat and foraging areas being cleared and excavated for borrow areas. Mobile wildlife would avoid the areas, but some individuals would be destroyed. A permanent minor impact would result from the additional disturbance of wildlife and loss of habitat.

Prior to construction of future HSDRRS projects, coordination with USFWS would be completed for reaches located near bald eagle nests or nesting bird colonies.

Construction activities associated with raising the foreshore protection would temporarily degrade foraging habitat for ducks and wading birds and could temporarily affect the movement of common wildlife along the shore of Lake Pontchartrain.

4.2.9.2.3 Cumulative Impacts

During construction of the HSDRRS, a small number of less mobile wildlife species (i.e., mice, reptiles, or nesting birds) would be lost; however, most species would return following completion of the construction. Both high- and low-quality wildlife habitat that is both locally and regionally common would be impacted and the cumulative permanent impacts on wildlife would be minor. Most species of mobile organisms would likely relocate to nearby extensive wetlands and shoreline habitats. The presence of construction-related activities, machinery, and noise would be expected to cause wildlife to avoid the area during construction; therefore, indirect impacts would occur on wildlife currently inhabiting the project area, and wildlife would migrate to other adjacent habitats. This migration would not exceed the carrying capacity of the adjacent habitat during its temporary use.

Loss of wetlands and non-jurisdictional BLH habitat from construction activities would affect local and regional wildlife species through a loss of foraging, nesting, and rookery habitat and fragmentation of habitat. Aquatic species (e.g., marine mammals) could experience temporary adverse effects from decreased water quality, pile-driving noise, and other disturbances. The HSDRRS could alter hydrology in the region and restrict access and migration pathways for some aquatic species.

Borrow areas would displace local wildlife during the clearing of land and excavation of materials. Once the material is excavated, however, the areas would be converted to aquatic habitat or scrub/shrub communities, which would offer habitat to some terrestrial and aquatic species. Any potential borrow site utilized for future borrow needs would require environmental clearance and coordination with state and Federal agencies.

Wildlife conservation is extremely important to Louisiana's tourism, aesthetics, outdoor sports (e.g., hunting and fishing), and overall quality of life. As Louisiana's landscape changes with environmental trends, pollution, land use, climate, and loss of natural resources, more focus is given to measures that reduce impacts on wildlife habitat. A balance between the engineering of risk reduction projects and conservation efforts is necessary, and often coincides with other present and future projects. This section of the CED summarizes impacts on wildlife and some of the conservation efforts occurring with other present and future regional actions.

Storm Damage Reconstruction

Most reconstruction projects would have no effect on wildlife because the projects are located primarily in urban areas. Some reconstruction projects have a beneficial effect on wildlife in the region. For example, renovation of the Bartholomew Golf Course would have marginal improvement on wildlife habitat in water traps (aquatic habitat), roughs, and in the tree, canopy lining many fairways. Improvements to parks, golf courses, and parkways would provide wildlife habitat for mammals, reptiles, and avian species. Sewage treatment infrastructure enhancement would improve water quality by capturing, controlling, and filtering tertiary runoff. Improved water quality would attract aquatic species that are an important food source for some wildlife species.

Redevelopment

Both residential and commercial redevelopment projects have a potential beneficial impact on wildlife habitat because redevelopment could include new utilities infrastructure (e.g., improved wastewater treatment and underground utilities). Underground utilities prevent harm to avian species by removing overhead lines, reducing the infrastructure footprint on the landscape (by removing impervious materials), and reducing electrocution of climbing animals and birds. In areas where redevelopment is designed as multi-use, cumulative beneficial impacts occur from the inclusion of green space and reduction in carbon emissions, as many are designed to connect communities with bike and pedestrian pathways, with some nature trails and interpretive centers that describe local flora and fauna. Redevelopment often includes rebuilding of libraries, museums, and nature trails that provide information to the general public on wildlife conservation and facilities focused on wildlife rehabilitation. This type of redevelopment has become extremely important since Hurricanes Katrina and Rita and the BP Deep Water Horizon oil spill.

Coastal and Wetlands Restoration

Coastal and wetland restoration projects would provide benefits to wildlife protection and conservation by creating and improving sensitive habitat that is used by a wide variety of species for nesting, hunting, foraging, and rearing. The Gulf coast and its associated wetlands provide important fish and wildlife habitat beyond the geographical reach of the shoreline, dunes, and wetlands areas. Wetlands and coastal areas often serve as nursery habitats for fish, amphibian, reptile, and crustacean species where eggs and immature individuals depend on wet habitats for sustenance. As habitat is degraded or reduced, wildlife suffers population losses. Alternatively, as habitat is improved, created, or restored, dependent wildlife and aquatic species can increase clutch size successes and improve populations. Shoreline protection, outfall management, terracing, and herbivory control projects would contribute additional benefits for wildlife by enhancing available habitat, creating new wetlands habitat, and protecting existing habitat.

Flood Risk Reduction Projects

Based on historical anthropogenic activities and land use trends in southeastern Louisiana, flood risk reduction projects would degrade water quality, cumulatively adversely impacting wildlife habitat. Wildlife habitat would be converted from one type (i.e., primarily uplands and BLH) to another type (i.e., primarily aquatic) once borrow material is excavated from the borrow areas. Potential benefits for wildlife would be the result of flood risk reduction infrastructure that improves hydrology and reduces erosion. Better operational procedures during flooding events could minimize the devastating effects on wildlife species by controlling the release of floodwater. However, the potential for wildlife to be trapped on the flood side of the system would be a detriment to wildlife. Flood risk reduction projects in Lake Pontchartrain and Breton Sound basins also result in lower salinity marshes, leading to a higher biodiversity, thereby providing a long-term benefit for wildlife.

Transportation

Transportation projects would continue to occur in the sub-basins (e.g., Twin Spans Bridge, Earhart-Causeway Interchange, I-12 to Bush, Louisiana) and construction noise would temporarily impact wildlife. Other transportation projects would include the removal of bridges and drainage culverts, which could be a benefit by improving water quality or could hinder wildlife access to adjacent habitats and ultimately reduce the genetic diversity and fitness of species over time. However, these impacts would be localized and would not be expected to significantly affect the species' regional populations. In some cases, bridge improvements would allow for improved passage and/or allow for shared space between wildlife habitat and residential communities.

4.2.9.2.4 Summary of Cumulative Impacts

Overall, construction activities associated with the HSDRRS and other regional present and future projects would contribute to the cumulative loss of wildlife habitat and resources within the project area. BLH forests, cypress swamps, marshes, and tidal channels impacted by projects provide habitat for an abundance of amphibians, reptiles, and shellfish. Coastal wetlands, marshes, and forests provide permanent habitat or indirectly serve as breeding and rearing refuge for wildlife. Cumulative impacts from construction activity and conversion of natural habitats to developed areas would be moderate, and cause habitat fragmentation, altered hydrology, and degraded habitat quality.

4.2.10 THREATENED AND ENDANGERED SPECIES

4.2.10.1 AFFECTED ENVIRONMENT

The Endangered Species Act (ESA) of 1973 (16 USC § 1531, as amended) requires that a discretionary Federal action not put into jeopardy the continued existence of a listed species or not destroy or adversely modify their critical habitat. The USFWS maintains and monitors non-marine species considered to be threatened with extinction or in danger of becoming extinct. The NMFS maintains and monitors marine mammals and some anadromous fishes. NMFS also has jurisdiction over species listed as depleted under the Marine Mammal Protection Act (MMPA) of 1972. All Federal agencies are required to use their authorities to further the purposes of the ESA.

The ESA also calls for the conservation of what is termed critical habitat – the areas of land, water, and air space that an endangered species needs for survival. Critical habitat also includes such things as food and water, breeding sites, cover or shelter, and sufficient habitat area to provide for normal population growth and behavior. One of the primary threats to many species is the destruction or modification of essential habitat by uncontrolled land and water development.

Existing Conditions

The USACE coordinated with USFWS and NMFS during the preparation of each IER to identify protected species that had the potential to occur within the sub-basin or parish. Table 4-18 provides a list of species protected by the ESA and MMPA, by parish, and a brief description of their preferred habitat. The brown pelican and the bald eagle have been delisted by the USFWS.

The piping plover and pallid sturgeon are known to occur within the project region, but they are not expected to occur within the area of potential effect of any of the HSDRRS projects. Descriptions of threatened and endangered species that could potentially occur in the project area are briefly described below.

Table 4-22: Threatened and Endangered Species with the Potential to Occur in the Project Area

Species	Federal Status	Habitat	Parish of Occurrence	Potential to Occur in Project Area
West Indian manatee *Trichechus manatus*	E	Open water	All	Yes, in Lakes Pontchartrain, Borgne, Bayou Dupre, Bayou Bienvenue, GIWW, and IHNC
Leatherback sea turtle *Dermochelys coriacea*	E	No breeding habitat; feeding habitat in near shore, open waters of Lake Pontchartrain and Lake Borgne	Jefferson Plaquemines	Yes, Lakes Pontchartrain, Borgne, and MRGO
Loggerhead sea turtle *Caretta caretta*	T	No breeding habitat; feeding habitat in near shore, open waters of Lake Pontchartrain and Lake Borgne	Jefferson Plaquemines St. Bernard	Yes, Lakes Pontchartrain, Borgne, and MRGO
Kemp's ridley sea turtle *Lepidochelys kempii*	E	No breeding habitat; feeding habitat in near shore, open waters of Lake Pontchartrain and Lake Borgne	Jefferson Plaquemines	Yes, Lakes Pontchartrain and Borgne, and MRGO
Green sea turtle *Chelonia mydas*	T	No breeding habitat; feeding habitat in near shore, open waters of Lake Pontchartrain and Lake Borgne	Jefferson Plaquemines	Yes, Lakes Pontchartrain, Borgne, and MRGO
Hawksbill sea turtle *Eretmochelys imbricata*	E	No breeding habitat; feeding habitat in near shore, open waters of Lake Pontchartrain and Lake Borgne	Jefferson Plaquemines St. Charles	Yes, Lakes Pontchartrain, Borgne, and MRGO
Gulf sturgeon *Acipenser oxyrhynchus desotoi*	T	Inhabits coastal rivers from Louisiana to Florida during the warmer months and overwintering in estuaries, bays, and the Gulf of Mexico	Jefferson Plaquemines St. Bernard Orleans	Yes, Lakes Pontchartrain, Borgne, IHNC, and GIWW

E= Endangered; T=Threatened; T/CH= Threatened with critical habitat. USFWS 2009a, USFWS 2009b, LDWF 2008

West Indian Manatee - The West Indian manatee is Federally listed and state-listed as endangered and is protected under the marine mammal protection act (MMPA), under which it is considered depleted (USFWS 2001). Critical habitat for the manatee has not been designated in Louisiana (USFWS 1977). The manatee occurs in both freshwater and saltwater habitats within tropical and subtropical regions and includes two subspecies, the Florida manatee and the Antillean manatee. The primary human-related threats to the manatee include watercraft-related strikes (impacts and/or propeller strikes), crushing and/or entrapment in water control structures (floodgates, navigation locks), and entanglement in fishing gear (discarded fishing line, crab traps) (USFWS 2007b).

The manatee is not a year-round resident in Louisiana, but it migrates to Louisiana waters during warmer months. Manatees prefer access to natural springs or man-made warm waters with dense beds of submerged aquatic or floating vegetation. Manatees also forage in shallow grass beds that are adjacent to deeper channels, or seek out quiet areas in canals, creeks, lagoons, or rivers, using deeper channels as migratory routes (USFWS 1999). There have been 110 reported sightings of manatees in Louisiana since 1975 (LDWF 2005). Sightings in Louisiana, which have been uncommon and sporadic, have included occurrences in Lake Pontchartrain and surrounding water bodies. Between 1997 and 2000, 16 manatee sightings were reported in the Lake Pontchartrain area with a general increase in the number of manatees per sighting (Abadie et al. 2000). Sightings of the manatee in the Lake Pontchartrain Basin have increased in recent years, and in late July 2005, 20 to 30 manatees were observed in the lake during aerial surveys (Powell and Taylor 2005).

Gulf Sturgeon - The Gulf sturgeon is Federally listed as threatened throughout its range and is state listed as threatened in Louisiana. The present range of the species extends from Lake Pontchartrain and the Pearl River system in Louisiana and Mississippi east to the Suwannee River in Florida (USFWS and NMFS 2003).

The Gulf sturgeon is an anadromous fish that migrates from saltwater into large coastal rivers to spawn and spend the warm months. Subadults and adults typically spend the 3 to 4 coolest months in estuaries or Gulf of Mexico waters before migrating into rivers as temperatures increase (USFWS and GSMFC 1995). This migration typically occurs from mid-March through June (Rogillio et al. 2007). Most adults spend 8 to 9 months each year in rivers before returning to an estuary or the Gulf of Mexico by mid-November to early December. Thus, the Gulf sturgeon spends most of its life in fresh water (USFWS and GSMFC 1995).

Critical habitat designated for the Gulf sturgeon in Louisiana includes Lake Pontchartrain east of the Lake Pontchartrain Causeway, Little Lake, the Rigolets, Lake Catherine, Lake Borgne, and the Mississippi Sound. These critical habitat units follow the shorelines of each water body. Estuaries and bays located adjacent to riverine units were designated as critical habitat to protect unobstructed passages for sturgeon between feeding and spawning areas (USACE 2006b). Studies conducted by the LDWF have shown the presence of Gulf sturgeon in Lake Pontchartrain, the Rigolets, and Lake Borgne during the winter and during periods of migration to and from marine environments. Most records of Gulf sturgeon from Lake Pontchartrain have been located east of the Causeway Bridge, particularly on the eastern north shore. Although Gulf sturgeon has been reported to inhabit Lake Pontchartrain west of the Causeway, typically near the mouths of small rivers on the north shore, critical habitat was not designated for the western half of the lake because these sturgeon are thought to have come from western tributaries and not the Pearl River (USFWS and NMFS 2003). In addition, observations of Gulf sturgeon in marine and estuarine habitats are associated with sand and mud bottoms (USFWS and GSMFC 1995), and sediment data from Lake Pontchartrain indicate that sediments from the eastern half of the lake have a greater sand content than those from the western half (Barrett 1976, as cited in USFWS and NMFS 2003). This is another reason for only half of Lake Pontchartrain east of the Causeway Bridge to be designated as critical habitat for the Gulf sturgeon.

Offshore critical habitat for the Gulf sturgeon extends from Lake Borgne and the Rigolets along the Gulf Coast to the Suwannee Sound, Florida. Sturgeon migrations to rivers that enter Lake Pontchartrain follow routes through Lake Borgne and the Rigolets. The only recent sighting of Gulf sturgeon within the MRGO occurred during a sonic tracking study completed by the USACE ERDC on January 19, 2005. The ERDC tracked a Gulf sturgeon moving from within the MRGO above Bayou La Loutre toward the marsh adjacent to the MRGO. Additionally, Gulf sturgeon have been collected in Breton Sound and from bayous connected to the MRGO. This suggests that, due to the proximity of the MRGO to the Breton Islands, sturgeon may use this channel as a passageway from Lake Borgne to the islands (USACE 2006b). However, the MRGO has not been designated as critical habitat (USFWS and NMFS 2003).

<u>Kemp's Ridley, Loggerhead, and Green Sea Turtles</u> - Sea turtles inhabit tropical and subtropical marine and estuarine waters around the world. Of the seven species in the world, six occur in the U.S., and all are listed as threatened or endangered. The three species identified by NMFS as potentially occurring in the vicinity of the HSDRRS project area are similar in appearance, though they differ in maximum size and coloration. The Kemp's ridley is the smallest sea turtle. The loggerhead is the next largest of these three species. The green is the largest of the three).
All three sea turtle species are known to forage as juveniles and adults in nearshore waters in Louisiana, including estuaries, and may be more likely to occur there in months when the waters are warmer. The Kemp's ridley and loggerhead turtles may find suitable foraging habitat for invertebrates and fish in the waters of Lakes Pontchartrain and Borgne. The green turtle would be less likely to occur there due to the scarcity of the submerged aquatic vegetation on which they feed. All three species nest on sandy beaches, which are not present in the project area, and the Kemp's ridley has not been reported to nest anywhere in Louisiana. None of these species have designated critical habitat in the region (USFWS 2007c).

4.2.10.2 ENVIRONMENTAL CONSEQUENCES

4.2.10.2.1 HSDRRS Construction Impacts

Each of the IERs and supplements was submitted to the USFWS and NMFS for review along with a request for concurrence with the USACE's determination of effect on protected species. Table 4-19 summarizes the effects on each of the Federally listed species, and concurrence was received from USFWS and NMFS on all determinations. Of the IERs, supplementals, and EAs completed, 23 reported that effects on threatened or endangered species may occur, but adverse effects were not likely to occur.

A Biological Assessment was submitted under Section 7 of the ESA for formal consultation for the improvements to the outfall canals at 17th Street, Orleans Avenue, and London Avenue. According to the Biological Opinion issued for this project component, the improvements resulted in an adverse modification of 3.3 acres of critical habitat for the Gulf sturgeon. However, NMFS concurred that there was likely no adverse effect on the sturgeon, manatee, pelican, or sea turtles, even though these species could forage or migrate near or within the potential area of effect.

The types of effects on each of the species that resulted from the HSDRRS projects as well as the standard best management practices followed are described below, by species. Mitigation and conservation measures that were implemented to further reduce the potential for these effects are described in section 5.0 and resulted in negligible impacts on protected species in all sub-basins. No take of threatened or endangered species were documented during HSDRRS construction activities.

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Table 4-23: Summary of the HSDRRS Impacts on Threatened and Endangered Species by IER

IER* #	Project/Parish	Species Potentially Present	Determination	Comments
IERS 1	Labranche/St. Charles	Manatee	Not likely to adversely affect (NLAA)	USFWS Concurrence of NLAA
IER 3	Jefferson East Bank/Jefferson	Manatee, Gulf sturgeon, Kemp's ridley, loggerhead, and green sea turtles	NLAA	Temporary disturbance to foraging areas during construction for manatee and sturgeon; permanent impacts on 9 acres and temporary impacts on 29 acres of Gulf sturgeon critical habitat; implemented manatee and sturgeon BMPs
IERS 3.a	Jefferson East Bank/Jefferson	Manatee, Gulf sturgeon, Kemp's ridley, loggerhead, and green sea turtles	NLAA	Temporary disturbance to foraging areas during construction for manatee and sturgeon; implemented manatee and sturgeon BMPs; loss of 8 acres of bottom feeding areas for sturgeon
IER 5	Outfall Canals at 17th Street, Orleans Avenue, and London Avenue	Manatee, Gulf sturgeon, Kemp's ridley, loggerhead, and green sea turtles	NLAA; adverse modification of sturgeon critical habitat (CH) (3.3 acres)	Temporary impacts on sturgeon and turtle foraging habits; the potential for the permanent loss of 3.3 acres of sturgeon critical habitat; no effect on manatee
IER 6	Citrus Lakefront	Manatee, Gulf sturgeon, Kemp's ridley, loggerhead, and green sea turtles	NLAA; adverse modification of sturgeon CH (6.9 acres)**	Temporary impacts on 61.1 acres of lake bottom comprising sturgeon and turtle foraging habits; no effect on manatee
IER 7	New Orleans East Lakefront to Michoud Canal	Manatee, Gulf sturgeon, Kemp's ridley, loggerhead, and green sea turtles	NLAA; adverse modification of shoreline (7.2 acres) **	Temporary disturbance to 118.1 acres lake bottom foraging areas during construction for manatee and sturgeon; implemented manatee and sturgeon BMPs
IERS 7	New Orleans East Lakefront to Michoud Canal	Manatee, Gulf sturgeon, Kemp's ridley, loggerhead, and green sea turtles	NLAA	Temporary disturbance to foraging areas during construction of barge access for manatee and sturgeon; implemented manatee and sturgeon BMPs

IER* #	Project/Parish	Species Potentially Present	Determination	Comments
IER 8	Bayou Dupre	Manatee, Gulf sturgeon, Kemp's ridley, loggerhead, and green sea turtles	NLAA for manatee; no effect on other species	Temporary disturbance to foraging areas during construction for manatee; BMPs were implemented
IER 9	Caernarvon Floodwall	Manatee and Gulf sturgeon	NLAA on manatee; no effect on other species	Temporary disturbance for foraging areas for manatees; BMPs were implemented
IER 10	Chalmette Loop	Manatee, Gulf sturgeon, Kemp's ridley, loggerhead, and green sea turtles	NLAA	Temporary disturbance to foraging areas during construction for manatee; BMPs were implemented
IERS 8,9,10.a	Chalmette Loop	Manatee, Gulf sturgeon, Kemp's ridley, loggerhead, and green sea turtles	NLAA for manatee; no effect on other species	Temporary disturbance to foraging areas during construction for manatee; BMPs were implemented
IER 11 Tier 2 Borgne	IHNC-Borgne	Manatee, Gulf sturgeon, Kemp's ridley, loggerhead, and green sea turtles	NLAA	Temporary and permanent impacts; permanently converted approximately 122 acres of emergent marsh and open water bottom
IERS 11.b Tier 2 Borgne	IHNC-Borgne	Manatee, Gulf sturgeon, Kemp's ridley, loggerhead, and green sea turtles	NLAA for manatee; no effect on other species	Reinforcement of IHNC levee and floodwalls all work on land no in-water construction.
IERS 11.c Tier 2 Borgne	IHNC-Borgne	Manatee, Gulf sturgeon, Kemp's ridley, loggerhead, and green sea turtles	NLAA for manatee; no effect on other species	Borgne Barrier Shoreline erosion maintenance
IER 11 Tier 2 Pontchartrain	IHNC Pontchartrain	Manatee, Gulf sturgeon, Kemp's ridley, loggerhead, and green sea turtles	NLAA	Temporary and permanent impacts; permanently converted 7 acres of open water bottom
				Extended temporary impacts for additional 12-month construction, however BMPs were followed for manatees and impacts were minimized impacts by filling scour

IER* #	Project/Parish	Species Potentially Present	Determination	Comments
IERS 11.d Tier 2 Pontchartrain	IHNC Pontchartrain	Manatee, Gulf sturgeon, Kemp's ridley, loggerhead, and green sea turtles	NLAA	hole for the sector gate and cofferdam construction by placing material during slack tide in the IHNC or when water was moving from Lake Pontchartrain into the IHNC to avoid the movement of sediments into Lake Pontchartrain and on to Gulf sturgeon critical habitat. It was not possible to use TYPE III Silt Barrier/Curtains, but the contractor monitored the turbidity during fill placement and did not exceed turbidity levels.
IERS 33.a	Mississippi River Co-Located Levees, Plaquemines and Orleans parishes	West Indian manatee, pallid sturgeon, piping plover, Gulf sturgeon, Green sea turtle, hawksbill sea turtle, Kemp's ridley sea turtle, leather back sea turtle, loggerhead sea turtle	NLAA manatee, pallid sturgeon, piping plover, and no effects for turtles and Gulf Sturgeon.	No T&E or critical habitat within project area.
PIER 36	BLH Wet & Dry = MB Credits Swamp = MB Credits Non-Refuge IM = Milton Island Marsh Restoration Non-Refuge/Refuge BM = Bayou Sauvage Marsh Restoration BLH-Wet/ IM = Bayou Sauvage PS Refuge BLH-Wet = Fritchie FS Refuge	West Indian manatee; Gulf sturgeon; and Kemp's Ridley, loggerhead, and green sea turtles	No effects for Mitigation Bank. NLAA West Indian Manatee; Gulf sturgeon; or Kemp's ridley, loggerhead or green sea turtles	The West Indian manatee; Gulf sturgeon; and Kemp's Ridley, loggerhead, and green sea turtles are expected to potentially be found in the project's borrow area. The borrow site for this project is in Gulf sturgeon critical habitat. BMPs would be followed to minimize adverse impacts to manatees.
PIER 36 Tier 1	Milton Island Marsh Restoration	West Indian manatee; Gulf sturgeon; and Kemp's ridley,	NLAA West Indian Manatee; Gulf sturgeon; or Kemp's ridley, loggerhead or green sea turtles	No listed species are expected to be directly impacted within the proposed marsh mitigation area. However, to minimize the potential for construction activities to cause

IER* #	Project/Parish	Species Potentially Present	Determination	Comments
		loggerhead, and green sea turtles		adverse impacts to manatee's standard manatee and Gulf Sturgeon protection measures would be implemented as stated in IER
PIER 36 Supplement 1 (SIER 1)	Bayou Sauvage, Turtle Bayou & New Zydeco Ridge Restoration Projects Saint Tammany & Orleans Parishes	West Indian Manatee; Kemp's Ridley Sea Turtle, Green Sea Turtle; Loggerhead Sea Turtle; Gulf Sturgeon	May affect, but not likely to adversely affect the Gulf Sturgeon, West Indian manatee, the green, Kemp's Ridley, and loggerhead sea turtles, and may affect but is not likely to affect Gulf Sturgeon Critical Habitat and is not likely to destroy of adversely modify it.	The manatees and sea turtles could be found in the borrow areas in Lake Pontchartrain and highly unlikely that the listed marine species would be found in the BLH-Wet mitigation project areas due to very shallow water. Standard manatee protected measures would be followed.
EA #546 SPIER 36 Supplement 1	EA Supplement PIER 36 Supplement 1 Bayou Sauvage, Turtle Bayou & New Zydeco Ridge	West Indian Manatee; Kemp's Ridley Sea Turtle, Green Sea Turtle; Loggerhead Sea Turtle; Gulf Sturgeon	May affect, but not likely to adversely affect the Gulf Sturgeon, West Indian manatee, and the green, Kemp's Ridley, and loggerhead sea turtles and may affect, but is not likely to adversely affect Gulf Sturgeon Critical Habitat and is not likely to destroy or adversely modify it.	No listed species are expected to be directly impacted within the proposed marsh expansion footprint since they would not be expected to be found in the area due to shallow water depths (typically less than 2 feet). No overall difference in impact to Gulf sturgeon, their critical habitat or any other T&E species from what was addressed in SIER 1.

IER* #	Project/Parish	Species Potentially Present	Determination	Comments
PIER 37	PS BLH-Wet/Dry= MB General FS BLH-Wet= Lake Boeuf Restoration General FS Swamp= Lake Boeuf Restoration General FS Fresh Marsh=Jean Lafitte Restoration Park/404c FS BLH-Wet= Jean Lafitte Restoration Park/404c FS Swamp= Jean Lafitte Restoration Park/404c Fresh Marsh= Jean Lafitte Restoration	West Indian manatee and Pallid Sturgeon	No effects for Mitigation Bank. NLAA West Indian Manatee and Pallid Sturgeon	No direct impacts to West Indian Manatee or Pallid sturgeon are anticipated from construction of these features. In order to minimize the potential for construction activities to cause adverse impacts to manatees and Pallid sturgeon standard protection measures would be implemented.
PIER 37 Tiered IER 1 NPS Joint EA`	Jean Lafitte National Park and Preserve Mitigation Features General FS FM = JL1B5 & JL15 Park/404c FL BLH-Wet = JL14A Park/404c FS Swamp= JL7 Park/404c FS FM = JL1B4	West Indian manatee	NLAA	To minimize the potential for construction activities to cause adverse impacts to manatee's standard protection measures would be implemented.
SPIER 37a	Mitigation for PS BLH Dry WBV HSDRRS	None	No impacts to Threatened and Endangered Species	None of the animals under USFWS and/or NMFS jurisdiction are expected to be found in the project area.

*S – Supplemental

** Impact from raising foreshore protection, potentially occurring between 2014 and 2057 (6.9 acres for IER #6 and IER Supplemental #6 and 7.2 acres for IER #7 and IER Supplemental #7).

West Indian Manatee - The USACE determined that the potential for a manatee to be in the project area during construction was unlikely, and the USFWS concurred that the HSDRRS was not likely to adversely impact this species. The USACE committed to implement BMPs to further reduce the potential effects. These BMPs include the following:

All contract personnel associated with the project would be informed of the potential presence of manatees and the need to avoid collisions with manatees. All construction personnel would be responsible for observing water-related activities for the presence of manatees. Temporary signs would be posted prior to and during all construction or dredging activities to remind personnel to be observant for manatees during active construction/dredging operations or within vessel movement zones (i.e., the work area), and at least one sign would be placed where it is visible to the vessel operator. Siltation barriers, if used, would be made of material in which manatees could not become entangled and would be properly secured and monitored. If a manatee is sighted within 100 yards of the active work zone, special operating conditions would be implemented, including: moving equipment would not operate within 50 ft of a manatee; all vessels would operate at no wake/idle speeds within 100 yards of the work area; and siltation barriers, if used, would be re-secured and monitored. Once the manatee has left the 100-yard buffer zone around the work area of its own accord, special operating conditions would no longer be necessary, but careful observations would be resumed. Any manatee sighting would be immediately reported to the U.S. Fish and Wildlife Service (337/291-3100) and the LaDWF, LaNHP (225/765-2821).

These procedures have been recommended by the USFWS and adopted by the USACE for use in situations where in-water construction activities potentially could occur when manatees may be present. Presently there has only been one siting that was reported to USFWS and LaDWF of two manatees which occurred on August 20, 2012 at approximately 1:30 pm as they passed through the Gulf Intracoastal Waterway Sector Gate at 30 degrees 00’52.03” N 89 degrees 54’03.94” W.

Gulf Sturgeon - The Gulf sturgeon was temporarily affected during construction activities due to increased turbidity, construction noise, potential disruption to migration paths, and vessel traffic. These effects dissipated upon completion of the HSDRRS construction. During the construction of the Seabrook gate complex (sector gate and two vertical lift gates) at the IHNC, as part of the effort to minimize impacts on Gulf sturgeon, a USACE biologist was on-site during the dewatering of the cofferdam. The cofferdam was scanned using a side scanner and checked with gill nets and an electro shocker to ensure that Gulf sturgeon were not entrained within the cofferdam, thereby minimizing impacts on Gulf sturgeon. As part of the coordination for IERS 5.a turbidity monitoring was conducted on each of the three outfall canals to ensure that turbidity control measures were effective and adjusted as needed. Three readings were taken during each workday from June 2014 through September 2014 with a turbidity meter within 500 feet lakeside from the point of discharge to ensure that at no point in time a 50 NTU in difference is exceeded. The largest excavation activity which occurred during this monitoring period was the excavation of the 17th Street Canal western peninsula to construct the canal bypass channel. As described in IERS #5.a, approximately 1.3 acres of land was excavated to an elevation of -15 ft. producing approximately 45,000 cy of material. Turbidity curtains were installed to trap any sediment released during this excavation activity. Likewise, turbidity curtains were installed at the Orleans Avenue and London Avenue Canals to control migration of sediments into Lake Pontchartrain, though the magnitude of dredging and excavation in these two canals was less than that of the 17th Street canal activities. The turbidity monitoring through September 2014 demonstrated that the turbidity control measures executed by the construction contractor successfully controlled the migration of sediments from the construction sites into Lake Pontchartrain. At no time did any of the turbidity readings taken exceed the 58.4 NTU threshold. The highest reading seen throughout the monitoring was 49.4 NTUs, but this was an anomaly caused by a thunderstorm-caused turbidity curtain failure which was quickly remedied; many of the readings were well below the highest readings seen during baseline monitoring. Secondary proof of the adequacy of the turbidity control measures was seen in the difference in turbidity readings taken inside and outside the turbidity curtain at any given time. During excavation/dredging activities, turbidity levels were much higher inside the curtain than outside the curtain, demonstrating the efficacy of the curtains.

As described in IERS 11.d the potential for impacts on manatees, gulf sturgeon, and Kemp's ridley, loggerhead, and green sea turtles due to adverse effects on the water quality of inshore areas of Lake Pontchartrain or the IHNC during the construction period was minimized through the use of BMPs and adherence to regulations governing stormwater runoff at construction sites. The contractor minimized impacts during the fill of the scour hole for the sector gate and cofferdam construction by placing material during slack tide in the IHNC or when water was moving from Lake Pontchartrain into the IHNC to avoid the movement of sediments into Lake Pontchartrain and on to Gulf sturgeon critical habitat. It was not possible to use TYPE III Silt Barrier/Curtains, but the contractor monitored the turbidity during fill placement. With continued implementation of BMPs, impacts from the continued construction of the proposed action on manatee, Gulf sturgeon and their critical habitat, on Kemp's ridley, loggerhead, or green sea turtles would be unlikely to adversely affect these species. Furthermore, the HSDRRS construction would have no direct or indirect impacts that would contribute to cumulative impacts on these species.

<u>Sea Turtles</u> - The LPV projects in the Jefferson East Bank, Orleans East Bank, New Orleans East, and Chalmette Loop sub-basins temporarily impacted Kemp's ridley, green sea turtle, and loggerhead sea turtle from disturbances to foraging areas, potential migration paths or patterns, and noise. Permanent impacts on foraging areas, due to the conversion of approximately 122 acres of emergent marsh and open water to the surge barrier (IER #11 [Tier 2]), impacted these species, but the NMFS concurred with the USACE that these actions did not likely adversely affect these species.

As described in IERS 5.a the following BMPs were followed to minimize impacts to Protected Marine Species which includes Bottlenose dolphins, sea turtles and Gulf sturgeon for entrapment prevention:

1. Prior to construction, the Corps of Engineers (COE) Technical Manager, the Contracting Officer Representative (COR) and the Contractors should conduct a site visit and meeting to develop a mutual understanding relative to compliance with the MMPA and the ESA.

2. Contractors shall instruct all personnel associated with the project of the potential presence of protected species in the area, and the need to prevent entrapment of these protected species. All construction personnel shall be advised that there are civil and criminal penalties for harming, harassing, or killing these protected species. The Contractor shall be held responsible for any protected species harassed or killed as a result of construction activities not conducted in accordance with these specifications.

3. Contractor shall observe the area to be enclosed for protected species at least 24 hours prior to and during closure of any levee, dike or structure. This is best accomplished by small vessel or aerial surveys, with an adequate number of experienced marine observers for the size of the site, scanning for protected species.

4. If any protected species are sighted within the area to be enclosed all appropriate precautions shall be implemented by the Contractor to ensure protection of the animal. These precautions shall include avoiding direct contact with and not feeding the protected species.

5. Any sightings of protected species within an enclosed project site shall be reported immediately to the COE. The point of contact within the COE will be Tammy Gilmore, (504) 862-1002 or email at tammy.h.gilmore@usace.army.mil. Coordination by the COE personnel with the National Marine Fisheries Service (NMFS) Marine Mammal Health and Stranding Response (MMHSRP) and the Louisiana State Coordinator for the Sea Turtle Stranding and Salvage Network (STSSN) will be conducted, as applicable, to determine what further actions may be required.

6. During enclosure construction, the Contractor will leave or construct at least one escape route or gap in retention structures to allow any protected species to exit shallow open water areas during construction activities. Escape routes or gaps in retention structures would be constructed to lead directly to open water outside the disposal site with a minimum width of 100 feet and have a depth as deep as the deepest natural entrance into the disposal site.

7. Escape routes and/or gaps in retention structures would remain open until visual inspections of the enclosure have determined that no protected species are present within the structure.

8. If observers note the animals are not leaving the area, but are visually disturbed, stressed, or their health is compromised then COE may require any pumping

activity to cease until the animals either leave on their own or are moved under the direction of NMFS.

a. In coordination with the local stranding networks and other experts, NMFS will conduct an initial assessment to determine the number of animals, their size, age (in the case of dolphins), body condition, behavior, habitat, environmental parameters, prey availability and overall risk.
b. If the animal(s) is/are not in imminent danger they will need to be monitored by the Stranding Network for any significant changes in the above variable.
c. The contractor may not attempt to scare, herd, disturb, or harass the protected species to encourage them to leave the area. Coordination by the COE with the NMFS SER Stranding Coordinator may result in authorization for these actions.
d. NMFS may intervene (catch and release and/or rehabilitate) if the protected species are in a situation that is life threatening and evidence suggests the animal is unlikely to survive in its immediate surroundings.

9. Any protected species observed dead must immediately be reported to the COE (Tammy Gilmore 504-862-1002) who will then report to NMFS and/or STSSN coordinator.

4.2.10.2.2 HSDRRS 2057 Impacts

Impacts on threatened and endangered species from the future construction activities associated with levee lifts (dredge, fill, and water body displacement) within the project area are expected to be short-term and minor, and permanent impacts would be negligible. Additional impacts on Gulf sturgeon and sea turtles would occur if repair or construction of foreshore protection and wave attenuation features and associated dredging and dredged material stockpiling in Lake Pontchartrain (Orleans sub-basin) were conducted. These construction activities were described in IERs #6 and #7 but were determined to be unnecessary to provide 100-year level of risk reduction for HSDRRS construction and were not constructed as part of HSDRRS 2011.

Short-term construction-related direct impacts from the future levee lifts construction would include decreased DO levels in the waters immediately surrounding the construction site, excessive turbidity due to construction runoff and sedimentation, and increased water body temperature due to the increased suspended solids produced during construction that could absorb solar radiation. Decreased water quality would adversely impact habitat used by West Indian manatee, sea turtles, and Gulf sturgeon. Suspended solids decrease visibility for foraging, migrations, and escaping predators. There are also likely temporary, minor water quality impacts due to increased nutrient loading, sediment oxygen demand, miscellaneous debris, and accidental spills from construction equipment. These impacts may delay or prohibit reproduction, damage food sources, or damage individuals. BMPs, SWPPP measures, and Spill Prevention

Control and Countermeasures Plans implemented on construction sites in the future would minimize levels of sedimentation, debris, or spills reaching waterways.

Indirect impacts include alterations to hydrology, which could result in water column impacts, alteration of patterns, water circulation, and normal water fluctuations, in addition to changes in salinity and nutrient loads in the water. After construction, the conditions would be expected to stabilize, allowing for suspended sediments to settle and vegetation to recolonize the area. Construction-related impacts would also affect lake bottoms, canal bottoms, drainage waterways, and open water. Direct impacts from dredging include increased turbidity during dredging, disruption of water bottoms from access channels and material stockpiles, and destruction of SAV.

The foreshore protection addressed in IERs #6 and #7 could be implemented by 2057 within the New Orleans East sub-basin. Repair and construction of the foreshore protection would permanently impact approximately 6.9 acres of lake bottom and 7.2 acres of shoreline and wetlands fringe, and temporarily impact 179.2 acres of lake bottom, which would also have direct impacts on water quality and protected species habitat. Mitigation measures for this future foreshore protection work would be necessary to minimize any potential impacts on Gulf sturgeon. These mitigation measures are outlined in section 5.3.2.4 of the CED Phase I.

4.2.10.2.3 Cumulative Impacts

The HSDRRS projects and their associated excavation of borrow areas contribute to cumulative impacts on the water quality of protected species habitat and designated Gulf sturgeon critical habitat in the project area. Direct impacts on protected species habitat occurred as a result of filling waterways and wetlands (open water aquatic, fresh marsh, brackish, and swamp habitats) for ROW for the HSDRRS; some additional habitat could be lost from future levee lifts through expanded levee footprints, but it is anticipated that these habitat losses would primarily occur on poor quality habitat at the toe of existing levees.

The direct cumulative impacts on protected species habitat are associated with construction activities; the associated dredge, fill, and material stockpiling activities; water body displacement; and hydrologic modifications of waterways and ecosystems. The cumulative HSDRRS construction and operational activities would likely cause sedimentation and contamination of waterways from stormwater runoff during rain events. These direct impacts include changes in water temperature, salinity, turbidity, DO, hydrology, and water velocity. These water quality impacts would impact West Indian manatee, Gulf sturgeon, and sea turtles by impacting their aquatic habitat and potentially impacting their food sources, abilities to forage, and visibility for migration and escape from predators. However, through Section 7 consultation and the implementation of BMPs as recommended by USFWS and NMFS, the permanent cumulative impacts on protected species are negligible.

Cumulative Impacts of Regional Actions

Present and future regional actions by USACE or other Federal agencies are Federally mandated to avoid impacts on threatened and endangered species. All Federal projects would be coordinated with the USFWS and the NMFS for determination of impact on threatened and endangered species prior to implementation, which minimizes the likelihood of direct, indirect, or cumulative adverse effects. Cumulative impacts stemming from drastic changes in land use from natural to developed, such as expansion of levee footprints into marshes, construction of confined disposal areas, and bridge improvement projects, could be a detriment to any of the protected species. However, some projects that enhance habitat through restoration or creation would have beneficial effects on threatened and endangered species. The benefit would include an increase in suitable nesting, loafing, and foraging habitat, as well as an increase in prey species abundance.

4.2.10.2.4 Summary of Cumulative Impacts Species

Within much of the HSDRRS project area (St. Charles, Jefferson, Chalmette Loop, Gretna-Algiers sub-basins), no cumulative direct or indirect impacts on threatened and endangered species would be expected to occur. However, as other regional projects are implemented, additional adverse modification of Gulf sturgeon critical habitat could occur in the Orleans East Bank and New Orleans East sub-basins. These modifications would contribute to the cumulative adverse impacts on adjacent critical habitat for the Gulf sturgeon; however, regionally these impacts would be negligible.

Cumulative indirect permanent impacts from the conversion of natural areas could also increase marsh fragmentation, alter hydrology, and, in turn, affect habitat quality, making the area unsuitable for some threatened and endangered species.

Other projects proposed in southeastern Louisiana would potentially lessen impacts from implementation of the HSDRRS, including projects such as freshwater reintroduction from the Bonnet Carré spillway, CFDC, and other CWPPRA diversion projects, as well as other coastal and wetlands restoration projects. Projects such as these would provide cumulative long-term beneficial impacts on threatened and endangered species. Some of these projects in southeastern Louisiana would include restoration projects, such the Bayou Bienvenue Restoration, which would create numerous acres of marsh and swamp through the placement of dredged sediments from the Mississippi River. Other proposed projects such as shoreline protection projects would positively impact Lake Pontchartrain and Breton Sound, resulting in lower salinity marshes with greater heterogeneity and interspersion. Enhancement of habitat through wetlands and coastal restoration projects would provide long-term benefits to the area and would be beneficial to threatened and endangered species.

4.2.11 CULTURAL RESOURCES

4.2.11.1 AFFECTED ENVIRONMENT

The affected environment described for cultural resources in the CED Phase I is incorporated by reference. There has been no change to the historic and existing environment previously described.

The HSDRRS corridor was subjected to archaeological survey. This required background historical research of the study area and identification of previous cultural surveys and known historic properties to assess the areas of probability for cultural resources. A Phase I cultural resource survey was conducted in the form of pedestrian surface surveys and systematic shovel test pit excavations and delineations, if necessary. If applicable, a Phase II site evaluation was conducted for testing of eligibility for the National Register of Historic Places (NRHP). In all cases, the cultural resource survey areas exceeded the size of the preliminary APE, allowing the USACE project archaeologists to limit the Area of Potential Effect (APE), as needed, to avoid any damage to historic properties with potential eligibility for the NRHP. Nautical remote sensing was conducted in areas of open water included in the LPV and cannot be separated by parish as with the terrestrial surveys.

Nautical Remote Sensing - Based on background research and previous cultural resources investigations in Lake Pontchartrain, it was determined that there was a high potential for cultural resources in submerged portions of the APE. Nautical remote sensing was conducted in numerous APE. These remote sensing operations, and their results, have been discussed in the Phase I CED and the reader is referred to that document for more detailed information.

4.2.11.1.1 Terrestrial Survey - LPV

St. Charles Parish - The original IER #1 APE, first discussed in the CED Phase I, included 9.9 miles of existing earthen levee from the Bonnet Carré Spillway East Guide Levee to the St. Charles-Jefferson boundary line. Twelve archaeological surveys had previously been conducted in or adjacent to the IER #1 APE, and an additional survey discussed within Phase I CED was conducted to complete coverage of the IER #1 APE. All these surveys concluded that no historic properties were found within the APE of St. Charles Parish.

The APE for IERS #1b contained an additional access road and ditch within St. Charles Parish, that had not been discussed within IER #1. Although outside of the APE of IER #1, these new APE discussed in IERS #1b were investigated by the initial cultural resources investigations that were summarized and included within the CED Phase I for IER #1. A conclusion of no historic properties affected was coordinated with the State Historic Preservation Officer (SHPO) in a letter dated June 7, 2011.

Jefferson Parish - The APE of IERS #2.a is located within Jefferson Parish, and includes a new drain line from the West Return Floodwall to the existing City of Kenner drainage system. The entirety of APE for IERS #2.a was previously researched and coordinated for no historic properties affected, by IER #2. The SHPO concurred with this finding in letter dated 15 February 2008 and the Mississippi Band of Choctaw Indians, Tunica-Biloxi Tribe of Louisiana, and the Choctaw Nation of Oklahoma concurred with the effect determination in an email dated 15 January 2008 and letters dated 9 January 2008 and 15 January 2008, respectively.

EA #496 examined effects of stability remediation activities on the inner western bank line of the 17th Street outfall canal in Jefferson Parish. The APE of this project had been previously considered for cultural resources in the IER(s) #5, #27 and #27.a. Coordination for no effect to historic properties was previously completed in these IER(s), with Louisiana SHPO and federally recognized Tribes.

Orleans Parish - IERS #5.a involved additional ROW for the 17th Street, Orleans, and London Avenue Canals. This ROW was covered by the original cultural resources survey for IER #5. In letters to the Louisiana SHPO and federally recognized Indian Tribes (Tribes) dated 22 February 2008 and 1 October 2008, the CEMVN provided project documentation and evaluation of cultural resources potential in the project area and found that the permanent pump stations would have no impact on cultural resources. The SHPO concurred with our “no historic properties affected” finding in a letter dated 17 March 2008 and again 10 November 2008, and the Seminole Tribe of Florida concurred in a letter dated 11 November 2008. Remaining Tribes did not respond with any questions or concerns to the finding of no historic properties affected.

The APE of IER #11 stretches across the Golden Triangle Marsh area from the Michoud floodwall south to the New Orleans side of the MRGO for approximately 2 miles. The width of the APE ranges from 600 ft at the MRGO closure structure, to 1,750 ft along the floodwall segment. Two staging areas and four potential disposal areas were located adjacent to the APE. An amendment to the IER #11 project area was added later. IER #11 Tier 2 Pontchartrain added an area measuring 1800 ft by 2,500 ft to the APE. This portion of the APE is located just to the south of the Senator Ted Hickey Bridge. IER #11 Tier 2 Borgne included additional area to the north and south banks of the construction access channels. These areas had a combined length of 13,000 ft and measure 100 ft wide on the north bank and 150 ft wide on the south bank. Cultural resources investigations and sites within the APE of IER #11 and its additions were discussed in the Phase I CED.

Some further Supplements to the amended IER #11 project areas have been completed since the CED Phase I was completed. IERS #11.b Tier 2 Borgne examined the effects of improved protection on the IHNC in both Orleans and St. Bernard Parishes. Correspondence with the Louisiana SHPO concluded that additional APE has been previously impacted by the construction of GIWW and IHNC, port facilities, railroads, bridges, and regular maintenance dredging, and a 13 September 2010 letter from the Louisiana SHPO concurred that no historic properties should be affected. IERS #11.c Tier 2 Borgne added additional ROW for shoreline protective measures but did not add any additional APE to the cultural resources coordination already completed. IERS #11.d Tier 2 Pontchartrain concerned the necessity that additional time be given to the completion of the Seabrook Floodgate Complex. No additional APE for cultural resources was necessary as a result of this document, and no further coordination occurred.

IERS #27.a concerned additional staging areas for proposed work on the London Avenue Outfall Canal. There were no impacts to cultural resources discussed within this document, as all proposed project areas were previously coordinated by IER #27.

St. Bernard Parish - IER Supplemental #8,9,10a discusses a swing span bridge to access the "island" of reach LPV 145 within St. Bernard Parish. All lands discussed as part of this action were previously discussed and coordinated for cultural resources by IERs #8, 9, and 10 (Table 2-20). No significant cultural resources exist or are affected.

A portion of IERS #11.c Tier 2 Borgne is within St. Bernard Parish. This Supplement examined additional ROW for shoreline protective measures but did not add any additional APE to the cultural resources coordination already completed. Cultural resources coordination for this IERS was completed in November 2010 with the original IER #11.

4.2.11.1.2 Terrestrial Survey – WBV

Orleans Parish - Three historic properties were found in Orleans Parish 16OR121, 16OR122, 16OR573. Archaeological site 16OR121 was avoided as a condition of the programmatic agreement and consultation with the LA SHPO and federally recognized Tribes. Detailed discussion of IER 33 and IER 33a can be found in the Plaquemines Parish discussion below. No NRHP historic districts or individually listed properties on the NRHP were identified within the APE (Table 4-21).

Table 4-24: Archaeological Investigations Within the HSDRRS WBV APE

(not cited by CED I)

Reference	Report Title	Archaeological Sites/ Historic Standing Structures within the APE	Eligibility and Recommendations
St. Bernard, Orleans, Plaquemines Parishes			
Boyko et al. 2013	Phase I Cultural Resources Surveys and Phase II National Register of Historic Places Testing and Evaluations Completed for Hurricane and Storm Damage Risk Reduction System – Mississippi River Levees Projects: The West Bank and Vicinity – Mississippi River Levees Co-Located Project Engineered Alternative Measures and Resilient Features	16OR122, 16PL196, 16PL155, 16PL120, 16PL254 16OR121, 16OR573, 16PL169, 16PL198 - 16PL204	Potentially eligible for NRHP. To be avoided. Not significant resources

Jefferson Parish - The actions discussed in IERS #12a are located within Jefferson Parish. The proposed action examined by IERS #12a consisted of an earthen levee enlargement and a shift of levee centerline, still within existing right-of-way. An additional access road and a pontoon bridge crossing were determined necessary for this action. All proposed actions of IERS #12a were within the areas investigated for cultural resources by IER #12. The SHPO and the Seminole Tribe of Florida concurred with our original "no historic properties affected" finding in a letter dated 1 August 2008, and an email dated 8 July 2008, respectively, and no other Tribes responded to our request for comment.

IERS #15.a addressed the relocation of a Chevron pipeline to allow completion of the WBV 15a.2 levee reach. This action did not affect any historic properties and was coordinated with letters received from the SHPO on February 22, 2010, and the Alabama Coushatta Tribe of Texas on May 4, 2010.

IERS #15.b referenced previously coordinated cultural resources studies that were completed as documentation for IER #15 and earlier documents.

IERS #16b did not become a completed document, but it was begun to address impacts caused by several Right-of-Way issues concerning placement of construction trailers and levee elements. Cultural resource investigations completed for IER #16 contained extra footprint that included the expansions of right-of-way to be addressed by IERs #16b.

Plaquemines Parish - The proposed actions assessed for impacts in IERS #12 are in Plaquemines Parish, as a Supplement to the actions of IER #12 and IER #13 that were presented in the CED Phase I involving Orleans, Jefferson, and Plaquemines Parishes. The proposed action of IERS #12 was to utilize the Westbank Site N area to deposit all clean, cleared and grubbed material removed during the construction of the West Closure Complex eastern floodwall and road realignment, as well as the Hero Canal Levee. Cultural resources coordination for IERS #12 was completed during the coordination of IER #12 and IER #13, with responses from SHPO and Chitimacha Tribe on December 26, 2007, the Mississippi Band of Choctaw on January 15, 2008, and the Choctaw of Oklahoma on December 5, 2007.

IERS #12/13 amended the APE, within Plaquemines Parish, of IER #13 to include various parcels outside the contiguous APE for use as staging areas and ROWs. These areas were fully investigated by earlier cultural resources studies with no cultural resources located, and the amendments of IERS #12/13 were coordinated with SHPO and federally recognized Tribes in a letter dated August 6, 2010. The SHPO, the Seminole Tribe of Florida, and the Alabama Coushatta concurred with our “no historic properties affected” finding in letters dated September 2, 2010, August 25, 2010, and August 26, 2010, respectively.

IERS #13a pertains to the temporary closure of Hero Canal, Plaquemines Parish. There was no impact to cultural resources as result of the proposals of this project, and a letter from the SHPO dated March 30, 2009 concluded compliance with NHPA for the proposed action.

Both IER #33 and IERS #33a have been mentioned above for Orleans Parish. This discussion addresses that Plaquemines Parish components of each evaluation. IER #33 treats the WBV-MRL Co-Located project and its effects within Orleans and Plaquemines Parish. Examination of the Louisiana Division of Archaeology site files identified 15 previously recorded archaeological sites within 0.5 mile of the APE. No NRHP historic districts or individually listed properties on the NRHP were identified within the APE.

Field investigation of the WBV-MRL corridor was completed between July 2 and November 12, 2010. High probability areas were surveyed to locate and define the boundaries of archaeological sites and to report standing structures within the project area. Phase 1 survey of high probability areas was conducted from approximate river mile 85.5 to mile 70 above Head of Passes, extending 30 feet from the existing levee toe on both the land- and riversides. Proposed access roads, ramps and staging areas were also investigated. Additionally, mechanical trenching was conducted near the Rockville Cemetery.

As a result of field investigations of the WBV-MRL corridor completed in 2010, 16 archeological sites and 12 non-site archeological loci were identified or relocated within the APE. Four sites (16OR122, 16PL196, 16PL155, and 16PL120) were determined significant as defined by NRHP Criteria but would be avoided during construction of the proposed undertaking. Site 16PL35 (Fort St. Leon) was previously assessed as eligible for listing on the NRHP, but the archaeological remains within the project right-of-way have been destroyed. An architectural survey also was completed, and no historic standing structures were identified within the APE. Borrow sources were the same as those coordinated by earlier IER.

The Louisiana State Historic Preservation Officer concurred with CEMVN's finding of "no adverse effect" in a letter dated December 22, 2010. The following federally recognized Tribes also concurred with CEMVN's effect determination: Caddo Nation of Oklahoma (email dated December 16, 2010), Chitimacha Tribe of Louisiana (telephone conversation of December 16, 2010), Coushatta Tribe of Louisiana (email dated December 16, 2010), Quapaw Tribe of Oklahoma (email dated December 16, 2010), Seminole Tribe of Florida (letter dated December 16, 2010), Alabama-Coushatta Tribe of Texas (email dated December 20, 2010) and Choctaw Nation of Oklahoma (letter dated December 14, 2010). No other federally recognized Tribes provided comment. Section 106 consultation is concluded for this project, with conditions of avoidance.

IERS #33a discussed the Resilient Features component of the HSDRRS/ M RL Co-Located Project area of Orleans and Plaquemines parishes. IERS #33a addressed certain areas that had been utilized by construction contractors, outside of right-of-way discussed within IER #33. These additional areas had the potential to adversely impact cultural resources. IERS #33a also addressed the use of all-clay material as a cap to the levee, instead of soil mixing. Fieldwork for the project was completed between March 22, 2011 and March 9, 2012. As a result of this effort, 12 archeological sites and 3 non-site archeological loci were identified or relocated. Sites16PL115 (Idlewild Plantation), 16PL196 (Belle Chasse Plantation), 16PL202 (Hygiene Plantation), 16PL204 (Fort St. Leon Plantation), and 16PL254 (Alpine Mud Products) were assessed as possessing those qualities of significance as defined by the National Register of Historic Places Criteria for Evaluation (36 CFR 60.4 [a-d]). All these sites were recommended to be avoided during construction of the proposed undertaking.

The remaining archeological sites (16PLI 69, 16PL198, 16PL249, 16PL250, 16PL251, 16PL252, and 16PL253) and non-site archeological loci (RF-BEL-05-01, RF-OAK-01 - 01, RF-SA-OAK-OIA-01) were examined within the Resilient Features project area. Each of these sites was assessed as not significant applying the National Register of Historic Places Criteria for Evaluation (36 CFR 60.4 [a-d]). Cultural resources compliance for this project was met by execution and implementation of a PA, developed in consultation with the Advisory Council on Historic Preservation, the Louisiana State Historic Preservation Office, and federally recognized Tribes. The PA was executed on December 15, 2011, and Section 106 consultation for the WBV-MRL project was completed by following its provisions (PA 1 Attachment/Appendix E).

4.2.11.1.3 Mitigation Restoration Projects

PIER #36 described and evaluated the proposed mitigation plan to compensate for unavoidable habitat losses caused by the construction of the LPV HSDRRS. PIER #36 contained potential actions in Orleans, Plaquemines, St. Bernard, St. Charles, St. John the Baptist, and St. Tammany Parishes. Numerous cultural resources surveys were completed in many of the areas of potential effect, and some cultural resource sites were recorded. In the Programmatic nature of future mitigation efforts documented by PIER #36, USACE chose to show its intent and to fulfill its obligations under Section 106 of NHPA through the development and implementation of a PA containing stipulations for future cultural resources documentation as needs were better defined. This PA was executed on 18 June 2013. Additional cultural resource surveys or investigations that may be required, will occur as stipulated by the PA (PA 2 Attachment/Appendix E). NHPA Section 106 consultations are complete for the purchase of mitigation bank credits (Table 4-22).

Table 4-25: Archaeological Investigations for Habitat Mitigation Projects of the HSDRRS APE

Reference	Report Title	Archaeological Sites/ Historic Standing Structures within the APE	Eligibility and Recommendations
St. Tammany Parish			
Pearson et al. 2014	Phase I Cultural Resources Survey and Evaluation, Milton Island Marsh Restoration Project Area, St. Tammany Parish, Louisiana.	16ST97 shell reef	Potentially Eligible – Project dimensions redefined to avoid site impacts
St. Tammany and Orleans Parish			
Wells et al. 2014	Phase I Cultural Resources Investigations and Remote Sensing Survey of Lake Pontchartrain and Vicinity Refuge Mitigation Projects – National Wildlife Refuge Habitat Mitigation Orleans and Saint Tammany Parishes, Louisiana – Turtle Bayou, Bayou Sauvage Marsh, and New Zydeco Ridge	16OR697	Ineligible
Lafourche Parish			
Jungeblut et al. 2020	Phase I Cultural Resources Investigation of The Proposed West Bank and Vicinity Hurricane and Storm Damage Risk Reduction System Flood Side Bottomland Hardwoods-Wet (Blh-Wet) And Swamp Mitigation Project, Lafourche Parish, Louisiana	16LF309, 16LF310, 16LF311, and 16LF312 and 29-07621 29-07622	Not Eligible Eligible

The Tiered IERs examined specific alternative actions presented by the PIER #36. TIER 1 of PIER #36 examines affected resources for mitigation actions at Milton Island, St. Tammany Parish. Pursuant to the PA for treatment of cultural resources that was signed for PIER #36, cultural resources near the Milton Island Marsh Restoration Area were reviewed. A cultural resources survey draft report titled “Phase I Cultural Resources Survey and Evaluation, Milton’s Island Marsh Restoration Project Area, St.

Tammany Parish, Louisiana" was provided to the SHPO and federally recognized Tribes for review and comment, along with the CEMVN finding of "no adverse effect with conditions". In consultation with the SHPO, the CEMVN recommended the conditions that an unanticipated discovery plan is developed, and that archaeological monitoring is conducted throughout construction of the restoration project. In their letter dated May 13, 2014, the SHPO concurred with the CEMVN findings and effects determination; the Jena Band of Choctaw Indians concurred in their letter dated May 20, 2014.

Supplement 1 to PIER #36. This Supplement specifically examines areas within Bayou Savauge, Turtle Bayou, and New Zydeco Ridge, as mitigation restoration projects. A cultural resources survey report was prepared in July 2014 covering the possible mitigation areas at Turtle Bayou, Bayou Sauvage Marsh, and New Zydeco Ridge. The SHPO concurred in a letter dated Oct 6, 2014, that the project will have no adverse effects on historic properties. No comments were received from federally recognized Tribes. Consultation pursuant to Section 106 of the National Historic Preservation Act has been concluded.

The PIER #37 for mitigation addresses the WBV HSDRRS projects, and affects St. Charles, Jefferson, Orleans, and Plaquemines parishes. Numerous known and unknown cultural resources were known or suspected to exist within the APE of PIER #37. CEMVN chose to fulfill its obligations under Section 106 of NHPA through the continued implementation of a Programmatic Agreement, which was executed on 18 June 2013.

PIER #37 will have Tiered IERs that examine specific areas for mitigation. Studies for these areas are not all completed. NHPA Section 106 consultations are complete for the purchase of mitigation bank credits. Several general locations have been proposed, including lands in the Jean Lafitte fresh marsh, adjacent to Lake Cataouatche, the Bayou Segnette BLH-Dry enhancement area, the Highway 307 Bayou Boeuf area, and some lands within the Barataria Unit Historic District, and/or are administered by the National Park Service (NPS). For restoration projects proposed on the Jean Lafitte National Historical Park and Preserve (JELA), the NPS conducted an independent assessment of potential impacts to cultural resources that are identified on NPS managed lands. The NPS coordinated a finding of no historic properties affected, with agreement received from SHPO on November 2, 2015, and from the Caddo Nation of Oklahoma (November 9, 2015), the Jena Band of Choctaw (November 24, 2015), and the Choctaw Nation of Oklahoma (December 8, 2015). The NPS will conduct any further consultation in accordance with Section 106 of the National Historic Preservation Act with the LA SHPO and federally recognized Indian Tribes, for restoration projects that are located on NPS managed lands. In accordance with the stipulations of the PA, the USACE, CEMVN assessed impacts to cultural resources that may result from proposed restoration projects located on NPS lands and will coordinate findings with the NPS to ensure that consistent information is provided to the LA SHPO and federally recognized Indian Tribes. Identified cultural resources that are determined to be eligible for listing or are listed on the NRHP will be avoided. If avoidance is not possible, mitigation strategies would be developed in accordance with the stipulations of the PA.

Two potential mitigation areas are a location along the east shore of Lake Salvador, and a portion of Yankee Pond. Both project locations possess a strong probability for the presence of cultural resources, and NRHP sites are located within one mile of the proposed Lake Salvador project location. Both Yankee Pond and the Millaudon Canal where half of the swamp project locations are proposed may be culturally important features, but both have lost much of the integrity that would make them significant. It is not likely that activities associated with the proposed restoration project would have a direct impact on cultural resources within the project area. Submerged cultural resources could exist within the borrow area located in Lake Cataouatche and Yankee Pond, and the removal or placement of borrow could have a direct impact on those cultural resources. It is important to recognize that Yankee Pond and Millaudon Canal have lost much of their cultural integrity over time and that the overall condition of the landscape that surrounds these features is critical in maintaining the cultural integrity of the Barataria Historic District. A review of previous research in the Bayou Segnette BLH-Dry enhancement project area identified cultural resources that could be directly impacted by the proposed project. Several surveys have been conducted in the proposed project area, but there is a potential that additional cultural resources could exist within portions of the project area not previously surveyed. Activities associated with this project have the potential to directly impact cultural resources in the project area.

Based on background research indicating that no Phase I cultural resources surveys have been conducted in the Hwy 307 Bayou Boeuf project area, the area would be surveyed for cultural resources prior to project implementation. As individual project features are developed, the project would be assessed for its effect on historic properties, and survey strategies and the Area of Potential Effect would be coordinated with the LA SHPO, tribes, and other interested parties as in accordance with the stipulations of the PA as executed on June 18, 2013.

The PIER # 37, TIER 1 EA, evaluated the construction of Avondale Gardens and other program features. The CEMVN has adopted Section 106 consultation conducted pursuant to the National Historic Preservation Act of 1966, as amended, by the National Park Service (NPS), Jean Lafitte National Historical Park and Preserve and New Orleans Jazz National Historical Park. The Louisiana State Historic Preservation Officer determined by letter dated Nov 2, 2015 that no known historic properties would be affected by the proposed action. In partial fulfillment of responsibilities under Executive Order 13175, the National Environmental Policy Act, and Section 106 of the National Historic Preservation Act, on June 3, 2015 the NPS offered federally-recognized 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. Additional consultation with the Caddo Nation was conducted on October 13, 2015 and November 6, 2015, and with the Jena Band of Choctaw Indians on October 13, 2015. The Caddo Nation concurred with the finding of no adverse effect in an email dated November 9, 2015, and the Jena Band of Choctaw Indians concurred in an email dated November 24, 2015. The Choctaw Nation of Oklahoma has requested that the NPS keep them informed of any archaeological sites that might be discovered during the project. In a letter dated December 3, 2015 the SHPO concurred with the NPS finding of no adverse effect to historic properties.

Supplemental EA #433 addressed the proposal to construct 24 acres of fresh marsh at Big Mar as mitigation for freshwater marsh loss due to the actions of unwatering as described in EA #433. Previous cultural resource surveys have occurred within the APE for the project, and no historic properties eligible for the NRHP were located. In letter dated December 16, 2010 the SHPO concurred with determination that no further cultural resource survey was necessary and that no historic resources were likely to exist within the APE of SEA #433.

SEA #572 evaluated the proposed construction of the conversion of 521 acres of agricultural fields to habitat mitigation along Highway 307 between Raceland and Des Allemandes in Lafourche Parish. Following the Programmatic Agreement as executed on June 18, 2013, CEMVN contracted cultural resource survey and decided of “No Adverse Effects” and consulted with the LA SHPO and Tribes regarding the results of the survey. The LA SHPO concurred on April 8, 2020. No federally recognized Tribes responded. The survey identified four archaeological sites (16LF309, 16LF310, 16LF311, and 16LF312) and two standing structures (29-07621 and 29-07622); only Standing structure 29-07622, one of the last vestiges of the Bowie Lumber Company’s cattle operations, retains its integrity and is determined eligible for the National Register of Historic Places. This resource will be avoided.

4.2.11.1.4 Borrow Sites

Most borrow areas utilized in any component of the HSDRRS project were discussed in the CED Phase I and are incorporated herein by reference. The discussion below includes only new borrow areas.

Orleans Parish - IERS #25.a discussed the addition of excess recycled embankment material adjacent to the Stumpf Borrow Site discussed in the original IER #25. Coordination for no historic properties affected took place before IER #25 was completed and did not require changes for IERS #25.a.

Plaquemines Parish - IER #35 discussed four new proposed contractor-furnished borrow areas. Each of these four proposed areas received a cultural resources survey that located no potentially eligible National Register resources (Table 4-23). The SHPO agreed that no historic properties are affected in letters dated May 7, 2008 and April 12, 2011 for Assumption Land Company; April 13, 2011 for Houma Excavation; July 1, 2011 for RBEND II; and July 22, 2011 for Robert Brothers Farm. No federally recognized Tribes commented or the proposed borrow areas, except for a request from the Choctaw Nation of Oklahoma on November 9, 2011 to receive a copy of a cultural resources survey report.

Table 4-26: Borrow Area Cultural Survey Results (not cited by CED Phase I) Within and Outside of the HSDRRS

Parish/County	Borrow Area	Sites within APE	Eligibility	Impact Statement
Orleans	Stumpf	None	N/A	No Known Impacts
Plaquemines	Assumption Land Company	None	N/A	No Known Impacts
	Houma Excavation	None	N/A	No Known Impacts
	RBend II	None	N/A	No Known Impacts
	Robert Brothers Farm	None	N/A	No Known Impacts

4.2.11.2 ENVIRONMENTAL CONSEQUENCES

4.2.11.2.1 HSDRRS Construction Impacts

The USACE held meetings with the Louisiana SHPO staff and THPOs to discuss the NEPA Alternative Arrangements project review and the development of a PA to tailor the Section 106 consultation process under the NEPA Alternative Arrangements. The USACE formally initiated Section 106 consultation for the LPV component (100-year) and the WBV component (100-year) of the HSDRRS in a letter dated April 9, 2007. This letter emphasized that standard Section 106 consultation procedures were implemented during PA development. The PA required that USACE develop predictive models for each HSDRRS APE activity area delineating the potential (low or high) for historic properties meeting the criteria for eligibility for the NRHP (36 CFR 60). These predictive models were to be developed by architectural historians, historians, and archaeologists who possess the professional qualifications established by the Secretary of the Interior (36 CFR Part 61). Based on the results of these models, USACE would provide the following:

1. Public Interpretation

2. Documentation consistent with the Level II Standards of the Historic American Building Survey/ Historic American Engineering Record

3. Historical, architectural, or archaeological monographs

4. Rehabilitation of historic buildings in accordance with the Secretary of the Interior's Standards for the Treatment of Historic Properties (36 CFR 68)

5. Off-site mitigation, including acquisition of property or preservation easements on property, as appropriate, containing threatened resources of comparable significance in circumstances where there is an imminent need to proceed with construction activity and it is in the public interest

However, the PA was never executed. Instead, standard Section 106 consultation procedures were determined to be suitable for all HSDRRS actions and were used throughout the consultation process.

In letters sent to the Louisiana SHPO and THPO of the 12 Federally recognized tribes with an interest in the region, the USACE provided project documentation, evaluated cultural resources potential in the project area, and found that the HSDRRS actions had no impact on historic properties with the implementation of the USACE mitigation measures (table 4-24). Section 106 consultation for the HSDRRS projects was then concluded. However, if any unrecorded cultural resources were determined to exist within the project boundaries, then no work proceeded in the area containing these cultural resources until a USACE archaeologist was notified and final coordination with the SHPO and Indian Tribes was completed.

Table 4-27: Cultural Resources Impacts (not cited by CED Phase I)

Parish/County	Sites in or Adjacent to APE	Impacts	USACE Mitigation
Orleans	16OR122	No known impacts with USACE mitigation implementation.	Avoidance of site vicinity during project activities.
Plaquemines	16PL196, 16PL155, 16PL120, 16PL254	No known impacts with USACE mitigation implementation.	Avoidance of site vicinity during project activities.
Impacts outside of HSDRRS (Mitigation Impacts)			
Orleans	16OR697	No known impacts with USACE mitigation implementation.	Cultural resource is not eligible for the National Register of Historic Places.
St. Tammany	16ST97 shell reef	No known impacts with USACE avoidance measures	Avoidance of site vicinity during project activities.

Implementation of the HSDRRS projects had beneficial indirect impacts by providing an added level of flood risk reduction to known and unknown archaeological sites in the project vicinity on the protected side of the levees, thereby reducing the damage caused by flood events. Erosion of ground deposits during flood events can result in severe damage and destruction of archaeological sites.

The remote sensing survey identified several submerged NRHP-eligible shipwrecks within the APE of the HSDRRS. Placement of no-work areas around these historic properties resulted in no direct impacts on these submerged cultural resources. All other project APE areas were surveyed and found to contain no cultural resources eligible for the NRHP. Implementation of the HSDRRS had beneficial impacts on cultural resources.

Erosion of ground deposits during flood events can result in severe damage and destruction of archaeological sites. Implementation of the HSDRRS had beneficial indirect impacts by providing an added level of flood risk reduction to known and unknown archaeological sites in the project vicinity within the protected side of the levees by reducing the damage caused by storm events. However, if any unrecorded cultural resources were determined to exist within the project boundaries, then no work proceeded in the area containing these cultural resources until a USACE archaeologist was notified and final coordination with the SHPO and Indian Tribes was completed.

All IER and IER Supplemental actions were committed to minimizing any potential for cultural resource impacts by the USACE through the Section 106 process. More detailed mitigation measures can be found in Section 5 HSDRRS Mitigation.

4.2.11.2.2 HSDRRS 2057 Impacts

Future levee lifts would most likely occur within the present HSDRRS project area; however, future levee lifts could require expanded levee footprints and expanded ROWs. Should the construction require a larger ROW, or new borrow areas, Section 106 would need to be reinitiated in order to determine the existence of known cultural resources eligible for the NRHP within the expanded APE, and to determine if the entire expanded APE has been subjected to a cultural resources survey. The potential for impacts would be negligible as all impacts on cultural resources would be minimized through the Section 106 process. If areas within the APE have not been surveyed, Phase I or Phase II cultural investigations would be necessary.

4.2.11.2.3 Cumulative Impacts

Section 106 consultation has been completed and all required mitigation measures implemented for cultural resources. No adverse impacts on cultural resources occurred. Any future HSDRRS activities would require the successful completion of Section 106, and mitigation for any potential adverse effects on potentially eligible historic properties. Therefore, there would be no adverse cumulative impacts on cultural resources from the HSDRRS.

Projects controlled by, and projects that acquire their funds from, Federal sources are subject to Section 106 guidelines and processes under the NHPA. Under these laws, the Federal entity is required to consider the effects of their projects upon cultural resources. It is the duty of the Federal entity to identify and evaluate all cultural resources within a project area, as well as to provide this information to the SHPO and tribal governments for review and comment on all cultural resources within the APE. Cultural resources or historic properties include any prehistoric or historic district, archaeological site, structure, or object included or eligible for listing on the NRHP. All Federal flood risk reduction, coastal and wetland restoration, and transportation projects are subject to these guidelines and processes, and therefore such Federal projects should not cumulatively adversely impact cultural resources.

Storm Damage Reconstruction and Redevelopment

Storm damage reconstruction and redevelopment projects in the region, in general, would not require cultural resource surveys because these projects will be using an existing footprint that may or may not have been previously surveyed. There is the potential for adverse effects on potentially eligible historic properties as a result of reconstruction and redevelopment of properties, and permanent cumulative impacts on cultural resources would occur. In southeast Louisiana, many of the properties likely to be adversely impacted by these types of projects contain historic structures, and zoning requirements in some urban areas would potentially reduce the level of cumulative impacts by requiring reconstruction and redevelopment projects to follow specific architectural guidelines.

Coastal and Wetlands Restoration

There is the potential for adverse effects on potentially eligible historic properties as a result of coastal wetlands restoration projects and permanent cumulative impacts on cultural resources could occur. However, avoidance and mitigative measures like data collection are implemented during design and construction and the final restoration projects ultimately protect historic properties outside of the coastal areas and in adjacent uplands.

Flood Risk Reduction Projects

Flood risk reduction projects have direct impacts through destruction of historic properties in in the footprint of new structures and from the removal of soils as borrow material, some of which would likely include archaeological deposits or other historic buildings. Long-term maintenance of levees through additional lifts would further impact historic properties in borrow areas. It is reasonable to anticipate that borrow material would be needed for most of these projects, and historic properties could likely be impacted during construction, but avoidance of direct impacts is incorporated into each action. Flood risk reduction efforts have a beneficial impact on the area's historic properties as well. Further, risk reduction projects like the HSDRRS reduce the likelihood of loss of historic buildings and archaeological deposits from seasonal flooding.

4.2.11.2.4 Summary of All Cumulative Impacts

While many cultural resource surveys have been conducted within the project APE, future and concurrent regional projects still have the potential to adversely affect cultural resources by the destruction of all or part of eligible archaeological sites, modification of historic structures, or alteration of the viewshed of historic districts. However, for Federal projects, if any unrecorded cultural resources are determined to exist within a project's boundaries, then no work will proceed in the area containing these cultural resources until the SHPO has been notified. As such, other Federal current and future regional projects would potentially have minor direct and indirect cumulative adverse impacts on cultural resources

4.2.12 RECREATIONAL RESOURCES

4.2.12.1 AFFECTED ENVIRONMENT

Existing Conditions

For many sub-basins, the affected environment described in Phase 1 did not change much since the report was released in 2011. Recreational resources include city, state and national parks; wildlife management areas; national wildlife refuges; scenic rivers;

GIWW/MRGO/IHNC complex; as well as numerous lakes, marshes, bayous, canals and estuaries.

Facilities include the Superdome sports arena, boat launches, visitor centers, museums, community centers, botanical gardens, playgrounds, golf courses, gymnasiums, volleyball courts, ballfields, carousel, picnic areas and shelters, fishing piers, walking/jogging paths including multiuse access routes on top of levees, bicycle trails, swimming pools and wave pool, primitive and developed campgrounds.

Recreational activities include hunting, fishing, boating, bird watching, wildlife observation, water skiing, swimming, picnicking, photography, bicycling, walking and jogging, off-road vehicle use, crawfishing, flying radio-controlled airplanes, canoeing, and hiking.

Parks have reopened and new parks have been constructed since completion of Phase I. Many of these recreational resources can be seen in Figure 4-14. The following sections summarize and update recreational resources within or adjacent to the sub-basins that contain the HSDRRS project corridor.

St. Charles, Gretna-Algiers, Harvey-Westwego, Lake Cataouatche **-** The affected environment for these four sub-basins generally remains the same as described in the CED Phase I, except that now, many parks and recreational facilities that were damaged by Hurricane Katrina and closed have re-opened.

The area of levee improvement in St. Charles Parish is mostly north of Highway 61 in rural sections and recreational opportunities are mostly in the form of fishing and hunting.

Gretna-Algiers form a Sub-basin of bedroom communities to New Orleans and offer typical recreational facilities, such as public parks and jogging trails. Located in Jefferson and Plaquemines parishes, Bayou Aux Carpes lies to the west of the Harvey and Algiers Canals and the GIWW (see figure 4-11). It was designated as a Section 404(c) wetlands area in 1985 (USEPA 1985 and *Federal Register* 44267-47268) and the final determination was amended in 1992 (USEPA 1992 and *Federal Register* 13745-13746). The Harvey-Westwego/Lake Cataouatche Sub-basin's Bayou Segnette State Park and campground offers cabins for rent and other recreational opportunities.

Parc des Familles in Marrero, Louisiana, has been constructed and is the largest park in Jefferson Parish at 610 acres and the second-largest park in the New Orleans area, trailing only New Orleans City Park. Future phasing of the Parc des Familles facility is ongoing. The park includes a sport quadplex comprised of four baseball fields with one field converting into a soccer/football field along with an 18-hole Disc Golf Course. There are batting cages, concessions and press box. The facility includes a boardwalk, nature trails, a pavilion, restrooms and picnic area.

Bayou Segnette State Park in Westwego was badly damaged by Hurricane Katrina. It, too, has reopened offering cabins, swimming, fishing and nature viewing.

Jefferson East Bank - Coconut Beach Volleyball Complex was relocated to Kenner, LA as a result of construction for the 17th Street permanent pump station construction and provides an additional recreational opportunity for the community of Kenner. Fishing opportunities exist at the mouths of the canals and the lakefront remains active for boating, walking, biking, and jogging.

Orleans East Bank - The peninsula at 17th Street is no longer available for people to walk and/or bank fish as a result of construction of permanent pump stations. The site was not previously a formal recreation area prior to construction, yet other locations in the area exist where people may walk and/or bank fish such as Breakwater Park, West End Park and Lake Shore Drive. Similar recreation opportunities that exist along the lakefront in Jefferson East Bank extend into Orleans East Bank.

Recreational boating and fishing in the Orleans East Bank Sub-basin occur in and around the IHNC. A public boat launch is provided at Seabrook Launch and Lakeshore Park. While most of the recreational boating occurs in the lake, boaters commonly seek food and services at commercial resources along the IHNC, including the private boat launch and storage facilities. Seabrook Boat Launch, the Frank Davis Pier, Morrison Play spot, Lakeshore Park, Pontchartrain Park, Wesley Barrow Stadium, and the Joe Bartholomew Sr. Golf Course have re-opened following closures after Hurricane Katrina.

New Orleans East - Recreational boating and fishing in and around the IHNC, Lake Pontchartrain, Bayou Bienvenue Wetlands Unit, MRGO, and Bayou Savage National Wildlife Refuge (NWR) is popular and has increased since Hurricane Katrina. Recreational boating is popular among the Pontchartrain RV park tenants on the IHNC, making the on-site public launch very active.

Bayou Sauvage NWR is approximately 25,000 acres with most of the refuge located within HSDRRS and provides wildlife-oriented recreation in an urban setting. Following Hurricane Katrina, the refuge has increased visitation to approximately 80,000 annual visitors.

Chalmette Loop - Extensive wetlands, bayous, and bottom land hardwood forests provide unique recreation opportunities for hunters and anglers. Bayou Bienvenue, Bayou Chaperon, Bayou Dupre, Bashman Bayou, Pirogue Bayou, Terre Beau Bayou, and Violet Canal are part of the Louisiana designated Natural and Scenic River System. These waterways connect with the MRGO, Lake Borgne, and ultimately the Gulf of Mexico. Immediately east of Lake Borgne is Biloxi State Wildlife Management Area (WMA). Recreation use of the WMA includes hunting, fishing, boating, crabbing, shrimping, and bird watching. St. Bernard State Park is to the south where recreation facilities include a campground, playground, covered pavilion, picnic tables, swimming pool, boat launch, man-made lagoon and trails.

Recreational Resources outside the HSDRRS - Recreational resources adjacent to the HSDRRS actions outside the sub-basins pertain primarily to borrow sites. No recreational resources exist at Westbank Site N (Plaquemines Parish), Stumpf (Orleans Parish), Assumption Land Company site (Jefferson Parish), Houma Excavation Site (Terrebonne Parish), RBEND II Site (St. John the Baptist Parish), and Robert Brothers Farm borrow sites (St. John the Baptist Parish).

Within St. Tammany Parish, communities like Abita Springs, Covington, Madisonville, Mandeville, Lacombe, and Slidell provide walking and biking trails as an integral part of the recreation development along Tammany Trace and the Lakefront. West of St. Tammany, there is a 27,500- acre, state-managed Joyce Wildlife Management Area that is used primarily by fishermen and hunters to pursue freshwater fish (bass, catfish, and bream), alligator, waterfowl, whitetail deer, and small game.

The Big Branch National Wildlife Refuge encompasses about 18,000 acres offering diverse habitats supporting a wide variety of wildlife species, attracting concentrations of waterfowl, wading birds, shorebirds, and neo-tropical migrants. In addition to providing habitat for a natural diversity of wildlife, the refuge seeks to provide a variety of opportunities for public outdoor recreation and education. Most of these opportunities are located on refuge lands west of Highway 11 and include hiking trails, public fishing, picnicking, interpretive tours, biking, canoeing, and hunting.

Pearl River Wildlife Management Area is approximately 35,500 acres of flat terrain and heavy forests along the floodplain of Pearl River. Numerous unique recreation opportunities exist for the public including hunting, fishing, hiking, camping, wildlife observation, and nature photography.

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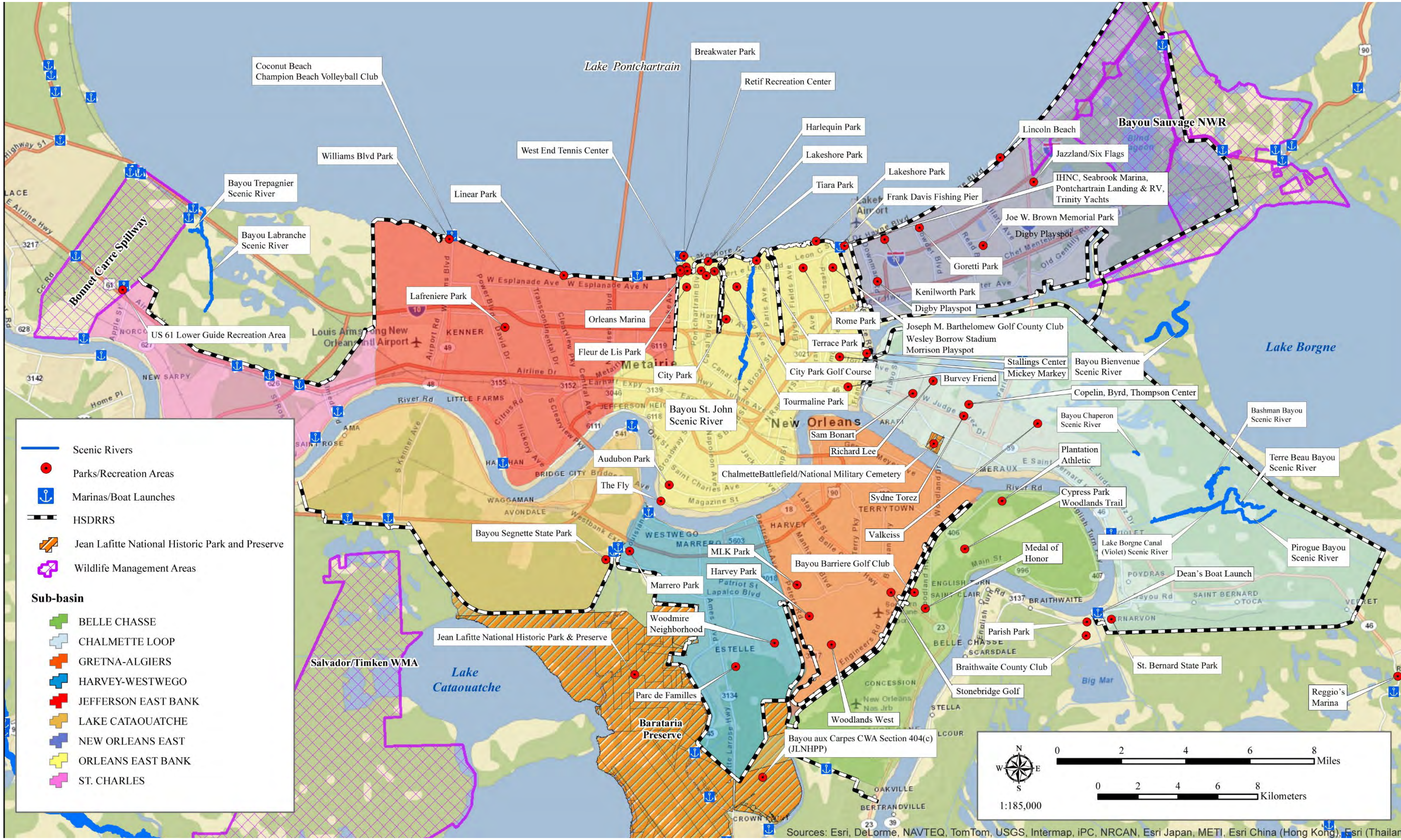
Figure 4-5. Recreational Areas within or near the HSDRRS



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4.2.12.2 ENVIRONMENTAL CONSEQUENCES

4.2.12.2.1 HSDRRS Construction Impacts

Impacts to recreational resources include the relocation of the Coconut Beach Volleyball Complex from Orleans Parish to Jefferson Parish, closure of the IHNC for two years, temporary impacts on fisherman, hunters and boaters in Lake Pontchartrain and road closures along the Lake to cyclists and levee walkers for extended periods of time. Many of the impacts to recreation were felt along Lake Pontchartrain where the levee was either raised or T-walls constructed. In addition, recreation use of the area was impacted by noise, dust, loss of access, or closure of recreation areas during construction activities. Overall, the temporary impacts from HSDRRS construction, such as transportation detours from road closures, lasted for the duration of construction. Much of the levee work was finished in summer of 2011. Permanent impacts to recreational resources relate to storm surge risk reduction and the potential for less storm surge damage to recreational facilities in the study area.

St. Charles - Much of the recreation impact were to fisherman not being able to access the Lake Pontchartrain levee batture and to recreational users who exercise on the levee. Impacts were temporary in nature, and fishing, hunting and recreational opportunities returned to pre-construction conditions.

Jefferson East Bank - In addition to the impacts identified in the CED Phase I, the multi-use paths were damaged during construction and repaired by the USACE. The Coconut Beach Volleyball Complex relocated to Kenner as a result of construction for the 17th Street permanent pump station construction providing an additional recreational opportunity for the community of Kenner.

Orleans East Bank - The requirement for additional right of way for the construction of permanent pump stations at 17^{th} Street Canal had short term impact to recreational boaters at Bucktown Marina as a result of staging and movement of barges. The peninsula at 17th Street is no longer available for people to walk and/or bank fish as a result of its excavation. The site was not a developed recreation area and there are other locations that people may walk and/or bank fish such as Breakwater Park, West End Park and Lake Shore Drive.

Impacts to boating have been moderate because of the closure of the IHNC due to placement of the cofferdam structure across the entire IHNC channel and due to the extended closure for construction of the Seabrook Gate. A public boat launch is provided at Seabrook Launch and Lakeshore Park. The Seabrook floodgate construction project has not precluded access to or use of those launches for people who wish to access Lake Pontchartrain directly. However, the project did restrict boaters wishing to travel between the Lake and the IHNC. While most of the recreational boating occurs in the lake, boaters commonly seek food and services at commercial resources along the IHNC, including the private boat launch and storage facilities. Persons who frequently use the private launch facilities on the IHNC to access the lake would either need to bring their boats to public launch sites on the lake or arrive at their destination by an alternative route. Impacts to Pontchartrain Park on the IHNC included difficulties in reaching the area due to increased traffic on the roads, increased noise due to heavy machinery, and minor visual impacts. Seabrook Boat Launch, the Frank Davis Pier, Morrison Playspot, Lakeshore Park, Pontchartrain Park, Wesley Barrow Stadium, and the Joe Bartholomew Sr. Golf Course were not operational during the majority of the HSDRRS construction. Many of these locations; however, have re-opened. Other impacts to recreational resources include access issues and an overall reduced quality of the recreation experience due to noise and disturbance.

New Orleans East - The Seabrook floodgate construction project moderately impacted boating and fishing, as a result of the placement of a cofferdam structure across the entire IHNC channel. Both the New Orleans East and the Orleans Eastbank sub-basins were impacted by the Seabrook floodgate construction. Boaters experienced restricted travel between the Lake and the IHNC for two years. People who frequently use the private launch facilities on the IHNC to access the lake would either need to bring their boats to public launch sites on the lake or arrive at their destination by an alternative route. Recreational boating is popular among the Pontchartrain RV park tenants on the IHNC, making the on-site public launch very active. Prior to the HSDDRS project, busy weekends had as many as 100 launches a day. However, with the extension of the temporary 12-month closure of the IHNC at Seabrook to approximately 24 months or September 2012, access to and from Lake Pontchartrain continued to be impeded. Recreational boating-related traffic that requires passage to the lake continued to be impacted from the extended closure of the Seabrook Pass. However, recreational boating and fishing returned to pre-construction levels following the completion of construction.

During the additional 12 months of construction, the cofferdam likely continued to reduce the quality of the local fishery; thereby, limiting local fishing opportunities. In addition, noise and vibration generated by construction activities temporarily affected the quality of fishing at the popular north scour hole. Since fishing at the south scour hole is technically prohibited by the Port of New Orleans, filling it would not adversely affect a legally designated public fishing location. However, filling this scour hole would likely reduce habitat and refuge sites for certain recreational fishery species and organisms they depend on; thereby reducing their availability to recruit into nearby areas where fishing is allowed.

Closure of the IHNC coupled with other extenuating circumstances (e.g., the Great River Flood of 2011, construction of the IHNC Borgne Barrier, and MRGO closure at Bayou La Loutre) has influenced fish assemblages within the vicinity of the Seabrook Structure over the last year. Impacts to aquatic resources can be attributed to the project construction activities, closure of the waterway, as well as hydrologic and salinity changes credited to several sources over the last couple of years. The cumulative effect of the extended closure indicates there may be a short-term direct effect on recreational fishing opportunities; however, the long-term effects are not likely to be measurable. Returning to a stable fish assemblage and normal recreational fishing opportunities depends on the stability of the aquatic resources of Lake Pontchartrain and the ability of the project area to rebound to pre-project conditions after the re-opening of the IHNC.

Poirrier (2013) found that the IHNC closure stopped significant levels of saltwater intrusion, stratification, bottom water anoxia and anoxia. According to Rod-n-Reel, the fishing reports varied about the effect of the IHNC closure. People reported carp jumping at Bonnabel Launch (August 2013); best fishing in the last ten years at Seabrook for big specks and redfish (November 2012); concern about algae bloom (April 2011); and no change in salinity in Lake Pontchartrain as a result of the closure (August 2014) https://www.rodnreel.com/guestbook/GBSearchResults.asp. During the additional 12 months of construction, Lakeshore Drive was open to traffic, thereby providing a second route to Seabrook Launch at the lake, Lakeshore Park and the Frank Davis Fishing Pier. Passive recreation such as walking around or fishing in Lake Pontchartrain was also impacted. Specifically, along the shoreline LPV 105-107 (IER 6 and IERS 6) the protected side of a new 4 ft. high I-wall was paved and has slope paving that could be used as a walking /biking path. However, walking/biking path users cannot cross to the flood side of the I-wall, as there is a 4 ft. drop-off and a 2 ft. safety fence on top of the I-wall to access Lake Pontchartrain.

Recreational impacts from the PIER 36 Bayou Savage and Turtle Bayou Restoration Project within Bayou Savage NWR includes restricted boating, fishing and hunting during construction and for a period afterwards. Recreational use, once the habitats are established, would be at the discretion of the Refuge or the local sponsor. Earthen retention dikes would remain in place for a period to allow for material to settle out within the restoration feature. Once the restoration is complete and the site matures, recreational users would benefit as a result of improved habitat quality attracting wildlife or fish in the mitigation area and the area surrounding it.

The Turtle Bayou feature may not see much change in recreational use from existing conditions since this area is difficult to access. After restoration, it is anticipated that recreational use (mainly hunting) would continue. Restoration at Bayou Savage (flood side feature) may directly impact the youth waterfowl hunting program that takes place usually November and January.

Temporary direct impacts from dredging Lake Pontchartrain include an increase in water turbidity, which would affect fishing in the area of the activity. Dredging activities would disrupt most recreational activity occurring within the area of work; however, these adverse impacts would be temporary and short-lived. There are, however, many other locations in the lake to fish. Once construction activities are completed, the newly dug pits at the lake bottom should offer new habitat and fishing opportunities should return to the area.

Impact to boaters would be minor and result from placement of the pipeline needed to deliver the dredge material to the restoration features. In general, waterways would remain accessible and would not be totally shutoff from navigation. Where the pipeline crosses a navigable waterway, it would be submerged. In areas where the pipeline crosses a body of waterway, it would run along the waterway near its edge. Boaters may have to travel longer distances to arrive at their destination in areas where the floating pipeline blocks navigation. Indirect impacts would also accrue to areas surrounding the proposed restoration features as wildlife and fish in the vicinity would benefit from improved habitat nearby.

Recreational opportunities should improve in Lake Pontchartrain Basin once all the LPV mitigation features are restored. These areas would provide valuable habitat to both fisheries and wildlife using the Lake and surrounding marshes. Long-term cumulative impacts of proposed marsh and BLH creation in the Lake Pontchartrain Basin would have positive impacts on recreational fishing and hunting by increasing habitat nursery and feeding areas. Cumulative impacts of these types of actions normally are positive for recreational resources; however, the negative impacts that occur during construction activities may affect recreational use in the short-term. Since there are an abundant number of places to fish and hunt in the basin, these negative, temporary impacts are expected to only minimally, cumulatively impact recreational resources and are far outweighed by the long-term benefits.

Chalmette Loop - Construction of a new flood control structure and sector gate, including the use of cofferdams, and construction of new levee and floodwalls, resulted in temporary disruption of access to hunting and fishing areas and organism movement in the vicinity of construction activities within the Chalmette Loop sub-basin. Fishery resources were removed with the installation of the structures, and had short-term effects on organism development, thereby having a temporary impact on recreational fishing. Access to private and public boat launches in the area was temporarily impacted during construction, but access to the boat ramps returned to normal upon construction completion. Temporary minor impacts on bird watching, wildlife viewing, and recreational fishing occurred near the ROW during construction of floodwalls (T-walls) on the Chalmette Loop levee.

Belle Chasse - The Belle Chasse Walking Park was temporarily closed during construction from approximately November 2010 through July 2011. The access road to Bayou Barriere Gold Course was closed and replaced with a new access road. Noise from the transportation and use of construction equipment/materials most likely affected play. Access to the golf course was available throughout the construction period. Cypress Park was temporarily impacted by dust and noise during construction activities.

Gretna-Algiers - Sediments that potentially escaped from erosion and sediment control features affected nearby water quality in the project area. Recreational activities in the Bayou aux Carpes CWA Section 404(c), now incorporated into the JLNHPP, were not adversely affected following the construction of the HSDRRS floodwall. Increased recreational activities were possible as a result of the implementation of the HSDRRS. No permanent impacts on recreational resources occurred.

Harvey-Westwego - Construction of an earthen levee with fronting protection, floodwalls, a sluice gate structure, and ancillary drainage structures had temporary impacts on recreational activities, including traffic congestion and noise. Traffic congestion during construction impacted recreational access, and noise affected the general recreational experience.

Approximately 15 of the 42 acres of cypress-tupelo swamp filled by construction activities are part of the JLNHPP and offer recreational value. Filling these 15 acres resulted in minor permanent impacts on recreation, as the areas were no longer available for recreational purposes. Noise from construction activities also impacted recreational use within the JLNHPP. Some minor temporary impacts associated with the demolition of the existing floodwall and construction of the new floodwall impacted recreational opportunities such as bird watching and wildlife viewing within the JLNHPP in the vicinity of the HSDRRS.

Lake Cataouatche - Minor permanent impacts on recreational resources occurred. Limited access to private and public boat ramps caused short-term indirect impacts on recreational resources in the project vicinity. Temporary and permanent bridges erected during HSDRRS construction potentially hindered boaters from accessing Davis Pond, Lake Cataouatche, and Salvador and Timken WMAs. Access to Bayou Segnette nature trail was temporarily impacted during construction at the park. However, pedestrian and vehicular access gates were constructed through the floodwall, thereby supporting recreational access to amenities within the park.

The temporary and permanent bridges spanning the Outer Cataouatche Canal potentially impeded recreationists that attempted boat access to Davis Pond, Lake Cataouatche, or Salvador and Timken WMAs during the HSDRRS construction. Minor direct impacts on recreation occurred within the sub-basin through the loss or modification of open water habitat. Specifically, short-term direct impacts on water quality in the Outer Cataouatche Canal resulted from the placement of fill into the canal, from bank stabilization activities, from closure and bridge construction, and from construction and installation of a scour pad at the outfall of the new US 90 pump station.

Material would be dredged from Lake Cataouatche and piped via Bayou Segnette to the project area. Fishing in waters adjacent to the borrow site and receiving areas were impacted by increased turbidity caused by dredging and placement activities. These impacts ceased once construction was completed. Additionally, the floating pipeline in Bayou Segnette blocked access temporarily during construction and caused an inconvenience to boaters traveling in the area. Indirect and cumulative impacts would depend on how the area is managed in the future.

4.2.12.2.2 Impacts to Recreational Resources outside the HSDRRS

As discussed in CED Phase I, there was the potential for the landowner to stock the previous borrow with native fish in the newly created lake/pond; however, this did not occur.

St. Tammany Parish - (PIER36, TIER 1 Milton Island Restoration Project). Recreational opportunities in the marsh mitigation area would include hunting for deer, wild hogs, rabbit, and possibly waterfowl. Fishing opportunities would be limited by the small amount of open water expected to form within the area. The proposed action would indirectly benefit recreational fishing opportunities through habitat improvement for the small juveniles of sought-after species that would eventually mature into harvestable size fish. The HSDRRS restoration projects within the Lake Pontchartrain Basin would have a positive cumulative effect on recreation by improving habitat for species sought after by recreational fishermen.

Recreational impacts from the PIER 36 New Zydeco Ridge Restoration Project within Big Branch NWR include restricted boating, fishing and hunting during construction and for a period afterwards. Recreational use, once the habitats are established, would be at the discretion of the Refuge or the local sponsor. Earthen retention dikes would remain in place for a period to allow for material to settle out within the restoration feature. Once the restoration is complete and the site matures, recreational users would benefit as a result of improved habitat quality attracting wildlife or fish in the mitigation area and the area surrounding it.

Hunting and all other recreational uses at the New Zydeco features would also restrict during construction to enable the new material to settle and provide an adequate base for growth. Hunters likely would have to navigate around the site through private land to hunt on NWR lands while the site is closed. Once the site is opened, better habitat from the BLH-W restoration should improve conditions and opportunities for big and small game hunting or bird viewing.

4.2.12.2.3 HSDRRS 2057 Impacts

Adverse impacts on recreational resources from future levee lifts would be negligible and would be limited to short-term recreational access closures during the actual construction activities. No permanent adverse impacts on recreational resources are anticipated from future HSDRRS work. Future borrow requirements (7.3 million CY) for levee lifts would require potential borrow sites to be investigated and have the environmental clearance required by the NEPA; therefore, the future borrow sites would be analyzed for any impacts on recreational resources.

4.2.12.2.4 Cumulative Impacts

Present and future actions by the USACE and other agencies, businesses, or the public would likely contribute to cumulative improvement to recreational resources, as many projects in the area include ecosystem and recreational infrastructure improvement.

Temporary cumulative adverse impacts on recreational resources have occurred and temporary impacts primarily associated with access closures would continue to occur for the life of the HSDRRS. Access and navigation to land- and marine-based recreational opportunities and resources have been affected. Noise and water quality issues from construction and future levee lifts cumulatively reduce fishing and hunting opportunities within the project area. In addition, the displacement of wildlife due to construction impacts would limit outdoor nature activities such as bird watching, hiking, and photography.

The HSDRRS would have long-term cumulative impacts on recreational fishing. In certain areas, such as the Seabrook gate complex and the protected side of the Borgne barrier (IER # 11 Tier 2 Pontchartrain and IER #11 Tier 2 Borgne), recreational fishing could take years to recover.

Recreational resources were affected through the alteration of the physical site and noise and vibration impacts from the HSDRRS. Green space and paved recreational paths were temporarily or permanently inaccessible to recreationists during construction. Some recreational facilities and associated infrastructure were inaccessible or unusable during construction. The borrow sites located throughout the HSDRRS project area offered little recreational value; therefore, the excavation of the borrow pits had negligible permanent impacts on recreational resources in the project area.

However, construction of the HSDRRS provides cumulative benefits for recreational resources in the area. The HSDRRS reduces flood and storm damage risk to recreation facilities, museums, sporting arenas, recreational paths, park infrastructure, and green space. Cumulatively, HSDRRS construction and borrow site excavation would have negligible permanent impacts on recreational resources.

Storm Damage Reconstruction

In conjunction with restoring existing floodwalls, floodgates, and levees throughout the area, there are ongoing government- and community-based efforts to restore and create new recreational opportunities in the HSDRRS project area. Although some of the reconstruction projects would temporarily reduce the access to existing recreational opportunities, in the long term, both quantity and quality of facilities and related infrastructure and managed lands would improve, contributing to an overall beneficial cumulative impact on recreational resources in the area. Community groups such as the Holy Cross Neighborhood Association of the Lower Ninth Ward and the Sierra Club New Orleans group have invested money and personnel into improving and increasing recreational opportunities in the project area.

Rebuilt schools in the hurricane-affected areas have a positive effect on recreational resources and green space in the region. Restored and newly created ball fields, playgrounds, and soccer fields provide recreational opportunity and recreational infrastructure for individuals living nearby. Major and minor renovations on municipal buildings, parks, community centers, and street repair projects in Jefferson, Orleans, Plaquemines, St. Bernard, and St. Tammany parishes improved recreational resources.

Redevelopment

Community redevelopment includes improvements to parks, playgrounds, walkways, and bikeways throughout the Metropolitan New Orleans area. Examples of these projects that are creating recreational opportunities include Bonnet Carré Spillway and the Trail Project in the HSDRRS vicinity and throughout Louisiana are implemented annually with FWHA Recreational Trails Program grant funds. For the application year beginning May 2010, $1,436,043 was available, with 80/20 percent matching for trails projects (Louisiana Office of State Parks, Division of Outdoor Recreation 2010). These projects would include the creation of trails for motorized and non-motorized use, and funding for related needs.

Project Rebuild Plaquemines is part of the redevelopment effort in the parish and was started following Hurricane Katrina in 2005. Project Rebuild helped rebuild three parks and construct one new park in Port Sulphur (Campbell 2010). There were no impacts on these parks from the modifications and new construction related to the HSDRRS system.

Coastal and Wetlands Restoration

Coastal and wetlands restoration projects, including the restoration or creation of marshes, would increase the quality and quantity of recreational resources in the project area. Ecotourism would increase in areas such as the Labranche Wetlands and the Harvey-Westwego area. Individuals gaining access to the marsh would allow for increased ecotourism, and seafood would also draw tourists.

Several proposed wetlands restoration projects in the project area would potentially improve water quality in several nearby water bodies, including Lake Pontchartrain, Lake Salvador (shoreline protection), MRGO, and Lake Borgne. Marsh restoration projects, such as Management of Rosethorne Municipal Effluent project and the South Shore of the Pen Shoreline Protection and Marsh Restoration project in Jefferson Parish, would also improve aquatic habitat and potentially provide habitat for fish displaced from turbidity or other construction-related impacts. Operation of the CFDC, in conjunction with other marsh and wetlands restoration projects, would reduce the potential adverse impacts of the HSDRRS by providing additional recreational fishing opportunities.

Marsh creation projects such as the Barataria Bay Waterway Wetland Restoration project, Bayou Dupont Ridge Creation and Marsh Restoration, South Shore of the Pen Shoreline Protection and Marsh Creation, Mississippi River Sediment Delivery System – Bayou Dupont, West Belle Pass Barrier Headland Restoration, Alligator Bend Marsh Restoration and Shoreline Protection, Cheniere Ronquille Barrier Island Restoration, Grand Liard Marsh and Ridge Restoration, Lake Hermitage Marsh Creation, Venice Ponds Marsh Creation and Crevasses, West Pointe a la Hache Marsh Creation, Chandeleu Islands Marsh Restoration, Labranche East Marsh Creation, Goose Point/Point Platte Marsh Creation, La Branche Central Marsh Creation, Bayou Bonfouca Marsh Creation, Fritichi Marsh Restoration, Caminada Headlands Back Barrier, Bayou Grande Cheniere Marsh and Ridge Restoration, Bayou Dupont Sediment Delivery-Marsh Creation, Northwest Turtle Bay, Terracing and Marsh Creation South of Big Mar, and South Lake Lery Shoreline and Marsh Restoration would increase recreational opportunities through the improvement of fish/wildlife habitat thus providing bird watching, hunting and fishing opportunities.

Flood Risk Reduction Projects

In conjunction with the HSDRRS, levee modification along the Mississippi River and MRGO deep draft deauthorization have temporarily impacted recreational resources in the New Orleans area. The NOV flood risk reduction project is currently in the planning process but would affect hundreds of acres of wetlands. These wetlands would be replaced with infrastructure such as levees, floodwalls, etc. Construction activities and noise would temporarily affect the recreational experience in a manner like the HSDRRS. Although opportunities for recreational boating, fishing, and wildlife viewing would be permanently affected, the quality of other recreational sites in the area would improve with the increased risk reduction from the project.

Transportation

Bridge widening and street repair taking place while HSDRRS was being constructed added to the temporarily displacement of recreationists or limited access to recreational spots, but following construction, recreational opportunities returned to pre-construction conditions. LDOT is constructing the Orpheum - Huron Bike Path in Jefferson Parish; an asphalt path at Tammany Trace Extension to Pelican Park; bike and pedestrian facilities at Lacombe Trailhead, Tammany Trace-Camp Salmen Extension, and US 190 sidewalks in Mandeville in St. Tammany Parish. These LDOT projects will benefit recreation resources by providing more recreational opportunity.

4.2.12.3 SUMMARY OF ALL CUMULATIVE IMPACTS

Recreational resources experienced substantial, temporary cumulative adverse impacts due to the HSDRRS and other ongoing and future regional projects during construction activities. Where construction projects cross recreational areas, temporary closures of access occurred. Some green space and other recreational areas were permanently lost or impacted, but cumulatively, improvements offered through these regional projects would provide beneficial effects on recreational resources in the HSDRRS area. Regionally, the permanent cumulative impacts on recreational resources would be negligible.

4.2.13 AESTHETICS

4.2.13.1 AFFECTED ENVIRONMENT

As result of the construction much of the HSDRRS corridor is currently comprised of higher levees, floodwalls, and floodgates that, while reducing the visual appeal and the line of sight between the urban environment and the natural environment, have become an accepted part of the landscape in the region (photograph 4-1). Levees that compose a portion of HSDRRS do provide opportunities to view wetlands and estuarine environments on the protected side and offer some of the most important aesthetics in the region. Lakes Pontchartrain, Borgne, and Cataouatche and surrounding wetlands are visible from the HSDRRS structures, and the HSDRRS in New Orleans East and St. Bernard Parish bisects wetlands and open water bodies of Bayou Sauvage NWR and the Central Wetlands Unit, respectively. It is important to note that these structures and amenities do not provide public access and therefore cannot be counted as publicly or institutionally significant to the area view shed.

Photograph 4-1. Examples of floodwalls and levees with floodwall caps.

Much of the protected side of the Jefferson and Orleans East Bank corridor is composed of residential and commercial development. The protected side of the St. Bernard and Jefferson West Bank HSDRRS corridors also contains a substantial amount of residential and commercial development. However, industrial development, primarily associated with the maritime industry, is common along segments of the HSDRRS. Vacant lots and city parks are also sporadically located along all reaches of the HSDRRS.

<u>St. Charles</u> - The visual landscape of HSDRRS is dominated by earthen levees, unimproved access roads, drainage canals, and borrow areas. In addition, structures and facilities related to the petroleum industry, such as storage tanks and piping, are also prevalent. To the north of the project area, the natural setting of the St. Charles sub-basin is dominated by swamp. Within this area are Bayou Trepagnier and Bayou Labranche, which are part of the Louisiana Natural and Scenic River system. Both bayou corridors are largely undeveloped and provide open vistas of solid and broken marshes interspersed with natural levees and spoil banks that support woody vegetation. To the northwest of the St. Charles sub-basin is the Bonnet Carré Spillway and included within it is the US 61 Recreation Area. The spillway offers a wide variety of aesthetic environments, including outstanding visual access provided for the Mississippi River, the western shore of Lake Pontchartrain, and the spillway structure itself, as well as views offered by I-10, which is situated along the western edge of the spillway where it enters Lake Pontchartrain.

Jefferson East Bank - The visual resources of the area include open vistas of the lake and shoreline across the northern portion of the Jefferson East Bank sub-basin, and the Labranche wetlands in the western portion. The floodwall system on the western end partially obscures the views of the natural setting of the Labranche Wetlands and Lake Pontchartrain, particularly from buildings that are not multistory. Between the levees and the shoreline in the northern portion of the sub-basin, Linear Park has an extensive lakefront pedestrian/bicycle path system which allows for viewing of these vistas. The view from the shoreline toward the protected side of the levee is dominated by earthen levees and stone/concrete riprap at the water's edge. The levee system on the northern portion of the sub-basin is relatively unobtrusive when compared to the floodwall system on the western portion of the sub-basin. In addition, the Lake Pontchartrain Causeway and its associated facilities on the shoreline are a major component of the man-made character of the Lake Pontchartrain shoreline.

Orleans East Bank -The HSDRRS for the Orleans East Bank sub-basin lies within an expansive public green space that extends from the Lake Pontchartrain shoreline to the Senator Ted Hickey Bridge crossing. Flood and water control structures evident in this area include a mixture of floodwalls and levees, the ICS installed after Hurricane Katrina, gates, and four pump stations with their associated outfall canals. The floodwalls are constructed utilizing a combination of concrete and metal sheet piling. Residents within the western portion of the Orleans East Bank sub-basin have raised concerns about the visual aesthetics of the ICS and how it contrasts with the adjacent flood control structures. In response to resident's concerns about the visual aesthetics of the ICS and how it contrasts with the adjacent flood control structures, USACE implemented temporary screening and landscaping plan to aid in blending the pump stations and their surrounding facilities into the environment. However, once the permanent pump station construction is complete these features would be removed, and permanent landscaping put in place.

New Orleans East - The western portion of the New Orleans East sub-basin's visual landscape along the Lake Pontchartrain shoreline is dominated by urban development, as well as risk reduction measures including earthen levees, architecturally treated floodwalls, floodgates, drainage canals, and pump stations. Dominant landscape features in the area include the Lakefront Airport, the Southshore Harbor Marina, and the remnants of Lincoln Beach and the Jazzland Amusement Park (see figure 4-14). Construction of the HSDRRS along Hayne Boulevard (LPV 106-108) includes a levee with an approximate 2 ft. high concrete I-wall with an additional 2 ft. high chain link safety fence. Where Seabrook pass connects to Lake Pontchartrain, now the view shed includes two vertical lift gates and sector gate in addition to the railroad bridge and Senator Ted Hickey bridge.

The eastern portion of the sub-basin is largely undeveloped and dominated by the Bayou Sauvage NWR (see figure 4-14). The Bayou Sauvage NWR is approximately 23,000 acres and consists of a variety of habitats, including freshwater and brackish marsh, BLH forests, lagoons, canals, borrow pits, chenieres, and natural bayous.

Chalmette Loop - Visually, the project area within the Chalmette Loop sub-basin is a contrast of natural and urban landscapes. The natural landscape is contrasted by unnaturally straight channels and spoil banks that cut through the coastal marsh. In addition, risk control measures such as earthen levees, floodwalls, and water control structures are evident across the project area in the Chalmette Loop sub-basin. Previous borrow areas for levee building material are also prevalent.

Primary viewpoints for the natural view shed of Chalmette Loop sub-basin are from the numerous scenic streams within the sub-basin itself. The natural landscape is dominated by coastal marsh, low-lying natural levees, and small ponds and bayous. Several scenic rivers cross through the Chalmette Loop sub-basin, including Bayou Bienvenue, Bashman Bayou, Bayou Dupre, Terre Beau Bayou, Lake Borgne Canal, Bayou Chaperone, Violet Canal, and Pirogue Bayou.

The addition of an approximate 22-mile concrete T-wall on top of the Chalmette Loop levee and a swing pivot bridge crossing Bayou Bienvenue has minor influence on the view shed since this area is remote.

Belle Chasse - Visually the Belle Chasse sub-basin is characterized by a natural landscape that has been altered by rural and urban development. The western portion of the sub-basin is rural with natural visual attributes that are dominated by freshwater marsh, low-lying natural levees topped with BLH tree species, and bayous and other waterways. This vista of marsh continues into the JLNHPP within the newly incorporated Bayou aux Carpes CWA Section 404(c). Further south on the western edge of the Belle Chasse sub-basin lies the relatively straight man-made Hero Canal, which contrasts with the natural features of the area. The JLNHPP (also called the Barataria Preserve) consists of a 28,600-acre preserve that includes bayous, swamps, marsh, and forests, which support an abundant wildlife population including alligators, nutrias, and over 300 species of birds.

The eastern portion of the sub-basin exhibits a more urban development around the Oakville area bounded by the Mississippi River and its earthen levee. Oakville exhibits a mix of single-family houses, manufactured homes, churches, and a small park. The land around the Hero Canal just north of Oakville presents a rather jumbled appearance with a mix of several industrial and commercial firms, as well as a landfill.

Gretna-Algiers - The visual landscape of the Gretna-Algiers sub-basin is dominated by urban development interspersed with flood risk reduction measures that include earthen levees, drainage canals, pump stations, and navigation canal locks and dams. On the protected side of the levee, the landscape is dominated by a mix of residential, commercial, and industrial development. Much of the commercial and industrial development is oriented to the maritime industry. Natural features dominate the unprotected side of the flood risk reduction measures. In the southern area of the sub-basin, adjacent to the GIWW, the area is predominantly undeveloped and is primarily BLH on the east bank of the GIWW and bayous on the west bank. Bayou aux Carpes CWA Section 404(c), found in the southwestern portion of the sub-basin, has been designated by the USEPA as a 404(c) because of its unique ecological features and is now a part of the JLNHPP.

Harvey-Westwego - The project area in the Harvey-Westwego sub-basin lies within a natural landscape that is characterized by wetlands and freshwater marsh interrupted by flood risk reduction measures such as earthen levees, floodwalls, and pump stations. The JLNHPP is located south of the HSDRRS in this sub-basin. Construction of channels and borrow pits through the wetlands and marsh have resulted in spoil banks that are not naturally found within the project area.

Lake Cataouatche - The HSDRRS in the Lake Cataouatche sub-basin lies within a natural landscape that has been altered by urban development and the construction of flood risk reduction measures. Bayou Segnette State Park is located within the Lake Cataouatche sub-basin. The primary viewpoints into the eastern portion of the sub-basin project area are from the state park's roads, parking lots, and various recreational facilities, including boat launches and cabins located along the Outer Cataouatche Canal. Adjacent to the southernmost portion of the sub-basin lies Lake Cataouatche and Lake Salvador, as well as the Barataria portion of the JLNHPP. Both the lakes have open vistas surrounded by fresh and brackish water marsh. The Salvador/Timken WMA lies to the west and southwest of the sub-basin.

4.2.13.1.1 Aesthetic Resources outside of the HSDRRS

Plaquemines Parish - Within Plaquemines Parish there were originally 15 borrow areas located outside of the HSDRRS. However, only four have been used for HSDRRS material to date. Those sites include Idlewild Stage 1 and 2, Citrus Lands and Plaquemines Dirt and Clay. View sheds into many of the borrow areas exist from the nearby roads and highways. The Citrus Lands and Idlewild Stage 1 and Stage 2 borrow areas are visible from LA 23, Conoco Phillips, and West Ravenna Road.

St. Bernard Parish - St. Bernard Parish contains four borrow areas that are outside of the HSDRRS; however, only one was used for material. The 1025 Florissant borrow area was excavated and is currently comprised of both maintained and unmaintained pastureland, while Acosta 1 and 2 were also excavated and are now maintained pastureland. The 1025 Florissant and the Acosta borrow areas are located near the San Bernardo Scenic Byway. The 29-mile San Bernardo Scenic Byway (on LA 46) is Louisiana's only State Scenic Byway in the Greater New Orleans Metropolitan Area. In St. Bernard Parish, the San Bernardo Scenic Byway meanders along the Mississippi River for approximately 25 miles and takes visitors past 19th century military barracks and the site of the Battle of New Orleans. Other visual resources located along the byway include ancient live oak and magnolia trees, plantation homes, and numerous historic cemeteries. Though there are restrictions to development along scenic byways, particularly for billboards and signage, developmental actions such as borrow pits are not restricted.

St. Charles Parish - Three borrow areas, Bonnet Carré Spillway (north), 3C Riverside (Site 1 and 2), and 3C Riverside Phase 3 borrow areas are in St. Charles Parish outside of the HSDRRS sub-basins. The area around the Bonnet Carré Spillway borrow area has been disturbed by sand haulers maintaining the spillway, as well as existing borrow pits scattered throughout the area. Visual resources associated with the Bonnet Carré spillway have been discussed in more detail in the section on the St. Charles sub-basin. The 3C Riverside (Site 1 and 2) is cleared and currently utilized as farmland. The 3C Riverside Phase 3 has also been cleared of vegetation. The Bonnet Carré Spillway (north) borrow area is publicly accessible, and view sheds of the area are offered from the maintenance roads, as well as the spillway levees. The 3C Riverside (Site 1 and 2) is adjacent to and within the view shed of residential areas. The 3C Riverside Phase 3 borrow area is within the view shed of LA 18, Mary Plantation Road/LA 3141, and LA 3127.

St. James Parish - The Big Shake borrow area is currently in active cultivation for sugarcane with minimal forestation; however, a portion of the site was excavated and utilized for HSDRRS borrow material. View sheds to the proposed borrow area are from two low-density residential areas to the south and east, as well as from LA 44. The small parcels of forest at the site do not serve as adequate buffers for these view sheds.

St. John the Baptist Parish - Two HSDRRS borrow areas, Willow Bend and Willow Bend II borrow areas, are in St. John the Baptist Parish and were excavated. The Willow Bend borrow area consists of maintained pastureland, while the Willow Bend II borrow area contains a mix of unmaintained farmland and pastureland. Both the Willow Bend and Willow Bend II borrow areas are located on private land and are visually remote and inaccessible. The landscape of both areas lacks distinct qualities that would make them visually significant.

St. Tammany Parish - The Tammany Holding Area borrow site is in St. Tammany Parish. The Tammany Holding site consists of three separates borrow areas and has been cleared as part of a residential development plan. To date, only the Tammany Holding site was excavated for HSDRRS borrow material. The area has been heavily disturbed as part of the residential development process by drainage, road building, and other infrastructure.

Hancock County, MS - Six HSDRRS borrow areas are in Hancock County, Mississippi. Of the six, only the Pearlington Sites and the Port Bienville site have been actively used for borrowing material. The Pearlington Dirt Phase 1 and 2 borrow area is forested while the Port Bienville site is undeveloped with dense vegetation and nearby ponds, streams, and small rivers. The Port Bienville site is near an industrial channel. All the HSDRRS borrow areas in Hancock County, Mississippi, are privately owned, remote, and inaccessible. They lack visual significance since their private land use does not allow for public access.

4.2.13.2 ENVIRONMENTAL CONSEQUENCES

4.2.13.2.1 HSDRRS Construction Impacts

Construction of the HSDRRS and excavation of over 20 borrow areas adversely impacted aesthetic (visual) resources in the short-term in all sub-basins. The visual attributes of the project corridor were temporarily impacted by construction activities and by the associated transportation activities needed to move equipment and materials to and from the construction sites. After construction, the project corridor returned, to the maximum extent practicable, to pre-construction aesthetic conditions, except for the Chalmette Loop and portions of Orleans East sub-basins where new floodwalls were constructed where previously there was only levee, thus further limiting the view shed. Direct long-term impacts on visual resources from the HSDRRS improvements were negligible. The levees, floodwalls, and other risk reduction structures were similar in design and scale to existing structures, with the primary difference being an increase in height of levees and floodwalls and an increase in scale of the majority of the gates, pump stations, and drainage structures. With construction of the HSDRRS, the appearance of the levees, floodwalls, and associated structures remained like what currently exists, only at a higher elevation.

Utilization of the borrow areas had an adverse effect on the view shed of the surrounding areas during the time they were active. The establishment of a borrow area contrasted with the surrounding natural landscapes and water features. Loss of natural visual resources of the borrow areas themselves were the most acute where they were forested. Long-term direct impacts on the visual resources around the borrow areas depends on their final design and use.

Construction of the HSDRRS indirectly benefited visual resources in the area. A reduced risk of flood and storm damage to parks and other green spaces in the vicinity has been realized from the project completion. Furthermore, flood and storm damage risk has been reduced for many of the residential neighborhoods and surrounding structures and facilities that would otherwise be negatively modified by the impacts of storm surge and flooding.

When practical, risk reduction features were designed so that visual and human-cultural values associated with the project were protected, preserved, maintained, or enhanced. Mitigation measures that minimize impacts on aesthetics can be found in section 5.0 Mitigation.

St. Charles - The levees, floodwalls, gates, and other flood control structures constructed were similar in design and scale to the existing risk reduction measures. However, a reduction of the vista outside of the risk reduction measures was experienced, but overall, the appearance of the levees, floodwalls, and associated structures remained like what existed prior to construction. Impacts were minimal to negligible.

Indirect impacts from the implementation of the risk reduction measures were negligible. Any induced development in the area will largely be dependent on local government's ability to limit development in flood prone areas.

Photograph 4-2. Aesthetic concrete stamping for floodwalls at the Williams Boat Launch.

<u>Jefferson East Bank</u> - Construction resulted in temporary impacts along the Lake Pontchartrain lakefront, where access to the vista of Lake Pontchartrain was restricted. After construction, turf grass was reestablished on the levees, and the appearance of the levees, floodwalls, and associated structures remained like the pre-construction conditions and only had negligible impacts on aesthetics. Beneficial impacts on the aesthetics of the sub-basin occurred with the replacement of patches to the risk reduction measures, which often visually contrast to the rest of the infrastructure, by the construction of new floodwall. A temporary sheet pile patch in the area near Vintage Drive, which was put into place after Hurricane Katrina, visually contrasted with the original architecturally treated floodwall. With completion of floodwall construction, a visually coherent, architecturally treated floodwall system was utilized. An aesthetic concrete stamping process was used on floodwalls within the Jefferson East bank sub-basin as shown in photograph 4-2 (e.g., Williams Boat Launch).

Some new elements were added to the visual landscape as part of the HSDRRS and included an earthen ramp that replaced a gate, realignment of sections of floodwall, the addition of fronting protection, breakwaters, and floodwall tie-ins at pump stations #1, #2, #3, and #4, and extension of the existing levee system across Causeway Boulevard. These new elements had a long-term minor impact on aesthetic resources in the Jefferson East Bank sub-basin. All the new elements were added to a view shed already dominated by flood risk reduction measures. The impacts on the visual resources from the HSDRRS were minor.

<u>Orleans East Bank</u> - Implementation of HSDRRS resulted in adverse temporary impacts on aesthetic resources along the Lake Pontchartrain lakefront, where access to the vista of Lake Pontchartrain was restricted during construction. After construction, the project areas were returned to pre-construction conditions to the greatest extent practicable, and the associated structure (e.g., levees and floodwalls) remained like the pre-construction conditions, resulting in only minor permanent impacts. As a result, only negligible long-term impacts from levees on aesthetics occurred. Upon completion of the HSDRRS construction, a more visually coherent, architecturally treated floodwall system was put in place.

Moderate visual (aesthetic) impacts on the residents of the Mariner's Cove complex resulted from the temporary pump station and closure structure at the 17th Street Canal. The scale and proximity of these structures intruded into this residential and recreational area and introduced an industrial aesthetic that had the potential of being considered inconsistent with the surrounding area. Moderate impacts also occurred on the western side of the 17th Street Canal and were related to altered views from the Bucktown Marina complex and to the general aesthetic setting of the historic Bucktown area.

Once constructed, the permanent pump station and closure structure would have similar impacts and create a dominating industrial presence at one of the prime view sheds in the area, the Hammond Highway Bridge crossing. Prior to construction of the ICS, the views from the bridge were of an open connection to Lake Pontchartrain. After construction, the view of the lake would be disrupted by the new pump station and closure structure. Once constructed, the permanent pump stations and closure structures at the Orleans and London Avenue canals would also result in industrial-type structures being in existing residential and park settings. The construction, operation, and maintenance of both the temporary and permanent structures have caused, and would continue to cause, localized visual and aesthetic impacts. Aesthetic impacts from the Orleans Avenue Canal were moderate in the Lakeshore community on the west side of the canal and minor to residents located to the east in the Lake Vista neighborhood, due to the canal's proximity to these residential areas. Both residential areas, however, had already experienced negative aesthetic impacts, as well as disruptions to public use of the corridors along the levees in the past. Moderate aesthetic impacts on the Lake Terrace community on the west side of the canal and minor impacts on the University of New Orleans campus also occurred as a result of the temporary pump station and closure structures at the London Avenue Canal. Similar impacts would result following the construction of the permanent pump stations. Steps were taken at the temporary pump station locations of London Canal, Orleans Canal and the 17th Street Canal to provide landscape screening of those facilities. These materials were also earmarked to be relocated and utilized at the permanent pump station locations in the future.

The floodwall sections were designed with an architectural treatment to the floodwall concrete, and the area adjacent to the floodwall was landscaped, where appropriate. An aesthetic concrete stamping process was used on various floodwalls within the Orleans East Bank sub-basin as shown in photograph 4-3 (e.g., Franklin Ramp). The long-term impacts on aesthetic resources in the sub-basin were moderate, as the project area was returned, to the maximum extent practicable, to pre-construction conditions after the floodwall construction. However, the temporary pump stations and closure structures, and the future construction of permanent pump stations would permanently alter view sheds in nearby residential areas.

New Orleans East - Construction modified 5 miles of the original 6.8 miles of earthen levee to new stretches of floodwall or earthen levee with a floodwall cap and a 2 ft. chain safety fence. The visual quality of the lakefront was altered by the construction of a floodwall in lieu of a vegetated levee, and this area is highly visible along Hayne Boulevard. However, the project area is highly urbanized, including roadways, railroad transportation corridors, and residential, commercial, and public services. Due to its current state of development, only minor permanent impacts on aesthetics were anticipated from the implementation of risk reduction systems within the Orleans East Bank sub-basin.

Photograph 4-3. Aesthetic articulated fin finish for floodwalls at the Franklin Ramp.

A small portion of the 23,000-acre Bayou Sauvage NWR was directly impacted by the improvement of the risk reduction systems due to the construction of T-wall sections in the eastern and southernmost portions of the sub-basin. Given the remote nature of the western portion of the sub-basin, these long-term impacts were negligible.

Six HSDRRS borrow areas are located within the New Orleans East sub-basin, however only Maynard and Eastover were excavated and Stumpf was used for staging. The majority of the borrow areas are remote and inaccessible to the public. Borrow areas within the New Orleans East sub-basin that had the greatest potential to impact aesthetic resources included Eastover Phase I and II sites (contractor-furnished borrow sites), where there are residential neighborhoods located to the west and southwest, as well as the East Point Court view shed The Eastover Phase I and II sites borrow sites are contractor-furnished borrow areas and did not benefit from mitigation measures; therefore, the long-term direct impacts on aesthetics from this borrow area depend on what the landowner decides to do with borrow area following excavation. As of 2015, of the borrow sites located in the New Orleans East sub-basin, only the Maynard, Eastover Phase I, and Eastover Phase II borrow sites were utilized for the HSDRRS construction.

Chalmette Loop - New structures were larger and visible from a greater distance; however, much of the HSDRRS is in remote and inaccessible areas, where the public has limited to no access. In addition, most HSDRRS improvements were within areas where similar risk reduction structures, navigation-related channel improvements, and other civil works projects already existed. As a result, overall permanent visual impacts from improvements to the HSDRRS were negligible to minor.

Several scenic rivers are located within the Chalmette Loop sub-basin; however, improvements to the HSDRRS took place outside the designated portions of these scenic rivers, and no long-term adverse impacts on visual resources of these areas occurred.

Nine HSDRRS borrow areas are identified and located within the Chalmette Loop sub-basin, of which only four were utilized including Acosta 1 and 2, Florissant, and DK Aggregates. The majority of the borrow areas are remote and inaccessible to the public. Borrow areas within the Chalmette Loop sub-basin that had the greatest potential to impact aesthetic resources included the DK Aggregate (contractor-furnished borrow) borrow area, where there are view sheds from residential areas and highways, and the borrow area is near the San Bernardo scenic highway. However, the DK Aggregate borrow site is contractor-furnished borrow areas; therefore, the long-term direct impacts on aesthetics from this borrow area depend on what the landowner decides to do with borrow area following excavation.

Belle Chasse - HSDRRS structures remained like the existing conditions, although they are larger and visible from a greater distance. The new floodgates and their associated transitional floodwalls and levees, levee segments, and pump stations are conspicuous visual features that have changed the pre-construction visual landscape. The improved risk reduction systems are in remote and inaccessible areas except for the new risk reduction systems replaced near LA 23. In addition, most improvements are within areas where similar risk reduction measures already existed and as such are not considered out of place. As a result, permanent impacts on aesthetics from improvements to the risk reduction systems were negligible to minor.

Gretna-Algiers - Following HSDRRS construction, the project area within the Gretna-Algiers sub-basin returned to pre-construction conditions, with structural components that were larger and visible from a greater distance. However, most of the structures are in remote and inaccessible areas. In addition, most improvements were done within areas where similar risk reduction structures already exist and, as such, are not considered out of place. The area known as Bayou Aux Carpes CWA Section 404(c) was incorporated into the JLNHPP and is within and adjacent to the HSDRRS in this sub-basin. The view shed into the project area from Bayou aux Carpes CWA Section 404(c) is limited; however, the area has a high aesthetic value due to its limited use and status as a CWA 404(c) area. Therefore, the direct and indirect permanent impacts on visual resources were moderate in areas very close to the project corridor, but minor from deep within the Bayou aux Carpes CWA Section 404(c) area. Permanent visual impacts from improvements to the HSDRRS were moderate.

Dredge material from the maintenance dredging of the Algiers Canal will be utilized in a marsh restoration project in the JLNHPP (IER #12). These dredged materials will be barged to the site from the Algiers Canal and placed in the JLNHPP “Geocrib” site in Lake Salvador. No adverse impacts were anticipated on aesthetic resources from disposal of this material.

Harvey-Westwego - The HSDRRS structures in the Harvey-Westwego sub-basin are in remote and inaccessible areas. In addition, most improvements were within areas where similar structures were previously present and are not considered out of place. Bayou aux Carpes CWA Section 404(c) and the JLNHPP, which are considered to have high aesthetic value, were impacted by the HSDRRS. Approximately 42 acres of cypress-tupelo swamp located within the JLNHPP were cleared for the implementation of the risk reduction system in the Harvey-Westwego sub-basin. Although the natural features of the cypress-tupelo swamp within the JLNHPP are considered to have high aesthetic value, there is limited visual access to the portions of the JLNHPP that were impacted. The impacted portions are in areas with limited interior park roads and are removed from the Barataria Unit visitor trails and visitor center. As a result, the permanent visual impacts within the JLNHPP from improvements to the HSDRRS were minor. Other long-term adverse impacts on aesthetic resources of the area were also minor. No borrow areas are located within the Harvey-Westwego sub-basin.

Lake Cataouatche - The improved HSDRRS structures remained like the existing conditions, although they are larger and more visible from a greater distance but were in remote and inaccessible areas. The Bayou Segnette State Park and the JLNHPP, which are considered to have a high aesthetic value, were directly impacted by the HSDRRS. Although floodwalls were constructed within Bayou Segnette State Park, they are located adjacent to a boat launch, pump stations, and a paved parking area. As a result, visual impacts from improvements to the HSDRRS were moderate.

As of October 2016, of the 12 borrow sites located in the Lake Cataouatche sub-basin, only four were utilized for the HSDRRS construction: Churchill Farms Pit A, River Birch Phase 2, South Kenner Road, and River Birch Landfill Expansion. All of these borrow sites are located off Highway 18 (River Road) and are not very visible.

4.2.13.2.1 Impacts from Borrow Sites Outside of the HSDRRS

The creation of borrow areas starkly contrasts with the natural landscape and, where visible to the public, adversely impacted the aesthetics of these areas. However, most of the borrow areas are located on private lands, in areas of limited view sheds, or are remote and inaccessible to the public.

The final design and function of the contractor-furnished borrow areas adopted by the landowner determines its potential long-term adverse or beneficial effects on the aesthetics of the surrounding area. Regarding the borrow sites utilized, impacts on aesthetic resources were negligible at the following borrow areas: 3C Riverside Phase 3 (St. Charles Parish), Big Shake (St. James Parish), Tammany Holding (St. Tammany Parish), and borrow areas in Plaquemines Parish (Citrus Lands, Idlewild Stage 1 and Stage 2, and Plaquemines Dirt and Clay).

The final design and function of the other borrow areas would be at the discretion of the landowners, and the ultimate reuse determines its potential long-term adverse or beneficial effects on the aesthetics of the surrounding area. Of these sites, only 3C Riverside Phase 3, Tammany Holding Area, Idlewild Stage 1 and Stage 2, and Plaquemines Dirt and Clay were utilized by the HSDRRS construction, as of October 2016.

Long-term adverse aesthetic impacts from borrow pit excavation were negligible from the use of the following borrow areas: Willow Bend/Willow Bend Phase II (St. John the

Baptist Parish), and Pearlington Dirt Phase I/Pearlington Dirt Phase II (Hancock County, Mississippi). Specific details are listed below:

- St. Bernard Parish - Three borrow areas, the 1025 Florissant (contractor-furnished borrow), and Acosta 1 and 2 (contractor-furnished borrow) borrow areas, are located within St. Bernard Parish and outside of the HSDRRS sub-basin boundaries. Two of the borrow areas, Acosta 1 and 2, are located along the San Bernardo Scenic Byway, which is considered to have a high aesthetic value. Current restrictions for development along Louisiana Scenic Byways apply only to signage and not to development actions such as borrow areas. The Florissant borrow area is located adjacent to and within the view shed of residential areas. As of October 2016, only the 1025 Florissant, Acosta 1 and 2 sites were utilized for the HSDRRS construction.

- St. Charles Parish - Three borrow areas, the Bonnet Carré Spillway (north) (government-furnished borrow), 3C Riverside (Site 1 and 2 - both contractor-furnished borrow), and 3C Riverside Phase 3 (contractor-furnished borrow) borrow areas, are located within St. Charles Parish outside of the HSDRRS project area. The Bonnet Carré Spillway (north) is in an area that is heavily used for recreational activities and is considered to have a high aesthetic value. The 3C Riverside (Site 1 and 2) is located within the view shed of a residential neighborhood and the 3C Riverside Phase 3 borrow area, though rural, is within the view sheds of LA 18, Mary Plantation Road/LA 3141, and LA 3127. As of March 2015, all these sites were utilized by the HSDRRS construction.

- The Port Bienville borrow site, a contractor-furnished borrow area, had impacts on the scenic quality of the area and the view sheds from scenic streams primarily through recreational boating, as access to the site, via roadway, is severely limited. As of October 2016, the Port Bienville borrow site was utilized by the HSDRRS construction.

4.2.13.2.3 HSDRRS 2057 Impacts

Where future levee lifts are required, these levees would further degrade the aesthetics of the surrounding areas due to the temporary lack of vegetation on the levee slopes and the increased height of the levees. In addition, temporary impacts on visual resources would occur during the actual implementation of the levee lifts when the area would contain construction equipment and staging areas. However, maintaining the earthen levees at 100-year risk reduction levels would provide a continued benefit to the region’s aesthetic quality due to a reduction in properties damaged by both storm surges and flood events. The HSDRRS 2057 impacts on aesthetics would be moderate to minor.

Current HSDRRS borrow sites may not be utilized for future levee lifts, and new borrow sites may be required, which could further reduce the project area’s aesthetic quality through the introduction of more disturbed borrow sites. Currently, the number and location of these borrow sites are unknown. However, prior to use of any new sites, the

USACE would be required to fully investigate the proposed borrow area's setting and any impacts on the aesthetic quality of the surrounding area per the NEPA. In addition, the USACE would be required to follow any specific parish ordinances (e.g., Jefferson Parish) for these proposed borrow sites.

4.2.13.2.4 Cumulative Impacts

Short-term adverse cumulative impacts on visual resources occurred, and would continue to occur, during all construction activities. Direct cumulative long-term impacts on visual resources from improvements to the risk reduction measures were minor, as most of the HSDRRS remained like what previously existed (levees, floodwalls, and associated structures), only at a higher elevation. In a few cases the levee reaches were realigned into more rural settings, or over the decades have become a part of the area's visual landscape and provide more park-like linear features. Other areas showed a more significant change where turf levees were replaced with concrete I- walls. These areas showed major long-term impacts to visual resources. In most cases these impacts were negative because the I-walls replaced a green space that tended to blend in with the background, especially in rural areas. Concrete I-walls significantly contrast with the natural landscape. Additionally, the cumulative impact of the reduction of threat to property posed from flooding, along with the restoration of damaged facilities, parks, and associated infrastructure could be beneficial to the regional aesthetic resources.

The use of borrow sites for levee construction and for future levee lifts would have a cumulative minor impact on visual resources, because most borrow sites are located on private land with limited to no public access, and where borrow sites are not backfilled, open water habitats remain.

Storm Damage Reconstruction

In conjunction with efforts to restore existing floodwalls, floodgates, and levees throughout the HSDRRS project area, there are completed and ongoing government- and community-based efforts to reconstruct damaged infrastructure, which would enhance the overall region's aesthetics. Although some of the projects might temporarily adversely impact the aesthetic resources in the area due to demolition, construction site equipment, and traffic congestion, in the long term, these enhanced facilities and related infrastructure would create a visually appealing presence, thereby contributing to an overall long-term beneficial impact on aesthetic resources in the area.

Community revitalization has been a central focus in rebuilding areas affected by the hurricanes of 2005. The demolition, renovation, and rebuilding of homes and even whole neighborhoods enhances the visual and aesthetic resources in the project area by replacing the vision of a devastated, blighted, abandoned region with one of hope and recovery. The rebuilding of schools, hospitals and clinics, and fire and police protection facilities in the hurricane-affected areas would have a positive effect on aesthetic resources. Recreational infrastructure such as restored and newly created ball fields, playgrounds, and soccer fields would provide a vista of green space for individuals living nearby. Additionally, major and minor renovations on municipal buildings, parks, community centers, and street repair projects in St. Charles, Jefferson, Orleans, Plaquemines, St. Bernard, and St. Tammany parishes would further provide individuals with outward visual cues indicating a region being restored and enhanced, which would have a positive effect on aesthetics as well.

Redevelopment

In general, redevelopment in all HSDRRS-affected parishes would result in beneficial long-term impacts on aesthetic resources in the region; however, short-term adverse impacts on visual resources due to these redevelopment construction activities, such as demolition, construction site equipment, and traffic congestion, would also occur. Redevelopment occurring in semi-pristine rural environments would have an adverse cumulative aesthetic impact but would be a cumulative beneficial impact in a damaged region.

Projects such as Project Rebuild Plaquemines, are part of the redevelopment efforts and were started following Hurricane Katrina in 2005. Specifically, Project Rebuild helped rebuild three parks and construct one new park in Port Sulphur (Campbell 2010). These parks and others being rebuilt and restored throughout the HSDRRS project area would provide a vista of green space in the view sheds of individuals living nearby. Other miscellaneous projects in the region providing opportunities to enhance visual appeal and aesthetic resources include the following: New Orleans Food and Farm Network, Parkway Partners and ReLeaf New Orleans, Bonnet Carré Spillway improvements, City of New Orleans park improvements, St. Charles Parish Land Use Plan, and FWHA Recreational Trail Program (see section 4.2.10.2).

Coastal and Wetlands Restoration

Coastal and wetlands restoration projects benefit aesthetic resources by increasing natural view sheds within the project area. Projects proposed, such as the Coastal Restoration Forest Initiative, would restore, protect, and conserve ecologically valuable lands in Louisiana's coastal forest system. Implementation of these types of projects would provide for new and improved aesthetics in forested ecosystems. The restoration of coastal habitats would allow native vegetation and wildlife to return to a previously disturbed area, which would increase the visual resources of the project area.

Flood Risk Reduction Projects

Historically, flood risk reduction projects have greatly altered the visual resources of southeast Louisiana. Cumulatively, ongoing and proposed flood risk reduction projects in the area would have adverse cumulative aesthetic impacts, as undeveloped lands are converted to risk reduction structures. Pump stations and other flood risk reduction infrastructure being built as part of SELA and NOV projects would not likely affect aesthetic resources in the long term, because they would be constructed in areas currently used for flood risk reduction. Upon completion of the SELA projects, landscaping and screening, pedestrian access, and other amenities will be added to cover or blend the flood risk reduction projects into the landscape. These flood risk reduction projects would indirectly contribute to adverse impacts on aesthetic resources in the area through inducing development in undeveloped areas. They would also permanently impact view shed opportunities within urban areas and alter more pristine view sheds within more rural and remote areas. However, these projects would cumulatively provide greater flood risk reduction throughout the HSDRRS project area, which in turn could have long-term beneficial impacts on aesthetic resources by reducing the frequency of storm surge devastation in the region.

Transportation

Numerous transportation projects would impact aesthetic resources, which would temporarily adversely impact those in the HSDRRS project area. Large transportation projects, if not planned with green spaces and adequate landscaping, could cause permanent adverse impacts on aesthetic resources.

The Huey P. Long Bridge widening project would substantially increase the size of the bridge and permanently impact visual resources in the area. However, because the bridge improvements are in alignment with the current bridge, and with the beneficial improvements to traffic flow, the impacts, although permanent, would be negligible. The Causeway Boulevard Interchange project at the junction of Causeway Boulevard and I-10 is constructing five new ramps to improve the efficiency and safety of this busy intersection. The addition of the new infrastructure would impact the visual resources of the area; however, the area is already heavily developed with urban buildings and roadways. The impact of the interchange project on visual resources, although permanent, would be negligible.

Most transportation projects would ultimately aid in traffic congestion reduction, which would in turn create a more positive urban view shed and would create beneficial impacts on these same communities within the HSDRRS project area.

4.2.13.2.2 Summary of Cumulative Impacts

Cumulative long-term impacts on visual resources are still evident from Hurricanes Katrina and Rita in the area, and include degraded, damaged, or destroyed homes, facilities, and recreational parks in the area. In general, all regional projects would have short-term moderate construction impacts on aesthetic resources. Most storm damage and redevelopment projects in the region would have beneficial cumulative impacts on visual quality after the post-construction phase. Flood risk reduction and coastal restoration projects would beneficially impact aesthetic resources and the overall visual view sheds within the project area, as the risk for storm damage and flooding would be reduced and marshes are created or restored. New and restored infrastructure redevelopment projects would also benefit the aesthetic resources in the project area by upgrading aging or failing infrastructure, which often contributes to a blighted visual quality within an area.

HSDRRS construction and the use of borrow sites have contributed to the permanent cumulative impacts on visual resources, but regionally, the cumulative impacts on aesthetics are negligible. Aesthetically enhanced floodwalls have been used in some locations, which minimizes the adverse degradation of the visual quality of HSDRRS structures, reducing the cumulative impacts on aesthetics.

4.2.14 AIR QUALITY

4.2.14.1 AFFECTED ENVIRONMENT

The enactment of the Clean Air Act of 1970 (CAA) resulted in the NAAQS and State Implementation Plans. The USEPA established NAAQS for specific pollutants to determine the maximum levels of background pollution that are considered safe, with an adequate margin of safety, to protect public health and welfare. The NAAQS standards are classified as either "primary" or "secondary" standards. The major pollutants of concern, or criteria pollutants, are carbon monoxide (CO), sulfur dioxide (SO_2), nitrogen dioxide (NO_2), ozone (O_3), particulate matter less than 10 microns (PM-10), and lead (Pb). The NAAQS are included in table 4-28.

Areas that do not meet NAAQS standards are called non-attainment areas or maintenance areas, while areas that meet both primary and secondary standards are known as attainment areas. When a non-attainment area improves air quality, it becomes a maintenance area. The air quality managers in maintenance areas develop maintenance plans to ensure that air quality does not exceed the NAAQS presented in table 4-28.

In 1978, Orleans, Jefferson, St. Bernard, and St. Charles parishes were designated as in non-attainment for O_3 because the NAAQS air quality standards were exceeded for a period. Air quality improved in the 1980s, and the four parishes became a maintenance area, known as the New Orleans Ozone Maintenance Area. The USEPA re-designated the New Orleans Ozone Maintenance Area as attainment/unclassified for the 8-hour O_3 standard effective June 15, 2005; however, the area remained designated as a transportation maintenance area for O_3.

In 1992 Ascension, East Baton Rouge, and Iberville Parishes (called Baton Rouge Area) were designated as in non-attainment for ozone under the 1-hour standard. On October 4, 2013, St. Bernard Parish was designated by the Environmental Protection Agency (EPA) as an SO_2 non-attainment area under the 1-hour standard. This classification is the result of area-wide air quality modeling studies, and the information is readily available from Louisiana Department of Environmental Quality, Office of Environmental Assessment and Environmental Services.

On April 1, 2015, the Louisiana Department of Environmental Quality submitted a St. Bernard Parish SO_2 Nonattainment Area Louisiana State Implementation Plan (SIP) Revision to the U.S. Environmental Protection Agency for review and comment. The purpose of the SIP is to achieve compliance with the 1-hour sulfur dioxide NAAQS as expeditiously as practicable, but by no later than October 4, 2018. Effective June 28, 2019, the EPA concluded that Louisiana has appropriately demonstrated that the nonattainment plan provisions provide for attainment of the 2010 1-hour primary SO_2 NAAQS in the St. Bernard Parish, Louisiana Nonattainment Area by the applicable attainment date and that the nonattainment plan meets the other applicable requirements under the CAA.

Conformity Determination. The Federal Conformity Final Rule (40 CFR Parts 51 and 93) states that Federal actions conform to Federal air quality regulations presented in the CAA. The rule mandates that a conformity analysis must be performed when a Federal action generates air pollutants in a region designated as a non-attainment or maintenance area for one or more NAAQS. A conformity analysis determines whether a Federal action meets the requirements of the general conformity rule. It requires the responsible Federal agency to evaluate the nature of the proposed action and associated air pollutant emissions, calculate emissions as a result of the proposed action, and mitigate emissions if *de minimis* thresholds are exceeded. If the emissions exceed established limits, known as *de minimis* thresholds, the proponent is required to implement appropriate mitigation measures.

Greenhouse Gases and Climate Change

Global climate change refers to a change in the average weather on the earth. Greenhouse gases (GHG) are gases that trap heat in the atmosphere. They include water vapor, carbon dioxide (CO_2), methane, nitrogen oxide (NO_x), fluorinated gases including chlorofluorocarbons and hydrofluorocarbons (HFC), halons, as well as ground-level O_3. The major GHG-producing sectors in society include transportation, utilities (e.g., coal and gas power plants), industry/manufacturing, agriculture, and residential. End-use sector sources of GHG emissions include transportation (41 percent), electricity generation (22 percent), industry (21 percent), agriculture and forestry (8 percent), and other (8 percent). The main sources of increased concentrations of GHG due to human activity include the combustion of fossil fuels and deforestation (contributing CO_2), livestock and rice farming, land use and wetlands depletions, landfill emissions (contributing methane), refrigeration system and fire suppression system use and manufacturing (contributing CFC), and agricultural activities, including the use of fertilizers. (California Energy Commission 2007).

In response to the Consolidated Appropriations Act, 2008 (House Resolution 2764; P L 110–161), USEPA has issued the Final Mandatory Reporting of Greenhouse Gases Rule. The rule requires large sources that emit 27,557 U.S. tons or more per year of GHG emissions to report GHG emissions in the U.S., collect accurate and timely emissions data to inform future policy decisions, and submit annual GHG reports to the USEPA. The final rule was signed by the USEPA administrator on September 22, 2009, published on October 30, 2009, and made effective December 29, 2009.

Table 4-28: National Ambient Air Quality Standards

Pollutant	Primary Standards		Secondary Standards	
	Level	Averaging Time	Level	Averaging Times
Carbon Monoxide	9 ppm (10 mg/m^3)	8-hour [1]	None	
	35 ppm (40 mg/m^3)	1-hour [1]		
Lead	0.15 $\mu g/m^3$ [2]	Rolling 3-Month Average	Same as Primary	
	1.5 $\mu g/m^3$	Quarterly Average	Same as Primary	
Nitrogen Dioxide	53 ppb [3]	Annual (Arithmetic Average)	Same as Primary	
	100 ppb	1-hour [4]	None	
Particulate Matter (PM-10)	150 $\mu g/m^3$	24-hour [5]	Same as Primary	
Particulate Matter (PM-2.5)	15.0 $\mu g/m^3$	Annual [6] (Arithmetic Average)	Same as Primary	
	35 $\mu g/m^3$	24-hour [7]	Same as Primary	
Ozone	0.075 ppm (2008 std)	8-hour [8]	Same as Primary	
	0.08 ppm (1997 std)	8-hour [9]	Same as Primary	
	0.12 ppm	1-hour [10]	Same as Primary	
Sulfur Dioxide	0.03 ppm	Annual (Arithmetic Average)	0.5 ppm	3-hour [1]
	0.14 ppm	24-hour [1]		
	75 ppb [11]	1-hour	None	

Source: USEPA 2010a at http://www.USEPA.gov/air/criteria.html, Units of measure for the standards are parts per million (ppm) by volume, parts per billion (ppb - 1 part in 1,000,000,000) by volume, milligrams per cubic meter of air (mg/m^3), and micrograms per cubic meter of air ($\mu g/m^3$).

(1) Not to be exceeded more than once per year.

(2) Final rule signed October 15, 2008.

(3) The official level of the annual NO_2 standard is 0.053 ppm, equal to 53 ppb, which is shown here for the purpose of clearer comparison to the 1-hour standard

(4) To attain this standard, the 3-year average of the 98th percentile of the daily maximum 1-hour average at each monitor within an area must not exceed 100 ppb (effective January 22, 2010).

(5) Not to be exceeded more than once per year on average over 3 years.

(6) To attain this standard, the 3-year average of the weighted annual mean PM2.5 concentrations from single or multiple community-oriented monitors must not exceed 15.0 μg/m3.

(7) To attain this standard, the 3-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor within an area must not exceed 35 μg/m3 (effective December 17, 2006).

(8) To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.075 ppm. (effective May 27, 2008)

(9) (a) To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.08 ppm. (b) The 1997 standard—and the implementation rules for that standard—will remain in place for implementation purposes as USEPA undertakes rulemaking to address the transition from the 1997 ozone standard to the 2008 ozone standard. (c) USEPA is in the process of reconsidering these standards (set in March 2008).

(10) (a) USEPA revoked the 1-hour ozone standard in all areas, although some areas have continuing obligations under that standard ("anti-backsliding").

(b) The standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 ppm is ≤ 1.

(11) (a) Final rule signed June 2, 2010. To attain this standard, the 3-year average of the 99th percentile of the daily maximum 1-hour average at each monitor within an area must not exceed 75 ppb.

EO 13514, *Federal Leadership in Environmental, Energy, and Economic Performance,* signed on October 5, 2009, directs Federal agencies to reduce GHG emissions and address climate change in the NEPA analysis. It expands upon the energy reduction and environmental performance requirements of EO 13423, *Strengthening Federal Environmental, Energy, and Transportation Management*. It identifies numerous energy goals in several areas, including GHG management, management of sustainable buildings and communities, and fleet and transportation management. The GHG covered by EO 13514 are CO_2, methane, N_2O, HFC, perfluorocarbons, and sulfur hexafluoride. These GHG have varying heat-trapping abilities and atmospheric lifetimes. CO_2 equivalency is a measuring methodology used to compare the heat-trapping impact from various GHG relative to CO_2. Some gases have a greater global warming potential than others. NO_x, for instance, has a global warming potential that is 310 times greater than an equivalent amount of CO_2, and that of CH_4 is 21 times greater than an equivalent amount of CO_2.

The CEQ provided draft guidelines for determining meaningful GHG decision-making analysis. The CEQ GHG guidance states that if the proposed action would be reasonably anticipated to cause direct emissions of 27,557 U.S. tons or more of CO_2 GHG emissions on an annual basis, agencies should consider this an indicator that a quantitative and qualitative assessment may be meaningful to decision makers and the public. For long-term actions that have annual direct emissions of less than 27,557 U.S. tons of $CO_{2,}$ CEQ encourages Federal agencies to consider whether the action's long-term emissions should receive similar analysis. CEQ does not propose this as an indicator of a threshold of significant effects, but rather as an indicator of a minimum level of GHG emissions that may warrant some description in the appropriate NEPA analysis for agency actions involving direct emissions of GHGs (CEQ 2010).

<u>Existing Conditions</u>

Orleans, Jefferson, Plaquemines, and St. Charles parishes are in attainment for all NAAQS; St. Bernard Parish, is in attainment for all NAAQS except for sulfur dioxide (SO_2). The New Orleans Ozone Maintenance Area, which includes all or part of Orleans, Jefferson, Plaquemines, St. Charles, and St. Bernard parishes, is a transportation maintenance area for O_3, as previously mentioned (USEPA 2010b). Although transportation conformity regulations do apply for non-attainment and maintenance areas, the nature of the HSDRRS project does not fall under a transportation conformity (USEPA 2010b). The HSDRRS project is a flood risk reduction project, not a transportation project; for example, widening a two-lane highway to four lanes with the intention of increasing the overall transportation capacity for the area, the HSDRRS project does not result in short-term or long-term transportation planning for the area. Vehicle emissions consist of construction/hauling vehicles traveling on established roadways and emissions from construction equipment. Therefore, the air emissions generated by the HSDRRS actions did not trigger a transportation conformity determination even if they exceed de minimis levels (100 tons per year).

4.2.14.2 ENVIRONMENTAL CONSEQUENCES

4.2.14.2.1 HSDRRS Construction Impacts

Temporary increases in air pollution from the HSDRRS projects occurred from three main sources: 1) emissions from transportation of construction materials to project sites such as clay fill, concrete and concrete piling, sheet pile, stone and rocks, etc.; 2) combustion emissions from the engines of construction equipment, workers' automobiles commuting to work, and trucks shipping miscellaneous supplies to project sites; and 3) fugitive dust (PM-10) when soils were disturbed at the construction site. The following paragraphs describe the air calculation methodologies utilized to estimate air emissions produced by the construction of the HSDRRS.

An air quality emissions analysis was conducted to determine the amount of air emissions that may be generated during construction of the HSDRRS projects. Transportation emissions are based upon the local and non-local truck and tug/barge miles traveled (roundtrip) to deliver the HSDRRS materials and are shown in Table 4-29. The main priority pollutant of concern is SO_2. The estimated emissions, shown in tons, represent truck and barge delivery of materials needed for HSDRRS construction over the last 8 years. They are not annual averages but are total emissions since construction beginning in July 2007. The average annual emissions for SO_2 did not exceed the 100 tons per year threshold and did not affect the attainment status for any of the parishes in the New Orleans metropolitan area.

Table 4-29: Diesel Emissions(tons)

Mode	Miles	Gallons of Diesel	VOCs	NOx	CO_2	CO	$PM_{2.5}$	PM_{10}	SO_2	NH_3
Local Truck	51,671,100.0	8,156,565.4	26.7	485.1	91,926.6	129.6	9.7	10.5	0.9	1.5
Non-Local Truck	19,349,900.0	3,050,537.3	10.0	180.7	34,378.8	48.2	3.6	3.9	0.3	0.6
Tug / Barge	947,700.0	8,429,062.5	196.8	5,194.2	263,646.6	432.9	94.9	103.2	512.3*	N/A
TOTALS	71,968,700.0	22,315,460.0	233.4	5,860.1	389,952.0	610.7	108.3	117.7	513.5*	2.0

*No separate emission factor used for SO_2 for tug emissions. Reported as SO_x.
Note: Mode miles are for round-trip deliveries. For barge, this includes tugs pushing empty barges back to the supplier, many of which are well outside the study area.

Temporary increases in air pollution occurred from the use of construction equipment (combustion emissions) and the disturbance of soils (fugitive dust) during construction of the HSDRRS project components. The following paragraphs describe the air calculation methodologies utilized to estimate air emissions produced by construction activities:

Fugitive dust emissions were calculated using the emission factor of 0.19 ton per acre per month (Midwest Research Institute 1996), which is a more current standard than the 1985 PM-10 emission factor of 1.2 tons per acre-month presented in AP-42 Section 13 Miscellaneous Sources 13.2.3.3 (USEPA 2001).

USEPA's NONROAD Model (USEPA 2005a) was used, as recommended by USEPA's *Procedures Document for National Emission Inventory, Criteria Air Pollutants, 1985-1999* (USEPA 2001), to calculate estimated emissions from construction equipment. Combustion emission calculations were made for standard construction equipment, such as front-end loaders, backhoes, bulldozers, and cement trucks. Assumptions were made regarding the total number of days each piece of equipment was used, and the number of hours per day each type of equipment was used.

Construction workers temporarily increased the combustion emissions in the airshed during their commute to and from the project area. Estimated emissions from delivery trucks also contributed to the overall air emission budget. Estimated emissions from delivery trucks and construction worker commuters traveling to the job site were calculated using the MOBILE 6.2 Model (USEPA 2005a, 2005b and 2005c).

St. Bernard Parish is currently in non-attainment status for SO_2. The construction of the Chalmette Loop floodwalls and the excavation of three borrow pits in St. Bernard (IERs 8, 9, 10 and IERS 8,9,10.a), however, were completed prior to St. Bernard Parish being designated as a non-attainment area for SO_2. There was some concern that the SO_2 emissions created by the HSDRRS work contributed to the designation of non-attainment status for SO_2 in St. Bernard Parish. Discussions between the USACE and the Louisiana Department of Environmental Quality (LDEQ) revealed that three major facilities contributed to the high levels of SO_2 in the air of St. Bernard Parish. All three facilities are permitted to release between 500 and 7010 tons of SO_2 per year.

Emission inventories (EI) of criteria pollutants must be submitted by each state to the Federal government for non-attainment areas. The EI is divided into four categories: point source, non-point source, on-road mobile, and non-road mobile.

Louisiana's EI for SO_2 is in accordance with the EPA's most recent inventory data requirements. An accurate EI of current emissions for all sources of SO_2 (point, non-point, on-road mobile, and non-road mobile sources) for St. Bernard Parish has indicated a downward trend in both point source and non-point and mobile source emissions. Table 4-30 (LDEQ, 2015) illustrates the downward trend of SO_2 from the various sources.

Table 4-30: St. Bernard Parish Reporting of SO2 in Tons per Year

Year	Major Source	Non-point and Mobile Sources
2005	6182	1124
2008	5700	832
2011	4893	706

As documented in Table 4-30, the levels of SO_2 from non-point and mobile sources were decreasing during the time of our HSDRRS work. Due to the nature and length of the USACE HSDRRS construction projects, the LDEQ did not feel that the HSDRRS had any significant effect to the air quality of the parish.

The Chalmette Loop Levee Road near the floodwalls is no longer under consideration for construction; therefore, there will be no increased impact to the SO_2 levels in St. Bernard and the air quality would not noticeably change from current conditions. The status of attainment would not be altered. Total SO_2 emissions for the remaining projects were calculated for each year of construction and are reported in table 4-31 below. Table 4-31. St. Bernard Parish SO_2 emissions of combined HSDRRS projects per year of construction.

Table 4-31. St. Bernard Parish Combined SO_2 Emissions/yr. of Construction.

St Bernard Parish	
Year	SO2 tons/year
2008	11.29
2009	24.13
2010	15.45
2011	36.31
2012	18.14

As previously mentioned, the HSDRRS was not intended to increase overall transportation capacity for the HSDRRS project area and was thus not reflected in short-term or long-term transportation planning for the area. Therefore, air emissions generated by the HSDRRS projects do not trigger a conformity determination if they exceed *de minimis* levels (100 tons per year). As there are no violations of air quality standards and no conflicts with the state implementation plans, the impacts on air quality from the implementation of the HSDRRS were minor.

The pollutants from construction which are listed as in non-attainment within a Parish must be calculated and reported for project construction. The Baton Rouge Area (Ascension, East Baton Rouge, and Iberville) is in non-attainment for ozone under the

1-hour standard and the tons per year of construction emissions for VOC and NO_x are reported in table 4-32 below.

Table 4-32. VOC and NO_x emissions tons/year during project construction by Parish

Iberville Parish		
Year	**VOC tons/year**	**NO_x tons/year**
2008	1.54	15.12
Ascension Parish		
Year	**VOC tons/year**	**NO_x tons/year**
2010	2.58	28.98
East Baton Rouge Parish		
Year	**VOC tons/year**	**NO_x tons/year**
2010	2.10	21.80

For the remaining parishes, the major GHG emissions (CO_2 and NO_x) for the HSDRRS activities were estimated at 49,477 tons a year, which is greater than the CEQ guidelines that state that 27,557 U.S. tons is the threshold at which agencies should consider further quantitative and qualitative assessment of GHG emissions (CEQ 2010). The annual estimated transportation emission of GHG was derived using truck and barge emissions for CO_2 and NO_x over the eight-year construction period. The total estimated emissions of GHG included delivery of materials from a substantial portion of the southeast United States. The short-term construction impact was major because it exceeded the 27,557 tons per year emission for CO_2, however, according to EPA's Green Book, because all local parishes were and are currently in attainment for CO_2 and NO_x, the local long-term impact of the construction of the HSDRRS to air quality was minor.

Standard construction BMPs were used during the construction of the HSDRRS, including proper and routine maintenance of all vehicles and other construction equipment to ensure that emissions were within the design standards of all construction equipment. Dust suppression methods were utilized to minimize fugitive dust. In particular, wetting solutions were applied to construction areas to minimize the emissions of fugitive dust. Impacts on air quality in the region resulting from the implementation of the HSDRRS were temporary and minor. No permanent impacts on air quality occurred.

Air Emissions Associated with Transportation of Building Materials. In order to construct the HSDRRS, substantial quantities of building materials needed to be brought to and transported within the Greater New Orleans Metropolitan Area. A transportation report and analyses were produced in 2009 (USACE 2009t) describing the estimated environmental impacts of transporting the materials necessary to construct the HSDRRS. The analyses was updated 2015 and addressed the effects of using public highways, railways, and waterways to supply materials to approximately 105 different construction projects associated with the HSDRRS in the new report titled "Transportation Report for the Construction of the 100-Year Hurricane and Storm Damage Risk Reduction System" (USACE 2015).

The original 2009 transportation report did not utilize final design and construction information because at the time construction was on-going and the data was unavailable; instead, the analysis was based on estimates of material quantities needed to construct the HSDRRS. The 2009 report developed the estimates from design calculations, construction narrative completion reports, pay estimates, best professional judgment and assumed quantities for similar levee and floodwall alignments nearby. These estimates are provided in the CED Phase I report.

The 2015 Transportation Report was prepared using Narrative Completion Reports (NCR) for actual quantities of materials that contractors used to construct the various segments of the system. In addition, the 2015 Transportation Report relied on pay estimate sheets, best professional judgment from construction engineers and project managers for constructed projects, and engineering design reports for projects not yet finalized (USACE 2015).

The 2009 Transportation reports description of the projects, materials, and transportation analyses did not represent a formal commitment to final design, equipment for use, vendors for supply of materials, or methods of construction, but gave an approximation of how the materials could be transported to the construction sites (USACE 2009t). The MOBILE 6.2 model was used to quantify the emissions from the transportation of construction (building) materials for the HSDRRS based on the data from the 2009 transportation report. MOBILE 6.2 is an emission factor model for predicting gram per mile emissions of hydrocarbons, CO, NOx, CO_2, PM, and toxics from cars, trucks, and motorcycles under various conditions (USEPA 2005a, 2005b, and 2005c). This analysis does not include non-road emissions from demolition and construction equipment used to build the HSDRRS, or the emissions from material transportation off public roads within temporary work area easements or at construction sites. MOBILE 6.2 was used to generate emission factors for volatile organic compounds (VOC), CO, oxides of NOx, exhaust PM, SO_2, ammonia (NH_3), and CO_2. The model calculates emission rates under various conditions affecting in-use emission levels (e.g., ambient temperatures, average traffic speeds).

Transportation conformity regulations do apply for non-attainment and maintenance areas and the nature of this project does not fall under a transportation conformity, so further requirements by the CAA general conformity rule (Section 176.(c)) did not apply (USEPA 2010b). Therefore, emissions were not segregated by parish or separated by the calendar year in which the emissions occurred.

4.2.14.2.2 HSDRRS 2057 Impacts

Over a 50-year period of analysis through 2057, present HSDRRS air quality impacts suggest that future levee lifts would create a minor impact on air quality if the New Orleans Maintenance Area becomes non-compliant with present-day NAAQS. It is difficult to determine if a low-emission fuel source will be available in the future or if air quality in the region would improve or get worse. The air impacts would be temporary, and emissions would be substantially less than from the HSDRRS 2011 construction since the number of simultaneous construction contracts would be substantially reduced for future levee lifts. Further, ambient air quality would return to background levels after the completion of future HSDRRS construction activities. Impacts associated with the future levee lifts and structural maintenance may be temporarily moderate but would be negligible in the long term.

Cumulative Impacts

There have not been any permanent cumulative impacts on air quality for the constructed items to date nor is there any anticipated cumulative impacts for potential future levee lifts over the 50-year analysis period. The air quality impacts would be temporary and ambient air quality would return to background levels after the completion of construction activities.

The cumulative impact of SO_2, VOC, and NO_x on the ambient air quality was less than 100 tons per year, on average. The impacts, therefore, are still considered to be minimal.

Redevelopment

The rebuilding and recovery efforts ongoing in the Greater New Orleans Metropolitan Area and throughout the Gulf Coast are creating large numbers of construction projects that would produce air emissions. These regional actions, combined with the HSDRRS construction, would increase the ambient air pollution levels in the New Orleans Maintenance Area, and local citizens may experience an increased exposure to air pollution. However, most of these emissions would occur primarily during construction activities and, therefore, would cause only short-term cumulative impacts on air quality. The ambient air quality should return to pre-construction conditions once completed, and permanent cumulative impacts on air quality would be negligible and thus have no effect on redevelopment.

Coastal and Wetland Restoration

As there are no violations of air quality standards and no conflicts with the state implementation plans, the cumulative impacts to air quality would be negligible and thus have no effect on coastal and wetland restoration.

Flood Risk Reduction

As there are no violations of air quality standards and no conflicts with the state implementation plans, the cumulative impacts to air quality would be negligible and thus have no effect on flood risk management

Transportation

As there are no violations of air quality standards and no conflicts with the state implementation plans, the cumulative impacts to air quality would be negligible and thus have no effect on flood risk management

4.2.14.2.1 Summary of Cumulative Impacts for Air Quality

The rebuilding and recovery efforts ongoing in the GNO Metropolitan Area and throughout the Gulf Coast are creating large numbers of construction projects that would produce air emissions. These regional actions, combined with the HSDRRS construction, would increase the ambient air pollution levels in the New Orleans Maintenance Area, and local citizens may experience an increased exposure to air pollution. However, most of these emissions would occur primarily during construction activities and, therefore, would cause only short-term cumulative impacts on air quality. The ambient air quality should return to pre-construction conditions once completed, and permanent cumulative impacts on air quality would be negligible.

4.2.15 NOISE

4.2.15.1 AFFECTED ENVIRONMENT

Noise is generally described as unwanted sound, which can be based either on objective effects (i.e., hearing loss, damage to structures, etc.) or subjective judgments (e.g., community annoyance). Sound is usually represented on a logarithmic scale with a unit called the decibel (dB). Sound on the decibel scale is referred to as sound level. The threshold of human hearing is approximately 3 dB, and the threshold of discomfort or pain is around 120 dB. Sound levels are typically expressed as A-weighted dB (dBA), which describes the relative loudness of sounds as perceived by the human ear. Noise levels occurring at night generally produce a greater annoyance than do the same levels occurring during the day. People generally perceive intrusive noise at night as being 10 dBA louder than the same level of noise during the day. This perception is largely because background environmental sound levels at night in most areas are also about 10 dBA lower than those during the day. Noise levels are computed over a 24-hour period and adjusted for nighttime annoyances to produce the day-night average sound level (DNL). DNL is the community noise metric recommended by the USEPA and has been adopted by most Federal agencies (USEPA 1974). Acceptable DNL noise levels have been established by the U.S. Department of Housing and Urban Development (HUD) for construction activities in residential areas (HUD 1984):

Acceptable noise levels have been established by the HUD for construction activities in residential areas (HUD 1984):

- Acceptable (not exceeding 65 dBA) – The noise exposure may be of some concern, but common building construction will make the indoor environment acceptable, and the outdoor environment will be reasonably pleasant for recreation and play.

- Normally Unacceptable (above 65 dBA but not greater than 75 dBA) – The noise exposure is significantly more severe; barriers may be necessary between the site and prominent noise sources to make the outdoor environment acceptable; special building constructions may be necessary to ensure that people indoors are sufficiently protected from outdoor noise.

- Unacceptable (greater than 75 dBA) – The noise exposure at the site is so severe that the construction costs to make the indoor noise environment acceptable may be prohibitive, and the outdoor environment would still be unacceptable.

A DNL of 65 dBA is the impact threshold most commonly used for noise planning purposes and represents a compromise between community impact and the need for activities like construction. A DNL of 55 dBA was identified by USEPA as a level below which there is no adverse impact (USEPA 1974).

There are no noise ordinances at the state level; however, there are noise ordinances at the local level, including Orleans Jefferson, St, Charles, St. Bernard, and Plaquemines parishes. The maximum permissible sound levels by land use category are outlined in table 4-33. Sounds generated from construction and demolition activities are exempt from the New Orleans ordinance between 7:00 am and 6:00 pm (11:00 pm for areas other than residential) (Chapter 66 Article IV New Orleans Municipal Code). In Jefferson Parish, industrial sound level limits apply to construction activity for all land use categories. In addition, the Jefferson Parish ordinance specifically prohibits the operation of any construction equipment within 300-foot of any residential or noise-sensitive area between 9:00 pm and 7:00 am Monday through Saturday, and 9:00 pm and 8:00 am on Sundays and holidays, except for emergency work (Section 20-102 Jefferson Parish Municipal Code). In St. Bernard, construction activities directly connected with the abatement of an emergency are excluded from the noise provisions listed below. No exemptions exist for St. Charles or Plaquemines parishes.

Table 4-33: Maximum Permissible Sound Levels by Receiving Land Use Category by Parish

Receiving Land Use Category	Time	Sound Level Limit (dBA)					
		New Orleans		Jefferson	St. Charles	St. Bernard	Plaquemines
		L_{10}	Lmax	Lmax	Lmax	Lmax	Lmax
Residential	7:00 am - 10:00 pm	60	70	60	50	65	60
	10:00 pm - 7:00 am	55	60	55	45	60	55
Commercial	7:00 am - 10:00 pm	65	75	65	65	70	65

	10:00 pm - 7:00 am	60	65	60	60	65	60
Industrial	At all times	75	85	75	N/A	-	75
	7:00 am – 10:00 pm	-	-	-	-	85	-
	10:00 pm – 7:00 am	-	-	-	-	80	-

Sources: Chapter 66 Article IV New Orleans Municipal Code, Section 20-102 Jefferson Parish Municipal Code, Chapter 24 Section 24-4 St. Charles Municipal Code, Article VI Section 11-132 St. Bernard Municipal Code, Article IX Section 17-133 Plaquemines Municipal Code, (www.municode.com).
L_{10} = sound pressure level that is exceeded 10 percent of the time
Lmax = maximum noise level of a particular event

Existing Conditions

Background Noise. Noise levels surrounding the HSDRRS are variable depending on the time of day and climatic conditions. Near many of the HSDRRS reaches, automobile and train traffic, and to air traffic specifically the Louis Armstrong Airport in parts of St. Charles and Jefferson parish, the New Orleans Lakefront Airport in Orleans parish, and the Naval Air Station in Plaquemines parish, contribute to the background noise levels.

As a general rule, noise generated by a stationary noise source, or "point source," will decrease by approximately 6.0 dBA over hard surfaces and 9.0 dBA over soft surfaces for each doubling of the distance. For example, if a noise source produces a noise level of 85 dBA at a reference distance of 50 ft over a hard surface, then the noise level would be 79 dBA at a distance of 100 ft from the noise source, 73 dBA at a distance of 200 ft, and so on. To estimate the attenuation of the noise over a given distance, the following relationship is utilized:

Equation 1: $dBA_2 = dBA_1 - 20 \log (d_2/d_1)$
Where:

dBA_2 = dBA at distance 2 from source (predicted)
dBA_1 = dBA at distance 1 from source (measured)
d_2 = Distance to location 2 from the source
d_1 = Distance to location 1 from the source
Source: California Department of Transportation 1998

Sensitive Noise Receptors. A number of parks, wildlife management areas, and wildlife refuges are located adjacent to or near the HSDRRS. These public lands are sensitive noise receptors where serenity and quiet are an important public resource. The Bayou Sauvage NWR and the JLNPP are located adjacent to the HSDRRS.

The areas with the greatest number of sensitive noise receptors, such as residential homes and apartments, schools, churches, and parks, are located in Orleans and Jefferson parishes. They are located adjacent to the HSDRRS reaches and are situated near Lake Pontchartrain, GIWW, and IHNC. In addition, a large number of residential sensitive noise receptors are located on the west bank of the Mississippi River in Jefferson Parish.

4.2.15.2 ENVIRONMENTAL CONSEQUENCES

4.2.15.2.1 HSDRRS Construction Impacts

No permanent noise impacts occurred as a result of HSDRRS construction, and all noise emissions were short-term, lasting only as long as the construction activities. Table 4-34 presents noise emissions for construction equipment utilized during the construction activities. Sound levels at 50 ft were estimated to range from 76 dBA to 91 dBA based on data from the FHWA (2007).

Table 4-34: A-Weighted (dBA) Sound Levels of Construction Equipment and Modeled Attenuation at Various Distances1

Noise Source	50 feet	100 feet	200 feet	500 feet	1,000 feet
Backhoe	78	72	68	58	52
Crane	81	75	69	61	55
Dump Truck	76	70	64	56	50
Excavator	81	75	69	61	55
Front-end loader	79	73	67	59	53
Concrete mixer truck	79	73	67	59	53
Bulldozer	82	76	70	62	56
Pile driver	91	85	79	71	65

Source: FHWA 2007.

[1] The dBA at 50 ft is a measured noise emission. The 100 to 1,000 ft results are modeled estimates.

Several of the projects required the use of pile drivers or vibratory hammers to anchor the T-walls. These were considered the dominant noise source during construction activities. Assuming the worst-case scenario of 91 dBA for actions that require the use of vibratory hammers or pile drivers, the noise model projected that such noise levels were required to travel 1,000 ft before they attenuated to acceptable levels of 65 dBA.

Some projects did not require the use of pile drivers or vibratory hammers, these reaches used earth-moving construction equipment, which produces noise emissions of 81 dBA. The noise model projected that noise levels of 81 dBA were required to travel 300-feet before they attenuated to acceptable levels of 65 dBA.

A number of sensitive noise receptors were located within 1,000 ft and 300 ft of the HSDRRS construction sites. Aerial photography was used to determine the number of sensitive noise receptors within the 1,000 ft and 300 ft zones. Table 4-35 summarizes the total sensitive receptors, segregated by sub-basins, IERs, and reaches that were temporarily impacted during construction of the HSDRRS. Table 4-36 summarizes the total sensitive receptors temporarily impacted during construction activities at the HSDRRS borrow pits.

Noise emission criteria for construction activities published by the FHWA has established a construction noise abatement criterion of 57 dBA for lands, such as NPS land, in which serenity and quiet are of extraordinary significance (23 CFR 722 table 1). The 57 dBA criterion threshold was used to measure the impacts from short-term noise emissions associated with constructing the HSDRRS adjacent to NPS lands. The noise model predicted that noise emissions of 91 dBA were required to travel 2,600 ft before they attenuated to 57 dBA.

Approximately 2,814 acres of land within the JLNHPP and 8,051 acres of land within Bayou Sauvage National NWR are within 2,600 ft of the HSDRRS. A number of state and city parks are located near the HSDRRS, including Bayou Segnette State Park, London Park, Ozone Park, Zephyr Park, Woodlake Park, St. Bernard State Park, Lake Shore Park, Pontchartrain Park, Linear Park, and Williams Boulevard Park, and had the potential to experience noise emissions greater than 57 dBA.

Impacts on the ambient noise environment resulting from the implementation of the HSDRRS were major, but short-term. Approximately, 8,114 single-family homes, 268 apartment buildings, 20 churches, 26 schools, including the University of New Orleans, and three hospitals are located within 300 or 1,000 ft from the edge of the project corridors. These sensitive noise receptors experienced noise emissions greater than 65 dBA, which are normally unacceptable (HUD 1984). Contractors often worked 24 hours a day, 7 days a week. Those working in Orleans and Jefferson parishes obtained permission from local authorities to operate at times beyond local ordinance permissible time frames.

During storm events, the noise generated by the operations of the pump stations in the Orleans East Bank sub-basin (IER #5) do exceed the local ordinances. However, these excessive noise levels only occur during storm events and therefore considered temporary, infrequent short-term adverse impacts.

Mitigation measures implemented are discussed in Section 5.

Table 4-35: Sensitive Noise Receptors Subjected to Construction Noise Emissions Equal to or Greater than 65 dBA

IER* #	Noise and Air Work Hrs.		Number of Sensitive Noise Receptors				
	Permissible Hours	Exceptions to Permissible Hours	Single-Family Homes	Apartment Buildings	Churches	Schools	Hospitals
St Charles Sub-basin							
1/S 1	24 hr./day, 7 days/week operations permitted	Daylight hours only: LPV-03d.2	4	0	0	0	0
Jefferson East Bank Sub-basin							

IER* #	Noise and Air Work Hrs.		Number of Sensitive Noise Receptors				
	Permissible Hours	Exceptions to Permissible Hours	Single-Family Homes	Apartment Buildings	Churches	Schools	Hospitals
2/S 2	24 hr./day, 7 days/week operations permitted	Pile driving limited to 7 am to 10 pm: all reaches	588	30	1	1	0
3/S 3.a	24 hr./day, 7 days/week operations permitted	No pile driving between 9 pm and 6 am: LPV-17.2, LPV-10.2, LPV-11.2, LPV-12.2, LPV-17.2	1385	48	2	1	1
Orleans East Bank Sub-basin							
4	7 am to 9 pm Mon-Fri, 8 am to 9 pm Sat & Sun	No pile driving between 9 pm and 6 am	460	46	2	6	2
Jefferson East Bank and Orleans East Bank Sub-basins							
5	24 hr./day, 7 days/week operations permitted	Pile driving limited to 7 am to 10 pm: LPV-101.02; 7 am to 9 pm Mon-Fri; 8 am to 9 pm Sat, no work Sun: LPV-103.01A2	98	4	1	0	0
27	24 hr./day, 7 days/week operations permitted**		1760	13	1	8	0
New Orleans East Sub-basin							
6/S 6	7 am to 9 pm Mon-Fri, 8 am to 9 pm Sat & Sun	No pile driving between 9 pm and 6 am: LPV-107	2063	62	4	4	0
7/ S 7	24 hr./day, 7 days/week operations permitted	No pile driving between 9 pm and 6 am: LPV-109.02b; work on weekends & holidays must be requested: LPV-110	6	0	0	0	0
11 Tier 2 Pontchartrain	7 am to 9 pm Mon-Fri, 8 am to 9 pm Sat & Sun	NA	0	0	0	0	0
11 Tier 2 Borgne /	24 hr./day, 7 days/week	NA	0	0	0	0	0

IER* #	Noise and Air Work Hrs.		Number of Sensitive Noise Receptors				
	Permissible Hours	Exceptions to Permissible Hours	Single-Family Homes	Apartment Buildings	Churches	Schools	Hospitals
S 11 Tier 2 Borgne	operations permitted**						
Chalmette Loop Sub-basin							
8	24 hr./day, 7 days/week operations permitted	NA	0	0	0	0	0
9	18 hr./day (6 am to 12:00 am), 7 days/week operations permitted	NA	13	0	0	0	0
10	24 hr./day, 5 days/week operations permitted, work on Sat & Sun requires 48 hr. notice	No pile driving between 9 pm and 6 am: all reaches	19	0	0	0	0
Belle Chasse Sub-basin							
13	7 am to 9 pm, 7 days/week at Pump Station #24, all other areas 24 hr./day, 7 days/week operations permitted	No pile driving between 9 pm and 7 am: WBV-09a, WBV-09b	49	0	3	0	0
Gretna-Algiers Sub-basin							
12/S 12	24 hr./day, 7 days/week operations permitted**	No pile driving between 9 pm and 7 am: WBV-09b	411	65	0	4	0

IER* #	Noise and Air Work Hrs.		Number of Sensitive Noise Receptors				
	Permissible Hours	Exceptions to Permissible Hours	Single-Family Homes	Apartment Buildings	Churches	Schools	Hospitals
Harvey-Westwego Sub-basin							

IER* #	Noise and Air Work Hrs.		Number of Sensitive Noise Receptors				
	Permissible Hours	**Exceptions to Permissible Hours**	**Single-Family Homes**	**Apartment Buildings**	**Churches**	**Schools**	**Hospitals**
14/S 14.a	6 am to 9 pm, 7 days/week: WBV-17.b2, WBV-14.i,, WBV-14.e.2; 24hr/day, 7days/week operations permitted: WBV-14.b, WBV-14.d, WBV-30, WBV-	No pile driving between 9 pm and 7 am: WBV-14.b	800	0	3	0	0
Lake Cataouatche Sub-basin							
15	6 am to 9 pm, 7 days/week: WBV-17.b2, WBV-14.i,, WBV-14.e.2; 24hr/day, 7days/week operations permitted: WBV-14.b, WBV-14.d, WBV-30, WBV-37	NA	0	0	0	0	0
16/S 16.a	24 hr./day, 7 days/week operations permitted	No pile driving between 109 pm and 5 am: WBV-73, WBV-75, WBV-77	7	0	0	0	0
17	24 hr./day, 7 days/week operations permitted: WBV-24, WBV-16.b, WBV-20, WBV-22; 6 am to 9 pm,7 days/week: WBV-16.2, WBV-21	NA	70	0	0	0	0
Total			**7733**	**268**	**17**	**24**	**3**

*S – Supplemental
**Used a worst-case scenario of 24 hours/day, 7 days a week for these IER work hours.
NA – not applicable

Table 4-36: Sensitive Noise Receptors that were Subjected to Noise Emissions

Borrow Sites Noise Emissions Work Hours and Locations			Number of Sensitive Noise Receptors				
IER* #	Construction Permissible Hours	Exceptions to Permissible Hours	Single-Family Homes	Apartment Buildings	Churches	Schools	Hospitals
New Orleans East Sub-basin							
18, 19 29, 25	24 hr./day, 7 days/week operations permitted	None	13	0	0	0	0
Chalmette Loop Sub-basin							
18, 19, 30, 31	24 hr./day, 7 days/week operations permitted	None	96	0	0	0	0
Belle Chasse Sub-basin							
18, 22	24 hr./day, 7 days/week operations permitted	None	8	0	0	0	0
Lake Cataouatche Sub-basin							
18, 19, 22, 25, 26, 28, 31	24 hr./day, 7 days/week operations permitted	None	123	0	2	2	0
Plaquemines Parish							
18, 19, 22, 23, 25, 26, 28, 31, 32	24 hr./day, 7 days/week operations permitted	None	61	0	1	0	0
St Bernard Parish							
18, 23, 31	24 hr./day, 7 days/week operations permitted	None	5	0	0	0	0
Hancock County							
19, 23, 26, 31	24 hr./day, 7 days/week operations permitted	None	16	0	0	0	0
Lafourche Parish							
31	24 hr./day, 7 days/week operations permitted	None	0	0	0	0	0
St Charles Parish							
23, 32	24 hr./day, 7 days/week operations permitted	None	30	0	0	0	0

Borrow Sites Noise Emissions Work Hours and Locations			Number of Sensitive Noise Receptors				
IER* #	**Construction Permissible Hours**	**Exceptions to Permissible Hours**	**Single-Family Homes**	**Apartment Buildings**	**Churches**	**Schools**	**Hospitals**
St James Parish							
30	24 hr./day, 7 days/week operations permitted	None	24	0	0	0	0
St. John the Baptist Parish							
26, 29	24 hr./day, 7 days/week operations permitted	None	1	0	0	0	0
St. Tammany Parish							
29, 31	24 hr./day, 7 days/week operations permitted	None	3	0	0	0	0
Ascension Parish							
32	24 hr./day, 7 days/week operations permitted	None	1	0	0	0	0
Iberville Parish							
19	24 hr./day, 7 days/week operations permitted	None	0	0	0	0	0
East Baton Rouge Parish							
31	24 hr./day, 7 days/week operations permitted	None	0	0	0	0	0
Total			**381**	**0**	**3**	**2**	**0**

*S - Supplemental

4.2.15.2.2 HSDRRS 2057 Impacts

Future levee lifts are planned to occur over the next 50 years. Provided that construction equipment noise emissions remain at 2011 levels, it is estimated that sensitive noise receptors would experience noise emissions greater than 65 dBA during construction of the planned levee lifts. Approximately 2,757 single-family homes, 120 apartment buildings, 13 churches, 10 schools, and three hospitals that are currently present in the project area would be exposed to noise emissions from future levee lifts that are normally unacceptable, as shown in table 4-37. While the noise emissions would create a major impact during construction activities, they would be temporary and sporadic (over 50 years), making the long-term impacts from noise emissions negligible.

Table 4-37: Sensitive Noise Receptors Impacted from Future Levee Lifts (HSDRRS 2057)

Estimate Noise Impacts 2057 HSDRRS	Number of Sensitive Noise Receptors				
HSDRRS Sub-basin	**Single-Family Homes**	**Apartment Buildings**	**Churches**	**Schools**	**Hospitals**
St Charles	4	0	0	0	0
Jefferson East Bank	632	45	3	2	1
Orleans East Bank	460	46	2	6	2
Jefferson East Bank and Orleans East Bank	98	4	1	0	0
New Orleans East	1,206	23	2	2	0
Chalmette Loop	13	0	0	0	0
Belle Chasse	49	0	3	0	0
Gretna-Algiers	32	2	1	0	0
Harvey-Westwego	231	0	1	0	0
Lake Cataouatche	32	0	0	0	0
Total	**2,757**	**120**	**13**	**10**	**3**

Cumulative Impacts

Cumulative noise impacts associated with HSDRRS construction activities were periodically major due to the number of sensitive noise receptors adjacent to the project areas; however, these impacts were temporary short-term impacts that were over once construction was complete. There were no permanent cumulative noise impacts resulting from construction of the HSDRRS.

A number of regional projects have been constructed, are currently on-going or are planned for the region that would produce noise emissions. The construction activities for these projects could potentially increase the ambient noise levels in the HSDRRS project area and extend the time that local residents are exposed to elevated noise levels.

4.2.15.2.3 Storm damage reconstruction and redevelopment

Projects would potentially cause temporary adverse impacts in the HSDRRS area; should pile driving operations occur, those impacts could be major. If HSDRRS projects coincide with storm damage and redevelopment projects, then short-term adverse cumulative impacts would occur on sensitive noise receptors in the region.

Several other flood risk reduction projects are underway in southeast Louisiana. These construction activities would potentially increase the ambient noise levels in the region and extend the time that local residents are exposed to elevated noise levels; however, these conditions would predominantly be limited to the fringes of the HSDRRS project area. Several other flood risk reduction projects are scheduled for implementation to the west of the project area. These projects may have minor and temporary adverse impacts on the local noise environment but would not contribute to adverse cumulative impacts on the noise environment.

Transportation

Projects, such as new bridge crossings and the IHNC Lock replacement project, would require the use of pile driving equipment. If pile driving for bridge crossings or the lock construction coincides with the future levee lifts, the noise impacts could temporarily impact residential homes and other sensitive noise receptors near these construction sites. Other present and future transportation projects may have temporary adverse cumulative impacts on the local noise environment.

4.2.15.3 SUMMARY OF ALL CUMULATIVE IMPACTS

Noise emissions associated with HSDRRS construction were major, but temporary. Approximately 8,037 single-family homes experienced noise emissions greater than 65 dBA, which are normally considered unacceptable (HUD 1984). During the future levee lifts, approximately 2,757 single-family homes would experience noise emissions greater than 65 dBA, which are normally considered unacceptable (HUD 1984). Noise emissions associated with HSDRRS construction and other regional projects would be limited to specific locations of construction activities and would be temporary in nature. No regional long-term cumulative noise impacts would occur.

4.2.16 TRANSPORTATION

The transportation network for the HSDRRS project area includes shallow-draft waterways, highways, as well as the streets and bridges supporting the local and regional communities. The transportation resource is important to the public because roads and highways are the main transportation mode used to travel within the metropolitan area and an increase in traffic congestion from HSDRRS construction in relation to existing traffic load and highway capacity could cause travel delays and driver frustration.

4.2.16.1 AFFECTED ENVIRONMENT

Regional transportation in and around the HSDRRS project area includes air traffic systems, railroads, public transit, navigation channels, and roadway networks. Figure 4-15 shows the regional transportation features in the project area.

Photograph 4-4. Hurricane Katrina flooding in the City of New Orleans.

The roadway system within the New Orleans area has been in disrepair for years due to underfunding (Bureau of Governmental Research 2008). The landfall of Hurricane Katrina in 2005 made the situation much worse and resulted in the need for some immediate repairs (photograph 4-4). Paving LA Roads (formerly called South Louisiana Submerged Roads Program) is a partnership between the New Orleans Regional Planning Commission (RPC), the City of New Orleans, LADOTD, and the FHWA to repair roads damaged as the result of Hurricane Katrina. The program is funded by the Emergency Relief Program of the FHWA and includes approximately 60 rehabilitation projects in Orleans, Jefferson, St. Bernard, Plaquemines and St. Tammany parishes, and is anticipated to cost approximately $150 million (LADOTD Paving LA Roads, 2015). Much of this work is complete and has repaired roads impacted by the Hurricane Katrina flooding. Many of the roads repaired through this program were used to transport HSDRRS materials.

Airline Services - The Louis Armstrong New Orleans International Airport is located east of most projects in the HSDRRS and is the primary commercial airport for the New Orleans area and most of the Greater New Orleans Metropolitan Area. The New Orleans Lakefront Airport is located on the southern bank of Lake Pontchartrain along Hayne Boulevard and serves general recreation flights, private charter flights, a small aircraft flight school, and some military flights. The New Orleans Lakefront Airport serves southeastern Louisiana and the Mississippi Gulf Coast (New Orleans Lakefront Airport 2010).

Public Transit - The Regional Transit Authority provides public transit within the New Orleans area. There are 28 bus routes that are accessible to clients with disabilities and serve all regularly scheduled routes (Regional Transit Authority 2010). The city has three streetcar lines that have been active since the early 1900s, and a fourth line along Loyola Avenue between Canal Street and the Union Passenger Terminal was added in 2014. The streetcars have been an integral part of New Orleans public transportation network since 1923. Greyhound runs a bus service for regional transportation service from New Orleans. The New Orleans Greyhound station is located on Loyola Avenue. There are also several taxicab companies that offer cab service, vehicles for hire, delivery service, and ground transportation.

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Figure 4-6. Transportation Features in the HSDRRS Project Area

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Roadway Network - Roads and bridges compose most of the transportation network serving the HSDRRS project area. Included with this network are several LADOTD roadway classifications, including interstates, principal roads, and local roads.

Interstates - The I-10 corridor serves as an expressway for commuter traffic, as well as a regional interstate roadway serving east-west traffic from Florida to California. There is also a significant amount of commuting outbound from New Orleans to the petrochemical and oil refining industries along I-310 and the Mississippi River, as well as the shipbuilding industry. I-10 also connects New Orleans to Baton Rouge, the state capital. I-610 serves as a bypass from downtown New Orleans. I-510 connects I-10 to US 90 in New Orleans, as well as New Orleans East and Chalmette.

Principal Roads - There are several principal roads located throughout the project area. Some of these roads include US 61 (Airline Highway), US 90, US 11, LA 23, LA 47, LA 46, Causeway Boulevard, Veterans Boulevard, Metairie Road, Lakeshore Drive, Robert E. Lee Boulevard, Gentilly Boulevard, Lapalco Boulevard, Leon C. Simon Drive, Downman Road, and Hayne Boulevard.

Local Roads - Local roads are also used throughout the project area. Some important local roads include LA 39, LA 48, 17th Street, Orleans Avenue, London Avenue, Loyola Drive, Vintage Drive, Franklin Avenue, Marconi Drive, Bullard Avenue, and Read Boulevard.

Navigation channels - The Port of New Orleans, which moves about 500 million tons of cargo each year, is located on the Mississippi River (photograph 4-5) and connects with the IHNC and GIWW. The Port of New Orleans is one of the world's busiest ports, with many intersecting transportation modes (river and ocean vessels, rail, and highway). The Port is served by six railroad lines, 50 ocean carriers, 16 barge lines, and 75 truck lines (Port of New Orleans 2010).

Photograph 4-5. The Port of New Orleans moves nearly 500 million tons of cargo each year.

4.2.16.2 ENVIRONMENTAL CONSEQUENCES

4.2.16.2.1 <u>HSDRRS Construction Impacts</u>

The *Transportation Report for the Construction of the 100-Year Hurricane and Storm Damage Risk Reduction System* prepared in 2009 describes the estimated quantities and anticipated impacts of transporting the materials necessary to construct the 100-year HSDRRS and is incorporated by reference (USACE 2009r). The 2009 report was updated in 2016 using the final transportation information and the analysis of that information is provided in this document, the CED Phase II. This Final Transportation Report updates the assumptions used in quantifying transportation impacts by using actual construction data, when available, including actual quantities used in building the HSDRRS and, in many cases, sources of materials. All assumptions can be found in

Appendix F and are referred to as the Transportation Report. There is a total of 150 projects analyzed in 19 risk reduction IERs for the HSDRRS actions constructed. The material quantities, trips, and timing of trips were analyzed for the 150 HSDRRS projects. The Transportation Report data was gathered from Narrative Completion Reports (NCR) for most of the levee contracts. The NCRs provide a detailed description of the actual material quantities and contracted companies used to construct the various segments of the system. In addition, the data gathering phase relied on pay estimate sheets and best professional judgment from construction engineers and project managers and used the engineering design reports for projects not yet finalized. This updated analysis addressed the effects of using the public highways and waterways to supply earthen borrow, structural steel (e.g., sheet pile, pipe pile, H-pile), ready-mix concrete, concrete pile, aggregate, and rock for 150 construction projects as part of the Lake Pontchartrain and Vicinity and West Bank and Vicinity Projects (Table 4-38).

Table 4-38: Quantities of Major Materials Used for the HSDRRS Projects[1]

Material	Quantity	Units
Earthen Fill	17,319,700	cubic yards
Concrete	1,559,500	cubic yards
Aggregate	2,979,300	tons
Sheet Pile	11,479,800	square feet
H-Pile	10,368,800	linear feet
Pipe Pile	845,500	linear feet
Concrete Pile	1,592,200	linear feet
Rock	3,043,500	tons

[1] Quantities provided in this table are from information contained in USACE Transportation Report 2016, Appendix F.

Most of all trips necessary to construct the HSDRRS were for the transportation of borrow material (earthen fill), and this material cannot be economically transported by rail or barge. The Transportation Report identifies material delivery routes for all material types from their point of origin to greater New Orleans on barges and trucks under the assumption that the choice of transportation mode was driven by transportation cost efficiencies and project access by water and over-land limitations. To predict transportation effects, the quantities of materials were compiled and converted to trips and miles per trip. Table 4-39 shows the miles traveled by mode and material type.

Table 4-39: Miles Traveled by Mode and Type of Material

Material	Truck Miles [1] (Local)	Truck Miles [1] (Non-Local)	Barge Miles
Earthen Fill (Borrow)	44,236,900	0	0
Concrete	1,841,300	0	0
Aggregate	3,828,100	9,766,400	85,500
Sheet Pile	191,300	3,914,700	133,500*
H-Pile	155,500	2,927,500	*
Pipe Pile	6,700	87,900	*
Concrete Pile	698,300	1,330,500	5,900
Rock	542,500	1,322,800	722,700
Total	**51,671,100**	**19,349,900**	**947,700**

Source: USACE Transportation Report 2016, Appendix F.
*133,500 barge miles include Sheet Pile, H-Pile, and Pipe Pile combined.
[1] Local travel is within the HSDRRS area; non-local travel is from outside the HSDRRS area.

Assessment of the environmental consequences from transport of materials to and within the GNO Metropolitan Area for construction of the 100-year HSDRRS focused on four primary areas:

- effects on traffic congestion
- effects on transportation infrastructure (e.g., road surfaces, bridges, culverts)
- accident risks (increased risks of fatalities, injuries, and property damage accidents)
- diesel emissions

Transportation impacts were modeled and evaluated by attaching the number of truck trips per day, over the course of each project construction, to each road segment traversed, by the route carrying materials from the material origin to the roadway exit point and returning to the origin. It is important to note that the Transportation Report did not predict traffic or road surface conditions on a segment of route on a given day in the overall project schedule. In order to assess effects on traffic, each route was parsed into segments according to LADOTD road classifications.

In general, the overall HSDRRS implementation caused adverse permanent and temporary impacts on transportation due to increased congestion, accelerated roadway wear-and-tear, and increased risk of traffic accidents on major and local access roads in the project area and throughout the Greater New Orleans Metropolitan Area. Temporary impacts on transportation due to increased congestion and increased traffic accident risk occurred during the construction period; however, these impacts were less than expected and as reported in the CED Phase 1 document and are no longer evident since construction has ended.

Permanent moderate impacts on transportation from infrastructure degradation occurred due to roadway wear-and-tear from the large volume of truck traffic required for the HSDRRS implementation. These impacts were likely greatest on local access roads and local bridges. Higher design characteristics for high-capacity roads, such as major highways, can withstand wear much better than local roads. Federal, state, and local government entities have rehabilitated and repaired some of the roadways through implementation of the Paths to Progress Paving LA Roads program, formally referred to as Submerged Road Program.

As shown in Table 4-40, approximately 1,300 lane miles of roadway within GNO were traversed constructing the HSDRRS. Principal, minor arterial roads and interstate highways make up over 86% of lane miles used to deliver the materials needed to construct the HSDDRS. These road classifications are the most robust because they are designed to handle large numbers of trucks daily.

Table 4-40: Lane Miles Used for Transport of HSDRRS Materials

LADOTD Road Classification	Class Description	12- Foot Lane Miles
1	Interstate	394.4
2	Expressway	82.2
3	Principal Arterial	412.1
4	Minor Arterial	313.8
5	Major Urban Collector	44.1
6	Minor Urban Collector	7.4
7	Local Road	45.3
Estimated Total Lane Miles		1,299.3

Source: USACE Transportation Report 2016, Appendix F.

Traffic Congestion. Congestion resulting from the implementation of the project was addressed using two methods: (1) using the RPC's Congestion Management Index (CMI) and (2) by defining thresholds at which the public was likely to perceive the increase in traffic (i.e., truck frequency threshold) and identifying which specific roads exceeded those thresholds. The calculated changes in the CMI provide a relative assessment for the predicted changes in traffic, and with a greater change in CMI, congestion is predicted to increase. The RPC asserts that any CMI score over 3.25 is considered "congested." None of the roads used to transport HSDRRS materials exceeded a CMI of 3.25. Interstate highways saw the largest change in CMI of all the road classes, 0.65, which infers a noted increase in congestion caused by the addition of delivery trucks. However, none of the interstates in the study area exceeded the frequency threshold. Table 4-41 shows the congestion impacts by class of road.

Table 4-41: Congestion

LADOTD Road Classification	Class Description	Maximum CMI With-Project	Maximum Change in CMI	Number of Roads Exceeding Truck Frequency Thresholds
1	Interstate	3.12	0.65	0
2	Expressway	2.95	0.17	0
3	Principal Arterial	2.26	0.04	5
4	Minor Arterial	2.07	0.01	7
5	Major Urban Collector	NA	NA	4
6	Major Urban Collector	NA	NA	4
7	Local Road	NA	NA	23

NA = CMIs are not developed for LaDOTD Road Classification 5, 6, or 7 because the RPC did not perform surveys on these road classes.

The thresholds shown in table 4-42 show the level of truck traffic at which the roadway users and adjacent property owners were likely to perceive an increase. Functional road classes 1 and 2, Interstate and Expressways, are estimated to have a substantially higher frequency of trucks, potentially increasing traffic and damaging roadways.

Table 4-42: Truck Frequency Thresholds by Functional Road Class

Functional Road Class	Materials Transportation Trucks Per 12-Hour Workday	Truck Frequency
1	1,500	30 seconds
2	1,500	30 seconds
3	360	2 minutes
4	240	3 minutes
5	150	5 minutes
8	50	15 minutes

Modified from USACE 2009r.

The roads listed in the following tables (tables 4-43, 4-44, 4-45, 4-46 and 4-47) and shown in the Figure 4-16 map were those predicted to be the most affected by increases in truck traffic and the durations for which those effects were expected. No thresholds were exceeded for any Interstate and Expressway routes in the region. Roadways that experienced actual large truck volume increases over an extended duration were Highway 3127 (connecting Willow Bend and 3-C Riverside borrow pits to Highway 90), Chef Menteur Highway and Highway 90 in St. Charles and Jefferson Parishes. The overall number of truck trips was less than projected in the 2009 report and was likely due to design changes that replaced earthen levees with concrete floodwalls or with steel sheet- and H-pile or deep soil mixing.

Table 4-43: DOTD Road Class 3
Number of Days Threshold of 360 Material Delivery Trucks Per Day Exceeded

	Statistics for Days on Which Materials Delivery Truck Count Threshold is Exceeded			
Roadway	Number of Days Threshold Exceeded	Minimum Trucks per Day	Average Trucks per Day	Maximum Trucks per Day
Highway 90 (St. Charles)	368	361	552	1,257
Highway 90 (Jefferson)	285	361	495	765
Paris Rd	173	498	537	568
Airline Hwy	169	363	505	640
Lapalco Blvd	90	365	419	604

Table 4-44: DOTD Road Class 4
Number of Days Threshold of 240 Material Delivery Trucks Per Day Exceeded

	Statistics for Days on Which Materials Delivery Truck Count Threshold is Exceeded			
Roadway	Number of Days Threshold Exceeded	Minimum Trucks per Day	Average Trucks per Day	Maximum Trucks per Day
Highway 3127	613	241	404	938
Chef Menteur Hwy	422	247	417	982
US Hwy 11	345	247	499	988
Highway 90 (St. Tammany)	265	562	568	743
E LA 46	173	247	283	351
Lake Forest Blvd	173	494	495	495
Highway 23	166	242	289	379

Table 4-45: DOTD Road Class 5

Number of Days Threshold of 150 Material Delivery Trucks Per Day Exceeded

Roadway	Days Threshold is Exceeded	Statistics for Days on Which Materials Delivery Truck Count Threshold is Exceeded		
		Minimum Trucks per Day	Average Trucks per Day	Maximum Trucks per Day
E Point Ct	411	221	583	990
Howze Rd	297	162	208	276
Barataria Blvd	135	152	179	196
Highway 3125	68	168	168	168

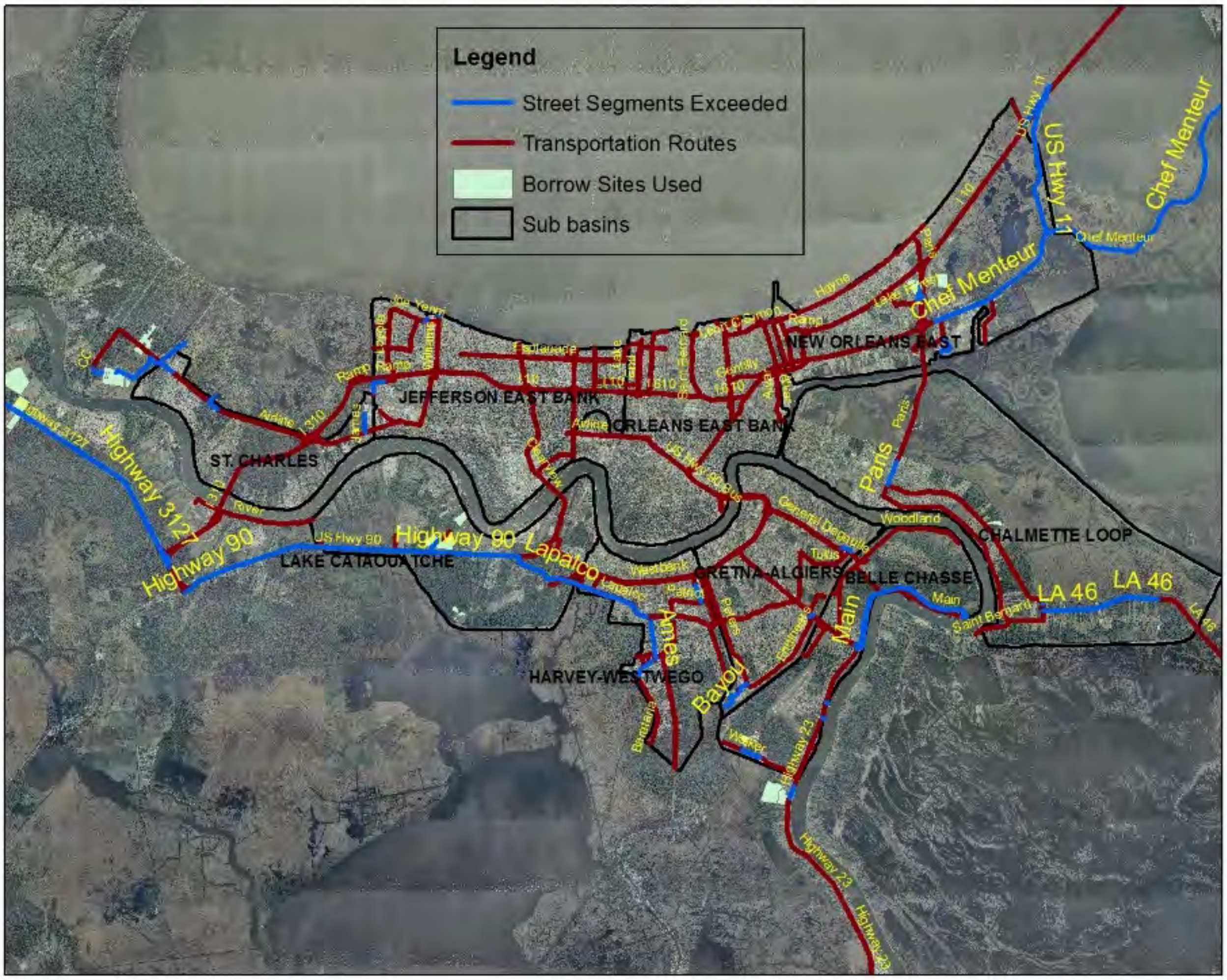
Table 4-46: DOTD Road Class 6
Number of Days Threshold of 50 Material Delivery Trucks Per Day Exceeded

Roadway	Days Threshold is Exceeded	Statistics for Days on Which Materials Delivery Truck Count Threshold is Exceeded		
		Minimum Trucks per Day	Average Trucks per Day	Maximum Trucks per Day
Veterans Memorial Blvd	149	75	75	75
Main St (Belle Chasse)	125	54	67	101
Ames Blvd	88	94	94	94
Avenue G	69	66	76	79

Table 4-47: DOTD Road Class 7
Number of Days Threshold of 50 Material Delivery Trucks Per Day Exceeded

Roadway	Days Threshold is Exceeded	Statistics for Days on Which Materials Delivery Truck Count Threshold is Exceeded: Minimum Trucks per Day	Average Trucks per Day	Maximum Trucks per Day
Walker Rd	839	52	107	162
Belle Chasse Launch Rd	630	72	72	72
MacAuthur Ave	630	72	78	78
Concord Rd	539	60	131	245
Bayou Rd	508	58	112	208
Williams Blvd	458	62	66	74
West X St	372	53	108	149
James Dr West	346	60	137	215
Lacrosse Ln	320	82	82	82
Van Ness Dr	254	66	220	584
Jourdan Rd	194	68	79	80
Veterans Memorial Blvd	149	75	75	75
Belleview Blvd	149	72	72	72
Michoud Facility Rd	137	69	86	140
Saturn Blvd	137	69	69	70
Lower Guide Levee Rd	133	142	148	148
Duncan St	129	92	92	94
Frontage Rd	90	142	142	142
Woodland Dr	90	142	142	142
South Concord Rd	80	80	114	146
Main St	69	66	66	67
Patterson Rd	69	66	66	66
Hester	68	168	168	168

Figure 4-7. Streets Exceeding Frequency Thresholds



Infrastructure Degradation. The effects on infrastructure are a function of vehicle axle configuration, load, number of trips, road design, and the pre-project condition of the road. Transportation impacts to construct the HSDRRS included traversing about 1,300 lane miles of roadway within Greater New Orleans Metropolitan Area, with 1.45 million truck trips. The designs for minor arterial, urban collectors, and local roads are not designated to support frequent heavy loads. The effects of extensively using these roads to haul large quantities of heavy loads accelerated the wearing of road surfaces, bridges, and culverts, as shown in table 4-48.

Table 4-48: Infrastructure

LADOTD Road Classification	Class Description	Length in Miles	Infrastructure Degradation*	Number of Truckloads
1	Interstate	175.2	394.4	
2	Expressway	27.7	82.2	
3	Principal Arterial	204.8	412.1	
4	Minor Arterial	258.5	313.8	
5	Major Urban Collector	44.1	44.1	
6	Minor Urban Collector	7.4	7.4	
7	Local Road	45.0	45.3	
		Total	1,300	1,450,000

*Includes 12 ft lane miles

The infrastructure repair cost assuming that all lane miles used for truck transportation needed repair after the project was complete, was estimated to be $645.8 million. This cost was based on the cost of $500,000 per lane mile derived from Paving LA Roads (Submerged Roads Program) and included repair to road surfaces and crossings within the roadway (see Figure 4-18).

Accident Risks. While the 2009 Transportation Report could only estimate the number of truck accidents, the current report can benefit from actual accident data to evaluate the impacts of material transportation. Ideally, USACE would have added a transportation accident reporting requirement to each of its contracts, in which case this report could explicitly count the number of accidents attributable to material transportation activities. Unfortunately, this did not happen. The next best approach is to use the accident data available from the LADOTD, which goes back to the year 2005. This accident data includes a category for accidents involving three-axle trucks, which is assumed to be mostly industrial vehicles like dump trucks. The downside of using the LADOTD data is that it includes accidents not caused by material transportation activity. However, by looking at years prior to HSDRRS construction activities, relative differences in annual accidents can provide insight into the impacts. Notably, during 2010 and 2011, when transportation activity was at its peak, there were a similar number of accidents compared to prior and subsequent years. For more information on accident risks, see Appendix F, Transportation Report.

The following is a discussion of the HSDDRS transportation impacts of the IERs and Supplemental IERs on traffic and streets within the nine project sub-basins. These impacts were estimated in the CED Phase 1 report which overestimated the number of truck trips necessary to deliver HSDRRS construction material. Theis CED Phase 2 updates the impacts using more actual recent truck trip data and identifies the additional transportation impacts of constructing the supplemental projects and two additional IERs, #27 and #33. The IER impacts are presented by sub-basin, while Borrow IERs #18, 19, 22, 23, 25, 26, and 29 through 32 are shown by parish. Construction activities and truck traffic resulting from the HSDRRS projects temporarily impacted traffic on roadways within the vicinity of each IER project area. There will be no long-term effects on transportation accident risks after construction is complete.

Mitigation efforts for the HSDRRS impacts on transportation are discussed in section 5.0.

Although the increase of truck volumes was noticeable in some areas, the amount of congestion experienced depended on the type of road and location. Roadways that experienced large truck volume increases were US 61 (Airline Highway) in St. Charles Parish, US 90 in St. Charles and Jefferson Parishes, and US 11 and US 90 in New Orleans East. All these roads were associated with trucks converging at and leaving from a borrow pit used by multiple projects or with projects requiring large amounts of clay borrow. Roads near individual project sites experienced smaller increases. Facilities like I-10 had enough capacity to 'absorb' the additional traffic. Since deliveries were spread over time and in different areas, concentrated truck traffic volumes occurred only in a few locations. Although the overall number of daily truck trips was large, the predicted impact was buffered by factors such as delays in project award dates, truck trips spread out over the road network and over time of day, and truck drivers avoiding low-capacity roads.

Flood Risk Reduction Projects by Sub-basin

St. Charles. The main highway utilized in this sub-basin was US 61 (Airline Hwy). US 61 had discernable increases in traffic due to trucks delivering material to IER #1 (La Branche Wetlands Levee). Road segments of US 61 in St. Charles Parish exceeded the threshold of traffic volume where residents and property owner would feel the effects of congestion. Specifically, stretches of Airline Hwy. had 169 days when there were 360 or more trucks per day using the road. The CMI for Airline Hwy. increased by 0.10 to a maximum of 2.1. The impact on US 61congestion was moderate. Additionally, smaller class streets such as Belleview Blvd. and James Dr. (class 7 roads) had 346 and 149 days, respectively, when increases in traffic volume could be felt by residents. Construction of the project was estimated to have required 3,963,200 total local truck miles and 716,800 total non-local truck miles (see Appendix F). US 61 was used heavily and experienced large traffic volume increases during the project construction. After construction was complete, moderate permanent impacts occurred due to infrastructure degradation.

Projects described by IER Supplemental #1, 1.b, 2.a and 16.b had impacts similar to those described for IER #1, with the exception of additional short-term direct impacts on traffic associated with the HSDRRS access roads perpendicular to US 61, which included Shell Access Road 2 and Cross Bayou Access Road, for LPV-04 and 05. The outer lane of US 61 was closed during the pile driving activity for a few hours each day, throughout consecutive days, for 4 to 5 weeks.

Jefferson East Bank. For the projects described in IER #2 (West Return Floodwall), truck access to the project site was via I-10 to Loyola Dr., Williams Blvd., West Esplanade Ave., Vintage Dr., Joe Yenni Blvd, Chateau Blvd. and the eastern part of Veterans Memorial Blvd. near the 17th Street Canal and western segment near the New Orleans International airport. Barges were used during construction and were accessed via Lake Pontchartrain to the Parish Line Canal. The construction of the projects described by IER #2 is estimated to have required approximately 723,300 total local truck miles and 795,300 non-local truck miles. Total barge miles for delivery of steel and rock totaled 25,800. One major roadway, Interstate 10, had moderate, adverse short-term impacts to the level of congestion as measured by the CMI. A stretch of I-10 in the Jefferson East Bank Sub-basin had an increase in the CMI to 4.1 from 3.35, both exceed 3.25 or a level of congestion where the users would perceive an impact from the addition of delivery trucks. Access roads such as Joe Yenni Blvd. had substantial changes, resulting in moderate short-term impacts.

Impacts for projects described by IER Supplemental #2 and #2.a were similar to those described for IER #2.

The HSDRRS construction components of reaches described for IER #3 (Lakefront Levee, Jefferson Parish) had truck accessed to the project sites via I-10 to Loyola Dr., Vintage Dr., Bonnabel Blvd., Causeway Blvd., Clearview Pkwy., or via Williams Blvd. Most of the truck traffic used US 61 and I-310/10. Barges were also used during construction and accessed the project area via Lake Pontchartrain. The construction of the projects described by IER #3 was estimated to have required 3,927,400 total local truck miles, 601,400 total non-local truck miles, and 220,200 total barge miles. IER #3 also had an impact on the CMI for Interstate 10; see comment above under IER #2. The additional truck traffic had a short-term impact on the congestion for US 61. After the construction of projects described by IER #3 was complete, the HSDRRS action had a moderate permanent impact due to infrastructure degradation.

Impacts for the projects described by IER Supplemental #3.a are similar to those described in IER #3.

Orleans East Bank. Truck access for the projects described by IER #4 (New Orleans Lakefront Levee), to project sites along Lakeshore Dr., was via I-610 or I-10 to Pontchartrain Blvd., West End Blvd., Canal Blvd., St. Bernard Ave., Gentilly Blvd., Elysian Fields Ave., Franklin Ave., France Road and a short segment of Robert E. Lee Ave. to the Orleans Ave. Canal. Most of the earthen fill truck traffic used US 61, I-10, and I-610. The additional truck traffic had adverse short-term impacts on the level of service for US 61, and potential moderate adverse short-term impacts on the level of service for local streets used to access work sites. The construction of the projects described by IER #4 required 1,316,750 total local truck miles, 996,300 total non-local truck miles, and 659 total barge miles.

The construction of the projects described by IER #5 and Supplemental #5.a (Outfall Canal Closure Structures) were estimated to require 1,731,900 total local truck miles, 887,000 total non-local truck miles, and 46,650 total barge miles. Moderate short-term impacts included temporary road closures and congestion in those areas where project construction occurred. Some roads were temporarily closed during transportation of construction materials or because of construction activities (i.e., bridge reconstruction or replacement). These temporary closures resulted in increased congestion of those roads in the vicinity not directly impacted by construction activities. Roads directly impacted by the HSDRRS at the 17th Street Canal potentially included Hammond Hwy., Pontchartrain Blvd., West End Blvd., and I-10/I-610. Roads directly impacted by the HSDRRS projects at the Orleans Ave. Canal include Lakeshore Dr., Robert E. Lee Blvd., Canal Street, Marconi Dr., and I-10/I-610. Roads directly impacted by the HSDRRS at the London Ave. Canal include Lakeshore Dr., Paris Ave., Elysian Fields Ave., and I-10/I-610. The impacts were considered short-term, lasting only as long as the time frame necessary to complete the construction activity. After construction of the projects described by IER #5 was complete, the project had moderate impacts due to infrastructure degradation.

Truck access to the project sites described by IER #27 and Supplemental #27.a (Outfall Canal Remediation) included Hammond Hwy., Pontchartrain Blvd., West End Blvd., I-10, I-610, Lakeshore Dr., Robert E. Lee Blvd., Canal Blvd., Marconi Dr., Leon C. Simon Dr., and Elysian Fields Ave.. Bridges along those roadways were also impacted. Adverse short-term impacts included short-term road closures and congestion in those areas where construction occurred. The local bridges over the outfall canals were closed on a short-term basis to lower segmented barges, equipment, and materials into the canal. One or both lanes were temporarily closed. These short-term closures resulted in increased congestion of roads in the vicinity not directly impacted by construction activities.

All the IERs in the Orleans East Bank sub-basin had an impact on congestion for I-10, and US Hwy. 90, as measured by the CMI. These major roadways saw increases in congestion, due to the addition of project delivery trucks, resulting in CMI rates of just above 4.0, well above the 3.25 factor consider the level where users would see travel impacts.

<u>New Orleans East</u>. Truck access to the project sites described by IER #6 (Citrus Lakefront Levee) and IER Supplemental #6 included Jourdan Ave., Downman Road, Paris Road, Bullard Ave, Hayne Blvd, Old Gentilly Rd, Michoud Blvd., Saturn Blvd., Chef Menteur Hwy., Industrial Parkway., Intracoastal Dr., LA 47, and I-10. The construction of the projects described by IER #6 was estimated to have required 160,000 total local truck miles, 1,294,500 total non-local truck miles, and 3,415 total barge miles. Segments of the two westbound lanes of Hayne Blvd. were temporarily

closed during construction. No impacts on the operation of the New Orleans Lakefront Airport occurred.

Truck access to the project sites described by IER #7 (New Orleans East Levee) included Hayne Blvd., Paris Road, I-10, US 90, and US 11, which caused a short-term reduction in LOS on these roads, resulting in adverse short-term impacts. US 90 and US 11 were used heavily, and experienced large traffic volume increases during the project construction. A temporary 3-lane-wide bridge was constructed to maintain traffic flow during the I-10 ramp construction for LPV-109. The construction of the projects described by IER #7 is estimated to have required 12,867,000 total local truck miles, 677,000 total non-local truck miles, and 35,925 total barge miles.

Impacts for the projects described by IER Supplemental #7 were like those described in IER #7; however, lane shifting and minor short-term lane closures on I-10 caused increased traffic congestion, although six lanes of traffic were in use throughout much of the construction period. The short-term lane closures were to be suspended if hurricane evacuation had been necessary. The closure of US 11 required the use of alternate routes, further increasing traffic congestion in the project area.

In projects described by IER #11 (Inner Harbor Navigation Canal Improved Protection) Tier 2 Pontchartrain and IER #11 Tier 2 Borgne, the roadways used to access construction sites for these projects were similar to those described in Orleans East Bank, New Orleans East, and Chalmette Loop sub-basins; however, the majority of transportation for materials was on barges for access to the GIWW and IHNC. The construction of the projects described by IER #11 required 205,776 total barge miles. There were 1,131,360 local miles driven transporting mostly aggregate and concrete ready-mix and 2,691,000 non-local truck miles for these two projects. France and Jourdan Roads were used via I-10 to bring in material for work described by IER #11 Tier 2 Pontchartrain, and Michoud Blvd, Intracoastal Dr and Industrial Pkwy, were used to transport material to IER #11 Tier 2 Borgne.

Specifically, the project's (IER #11 Tier 2) road access to the Michoud Canal staging area were from US 90, Industrial Pkwy, and Intracoastal Dr, while road access to the MRGO staging area was from LA 47. The increased level of truck traffic within the project vicinity potentially contributed to adverse short-term impacts from delays experienced during hurricane evacuations (notably Hurricane Isaac in 2012), since the roads within the vicinity of the project would be used for hurricane evacuation routes. There were no impacts on hurricane evacuation because construction was halted before evacuation began. Roads utilized for the various HSDRRS projects constructed in the sub-basin experienced degradation from additional truck traffic, and the projects had a moderate impact on the transportation infrastructure.

Navigation traffic in the IHNC and GIWW experienced an extended temporary channel closure (approximately 24 months), and delays from the use of bypass channels during sector gate construction activities and narrowing of the channels due to location of barges, dredges, and material in the channels. CEMVN provided navigation bulletins to inform vessel traffic of the changes in channel configuration, when complete closures of navigation channels would occur (such as Bayou Bienvenue and the IHNC), and all construction areas included safety measures such as a Helper Assistant Boat/Contact Vessel stationed in the construction areas.

Chalmette Loop. Construction of components described by IER #8 (Bayou Dupre Control Structure) caused short-term adverse impacts on local waterborne transportation and operation of local highways and moderate long-term impacts due to infrastructure degradation. Most of the traffic associated with the projects was waterborne, due to the limited road access to the project sites. Barges accessed the project area via the Violet Canal, and light loads were brought through Lake Borgne. The construction of the components was estimated to have required 13,000 total local truck miles, 156,400 total non-local truck miles, and 9,500 total barge miles. Most of the material used for construction for projects described by IER #8 was trucked to the construction site. However, the contractor used barges to transport piles, the sector gate leafs, a barge-mounted crane, an excavator, and a hopper barge for excavated material from the channel.

Adverse short-term impacts on traffic in local waterways and on roads within the vicinity of the project area described by IER #9 (Caernarvon Floodwall) due to waterborne transportation and worker/truck transportation occurred during construction. The construction of the projects described was estimated to have required 684,310 total local truck miles, 248,900 total non-local truck miles, and 5,304 total barge miles (Appendix F). During construction, barges were only used to transport the materials for the Hwy 39 (Judge Perez Dr) floodgate, the railroad floodgate, the LPV 149 sector gate, and for piles for LPV 149 (four barge trips for delivery of piles). Most truck traffic was expected to use LA 39. Moderate impacts due to infrastructure degradation occurred. Smaller access roads potentially had substantial adverse short-term impacts on their level of service.

Truck traffic for the HSDRRS components described by IER #10 (Chalmette Loop Levee) accessed the project sites by I-10, I-510, LA 47 (Paris Road), LA 46 (St. Bernard Hwy), and LA 39. Paris Road did see an increase in the volume of traffic reflected by an increase in the CMI of 0.25. However, the maximum CMI for Paris Road remained well below 2.50. The construction of the project components was estimated to have required 960,170 total local truck miles, 1,304,000 total non-local truck miles, and 91,906 total barge miles (Appendix F). The major roadways had little change in congestion, and experienced moderate infrastructure degradation, but the access roads potentially had substantial changes in their level of service, resulting in adverse short-term impacts.

Belle Chasse. Components described in IER #13, Supplemental #12/13 and Supplemental #13.a (Hero Canal Levee and Eastern Terminus) and IER #33 and Supplemental IER #33.a (MRL) involved truck access to the project sites primarily by US 90, LA 23, Walker Road and Main Street near the Belle Chasse Ferry landing. The construction of IER #13 components was estimated to have required 973,750 total local truck miles, 339,500 total non-local truck miles, and 19,860 total barge miles (Appendix F). There were adverse short-term impacts from an increase in the number of vehicles using LA 23 and Walker Road. Road users of Highway 23 saw 166 days when there were more than 240 delivery trucks, per day, passing through. The floodgate at LA 23 does not impede traffic on LA 23, except when the gate is closed during a storm event. When the gate is closed during storm events, vehicles will use the emergency bypass. Walker Road was used as an access road to the GIWW West Closure Structure for trucks exiting from LA 23. Walker Road had nearly 840 days when there were at least 50 delivery trucks per day passing through. Long-term moderate impacts on transportation occurred due to infrastructure degradation from increased truck traffic.

During construction, navigation within Hero Canal was restricted to vessels that could pass through the 56 ft wide gate. A stoplog closure was built in phases, allowing continuous passage of vessels in the canal.

The construction of IER #33 components was estimated to have required 5,158,620 total local truck miles, 2,548,700 total non-local truck miles, and 2,380 total barge miles (Appendix F). There were adverse, short-term impacts from an increase in the number of vehicles using LA 23 and Main Street which served as an access road to the Mississippi Levee. Segments of Main Street are classified as DOTD class 6 and 7 roads which had 125 days and 69 days when there were 50 or more delivery trucks per day passing through. Also, Woodlawn Drive and Patterson Road also exceeded thresholds for a shorter period of time. When a road exceeds a threshold, roadway users and adjacent property owners would likely perceive an increase in traffic.

<u>Gretna-Algiers</u>. Truck traffic accessed the project sites described in IER #12, Supplemental #12/12.a (Harvey and Algiers Canal Levee and Floodwalls) primarily by US 90, Lapalco Blvd, and LA 23. Barge access was through the GIWW. The construction of the components was estimated to have required 3,375,640 total local truck miles, 1,676,500 total non-local truck miles, and 202,873 total barge miles (Appendix F), and had a moderate long-term impact due to infrastructure degradation.

<u>Harvey-Westwego</u>. Truck traffic for the HSDRRS components described in IER #14 (Harvey to Westwego Levee) and IER Supplemental #14.a accessed the project sites primarily by US 90, Lapalco Blvd, LA 45 (Barataria Blvd), Ames Blvd, and LA 3134 (Lafitte LaRose Hwy). LA 3134 was raised between the WBV-14d floodwall and the WBV-14e levee. This caused moderate short-term impacts and transportation delays in the vicinity of the project site. The construction of the projects described by IER #14 was estimated to have required 7,969,410 total local truck miles, 833,600 total non-local truck miles, and 4,295 total barge miles (Appendix F), causing moderate long-term impacts from infrastructure degradation. Impacts for the projects described by IER Supplemental #14.a were similar to those in IER #14 but were slightly increased because the duration of the construction was longer than was originally anticipated.

<u>Lake Cataouatche</u>. Truck traffic for the projects described in IER #15, Supplemental #15.a and #15.b (Lake Cataouatche Levee) accessed the project sites primarily by US

90. The construction of the components was estimated to have required 1,380,930 total local truck miles and 200,600 total non-local truck miles and 31,820 barge miles (Appendix F), which caused moderate long-term impacts on transportation due to degradation of roads and bridges.

Truck traffic accessed the project sites described in IER #16 (Western Terminus Levee) and IER Supplemental #16.a and 16.b primarily by US 90, River Road, and South Kenner Road. The construction of the components was estimated to have required 3,955,060 total local truck miles, 2,206,000 total non-local truck miles, and 9,690 total barge miles (Appendix F), causing infrastructure degradation. Traffic flow was maintained during levee construction by the construction and use of a temporary bypass roadway, which included a two-lane shift to the north within the existing US 90 ROW. Truck traffic for projects described by IER #17 (Company Canal Floodwall) accessed the project sites primarily by US 90 and Lapalco Blvd. The CMI for Lapalco Blvd increased by 0.75 to a maximum CMI of 2.85. Although this roadway saw a large increase in traffic, the CMI remained below 3.25 which is considered congested. Waterborne access was through the Company Canal and the Harvey Canal. Minor impacts on waterborne transportation systems occurred when construction activities were conducted on a marine plant or temporary work platform located over water. To reduce the impacts on waterborne transportation, water-based construction activities were phased or sequenced, where practicable. The construction of the projects described by IER #17 was estimated to have required 1,053,120 total local truck miles, 971,400 total non-local truck miles, and 24,916 total barge miles (Appendix F). Pull-offs/U-turns for the borrow trucks were constructed by the USACE along US 90 on both the eastbound and westbound side of the roadway to decrease the number of trucks stopped on the roadway.

<u>Borrow Sites by Parish</u>

Many of the HSDRRS borrow sites are located outside of the HSDRRS nine sub-basin project areas, this section will discuss the borrow impacts by parish rather than by sub-basin. All roadways utilized for transportation of borrow material experienced some degree of infrastructure degradation due to increased truck traffic; infrastructure degradation (i.e., roads and bridges) is a moderate long-term impact on transportation.

<u>St. Charles Parish</u>. The Bonnet Carré North area is a government-furnished borrow pit utilized for construction of the HSDRRS. US 61 is the major transportation corridor adjacent to the Bonnet Carré North area borrow site and was analyzed in IER #18. US 61 was used heavily and experienced large traffic volume increases during the project construction. The Lower Guide Levee Road and LA Hwy 628 (CC Road) were also utilized for accessing the sites from the east and west. The Lower Guide Levee, adjacent to a residential area, did experience a large increase in traffic volume. This Class 7 road, which served as an access road to the Bonnet Carré borrow site, had 133 days when the threshold of 50 delivery trucks per day was exceeded or had 133 days when roadway users and adjacent property owners would likely perceive an increase in traffic.

IERs #23 and #32 discusses the 3C Riverside (Sites 1 and 2) and the Phase 3 sites, which were utilized for HSDRRS construction. Borrow sites 1 and 2 are located in a rural area on LA 3127. The 118-acre Site 1 is located across from the intersection of LA 3127 and LA 3141. The 146-acre Site 2 is located north of the intersection at LA 3127 and LA 3141. Truck hauling had adverse short-term impacts on vehicle traffic and resulted in a moderate increase in congestion on Hwy 3127 which exceeded its capacity threshold 613 days or when there were over 240 truck deliveries per day passing through. As discussed in IER #32, the 3C Riverside Phase 3 site is located between LA 3127 and LA 18 (River Road). Roads near the site that were also likely used by trucks accessing the borrow area were LA 3141, LA 3127, I-310, the Hale Boggs Bridge, and I-10. The site was not accessed from residential streets. To complete HSDRRS excavation of the 3C Riverside borrow area, it was estimated that it would take approximately 149,200 truckloads. There were likely adverse short-term, congestion-related impacts on those roads in the vicinity of the borrow area. Congestion impacts were moderate during the construction period.

Jefferson Parish**.** Borrow sites analyzed in IERs #18, #19, #26, and #31 are located in Jefferson Parish and are near US 90 (Westbank Expressway), LA 18 (River Road), and South Kenner Ave. US 90 was used heavily and experienced large traffic volume increases during project construction.

The Churchill Farms Pit A, River Birch Phase 1 and 2, River Birch Landfill Expansion and South Kenner Road sites are borrow pits in Jefferson Parish that were used for HSDRRS construction and are located close to US 90, which is a heavily used commercial road on the west bank of the Mississippi River in Jefferson Parish. The immediate area in the project vicinity is mostly industrial, so additional truck traffic likely had no transportation impact. However, just south along Hwy 90 in Jefferson Parish are the communities of Waggaman and Avondale. Residents in these communities likely did realize transportation impacts from delivery of HSDDRS materials. Hwy 90 had 285 days in which there were over 360 delivery trucks per day passing through which was likely to have caused some traffic delays for vehicles attempting to gain access to Hwy 90 travelling east or west.

The River Birch Phase 1 and River Birch Phase 2 sites, located in rural areas, were utilized for HSDRRS construction and had four access points from a shell entrance road that leads to LA 90. The River Birch Phase Landfill Expansion borrow site is discussed in IER #31 and is located on US 90 within the Lake Cataouatche sub-basin. Access to the site was not provided from any residential streets. To complete excavation of the River Birch contractor-furnished borrow areas, it was estimated that it would take approximately 113,500 truckloads. Short-term, congestion-related impacts on US 90 and Live Oak Blvd, in the vicinity of the River Birch borrow areas, were moderate. Similarly, congestion impacts and decreases in LOS around the excavation area were likely moderate during the construction period.

Orleans Parish**.** Five borrow pits used for HSDRRS construction are located in Orleans Parish and were analyzed in IERs #18, #19 and #29. Trucks hauling borrow material from the following borrow pits utilized roads throughout the parish for delivery to HSDRRS project areas.

The Maynard borrow site is analyzed in IER #18. The Maynard site fronts a service road that connects Almonaster Ave, and Chef Menteur Hwy. The area in the project vicinity involves mostly commercial trucking, so additional truck traffic was not likely to impact area roadways or traffic. The Eastover Phase 1 and 2 borrow areas are located on East Point Court, which also serves as the I-10 East service road and was used for construction. Roads near the site that were likely used by trucks accessing the borrow area are I-10, I-510 and Lake Forest Blvd. To complete excavation of the HSDRRS borrow area, it was estimated that it took approximately 144,000 truckloads. Congestion impacts on the I-10 and I-510 service roads, Lake Forest Blvd, and Chef Menteur Hwy were moderate during the construction period. The Stumpf Phase 1and Stumpf Phase 2 borrow areas are located on Industrial Pkwy. Industrial Parkway intersects Chef Menteur Hwy, which has a high volume of commercial traffic. Nonetheless, congestion impacts along Chef Menteur near the borrow sites were moderate as there were 422 days in which 240 or more delivery trucks per day used this segment of highway.

<u>St. Bernard Parish</u>**.** Five HSDRRS borrow sites described in IERs #19, #23 and #31 are in St. Bernard Parish. These sites can be accessed by traveling on either LA 39 or LA 46.

The DK Aggregates/Contreras sites are located on LA 46 which is a four-lane highway. About 61,000 truck trips were made from the DK Aggregate/Contreras sites. There were 173 days when LA 46 had more than 240 trucks traversing between the borrow sites and East Judge Perez Dr, which was likely to have caused moderate traffic delays and congestion for vehicles. Adding to the congestion on LA 46 are truck trips of borrow to and from the Acosta 1 and Acosta 2 borrow sites which are located on LA 46 south of DK Aggregates. Roads near the sites that were also likely used by trucks utilizing the borrow area included LA 39, LA 47, I-510, and I-10. Access to the sites was not provided from any residential streets. Approximately 16,000 truckloads were delivered from the Acosta contractor-furnished borrow areas. Adverse, short-term, congestion-related impacts on LA 46, LA 39, LA 300, Paris Road, I-510, and I-10 in the vicinity of the Acosta borrow areas were likely moderate.

The 1025 Florissant Hwy borrow area is located on Florissant Hwy on the north side of LA 46 on road segments that do not receive heavy traffic loads; thus, the adverse short-term impacts were minor.

IERs #22, #31, and #32 described the HSDRRS borrow sites located in Plaquemines Parish. The main highway located in Plaquemines Parish on the west bank of the Mississippi River is LA 23.

The Westbank N area, described in IER #22, is in a rural area on the south side of Walker Road near LA 23 and was utilized for construction. Truck hauling caused adverse short-term impacts on vehicle traffic and resulted in minor congestion on Walker Road, which had 839 days when there were 50 or more delivery trucks traversing the area daily. However, since the area is not residential, impacts were minimal to residential traffic.

The Idlewild Stage 1 and Stage 2 sites were accessed via LA 23 and were used for construction. Stage 1 is described in detail in IER #32 while Idlewild Stage 2 is described in IER #31. Construction access to these sites was from LA 23 and other farm roads that connect to LA 23; access to the sites was not provided from any residential streets. To complete excavation of the Idlewild borrow area, it was estimated to take approximately 36,000 truckloads. Adverse short-term, congestion-related impacts on LA 23 in the vicinity of the Idlewild Stage 1 and 2 borrow areas were moderate.

Other HSDRRS borrow sites described in IER #32 that are located in Plaquemines Parish include Citrus Lands and Plaquemines Dirt and Clay sites. The Citrus Lands and Plaquemines Dirt and Clay sites are adjacent to one another and are located on LA 23. Roads near the site used by trucks accessing the borrow area are Lacrosse Lane and other farm roads. Access to the site was not provided from any residential streets. To complete excavation of the Citrus Lands and Plaquemines Dirt and Clay borrow areas, it is estimated that it would take approximately 21,000 truckloads. There were likely adverse minor short-term, congestion-related impacts on those roads in the vicinity of each of the borrow areas.

St. James Parish. The Big Shake borrow area, discussed in detail in IER #30, is located between West Jefferson Hwy (LA 44) and LA 3125 on Hester Street. The site is accessible from I-10 and US 61 using LA 3125. In order to access LA 44, vehicles must use a very narrow road and cross a set of raised railroad tracks. To complete excavation of the borrow area, it is estimated that it would take approximately 8,000 truckloads. Adverse short-term impacts from congestion would likely be moderate during the construction period. There were 68 days when LA 3125 had more than 150 trucks per day travelling between the borrow site and Hwy 3213.

St. John the Baptist Parish**.** The Willow Bend borrow areas, discussed in IER #26 and #29 and located in a rural area on the south side of River Road, were used for HSDRRS construction. These borrow areas are not located near any HSDRRS construction sites and fill was hauled out of the parish to the project sites. Truck hauling caused adverse, short-term moderate impacts on vehicle congestion on LA 3127 as the frequency threshold was exceeded on 613 days when there were 240 or more delivery trucks per day hauling borrow material. Other major roads in the vicinity include LA 639, West 4th Street, and Goldmine Plantation Road. To complete excavation of the borrow area, it was estimated to take approximately 187,000 truckloads.

St. Tammany Parish**.** The Tammany Holding borrow area, discussed in IER #29, is located off of I-10 near Oak Harbor Blvd, and was used for construction. The site is accessible using Oak Harbor Blvd to Harbor Center Blvd and Lakeshore Blvd North, Howze Beach Road, or LA 433. To complete excavation of the borrow area, it was estimated that it would take approximately 56,000 truckloads. Adverse short-term impacts due to congestion for the areas around the site were likely moderate during the construction period. There were 297 days during the construction period when there were 150 or more delivery trucks per day using Howze Beach Road.

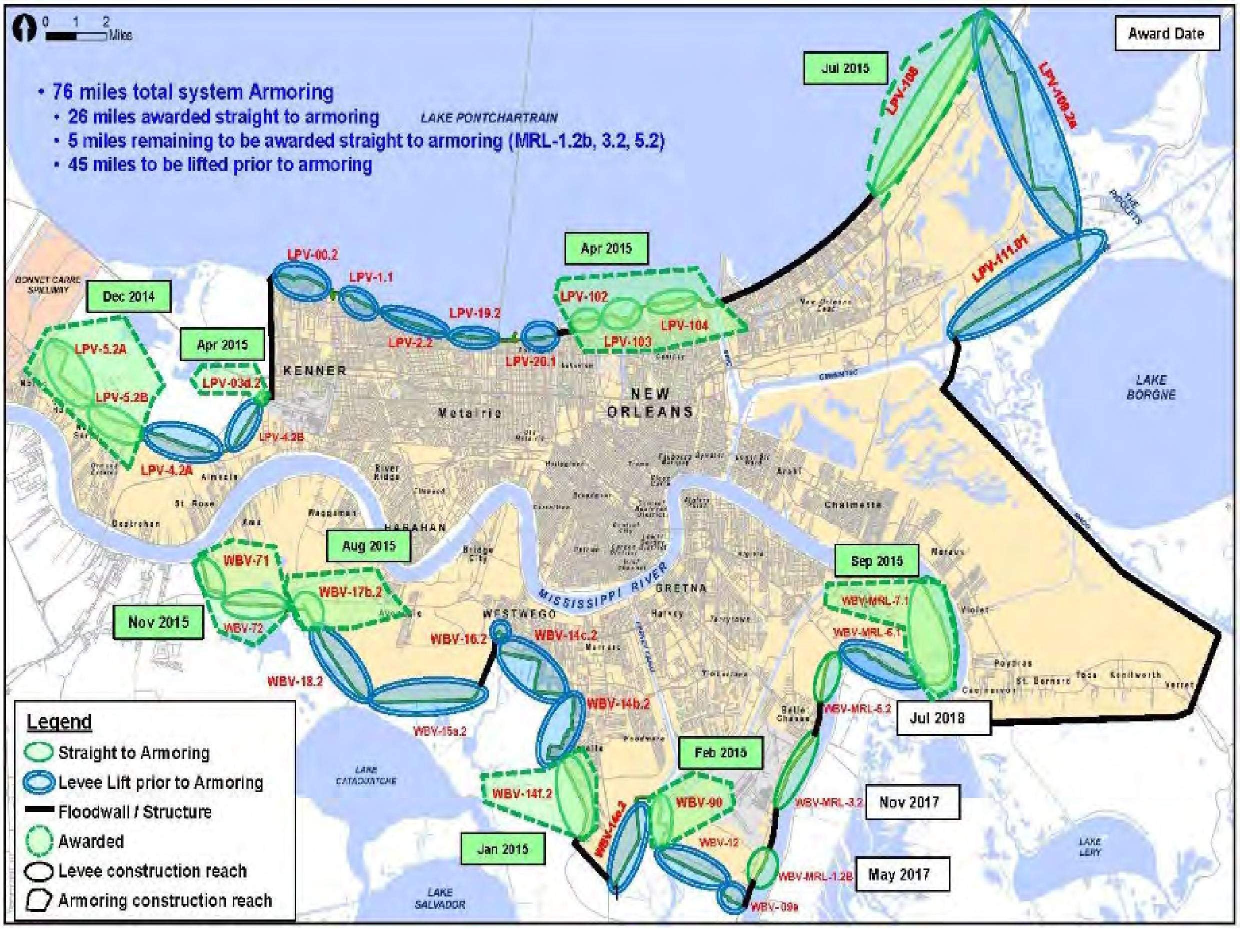
Hancock County, Mississippi**.** Three borrow sites in Hancock County were described in IERs #19, #23, and #31. The Pearlington Dirt Phase I and Phase II sites, which are in a rural area and front Whites Road and are near US 90 and US 604, were utilized for the HSDRRS construction. The logging industry is a major contributor of jobs in the area and truck haulers blended in with the local commercial truckers. Truck hauling caused adverse short-term impacts on vehicle traffic on the local roads. Hwy 90 in St. Tammany Parish had 265 days when there were 240 or more delivery trucks per day accessing the road, which caused moderate congestion impacts.

The Port Bienville borrow site is located on US 90 and borrow material was used for construction. Roads near the site also likely used by trucks for the HSDRRS construction are Lower Bay Road, MS 607, MS 43, MS 603, US 190, and I-10. There are three access roads to the site, one from US 90 and two from Lower Bay Road. No residential streets provided access to the site. To complete excavation of the Port Bienville borrow area, it was estimated that it would take approximately 13,000 truckloads. Adverse short-term, congestion-related impacts on Lower Bay Road, US 190, and I-10 in the vicinity of the Port Bienville borrow area were likely minor. Similarly, adverse short-term impacts from congestion around the excavation area were likely minimal during the construction period. However, The Port Bienville borrow site, near the Pearlington sites, were excavated during the same period causing moderate congestion to Hwy 90 in St. Tammany Parish.

4.2.16.2.2 HSDRRS 2057 Impacts

Short-term, temporary construction-related transportation impacts due to future levee lifts and armoring would take place and be similar to the HSDRRS construction impacts. The Armoring Program comprises the installation of erosion risk reduction measures on the levee crown, landside slope and a 15-foot portion of the berm. All armoring activities and construction will only occur on the levee or within the levee ROW and on existing roads (figure 4-17). Minor to moderate impacts to congestion on some local road segments including access roads, and minor congestion on major roadways that could result in adverse short-term impacts could occur. Adverse short-term impacts include road closures and congestion in those areas where construction would occur. After construction is complete, the HSDRRS armoring would have minor long-term impacts on transportation from infrastructure degradation.

Figure 4-8. HSDRRS Armoring



Similar to the use of the borrow areas for completed construction, there would be impacts on the roads that are used near borrow areas used for future levee lifts. Adverse short-term, congestion-related impacts and degradation of the roads in the vicinity of the proposed 2057 borrow areas would likely be minor to moderate during the construction period. Impacts on transportation would occur as a result of the additional demand for borrow, but until borrow sites are selected, the total impacts cannot be estimated.

Cumulative Impacts

The HSDRRS construction and associated excavation of borrow areas contributed directly and indirectly to cumulative impacts on the transportation system throughout the project area. Cumulative moderate adverse impacts such as increased congestion resulting in longer travel times and damage and degradation of infrastructure and roadway wear-and-tear due to increased truck traffic occurred within the project area. Likewise, lower flood risk to the Greater New Orleans Metropolitan Area upon completion of the HSDRRS is expected to cause additional economic and population growth in the region and thus increase the demand for transportation resources, which could lead to cumulative indirect long-term adverse impacts. Indirectly, traffic congestion caused by truck traffic on some roadways likely altered traffic patterns of commuters and residents, increasing traffic congestion on roads not directly used for HSDRRS-related transportation.

The majority of HSDRRS impacts on transportation are short-term and will end when construction is completed. Future levee lifts would continue to have temporary road impacts, but over the 50-year life of the project, these would be sporadic and widespread. Long-term cumulative impacts on transportation from the HSDRRS would occur from damage to roadways from truck traffic.

Construction of the HSDRRS would also provide beneficial impacts on transportation resources in the region, as it reduces flood risk and future storm damage to these resources. The HSDRRS construction has the long-term potential to save millions of dollars in repair costs for highways, roads, bridges, railroads, airports, and public transit systems (streetcar lines) that could otherwise be damaged by future flooding.

Present and future actions by the USACE and other agencies for project construction and maintenance would likely further contribute to cumulative degradation of roadway pavement and traffic congestion, since many projects require the use of heavy trucks and construction equipment.

Storm Damage Reconstruction

There are several transportation-related projects in the vicinity of the HSDRRS that were recently completed. Two transportation-related projects within the Jefferson East Bank sub-basin include the Earhart-Causeway Interchange and the Huey P. Long Bridge Widening in Jefferson Parish. Transportation-related projects within the New Orleans East sub-basin include the replacement of the Florida Bridge over the IHNC in Orleans and St. Bernard parishes, repair of the I-10 Bridge over Lake Pontchartrain, the replacement of the IHNC Lock and associated modification to the St. Claude Ave., and North Claiborne Ave. bridges, and the Causeway/I-10 Interchange projects. Construction of I-49 south from Raceland to the Westbank would take place within the Lake Cataouatche sub-basin. These projects would increase construction-related traffic in the area in the short term but would be beneficial in decreasing traffic congestion when completed. Moderate to major impacts on transportation occurred as a result of these projects.

Transportation

There are several transportation-related projects in the vicinity of the HSDRRS that were recently completed. Two transportation-related projects within the Jefferson East Bank sub-basin include the Earhart-Causeway Interchange and the Huey P. Long Bridge Widening in Jefferson Parish. Transportation-related projects within the New Orleans East sub-basin include the replacement of the Florida Bridge over the IHNC in Orleans and St. Bernard parishes, repair of the I-10 Bridge over Lake Pontchartrain, the replacement of the IHNC Lock and associated modification to the St. Claude Ave, and North Claiborne Ave bridges, and the Causeway/I-10 Interchange projects. Construction of I-49 south from Raceland to the Westbank would take place within the Lake Cataouatche sub-basin. These projects would increase construction-related traffic in the area in the short term but would be beneficial in decreasing traffic congestion when completed. Moderate to major impacts on transportation occurred as a result of these projects.

Flood Risk Reduction Projects

Construction of other flood control projects, including floodwalls, floodgates, and levees throughout the area, is currently under way or being planned for the near future. Many of these projects would require transport of material (borrow, sheet metal, h-piles, etc.) by heavy trucks.

Other flood risk reduction projects are located throughout the project area, including Orleans, Plaquemines, St. Bernard, Jefferson, and St. Charles parishes. Projects such as Southeast Louisiana (SELA) flood risk reduction project, New Orleans to Venice Federal and non-Federal Levees, Morganza to the Gulf, Larose to Golden Meadow, and Grand Isle and Vicinity would involve temporary road closures, increased traffic congestion and additional roadway degradation through the HSDRRS project area, since some of the major roadways would potentially be used by construction equipment and heavy trucks for material transport. Flood risk reduction projects require a substantial increase in heavy truck use for borrow requirements; thereby yielding roadway impacts similar to those of the HSDRRS. Moderate to major impacts on transportation would occur as a result of these projects within the next 3 to 5 years.

4.2.16.2.1 Summary of Cumulative Impacts

The combination of the HSDRRS construction, excavation of borrow areas, and other regional projects (e.g., transportation, storm damage reconstruction, coastal and wetlands restoration and flood risk reduction projects) contribute directly and indirectly to cumulative impacts on transportation in the project area. Cumulative moderate adverse impacts such as increased traffic, road closures, damage and degradation of infrastructure and roadway wear and tear due to increased truck traffic, in conjunction with concurrent regional construction projects, would be expected within the HSDRRS project area. Likewise, lower flood risk to the Greater New Orleans Metropolitan Area upon completion of the HSDRRS would cause additional economic and population growth in the region and thus would increase the demand for transportation resources, which could lead to cumulative indirect long-term adverse impacts. However, there would also be long-term beneficial impacts on transportation resources from the HSDRRS construction due to the potential to save millions of dollars in repair costs for transportation infrastructure that could otherwise be damaged by flooding.

Figure 4-9. Submerged Roads Program/Path to Progress

4.2.17 SOCIOECONOMIC RESOURCES

4.2.17.1 AFFECTED ENVIRONMENT

This section provides an overview of social patterns and neighborhoods located within the HSDRRS area and the analysis performed to address HSDRRS's potential to affect demographic patterns and other social and economic characteristics within the area. Additionally, within this section is an overview of the variables that are indicators of low-income and minority populations.

The HSDRRS impact area includes businesses, employment, and income opportunities in St. Charles, Jefferson, Orleans, Plaquemines, and St. Bernard parishes.

Immediate Post-Hurricane Katrina Conditions

When Hurricane Katrina hit, it devastated many parts of the HSDRRS area, especially Orleans, St. Bernard, and Plaquemines parishes, resulting in a tremendous loss of these parishes' population (Rudowitz et al. 2006; USCB 2010). Orleans Parish had a pre-Hurricane Katrina population of 452,170, and by July 2006 the USCB (2010) reported that Orleans Parish had approximately half of its pre-Hurricane Katrina population return (223,388 persons). However, the Louisiana Health and Population Survey, conducted after the 2006 USCB survey, estimated the parish's population at 191,139, an estimate approximately 14 percent lower than the USCB's estimate (Rudowitz et al. 2006).

Orleans Parish was heavily impacted from Hurricane Katrina with widespread damage to housing and other infrastructure. It has been estimated that approximately 80 to 85 percent of New Orleans was flooded with 6 to 20 feet of water. The storm displaced more than a million people in the Gulf Coast region, with up to 600,000 households still displaced a month later.

The Louisiana Recovery Authority (LRA) estimated that over 1,500 fatalities occurred from Hurricanes Katrina and Rita combined, and as of 2007, 135 residents were still missing. Hurricanes Katrina and Rita reduced the availability of health care, schools, police, and fire protection. National Guard troops were brought in to assist the region. Many services were unavailable following the hurricanes. Police and firefighters were placed in the difficult position of not returning to work as their homes were damaged or unlivable, causing a large decrease in staff, which greatly reduced these services. Some facilities remain closed, and dislocated employees might never return to the area (GNOCDC 2010a).

St. Charles Parish

Health Care

The St. Charles Parish Hospital in Luling, Louisiana, approximately 20 miles northwest of New Orleans, evacuated their patients before Hurricane Katrina made landfall. The hospital's patients were evacuated on Sunday afternoon in advance of the approaching storm (Gray and Hebert 2006). Besides suffering severe wind damage, the medical facilities in St. Charles Parish were either nominally affected or were brought back into operation shortly after the storm passed. Additionally, these facilities took in many of the medical patients from the remaining four parishes that needed immediate care.

Schools

Parish schools remained closed for 12 days following Hurricane Katrina. The district sustained more than $5 million of damage, including destroyed portables, roofs blown from buildings, gymnasium and stage floors destroyed by water, and broken windows. The district lost all power during the storm. As of 2009, there were between 850 and 900 students displaced from other school systems that were still being educated in St. Charles Parish schools (Cancienne 2009).

Police Protection

The population and traffic counts on the highways within St. Charles Parish soared after the storm. According to census estimates released in October 2005, the flood of new residents boosted the population of St. Charles Parish substantially, from 50,000 to 65,000 people. This was naturally followed by a spike in the overall crime rate, but the situation was temporary. Most residents that were displaced from other damaged parishes returned to their previous homes or migrated out of the area (Scallan 2010).

Fire Protection

The fire departments in St. Charles Parish were minimally affected by Hurricane Katrina. However, members of the St. Charles Fire Department were crucial in the support offered to the other parishes impacted by the storm.

Jefferson Parish

Health Care

Only three of Jefferson Parish area's hospitals operated throughout the hurricane: East Jefferson General Hospital, West Jefferson Medical Center, and Ochsner Clinic Foundation. After the Charity Hospital System closed, the burden to treat uninsured patients fell on the two public hospitals within Jefferson Parish - East Jefferson General Hospital and West Jefferson Medical Center (Health Affairs 2006).

Schools

Hurricane Katrina severely damaged the school system in Jefferson Parish, damaging five schools and destroying five other school facilities. According to the Jefferson Parish School Board's website, 5 weeks after the storm, 85 principals and 3,300 teachers returned to work and reopened 80 schools. The Jefferson Parish Public School System sustained approximately $40 million in direct damage to its physical plants from Hurricane Katrina, and $300,000 in damages from Hurricane Rita (Louisiana Department of Education 2005). Through a public assistance grant from FEMA, Jefferson Parish provided more than 75 temporary classrooms to house more than 1,800 displaced students at four school sites.

Police Protection

During Hurricane Katrina, the five-story Jefferson Parish Sheriff's Office building located in Harvey was severely damaged by water and flying debris. During emergencies, the office is and was used as a shelter and command center for the sheriff's department operations (FEMA 2007b).

Fire Protection
Fire protection personnel worked unscheduled overtime in the aftermath of Hurricane Katrina; however, much of this overtime was reimbursed by FEMA (Jefferson Fire Fighters Association 2010). Hurricane Katrina severely damaged two of nine East Bank Consolidated Fire Department stations. Those two buildings are being rebuilt for $5.3 million and paid for with millage money. Two years after Hurricane Katrina, the Jefferson Parish fire departments were at or near full operational status (Jefferson Parish Fire Department 2010).

Orleans Parish

Health Care

Some medical clinics and hospitals in Orleans Parish damaged by Hurricane Katrina reopened soon after the storm subsided. However, numerous medical centers devastated by floodwaters remained closed and the number of pre-Hurricane Katrina beds available to the sick was reduced by 50 percent. Charity Hospital, which for generations provided care to the poor and uninsured in Orleans Parish, flooded during Hurricane Katrina and has been closed since the August 2005 storm. Local clinics handled most emergencies and were able to quickly determine if a patient needed to go to a hospital and, if so, arranged the transfer to a nearby parish hospital (Marcheta, et al. 2007).

Schools
The public-school system, widely viewed as one of the worst in the Nation prior to Hurricane Katrina, was devastated after Hurricane Katrina. The city's students and teachers were quickly scattered around the country. Altogether an estimated 250,000 residents evacuated to Houston, and thousands of students entered the Houston public schools. Orleans Parish suffered significant losses of infrastructure due to Hurricane Katrina. The flooding caused by the storm resulted in the condemnation of many of the existing schools in the parish. The New Orleans Recovery School District was created before Hurricane Katrina by legislation passed in 2003 as a special district administered by the Louisiana Department of Education (Louisiana Recovery School. District 2010). Immediately after Katrina, the New Orleans Recovery School District was greatly expanded by the Louisiana state legislature to include almost all of the schools within New Orleans (Chang 2010).

Police Protection
Prior to the storm, the New Orleans Police Department employed 1,721 police officers, correctional officers, and civilians. Immediately after the storm, 62 police officers voluntarily resigned, 46 officers abandoned their posts and did not return, 18 officers resigned under investigation, 11 were terminated for neglect of duty, 11 retired, and three died. As of December 2005, the New Orleans Police Department

had lost 151 officers, seven civilian employees, and two correctional officers, which is a reduction of nearly 10 percent (Capochino 2005b). The Louisiana State Police and National Guard troops that assisted in enforcing the law after Hurricane Katrina were released in late 2007 (Williams 2009a).

Fire Protection
In the first few days after Hurricane Katrina, Orleans firefighters fought several large fires that raged throughout the city and rescued thousands of residents who were trapped by the rising water in the attics and on their rooftops of their homes. Over 62 percent of the 654 Orleans firefighters lost their homes, and for over a year, hundreds of these firefighters were separated from their families (Tak et al. 2007).

Most of the fire stations in Orleans Parish sustained substantial damage from Hurricane Katrina. The St. Claude/Florida Avenue Station was housed at its pre-Hurricane Katrina location, but within a trailer. The Holy Cross Station moved from their damaged headquarters on 6030 St. Claude Avenue to the corner of North Claiborne Avenue and Caffin Avenue (Kruger 2009).

St. Bernard Parish

Health Care
The 200-bed Chalmette Medical Center sustained heavy flood damage during Hurricane Katrina. Flooding caused more than 12 feet of water to cover the entire first floor. Just weeks prior to the storm, the medical center had opened a $17 million wing. The adjacent 47,000 square foot medical office building and a nearby physical rehabilitation skilled-nursing facility were also severely damaged during the storm and subsequent flooding. The Chalmette Medical Center was condemned in the fall of 2006 and had to be demolished along with the adjacent medical services buildings in February 2007 (Turni Bazile 2007). In April 2006, there were limited medical services available in St. Bernard Parish. The St. Bernard Health Center, a 22,000 square foot prefabricated temporary facility, opened in May 2007. In order for this center to open, it was financially supported by FEMA and Chalmette Refining and was operated by the Franciscan Missionaries of Our Lady Health System and Ascension Health (Louisiana Speaks 2007).

Schools
Prior to Hurricane Katrina, the St. Bernard school district serviced approximately 8,800 students, from grades Pre-K through 12, at its 15 school sites. During the storm, each of those sites was devastated, some beyond repair. However, just 11 weeks after the storm, the St. Bernard Parish Public Schools reopened one school, the St. Bernard Parish Unified School, in temporary trailers on the football field parking lot and on the second floor of Chalmette High School (St. Bernard Public Schools 2007). CED Phase I summarizes of what were found to be the most structurally sound buildings and repairable sites within the parish directly after the storm (FEMA 2007a).

Police Protection
In St. Bernard Parish, all but an estimated five of 27,000 residences received water damage, as well as nearly all 3,000 businesses and government buildings, including

those operated by parish government, the Sheriff's Office, the School Board, and the Lake Borgne Basin Levee District Board (Cannizaro 2010). The St. Bernard Sheriff's Department office was condemned after Hurricane Katrina. Staff and equipment in the Sherriff's office were consolidated, and the department experienced a significant reduction in staff and equipment. However, by 2006, the Sheriff's department was performing its regular functions within St. Bernard Parish (Louisiana Speaks 2006).

Fire Protection
Days after Hurricane Katrina, an estimated 27,000 to 29,000 homes in St. Bernard Parish were inundated by 3 to 14 feet of water. The local firefighters of the parish were the first to respond, performing search and rescue, providing emergency medical services, and extinguishing fires (Ruiz 2007). The St. Bernard Parish Fire Department suffered personnel and equipment losses and operated out of a damaged building and a temporary station in a group trailer site. By April 2006, there were approximately 100 active firefighters, and the department had on hand six fire apparatuses, two squad units, a tanker, and a mini pump. A large percentage of equipment for the Sheriff and Fire Departments was destroyed, and the U.S. Forest Service was assisting operations by supplying manpower and vehicles (Louisiana Speaks 2006).

A year after Katrina, the Chief of the Fire Department estimated that the department's firefighting capability was at 45 percent of pre-Hurricane Katrina levels. The department was still working out of seven mobile homes used as temporary fire stations, strategically placed throughout the parish (Louisiana Speaks 2006)

Plaquemines Parish

Health Care
All health care and medical services were interrupted in Plaquemines Parish for some time after Hurricane Katrina. The residents of lower Plaquemines Parish (below Belle Chasse) had one medical center in Port Sulphur. Otherwise, residents used medical facilities in the New Orleans area (PlaqueminesParish.com 2010) Plaquemines Parish lost all of its local government and many of its school district facilities.

Schools
The Buras Middle School and High School were badly damaged. The Port Sulfur Middle School and High School held classes in temporary facilities. New teacher housing was constructed at the site where the Buras High School stood. On the East Bank of the Mississippi River, both the Phoenix Grade School and High School held classes in temporary structures. In 2006, of the 14 schools that once existed in Plaquemines Parish, seven were reopened, six were demolished, and one was under construction.

Police Protection
As a result of Hurricane Katrina, the Sheriff's Office communications system was decimated. The 911 Communications Center and Lock-up Facility located in Port

Sulphur were flooded with at least 18 ft. of water, and as a result, the communications equipment and holding areas were lost. Communications immediately after Katrina and for days following the storm were limited from short- range to no communications in the southern regions of the parish, while the northern portion of the parish utilized an overwhelmed backup radio system (Hingle 2006). The infrastructure of the Sheriff's Office was subject to various degrees of damage from light to total destruction (Hingle 2006). As a result of the storm, the Sheriff's Office lost 56 deputies. The reasons stated for this loss of staff ranged from personal to the relocation of the officer's families outside the region and the state.

This loss of personnel decreased staff from a pre-Hurricane Katrina high of 244 to a 2006 level of 180 (Hingle 2006). The Sheriff's Office homeland security mission remained stable after Katrina, except for the temporary loss of the security detail at the Conoco-Phillips refinery. Prior to Hurricane Katrina, the Sheriff's Office had a total of 14 individual office buildings and locations within the parish. CED Phase I provides a breakdown by facility of the damage caused by these storms.

Fire Protection

Although most of the physical infrastructure of the Plaquemines Parish Fire Department was severely damaged due to Hurricane Katrina, the all-volunteer fire department was able to operate efficiently during and after the storm. CED Phase I lists all the divisions in Plaquemines Parish that were in operation immediately after Katrina and Rita.

Pre- and Post-Katrina Comparisons and Recovery Summary

One major organization provided data for post- Katrina impacts and the slow recovery which followed which was the Greater New Orleans Community Data Center (GNOCDC). GNOCDC, working with the Brookings Institute, became a clearinghouse for information throughout the early post-Katrina recovery efforts and continues to do so today. Much of the data utilized for the socioeconomic pre- and post-Hurricane Katrina comparisons was originally sourced from this non-profit organization.

Since the 2005 hurricane season, much of the project area has changed. Recent demographic information for the Greater New Orleans Metropolitan Area includes the following statistics, which illustrate the region's changing demographics:

- The share of African Americans in the city is now 59.1 percent, which is down from 66.7 percent in 2000 but has been steadily increasing since its lowest point of 57.8 percent in 2006.
- The percent of the city's households that include children has fallen dramatically from 30 percent in 2000 to 21 percent in 2013, and across the metropolitan area the percent of households with children has fallen from 34 to 26 percent.
- In New Orleans, the share of the population that is Hispanic has grown steadily from 3.1 percent in 2000 to 5.5 percent in 2013 and from 4.4 percent to 8.3 percent across the metropolitan area.

- The percent of New Orleans households without a vehicle fell from 27 percent in 2000 to 19 percent in 2013 (which is the year with the most recent available data), and across the metropolitan area has fallen from 15 to 11 percent of all households by 2013 (GNOCDC 2014).

As the city moves closer to its pre-storm population (see table 4-45), some of these demographic changes may persist while others may be a temporary result of Katrina. The future demographic profile of New Orleans will be largely influenced by the overall job market, the availability of affordable housing, residents' confidence in schools and other critical services, and the ties to the city of its displaced residents (GCR and Associates 2010).

In the project area in 2014, the average earnings in the metropolitan area have increased 19 percent from 2004 to 2014 and the number of employees for the region in January 2015 reached 91 percent of its level from 2004 (BLS 2015). Post-Hurricane Katrina recovery has also had an unexpected increase in entrepreneurship, with 427 of every 100,000 adults in the metropolitan area starting a business as compared to 333 of every 100,000 adults nationally (GNOCDC 2011). Although the rest of the Nation experienced severe job losses during the 2008 to 2009 recession, New Orleans experienced relatively mild job losses. For the period from July 2008 to July 2010, the Greater New Orleans Metropolitan Area lost only 0.8 percent of all jobs, while the Nation lost 5.0 percent of all jobs (GNOCDC 2010c). However, although the area job loss rate was less than National losses, the recession did slow the metropolitan area post-Hurricane Katrina jobs recovery, so that by July 2010 there were 89,000 fewer jobs (15 percent) than 5 years earlier (GNOCDC 2010c). This has resulted in rising unemployment, with percentages in the metropolitan area at 8.4 percent in July 2010 up from 5.1 percent in July 2008. By December 2014, the unemployment rate had dropped to 6.5 percent (U.S Bureau of Labor Statistics 2015).

In April 20, 2010, the recovery was again hampered by the BP Deepwater Horizon rig explosion and major oil spill in the Gulf of Mexico. The news reports of oil coursing into the Gulf of Mexico with images of ecological damage and a Federal drilling moratorium exposed the economic dependency of the region to the Gulf of Mexico's resources. This has impacted a large portion of the population that was either directly involved in the seafood or oil industries or that suffered indirect impacts (e.g., bait and tackle shops, boat dealers, fuel sales, restaurants) (Hammer 2010).

The oil spill and the Gulf of Mexico drilling moratorium that followed, began to damage key industries that drive the New Orleans regional economy, causing 2.5 percent fewer natural resources and mining jobs in July 2010 as compared to 1 year earlier, even as these same types of jobs increased nationally by 6.7 percent (GNOCDC 2010c). Tourism in the area decreased, and although the New Orleans sales tax collections stalled in 2008 from January through July 2010, tax collections were 8 percent lower than the same months in 2005. At the height of the oil spill in the summer of 2010, BP hired more than 10,000 local boats and their captains as part of the Vessels of Opportunity program; however, by September of 2010, the company employed only 810 vessels (Jervis 2010). The program was phased out in 2011 (The Louisiana Weekly 2012).

In a study commissioned by a regional economic development agency in October 2010, the Times-Picayune reported that the short-term gross revenue loss to the fishing industry from the Deepwater Horizon oil spill could be approximately $115 million to $172 million from 2011 to 2013. This study, the first of three studies commissioned, focused exclusively on the short-term economic impact of the spill on fisheries, the fishing industry, and fishermen. The study did not include any potential long-term ecological effects or changes in demand for Gulf seafood, and did not include impacts on related industries, such as seafood processing and recreational fishing. The revenue losses equate to a job loss of 2,650 to 3,975 "full time equivalents" and an earnings loss of $68 million to $103 million for the period from 2011 to 2013 (White 2010).

Population and Housing

Population and housing in the post-Hurricane Katrina recovery were and continue to be integrally related to each other and in many ways are the most measurable methods of depicting the HSDRRS project area storm recovery. Hundreds of thousands of homes were destroyed by the 2005 storms, which caused an immediate short-term escalation in rental rates for the remaining habitable rental housing. In addition to uncertainty with the hurricane protection system, environmental concerns from the flooding, insurance compensation, and FEMA insurance program requirements (NFIP) became factors in how many people could or would return to their homes after the storms.

Table 4-49 shows Census population estimates from pre-Hurricane Katrina (July 1, 2005 estimate) to 2008, actual 2010 data from the 2010 Census, and estimates for 2013 for selected parishes in the area, excluding St. Tammany, which showed population increases. Note that a sharp population decline occurred in Orleans and St. Bernard parishes and a lesser but substantive decline occurred in Plaquemines Parish between 2005 (pre-Katrina estimate) and 2006 due to the severe damage caused by the storm. The population of Jefferson Parish also declined after the storm, but the decrease was small in comparison to St. Bernard, Orleans, and Plaquemines parishes. The least storm-affected parish, St. Charles, gained population after Katrina. It suffered only minimal damage, and subsequently absorbed some of the population displaced from the other four parishes. From 2006 to 2007, populations increased in all the affected parishes. Annual increases continued through 2010, except for slight decreases in the estimates for Plaquemines and St. Charles parishes between 2007 and 2008. In 2013, the region was still just over 15 percent below pre-Katrina population levels. St. Bernard was down 39 percent, Orleans Parish down 23.4 percent, and Plaquemines Parish was down by 20.3 percent. Only St. Charles Parish gained population between 2005 and 2013, showing a 3.8 percent growth rate. Population continued to increase from 2010 to 2013 in all counties except for St. Charles, which decreased in population slightly.

Table 4-49: Population, Pre-Katrina through 2013

Parishes	Population Estimates[1]							
	2000	2005*	2006	2007	2008	2010	2013	Percent Change 2005* - 2013
Jefferson	455,406	456,554	426,285	432,683	431,759	432,552	**434,767**	**-4.8**
Orleans	484,692	494,294	230,172	268,751	301,842	343,829	**378,715**	**-23.4**
Plaquemines	26,749	29,558	22,329	22,709	22,677	23,042	**23,550**	**-20.3**
St. Bernard	67,230	71,300	16,563	23,613	28,879	35,897	**43,482**	**-39.0**
St. Charles	48,019	50,670	52,453	52,765	52,516	52,780	**52,617**	**3.8**
Area Totals	1,014,886	1,102,376	747,802	800,521	837,673	888,100	**933,131**	**-15.4**

Source: USCB, County Intercensal Estimates (2000-2010) and State and County QuickFacts (2013)
*Pre-Hurricane Katrina Estimate
[1]Population estimates for 2005 – 2009 and 2013 as of July.

The five-parish area provides risk reduction for a highly urbanized area of Louisiana. Within the region's urban areas there is a wide range of services and facilities that contribute to the local tax base including numerous commercial and residential properties with a range of values; public facilities and services; utilities; public transit; streets and bridges; police and fire protection facilities and services; schools and educational services; and hospitals and health care services. Many of these properties and services were severely impacted by Hurricanes Katrina and Rita (photograph 4-6).

Photograph 4-6. Damaged properties due to Hurricane Katrina.

The GNO Metropolitan Area is one of the largest market centers in the southeastern U.S., with unique resources that influence property values. Table 4-50 shows the changes in prices for single-family homes in the five-parish area.

Table 4-50: Average Single-Family Housing Prices, 2000 and 2005 through 2014

Parish	Average Housing Price 2000	Average Housing Price 2005	Average Housing Price 2006	Average Housing Price 2007	Average Housing Price 2008	Average Housing Price 2009	Average Housing Price 2010	Average Housing Price 2014	Change 2000-2005	Change 2005-2010	Change 2000-2010
Jefferson	$145,960	$200,408	$211,053	$215,547	$199,070	$187,095	$184,286	**$189,565**	37%	-8%	26%
Orleans	$155,232	$237,768	$226,716	$189,610	$205,970	$214358	$254,309	**$272,853**	53%	7%	64%
Plaquemines	$150,076	241,293	$273,391	$286,753	$255,402	$302,976	$225,916	**$257,380**	61%	-6%	51%
St. Bernard	$89,429	114,433	$49,791	$76,913	$98,151	$100,772	$102,744	**$126,796**	28%	-10%	15%
St. Charles	$147,533	$186,396	$229,826	$222,471	$213,269	$199,402	$197,854	**$197,421**	26%	6%	34%

Sources: UNO 2002, UNO 2006, UNO 2012, NOMAR 2104

Because many housing units that were not destroyed by the hurricane were severely damaged, many people who lived in apartments or multi- and single-family units were unable to return following Hurricane Katrina. By 2008, many of the people who returned to the metropolitan area were still living in FEMA trailers while housing units were being repaired or reconstructed. The final trailer was vacated in 2012 (Washington Times 2012).

The American Red Cross estimated that about 135,000 housing units in the New Orleans metropolitan statistical area were destroyed by Katrina, while many more were severely damaged. According to the GNOCDC, in New Orleans alone 134,000 housing units, or 70 percent of all occupied units, suffered damage from Hurricane Katrina and the subsequent flooding (GNOCDC 2010b). This enormous loss of housing in Orleans and St. Bernard parishes was also reflected in the population recovery trends (see table 4-51, 4-52). Following Hurricanes Katrina and Rita, close to 100 percent of the homes in St. Bernard Parish were officially deemed uninhabitable (St. Bernard Project 2009). As of 2013, the housing stock had recovered to just over 60% of the pre-Katrina stock. (US Census 2015).

Pre-Katrina, there was a high percentage of rental units in Orleans and Jefferson parishes, while the other parishes were mostly comprised of owner-occupied housing units. Figures 4-19 and 4-20 show that, as the parishes recovered from storms, it was the owner–occupied units that were the first to be repaired and renovated, which provided a secure place for parish residents to live. In 2004, 43 percent of renters within New Orleans paid more than 35 percent of their pretax income on rent and utilities as compared to 2008 when this number rose to 58 percent (GNOCDC 2010b). This created a situation where affordable rental housing, needed by many low-income families in order to return to the project area, was difficult to find.

Since January 2006, more than 80,000 residential properties have been placed back into service or are in the process of rehabilitation. However, there is still substantial blight in the city, with many homes that were active pre-storm yet to be repaired. There are currently an estimated 35,200 residential units that were active pre-Katrina but are not active today (GCR and Associates 2010).

Table 4-51: Housing Units in Project Area, 2000

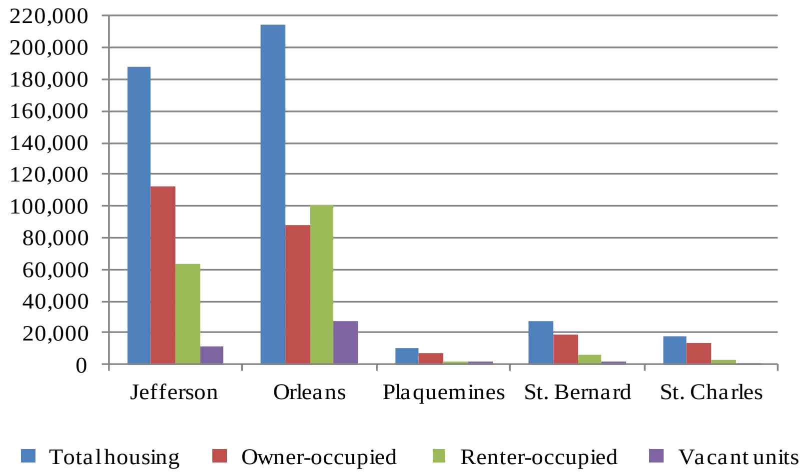
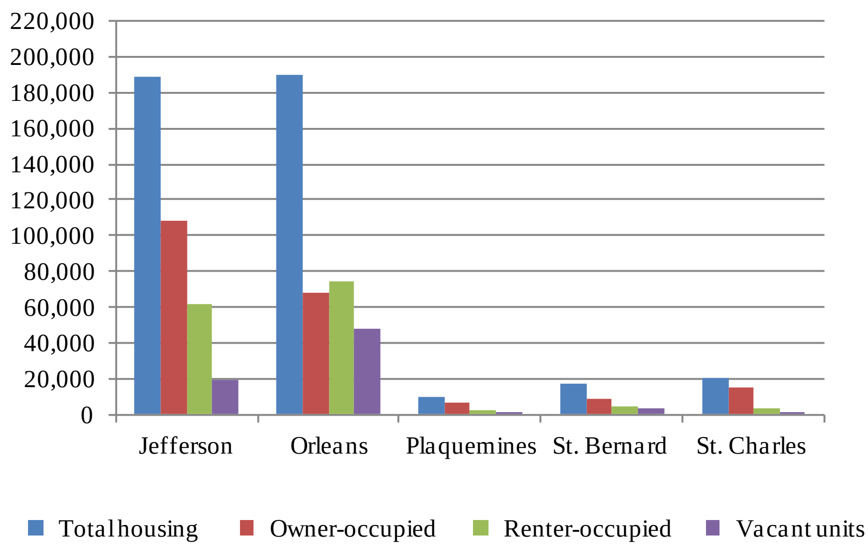


Table 4-52: Housing Units in Project Area, 2008



Housing programs, both Federal- and state-run, although predominantly funded by Federal aid, have played a large role in Louisiana's post-Katrina housing recovery and have gone a long way toward subsidizing homeowners' efforts to rebuild. For example, in Orleans Parish alone, more than 46,000 homeowners had received Road Home grants averaging approximately $91,000 as of February 2012 (LRA 2012). Nonprofit organizations have filled an important niche within the region and have teamed with state and Federal agencies, as well as other nonprofits, in order to help regional residents, find a new home or repair an existing one. The nonprofits involved in the project area are too numerous to name, but a few of the organizations that have taken on pivotal roles in housing recovery and community revitalization are:

- Beacon of Hope Resource Center
- Build Now
- Catholic Charities Archdiocese of New Orleans
- Common Ground
- Community Center of St. Bernard
- Habitat for Humanity
- Hands on New Orleans
- Preservation Resource Center of New Orleans
- Project Homecoming
- Providence Community Housing
- Rebuilding Together New Orleans
- The St. Bernard Project

Blight is rapidly declining in the worst hit areas in the region, down from 98,402 unoccupied residential and commercial addresses in March 2007 to 64,135 in June 2010. In St. Bernard Parish, blight has fallen from 19,525 unoccupied residential and commercial addresses in 2007 to 13,927 as of 2010 (GNOCDC 2010b). New construction or newly renovated buildings are a more prevalent sight than in the earlier years following the aftermath of the storms however, abandoned properties in certain sections of the region can still be seen in large numbers.

Business and Industry, Employment and Income

The overall storm recovery has been slow, but based upon U.S. Postal Service data by 2014, 88.4 percent of Orleans Parish Pre-Katrina households had returned and were actively receiving mail (GNOCDC 2008). Business and industrial activities are an important component of socioeconomic resources and, as such, provide an economic base for communities and are part of a community's long-term economic stability. Table 4-53 shows labor force and employment, comparing data gathered in 2000 (Pre-Katrina) to 2007 and 2013 (Post-Katrina).

Table 4-53: Labor Force and Unemployment: Pre- and Post-Hurricane Katrina Annual Averages for 2000, 2007, and 2013

Parish	Pre-Hurricane Katrina		Post-Hurricane Katrina			
	Labor Force (2000)	Unemployment Rate (percent)	Labor Force (2007)	Unemployment Rate (percent)	Labor Force (2013)	Unemployment Rate (percent)
Jefferson	231,695	4.3	219,411	3.2	**212,727**	5.8
Orleans	210,684	5.1	106,509	4.5	**156,213**	7.3
Plaquemines	11,006	5.4	8,931	3.5	**9,370**	5.8
St. Bernard	32,177	5.1	9,662	3.9	**19,173**	6.2
St. Charles	23,892	5.2	26,031	3.4	**24,901**	5.8
Louisiana	2,031,296	5.0	2,010,661	3.8	**2,089,186**	6.7

Source: BLSNote: Annual average unemployment rate data available by year at http://www.bls.gov/lau/#tables. Data for these parishes are not available for 2005 and 2006.

In 2007, post-Katrina, unemployment rates throughout the region were below pre-Katrina rates, as the labor force in most parishes was smaller and there was substantial recovery-related employment. By 2013, unemployment rates in the region and across the Nation were up substantially, as a result of the overall downturn in the economy. While the 2013 HSDRRS region unemployment rates were higher, they were all below the U.S. average unemployment rate for 2013 of 7.4 percent.

The size of the labor force in the five-parish region was approximately 27 percent smaller in 2007 (post-Katrina) than in 2000. During that time period, the size of the labor force in the State of Louisiana declined 1.0 percent, that decline was caused by the substantially smaller labor force in the HSDRRS region and particularly in Orleans Parish. In 2013, the labor force in the HSDRRS region was still 17 percent smaller than in 2000. In 2013, the size of the state's labor force exceeded 2000 level, but the region's labor force remained smaller by more than 87,000.

Table 4-54 shows a comparison of median household incomes, from pre-Hurricane Katrina 2000 and 2009 through 2013 (post-Hurricane Katrina), within the five parishes, along with state and National data. All parishes within the HSDRRS project area increased in median household income. Plaquemines Parish had the greatest increase in median household income (44 percent), with St. Bernard Parish showing the lowest growth (15 percent). With the exception of St. Charles and Plaquemines Parishes, median household income in the region's parishes was below the National average (USCB 2015).

Table 4-54: Median Household Incomes, 2000 and 2009 through 2013

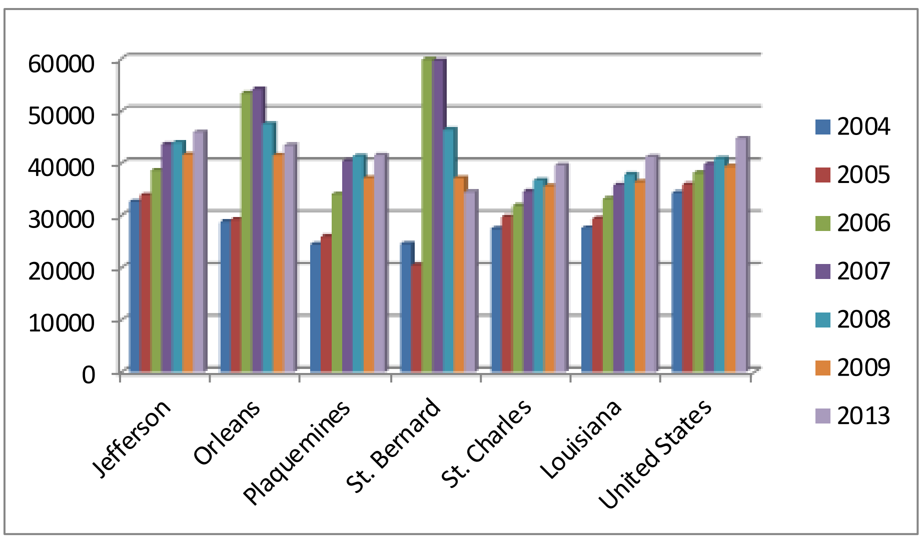
Parishes	Pre-Hurricane Katrina (2000)	Post-Hurricane Katrina (2009-2013)	Pre-Hurricane Katrina to 2013 Percent Change
St. Charles	$45,139	**$58,758**	+30%
Jefferson	$38,435	**$48,261**	+25%
Orleans	$27,133	**$37,146**	+36%
St. Bernard	$35,939	**$41,353**	+15%
Plaquemines	$38,173	**$55,138**	+44%
Louisiana	$32,566	**$44,874**	+37%
U.S.	$41,994	**$53,046**	+26%

Per Capita Personal Income and Regional Growth

Personal income is the income that is received by persons from all sources. It is calculated as the sum of wage and salary disbursements, supplements to wages and salaries, proprietors' income with inventory valuation and capital consumption adjustments, rental income of persons with capital consumption adjustment, personal dividend income, personal interest income, and personal current transfer receipts, less contributions for government social insurance (Bureau of Economic Analysis [BEA] 2010).

Per capita personal income is the personal income of the residents of a given area divided by the resident population of the area. In computing per capita personal income, BEA uses the USCB's annual midyear population estimates (BEA 2010). Figure 4-21 shows the changes in per capita personal income in the parishes for the 6-year period between 2004 and 2009 and 2013. Orleans and St. Bernard parishes had substantial spikes in per capita personal income in 2006 and 2007, likely the result of the large influx of recovery funds providing higher than average wages for some workers and fewer lower income residents who had returned. Per capita personal income in Jefferson, Plaquemines, and St. Charles parishes increased every year until a slight decrease in 2009 – the same pattern seen in the state as a whole and the U.S. as a result of the recession. Per capita personal income in Orleans and St. Bernard parishes decreased in each of the years after the spike in 2006; however, in 2009 they were still substantially above pre-storm levels with Orleans Parish up by 31 percent and St. Bernard Parish up 15 percent from 2004. By 2013, all the parishes in the study area rebounded except for St. Bernard (Table 4-55).

Table 4-55: Per Capita Personal Income 2004 through 2009 and 2013



Source: Bureau of Economic Analysis

Community Cohesion

Community cohesion is the unifying force of conditions that provide commonality within a group. These characteristics may include such things as race, education, income, ethnicity, religion, language, and mutual economic and social benefits. Community cohesion has been described as the unifying force that bonds people together long enough to establish meaningful interactions, common institutions, and agreed-upon ways of behavior. It is a dynamic process, changing as the physical and human environment changes. As stated in the beginning of this section, the impacts from Hurricane Katrina included loss of life, destruction of homes and businesses, damage and disruption to public facilities and services, high unemployment, loss of income, disruption and closure of local institutions, and the loss of neighborhood unity.

One of the most distressing and often most traumatizing parts of the 2005 hurricane season was the loss of homes. However, this loss of homes caused and precipitated other deeper losses such as the dispersion of families and neighbors, the loss of social networks, family records, and cultural histories, and in many cases the loss of loved ones (GNOCDC 2010c). Southeast Louisiana is a region that has a long history, deep loyalties, and family lineages over generations. Specifically, New Orleans was and is a city of unique neighborhoods. New Orleans has 73 neighborhoods that were distinctive before the storms and may even have become more distinctive after the storms. Neighborhood organizations, which have been at the heart of the New Orleans recovery, have come together and organized in ways that have been largely unprecedented and thought to be impossible before the storm (GNOCDC 2010c).

Prior to Katrina, there were a few organizations focused on community development within southeast Louisiana; however, post-Hurricane Katrina, many of these organizations grew and strengthened, and many new organizations and networks of organizations came to the aid of the beleaguered region. Specifically, many of these organizations came to the rescue of neighborhoods and more vulnerable populations within New Orleans. Pre-Hurricane Katrina, New Orleans was often seen as a city that displayed high levels of citizen passivity, intercommunal conflict, and corruption. These new organizations grew out of a sense of cultural continuity, community cohesion, and the need to restore the social fabric destroyed by the scattering and disbursement of people in the region and in their own neighborhoods. In New Orleans, much of this action by organizations was spurred by the Bring New Orleans Back Commission, which announced in November 2005 that heavily flooded neighborhoods would have to prove their viability and warrant city investment by the number of returning residents to the flooded and damaged neighborhoods (GNOCDC 2010c).

Engaged in recovery discussions and armed with this invigorated sense of community, residents wanted to rebuild their communities to be safer, stronger, and more equitable. Paramount to these broader social issues was providing greater opportunities to residents upon returning (GNOCDC 2010c).

Community developers have focused on bringing back entire blocks at a time in order to try and stabilize neighborhoods. One such effort has been Musician’s Village, which features 82 homes and a performing arts center.

Photograph 4-7 shows what is left of the historic East Pointe a la Hache courthouse, which was severely damaged by both Katrina and arson prior to Katrina. This structure was an anchor for the community and, due to the lack of returning population, will probably not be replaced. A number of Federal, state, and local organizations, businesses, schools, religious and other non-profit organizations, and other institutions have participated in the recovery of the region, following the 2005 storms. In many ways this reflects the strong social bond, community cohesion, and regional and National fiscal support.

Photograph 4-7. Severely damaged East Pointe a La Hache Courthouse.

Healthcare

Post-Katrina healthcare recovery was discussed by Dr. Marcia Brand, Associate Administrator with the U.S. Department of Health and Human Services, on December 3, 2009, in a statement to the U.S. House of Representatives, Committee on Oversight and Government Reform (U.S. Department of Health and Human Services 2009) and is discussed below.

The Health Resources and Services Administration helps U.S. residents receive quality health care without regard to their ability to pay. To help fulfill this mandate in 2007 the Center for Medicare and Medicaid Services awarded the State of Louisiana the Primary Care Access and Stabilization Grant, a 3-year grant of $100 million to assist public and nonprofit clinics in the greater New Orleans area. This grant was to aid in expanding access to primary care, including primary mental health care, to all residents, including low-income and uninsured residents within Jefferson, Orleans, Plaquemines, and St. Bernard parishes. The Louisiana Department of Health and Hospitals (LDHH) made provisions with the Louisiana Public Health Institute to help the state administer and oversee this grant's day-to-day operations. As of September 30, 2009, a total of approximately $61 million has been disbursed with an additional $15.02 million projected to be allocated in December 2009, to 25 sub-awardees through the Louisiana Public Health Institute. The organizations receiving the grant funds operate 91 primary and behavioral health care sites across the region, including fixed and mobile facilities. About 56 percent are primary care centers, 30 percent are behavioral health sites, and 14 provide a combination of services. Fourteen percent of these locations are mobile sites, and 86 percent are fixed sites (U.S. Department of Health and Human Services 2009). Approximately $4 million of Primary Care Access and Stabilization Grant funding was specifically allocated to the City of New Orleans Health Department to increase clinical services, recruit health professionals for two new public health care sites, and staff dental and vision care mobile vans (U.S. Department of Health and Human Services 2009).

Additionally, in February 2009, through the American Reinvestment and Recovery Act, the New Orleans area received $7.4 million that allowed health centers to provide primary care services to an additional 35,000 patients at more than 20 clinics (U.S. Department of Health and Human Services 2009).

Currently, 87 community-based health centers operate across Orleans, Jefferson, Plaquemines, and St. Bernard parishes in Louisiana. GNOCommunity.org is “a service dedicated to helping individuals find a quality healthcare center that fits their needs.” The website is searchable by zip code or type of health service sought. The centers are open to all people “regardless of their ability to pay” and are funded in part by the Primary Care Access and Stabilization Grant grants discussed above, which expired at the end of September 2010 (Health Affairs 2010).

St. Charles Parish - Two hospitals are currently in operation in St. Charles Parish, and all are in Luling, Louisiana:

- One acute care hospital - St. Charles Parish Hospital
- One rehabilitation hospital-St. Charles Specialty Rehabilitation Hospital LLC

Jefferson and Orleans Parish - Numerous health care facilities are in operation in Jefferson and Orleans parishes, and provide the primary medical services to the metropolitan area. These include:

- Touro Infirmary, New Orleans
- Ochsner Baptist Hospital, New Orleans
- Children’s Hospital of New Orleans
- Tulane University Medical Center, New Orleans
- LSU Medical Center, New Orleans
- East Jefferson General Hospital, Metairie
- West Jefferson Medical Center, Marrero
- Ochsner Medical Center, Kenner
- Ochsner Medical Center West Bank, Gretna
- Ochsner Foundation Hospital, Jefferson
- Tulane Lakeside Hospital, Metairie

The LSU Medical System has determined that the Charity hospital is not suitable to return to use as a hospital and has since been closed. LSU completed the construction of a new medical complex in association with a new Veterans Administration hospital just north of the Central Business District in the City of New Orleans (Barrow 2010a).

The new 34-acre 200-bed Veteran’s Administration hospital complex to replace the one damaged during Hurricane Katrina is complete and is near the present Tulane Medical Center.

A new heliport was constructed for Tulane Medical Center. When the levees were breached after Hurricane Katrina, Tulane Medical Center turned the top level of its hospital parking garage into a temporary evacuation zone. This space was used to airlift hundreds of patients, medical staff, and others to safety. The new heliport is used to speed up future evacuations but also benefits the expansion of Tulane's patient base beyond the city (Barrow 2010b).

St. Bernard Parish - The St. Bernard Parish Hospital opened in September 2012. The "113,000 square foot state-of-the-art hospital facility supports 40 patient beds, an intensive care unit (ICU), 4 operating suites, 2 endoscopy suites, cardiac catheter lab, plus a 10-bed emergency department (SBPH, 2015)."

Plaquemines Parish - The Plaquemines Parish Medical Center opened in Port Sulphur in September 2014. Although the Medical Center existed largely as a clinic before, it greatly expanded its services upon opening the much larger facility (WWL, 2014).

Schools

Four of the five project area parishes (Jefferson, Orleans, Plaquemines, and St. Bernard) saw large drops in their school enrollment figures after Katrina, while St. Charles Parish experienced slight increases in the number of students after the storm as shown in table 4-56. This is due in part because St. Charles was farther away from the storm's center as it passed overhead, and there was little flooding from levee failure.

Table 4-56: Public School Enrollment by Parish (2000-2010, 2013)

School Year		St. Charles	Jefferson	Orleans	Plaquemines	St. Bernard
2000-2001		9,984	51,110	78,041	4,989	8,588
2001-2002		9,947	50,915	73,724	4,933	8,635
2002-2003		9,807	51,669	71,212	5,475	8,775
2003-2004		9,757	51,675	69,051	5,823	8,950
2004-2005		9,797	51,666	66,372	5,952	8,872
2005-2006	Jan	9,945	41,750	6,242	3,563	955
	Feb	9,885	42,240	9,298	3,623	1,670
	Mar	9,846	42,339	10,222	3,664	1,940
	Apr	9,775	42,777	10,816	3,721	2,268
	May	9,761	42,685	12,103	3,762	2,337
2006-2007	Oct	9,734	43,617	25,651	4,374	3,536
	Feb	9,653	43,683	26,165	4,411	3,764

2007-2008	Oct	9,639	44,058	32,149	4,496	4,198
	Feb	9,547	43,602	32,887	4,472	4,229
2008-2009	Oct	9,606	44,018	35,955	4,521	4,684
	Feb	9,556	43,979	35,976	4,451	4,798
2009-2010	Oct	9,706	45,076	38,051	4,698	5,298
2013-2014	Oct	9,648	47,564	44,686	5,001	7,137

Source: Louisiana Department of Education. *LEA and School-Level: Public Student Counts and Percentages, Multi-Stats by LEA 2000-2009.* Downloaded from *www.doe.state.la.us/lde/pair/1489.html.* From a compilation by the GNO Community Data Center. <www.gnocdc.org>

Note: Orleans schools include charter and non-charter schools overseen by the Recovery School District, the Orleans Parish School Board, also known as New Orleans Public School Board and the Board of Elementary and Secondary Education

St. Charles Parish. Although St. Charles Parish public school enrollment increased immediately post-Hurricane Katrina, enrollment in 2013 (9,706 students) was virtually the same as it was in 2004 (9,797 students) (Louisiana Department of Education 2014). Based upon data from the Louisiana Department of Education, public schools in St. Charles Parish have improved performance scores from 104.9 in 2009 to 105.9 in 2014, the second highest in the state (Cowen Institute 2014).

Jefferson Parish. Jefferson Parish school enrollment was less affected by Hurricane Katrina in 2005 and rebounded at a more rapid pace than neighboring Orleans Parish. By 2014, 88 schools were located on the east and west banks of Jefferson Parish with a total enrollment of 44,844 students (Jefferson Parish Public School System 2014). For the 2014 school year, Jefferson Parish's public-school system posted an average performance score of 87.2, only slightly below the state average of 89.2 (Cowen Institute 2014).

Orleans Parish**.** One of the most dramatic changes that New Orleans has experienced since Hurricane Katrina is the public-school system. The governance structure of the school system has been completely reorganized, which allowed some schools to be governed under the direction of the locally elected Orleans Parish School Board, while others are governed by the state-run Recovery school district RSD, and the remaining schools operate as independent charter schools. The Orleans Parish School Board currently has six District-run schools and 14 charter schools. The RSD operates 63 schools, all of which are charter schools (RSD Louisiana, rsdla.net, 2015).

Collectively, the performance of the schools has improved dramatically, though as a whole, New Orleans' schools still perform below the statewide levels. Post-Hurricane Katrina, after decades of underperformance, the average performance score of New Orleans Public Schools has risen to 83.4 (*Cowen Institute* 2014). While enrollment since Katrina is smaller, this has created an opportunity to reimagine the physical profile of the school system as well. The New Orleans public schools have embarked on a $1.8 billion capital campaign initiative over the next 10 years (GCR 2010).

St. Bernard Parish. Lacoste Elementary and the Maumus Center have reopened, while Sebastien Roy Elementary School remains closed.

Plaquemines Parish. Prior to Katrina there were 14 public schools in Plaquemines Parish. By late 2006, seven of these schools were reopened. Although progress is being made, there are still only eight public schools open within the parish, including three high schools, one middle school, three primary schools, and one school for middle and high school children with special needs. These schools are listed below (PPSB 2015):

- Belle Chasse High School
- South Plaquemines High School
- Phoenix High School
- Belle Chasse Middle School
- Belle Chasse Primary School
- Boothville-Venice Elementary School
- South Plaquemines Elementary School
- Plaquemines Parish Learning Center

Police Protection

St. Charles Parish. Except for the initial post-disaster contingent, there were never any residual supplemental police forces, such as the U.S. Army, the National Guard, or the Louisiana State Police, needed in St. Charles Parish. The St. Charles Sheriff's Department was one of the first agencies opened to allow residents to return to the affected areas. They were also able to aid parishes that were severely affected (Robicheaux 2009).

St. Charles Parish has two districts, one on the east bank of the Mississippi River and one on the west bank, which together employ 370 full-time personnel, both officers and civilians (Robicheaux 2009). Under the 911 Call Center, there are four operators and one supervisor per 12-hour shift, and there are 16 officers and three supervisors in corrections per each 12-hour shift. Additionally, there are approximately 280 vehicles, including motorcycles, trucks, etc. This excludes watercraft, which can vary largely in number depending on need (Robicheaux 2009).

Jefferson Parish. The Jefferson Parish Sheriff's Office employs 1,457 staff, including about 280 patrolling deputies. The Office operates a fleet of over 1,400 vehicles. The Office operates the Jefferson Parish Correctional Center, which currently has a maximum capacity of 1,208 inmates (Jefferson Parish Sheriff's Office Budget-At-A-Glance 2014).

Orleans Parish. Orleans Parish receives police protection from the eight districts of the New Orleans Police Department. The First and Second districts are still housed in their pre-Hurricane Katrina headquarters buildings at 501 N. Rampart Street and 4317 Magazine Street, respectively. The Third District, which includes the hard-hit Lakeview, Gentilly, and London Avenue suburbs, is now housed at 4650 Paris Avenue. Their old headquarters at 1700 Moss Street has been demolished. The Fourth District is located on the West Bank of the Mississippi River and consists of Algiers, English Turn, and other areas on the West Bank extending downriver. The Fourth district is now located at 2405 Sanctuary Drive in the Federal City development. Other than extensive wind-damage and some localized flooding, the West Bank survived Katrina relatively well (Williams 2009a). In contrast, directly across the Mississippi River, the Fifth District Station and Substation sustained major damage from Hurricane Katrina and, after moving several times to temporary facilities, are now located at 3900 N. Claiborne Avenue (Williams 2009a).

Today, the total force in the New Orleans Police Department comprises over 1,156 individuals on active duty with a goal of reaching 1,600. Additionally, there are over 700 marked police vehicles. (The Times-Picayune February 6, 2015). Until recently, the police force worked in 12-hour shifts. It now works in three 8.5-hour shifts (Williams 2009a).

St. Bernard Parish**.** The Sheriff's Office, after a period in which its administrative and enforcement offices were housed in trailers at the Port of St. Bernard, has moved back into many of its pre-Hurricane Katrina buildings. The department has reintroduced virtually all services available before the storm (Cannizaro 2010). A new office building was constructed at the end of 2011 behind the parish courthouse in Chalmette to house the administrative offices and the offices of its Civil and Tax divisions (The Times Picayune October 27, 2011).

The Sheriff's Office has reopened most of the parish sub-stations, reopened the Parish Prison and Juvenile Detention Center, reintroduced the D.A.R.E. anti-drug program for children in schools, restarted the Citizens Police Academy for residents to better understand law enforcement, restarted the Neighborhood Watch program, and again celebrates the National Night Out Against Crime (Cannizaro 2010).

While the population of the parish has dropped, there are new problems due to an influx of residents who moved to St. Bernard after the hurricane, some because they were displaced from other parishes by the storm and some as a result of the ongoing recovery work in the parish (Cannizaro 2010). As of 2010, the department answers 3,000 calls a month for assistance from the public and is making approximately 300 arrests a month, focusing on narcotics activity, personal and property crimes, and traffic enforcement, including impaired driving (Cannizaro 2010). As reported by the Sheriff's Office, many neighborhoods have repopulation on some streets while having vacated properties on others. Per Officer Cannizaro, this results in fewer residents to act as "the eyes" of the department to see and report suspicious characters and activity, making it more important for sheriff's deputies to be vigilant (Cannizaro 2010).

Plaquemines Parish**.** Currently, the Sheriff's Office has a staff of 204 full-time employees and three part-time, and the three patrol districts are currently fully staffed. All shifts are 12-hour shifts and are the same shift patterns that were in use prior to

Hurricane Katrina. Due to the Post-Hurricane Katrina population shift in the parish, the number of deputies in District 2 is currently four deputies less than pre-Hurricane Katrina, while the number in the 1st District has increased by a total of eight deputies.

There is a total of 58 patrol deputies, including deputies who are currently in training. There are no residual supplemental forces in service. These numbers do not include deputies who are assigned to specialized units, such as Criminal Investigations and Narcotics, Crime Prevention, Marine Patrol, Aviation Unit, and multi-jurisdictional task forces. There are approximately 62 marked patrol cars within the fleet (Plaquemines Parish Sheriff's office ppso.net).

Prior to Katrina, the Sheriff's Office operated an 815-person Detention Center located near the community of Davant on the east bank of the parish. The Detention Center sustained catastrophic wind damage and was submerged in over 17 ft of water, resulting in the total loss of the facility. A much-needed infusion of funds was received in October 2010 when the Plaquemines Parish Sheriff's Office was granted additional FEMA funding of more than $36.7 million for criminal justice facilities (FEMA 2010). Since Katrina, prisoners were held at the Belle Chasse Lock-up and in correctional facilities in the Metro New Orleans area. The Plaquemines Parish correctional facility opened in 2015 (Times Picayune February 15, 2015).

Fire Protection

Jefferson Parish**.** The Jefferson Parish fire departments are at or near full operational status. Although the West Bank was less damaged than the East Bank, they were back to 100 percent operations 6 to 7 months after the hurricane.

Orleans Parish**.** As of 2015, there are 32 fire stations in Orleans Parish that are divided into six Districts. The New Orleans Fire Department operates a total of 29 engines, five ladders, two rescues, one Haz-Mat unit, and numerous other special, support, and reserve units (City of New Orleans 2015).

St. Bernard Parish**.** Work on the fire stations has continued steadily with FEMA funding. Of the 10 fire stations in St. Bernard Parish, seven are new or newly renovated (St. Bernard Parish Government 2010). Most of the newly constructed stations were built to minimize damage from storms – they have elevated sleeping quarters and first floors are designed to be easily cleaned after a storm. The new construction has finished (St. Bernard Parish Government 2015).

Plaquemines Parish**.** Ten of the twelve fire stations in the Plaquemines Parish fire department currently in operation have been constructed since 2009, replacing the stations that were badly damaged by Hurricane Katrina.

4.2.17.2 ENVIRONMENTAL CONSEQUENCES

4.2.17.2.1 HSDRRS Construction Impacts

Socioeconomics. The large-scale socioeconomic impact from the HSDRRS to the study area is primarily beneficial. No permanent direct or indirect adverse impacts of a significant nature on population and housing, business and industry, employment and income, community and regional growth, or community cohesion occurred as a result of HSDRRS construction activities. The collective impacts that occurred and documented in the CED Phase I document and those that occurred subsequent to the CED Phase I release are described below.

Population and Housing. Although the USACE attempted to limit new ROW acquisition for the HSDRRS improvements in certain reaches of the HSDRRS, increased ROW was necessary. These acquisitions removed private property from the property tax rolls and had a minor impact on property tax revenues. However, many reaches of the HSDRRS are far from the more populated Orleans Parish, and especially in St. Charles, Jefferson, and Plaquemines parishes, much of the HSDRRS alignment is far from inhabited areas. The HSDRRS had short-term and long-term beneficial direct and indirect impacts on the project area's population and housing. With the 100-year level of risk reduction, the probability of residential damage and destruction from a storm event declined.

The population of many of these neighborhoods, which were provided a greater level of risk reduction, is returning. Additionally, with the HSDRRS complete, all structures within the system achieved the levels of risk reduction consistent with the National Flood Insurance Program (NFIP) standard of providing 100-year level of risk reduction. Continued eligibility for lower insurance premiums in the NFIP, which is administered by FEMA, for properties within the project area would further encourage long-term investment of economic resources and aid in a strong and sustainable recovery of the population in the region. As a result of the completion of HSDRRS, revised flood insurance rate maps (FIRMS) have been issued by FEMA which shows significant portions of Orleans and Jefferson parishes that are no longer located in Special Flood Hazard Areas. Because base flood elevations (BFEs) for most areas within HSDRRS is lower, the annual premiums for flood insurance policies reflect broad declines, and in many instances, significant declines. The lower cost of flood insurance policies is an important factor that increases the affordability of housing and tends to encourage ownership and occupancy. In addition, the lower BFEs tend to reduce the cost of new construction in the area as fill or elevation requirements are not as great compared to pre-HSDRRS conditions. This effect also encourages rebuilding, restoration, and new construction of housing and commercial properties in the area.

Outside of the HSDRRS project area, within St. Tammany Parish, the Tammany Holding Corporation borrow site had temporary direct adverse impacts on nearby communities' homes from borrow construction activities, which included air quality, noise, and increased traffic. These impacts would be expected to be moderate but temporary, lasting only if required to complete HSDRRS construction. The Tammany

Holding borrow site was utilized for the HSDRRS construction.

Residents near the construction sites experienced greater than usual traffic congestion and increased noise levels. Residents would be at a reduced risk of permanent displacement due to the lowered risk of flooding as compared to having no HSDRRS construction or 100-year level of risk reduction. The lower cost of home ownership is an incentive to live within the footprint of the project. How many people would have left otherwise cannot be accurately quantified, with the effect being moderate at best when compared the HSDRRS with HPS system that existed prior to Katrina in 2005.
The CED Phase I described borrow pits West Bank Site F in Jefferson Parish and Bazile in Plaquemines Parish as having moderate temporary impacts to middle income African American communities, however these pits were not excavated so these impacts did not occur.

Business and Industry, Employment and Income. The HSDRRS construction activities provided a temporary direct socioeconomic benefit through local spending and employment and will continue to do so through August 2014 when the majority of the HSDRRS construction was be completed. As is shown in appendix H, the award of over $6.5 billion in construction contracts to date, and the expenditure of approximately $14 billion in the region on the HSDRRS through August 2014 provides local and regional construction and material supply businesses opportunities to hire, grow, and create sustainable businesses in the area. Although this is short-term (approximately 8 years) spending on construction projects, these businesses that have benefited from the construction opportunities will likely continue to provide jobs and compete for future construction contracts in the region and nationwide.

In the long-term, providing 100-year level of risk reduction will allow FEMA NFIP certification of the 100-year level of risk reduction, providing an overall economic benefit to the community. No significant adverse impacts on mineral or fisheries production were identified. Forestry or agricultural products were not impacted from floodwall and levee construction. Temporary adverse impacts occurred during construction near areas where there were closures of navigation channels, roads and highways. Additionally, general overall traffic congestion during the HSDRRS construction occurred, affecting adjacent businesses and industry, although these adverse impacts were temporary in nature (no greater than 3 years). Businesses, industries, employment, and income throughout the region were severely impacted from Hurricane Katrina. The 100-year level of risk reduction provides a greater level of safety, ensuring long-term beneficial impacts on the businesses and industries within the project area, which in turn should reflect positively on employment and income in the future.

In Plaquemines Parish, the West Bank Site N borrow site, which was used for HSDRRS construction, potentially caused negligible temporary adverse construction impacts on neighboring communities along LA 23 due to traffic congestion. These traffic impacts caused an increase in noise levels and air emissions near the borrow site area. Also, in Plaquemines Parish, the Myrtle Grove and Tac Carrere borrow sites potentially caused negligible temporary adverse construction impacts on residents in the surrounding areas. None of these surrounding communities were low-income or minority communities; therefore, no Environmental Justice issues occurred because of the borrow areas. However, businesses and industries within adjacent areas potentially suffered these same temporary adverse impacts due to traffic congestion.

Outside of the HSDRRS, within St. Tammany Parish, direct adverse short-term impacts from borrow site activities such as fugitive dust emissions, and increased noise and traffic occurred within 1 mile of the Tammany Holding Corporation borrow site. This HSDRRS borrow action created two borrow areas with a combined area of 388 acres.

The HSDRRS construction activities provided a temporary direct socioeconomic benefit through local spending and employment. As shown in Appendix P, the award of over $11 billion in construction contracts through 2010, and the expenditure of a total $14 billion in the region on the HSDRRS through 2018 provided local and regional construction and material supply businesses opportunities to hire, grow, and create sustainable businesses in the area. Although this short-term (approximately 11 years) spending on construction projects, these businesses that have benefited from the construction contracts in the region and nationwide. Providing 100-year level of risk reduction provides an overall economic benefit to the community.

In addition, some businesses were temporarily adversely impacted due to increased traffic congestion, impeded access, and reduced visibility. In Plaquemines Parish, traffic congestion temporarily affected the revenues of businesses along LA 23 due to customers avoiding the area. The lifting of a levee section at the Belle Chasse Ferry Landing caused some temporary lane closures, which contributed to congestion. The construction of a waterline along Walker Road reduced the visibility of some businesses in the area, potentially affecting their revenues. In addition, the businesses that rely on the Hero Canal for access were adversely impacted by its temporary closure. The Belle Chase Tunnel was temporarily closed in order to construct a T-Wall along the GIWW causing temporary traffic congestion. In Orleans Parish, the temporary closure of the IHNC for the construction of the Seabrook Pass floodgate disrupted business for some of the clients of the Port of New Orleans affecting revenues that accrued to the port. Furthermore, the closure affected the transient boat slip rental at the South Shore, Orleans, and the Pontchartrain Landing Marinas.

Per Capita Personal Income, Community and Regional Growth - Impacts of Hurricane Katrina included loss of life, destruction of homes and businesses, damage and disruption to public facilities and services, high unemployment, loss of income, and disruption and closure of local institutions. As was seen early in the recovery timeline, individuals and even whole neighborhoods and communities were unsure of the decision to return, which caused large decreases in community and regional growth. Although there has been an increase in per capita income, this has been at the expense of the working poor who often were unable to return to the project area. However, an equal reduced risk of flooding for all individuals residing within the HSDRRS is ensured, providing both short-term and long-term beneficial impacts on the project area's per capita personal income and community and regional growth.

Short-term (approximately 8 years) beneficial impacts on community and regional growth resulted from the HSDRRS construction projects. Approximately $6.6 billion was contracted for HSDRRS construction to date (see appendix H). While many of the prime contractors are based outside the Region of Influence (ROI), many have established offices in the region. Impacts also result from the local subcontractors, laborers, equipment leased or purchased, housing, fuel, food, and the many other supplies required to support this massive construction effort. It is unknown whether businesses that have established local offices or moved to the New Orleans area to work on HSDRRS construction projects will remain after August 2014, when the majority of HSDRRS work was estimated to be complete. However, these businesses will have established local skilled labor and qualifications to compete for future contracts both regionally and nationwide.

The USACE, with the assistance of many academic and professional economists and regional scientists, developed the Economic Impact Forecast System (EIFS) to address the economic impacts of planned Federal actions and to measure their significance. As a result of its designed applicability, and in the interest of uniformity, EIFS was used in the CED to forecast the economic impacts of HSDRRS-related construction and to measure their significance. The user defines an economic ROI by identifying the counties/parishes or cities to be analyzed. Once the ROI is defined, the system aggregates the data, calculates multipliers and other variables used in the various models in EIFS and uses the data to forecast impacts.

The inputs into EIFS are key to the development of valid impact forecasts. The following assumptions were used in these forecasts for the CED analyses:

- The ROI includes Jefferson, Orleans, Plaquemines, St. Charles, and St. Bernard parishes
- $14 billion in expenditures in the ROI from September 2005 through the end of 2011
  - $1 billion from September 2005 through December 2006 (Task Force Guardian repairs)
  - $13 billion from March 2007 through December 2011
- “Total” impacts were calculated (rather than “Local”) based on the assumptions that some contractors are based outside the ROI, some workers’ permanent homes are outside the ROI, and some materials/supplies were purchased outside of the ROI.

In addition to benefiting the region by increasing safety, the Federal investments in the HSDRRS played a role in boosting the economy of the Greater New Orleans Metropolitan Area devastated by Hurricane Katrina. The EIFS forecasts the economic impact on the ROI of the $14 billion in expenditures for the HSDRRS. Expenditures were estimated for each year, EIFS impact forecasts were developed for each year, and the impacts were added together to develop the total forecast impacts shown in table 4-57.

Table 4-57: Estimated Regional Economic Impacts: EIFS Forcast Output

Sales Volume – Direct	$13,071,237,100
Sales Volume – Induced	$32,547,384,200
Sales Volume - Total	$45,618,621,000
Income – Direct	$2,293,303,940
Income – Induced	$5,710,326,460
Income – Total	$8,003,631,200
Employment – Direct	58,916
Employment – Induced	146,704
Employment - Total	205,620

Note: Employment Multiplier: 3.49; Income Multiplier: 3.49
Source: Economic Impact Forecast System, USACE

The EIFS forecasts that the $14 billion invested in the HSDRRS had impacts of $45.6 billion on sales in the region. Sales volume is the direct and indirect change in local business activity and sales (total retail and wholesale trade sales, total selected service receipts, and value added by manufacturing). Approximately $13.1 billion of the total is direct sales, the immediate first round of sales generated by project expenditures. The remaining $32.5 billion were sales induced by the initial expenditures. Forecast total income (the total change in regional wages and salaries) resulting from the $14 billion in expenditures was estimated to be approximately $8 billion, while forecast employment (direct and induced) was estimated to be 205,620. Annual inputs into and outputs from the model are presented in appendix P.

In addition to generating the impacts shown in table 4-57, EIFS makes a calculation that allows the user to evaluate the significance of the impacts. This analytical tool, known as the Rational Threshold Value (RTV), reviews historical trends for the designated ROI, assesses the historical fluctuations in sales volume, income, employment, and in some cases population, and provides a basis for assessing whether or not the impacts are outside of normal historical variations. It essentially measures the intensity of the impacts.

The RTVs are shown for each year in appendix P. They are not included in table 4-57 because they are calculated independently by year and a total cannot be calculated for the multi-year time period. For this project, the RTVs show that the expenditures in 2005 and 2006 were not sufficiently large to be outside what might be expected based on historical fluctuations. For the years 2007 through 2011, the RTVs indicate that, except for the income RTV in 2007, the HSDRRS expenditures resulted in substantial positive impacts on the region over and above what would have been expected based on historical fluctuations.

The regional impacts of constructing the HSDRRS was estimated using the Corps' certified Regional Economic System (RECONS).[2] See Appendix P for specific details, methodology, and assumptions for this RECONS model. For the region including the study area, the construction stimulus of $11,957,422,530 has generated 182,553 worker-years of labor, $9,237,425,543 in labor income, $18,767,621,427 in output, and $12,549,863,287 in Gross Regional Product. For the state of Louisiana as a whole, the construction stimulus generated 194,141 worker-years of labor, $9,716,436,624 in labor income, $20,341,170,507 in output, and $13,373,115,470 in Gross Regional Product (see table 3 in Appendix P). The impact area captures about 87% of the direct spending on the project. About 6% of the spending leaks out into other parts of the state of Louisiana. The rest of the nation captures about 6%. The secondary impacts, the combined indirect and induced multiplier effects, account for nearly 44% of the total output, about 34% of jobs, 33% of labor income, and almost 41% of gross regional product in the impact area.

<u>Community Cohesion</u>. As discussed in an earlier section of this evaluation, the impact of Hurricane Katrina to all socioeconomic resources, and in particular to community cohesion, was monumental in its scope and severity, and was evidenced in many instances by the total loss of neighborhood unity. Given the unprecedented scale of community disruption in the aftermath of the storm, both the repair of the pre-existing 'hurricane protection project and the subsequent construction of HSDRRS, contributed immensely to reestablishing community cohesion in the region on a large scale. Indicators of population in-migration and extensive rebuilding activities are were only possible thorough the coalescing and reconnection of patterns of human interaction, communication, organization, and collective sense of identity which defines the essence of community cohesion. Moreover, public awareness and anticipation of high levels of flood risk reduction that was manifested during the HSDRRS construction phase, to a significant extent encouraged and induced business and industrial development, community and regional growth, that are ultimately reflected spatially within the protected area in solidifying and expanding community activity, resilience, and decreasing social vulnerability.

This can be contrasted with the direct and indirect impacts of the physical construction activities associated with HSDRRS. These impacts were discussed in detail with respect to a number of socioeconomic resource areas and found that while these impacts were localized to construction sites, including borrow areas, and in several instance were adverse and severe, the impact on community cohesion was equally short-term, whenever adverse impacts were experienced.

In particular, construction activities associated with HSDRRS in most cases had minor impacts on community cohesion as evidenced through traffic congestion that potentially "divided" a community, or caused temporary or permanent relocation of local institutions or recreational areas used frequently by the public (e.g., Coconut

[2] The Economic Impact Forecast System (EIFS) was used to estimate the impacts of construction of the HSDRRS in Phase I of the CED. RECONS is now the Corps standard for estimating the Regional Economic Development effects of Corps projects and was the model used in Phase II.

Beach). However, no permanent impacts on community cohesion occurred with the implementation of the HSDRRS.

Moreover, the objective of the HSDRRS was to reduce storm surge damage to residences and businesses. Public involvement with the community was part of this process. Many residents and businesses adjacent to the project area were significantly damaged by Hurricanes Katrina and Rita, reducing the potential for community cohesion. As with per capita personal income and community and regional growth, the HSDRRS ensured that all individuals within the 100-year risk reduction system have the same level of risk reduction and, thus, a level of security that allows them to return to their communities.

Appropriate emphasis should be given to the “spatial” aspect of ‘community cohesion’ as integral to its definition. From a socioeconomic perspective, what is critical is not that there are in fact patterns of social interaction and interrelationships present in a community, or that those interactions and interrelationships are either vibrant and convey a sense of collective identity or whether they are loose or strained that are reflective of ongoing destructive social issues or economic recession. The key to understanding community cohesion as a resource area from the perspective of a Federal action is to determine whether that action to a significant degree either physically impairs, interrupts, preserves or enhances those interactions within a defined space. Certain attributes of HSDRRS construction activities unquestionably have adverse direct effects such as the aforementioned traffic congestion, delays and detours, and business interruption since it interferes, within a terrestrial setting, the ability of individuals to effectively engage in the social activities normally associated with community life. Such direct and indirect, adverse or beneficial impacts of HSDRRS construction activities upon community cohesion in this respect frequently originate in other socioeconomic resource areas, such as displacement of population, employment, and transportation. The completion of HSDRRS alleviates the temporary impacts on community cohesion since there is no spatial aspect of the construction activities or the design that interferes in a significant way with the patters of social interaction. As previously mentioned, the completion of HSDRRS ultimately serves to preserve and enhance those social interactions.

<u>Environmental Justice</u>. The USACE undertook the EJ analysis for the HSDRRS actions in accordance with the requirements of EO #12898 and the DoD’s Strategy on Environmental Justice, dated March 24, 1995. The EJ analysis identified low income and minority communities and determined that there are no high and adverse disproportionate impacts to EJ communities as a result of the federal action, the construction of the 66 HSDRRS projects. There were adverse impacts from the construction of the HSRRS to all surrounding communities, including EJ and non EJ neighborhoods. These impacts were temporary in nature occurring during construction activities while providing long-term flood risk reduction benefits to all within the HSDRRS.

To accomplish the EJ analysis, the USACE identified low-income and minority populations within each project area of the 66 IERs, Supplementals and EAs. The project area is defined as that area within 1.0 miles of the construction zone. For a listing of EJ communities by IER, see the EJ appendix, Table 1. When appropriate and as needed, community outreach activities such as EJ stakeholder meetings were held. See Section 6 for information on dates and locations of public meetings.

The EJ Appendix provides a summary of the effects of constructing the HSDRRS actions on EJ communities and identifies and addresses any disproportionately high and adverse human health or environmental effects on minority and low-income populations. The information summarized in this section is taken from the EJ Appendix and ultimately from each of the 66 IERs, supplemental IERs, and EAs and are available for review on https://www.mvn.usace.army.mil/Environmental/NEPA/. The demographic data sources utilized in the EJ analysis is from the U.S. Census. Each IER EJ analysis utilized Census Block Group level statistics.

Public involvement has been a key component of the NEPA Alternative Arrangement process for the USACE. Through the 200 public meetings, over 6,500 site visits and field trips, postings to the www.nolaenvironmental.com website, notices of availability providing an opportunity for the public to comment for all IERs, and focused neighborhood project design meetings, minority and low-income residents in the Greater New Orleans Metropolitan Area who were potentially impacted by HSDRRS construction activities and borrow site excavation had the opportunity to be involved in the HSDRRS planning and design. By incorporating public comments and concerns into all HSDRRS project designs, the USACE has considered the potential for any high and adverse disproportionate impacts on low-income and minority communities with each HSDRRS action, and modified construction implementation plans as necessary.

During the scoping meetings, the comment or question often arose regarding the timing of the HSDRRS work in low-income and minority communities, in relation to other more affluent non-African American communities. In response, the USACE reiterated that the HSDRRS construction work was approached from the standpoint that *ALL* communities within the project area were provided the same 100-year level of risk reduction. The same series of analysis, design, and construction and environmental planning steps were completed prior to the execution of a construction contract for work on all HSDRRS reaches. However, each HSDRRS action had different challenges that could require specific increases in schedule time for one or more of these steps, which could ultimately affect the execution of the construction contract award. In general, at the beginning of the design process it was unknown which, if any, of these steps caused potential delays in the project execution and ultimately the timing of the construction of that particular action. Therefore, although useful to the public and a way to potentially alleviate concerns of residents of minority and low-income communities, exact construction timelines were not provided in the IERs. Public meetings and press releases were used to track progress on individual IERs as environmental compliance, design, and construction moved forward.

There are no permanent high and adverse disproportionate impacts on minority or low-income communities from HSDRRS construction *within* the system levee boundary. Many HSDRRS reaches are within uninhabited areas or overlay existing levee and floodwall alignment ROWs. However, some HSDRRS reaches are adjacent to residences and businesses, and in these reaches, short-term construction impacts, such as noise, dust and transportation, were experienced by all residences and businesses located near the HSDRRS, regardless of race or income level. No disproportionate impacts on low-income or minority communities occurred from HSDRRS construction, because all residences and businesses and were impacted to some extent and are provided an equal level of risk reduction. Further, all floodwalls, floodgates, pump stations, and levees were built adjacent to communities composed of all income levels and races.

A vast majority of the 66 IERs and Supplemental IERs evaluated project modifications within an existing ROW in areas having environmental compliance and in uninhabited areas where there would be no EJ impacts to any community. One IER supplemental of note did cause temporary construction impacts for longer than expected. IERS 11.d, IHNC Seabrook Gate Extended Construction, incurred weather and project delays during construction of the surge protection sector gate in the IHNC at Lake Pontchartrain which lengthened the construction schedule for an additional year. The construction activities, including pile driving and other construction related noise and truck traffic affected communities near the project, particularly the Pontilly and Pontchartrain Park neighborhoods. Meetings with the community residents were held to explain the reasons for the extension and to describe the USACE Best Management Practices which minimize noise from pile driving, dust from transport of materials and road congestion. The impacts due to construction activities, including noise, air quality and traffic were temporary and disproportionate high adverse effects did not occur. The majority of Orleans Parish residents are minority and over 20 percent have incomes below the poverty level. Additionally, the effects of building the HSDRRS were felt by everyone living within the system boundary.

The EJ analyses of the IER and Supplemental IER projects showed that there would be no disproportionate high and adverse impacts to low-income or minority residents living within the hurricane system. More recently completed projects (after November 2010), including PIER 36, LPV Mitigation; PIER 37, WBV Mitigation; EA#496, Outfall Canal Remediation, all did not have a disproportionate impact on an EJ community. IER 33 and IERS 33.a described the Co-Located MRL Levee and Resilient Features projects in Belle Chasse, LA. There were no disproportionate high and adverse effects from the construction of these projects to nearby residents in Belle Chasse. Residents living within block groups around the MRL projects, between LA Highway 23 and the Mississippi River, did not meet the criteria for being a minority or low-income community.

Many borrow sites located *outside* of the HSDRRS are in undeveloped areas, and excavation of material in those borrow sites had no disproportionate impacts on minority or low-income communities. Refer to the EJ Appendix, Tables 2 and 3, for information on communities near borrow sites and related impacts. However, some borrow sites proximate to residential neighborhoods (within a 1-mile radius), but *outside* of the HSDRRS boundaries (and therefore, not receiving the risk reduction benefits of the HSDRRS, but experiencing the temporary construction impacts) had the potential for short-term noise, air quality, and traffic impacts on nearby residences, and in some locations, these temporary impacts could only be experienced by minority or low-income communities. No permanent disproportionate impacts occurred on minority or low-income communities from any borrow site excavation, because noise and air emissions and transportation impacts ceased at the end of the use of the borrow site.

4.3.14.2.2 <u>HSDRRS 2057 Impacts</u>

The future levee lifts would cause temporary and sporadic construction impacts on residents and businesses, which would affect the socioeconomic resources and low-income and minority communities in a manner similar to the original levee construction for the HSDRRS improvements. Noise, air quality, and traffic impacts would potentially occur for citizens near these levee reaches. Future construction footprints could be greater than the HSDRRS 2011 levee footprints, and potentially require additional ROW acquisition. Should additional ROW be necessary, then any property acquisitions would have limited impacts on property tax revenues. However, maintaining the earthen levees at the 100-year risk reduction level would continue to provide a benefit to the region's residents, businesses, and industries within the project area, which would in turn reflect positively on employment and income due to a reduction in storm-damaged properties from storm surges and hurricane flood events. No adverse long-term socioeconomic impacts would occur from HSDRRS 2057 construction.

The future levee lifts currently would require excavation of existing borrow and new borrow sites which will require new NEPA documentation. Prior to any new borrow sites being developed, the USACE would fully investigate the proposed borrow area's setting and any impacts on socioeconomic resources, including the potential to disproportionately impact low-income and minority communities near any borrow site. In addition, the USACE would be required to follow any specific parish ordinances (e.g., Jefferson Parish) for any borrow sites, which could further reduce impacts on low-income and minority communities or socioeconomic resources in the borrow project excavation areas. However, temporary impacts on noise, air quality, and traffic impacts would potentially occur to citizens residing near these borrow sites. Additionally, indirect impacts from new borrow sites could include reductions in property values in the vicinity and indirectly lower tax revenues for the parish where the borrow site would be located.

Future expenditures for levee lifts and HSDRRS maintenance activities would provide an economic benefit to the region. These expenditures are not known at this time but given the volume of material needed for future levee lifts, and the scale of the structural components requiring periodic testing and maintenance, these expenditures in the community would be substantial.

Cumulative Impacts

The HSDRRS construction and associated excavation of borrow contributed directly and indirectly to short-term cumulative impacts on the socioeconomic resources throughout the project area during construction. The HSDRRS construction and excavation of borrow did not cause disproportionate cumulative impacts on low-income and minority communities within the project area. All citizens, regardless of race, income level or age, experienced short-term cumulative impacts during construction due to heightened noise levels, air emissions, and traffic congestion. Lowering flood risk to the Greater New Orleans Metropolitan Area and maintaining that reduced risk of flooding in the future would cumulatively cause long-term economic and population growth in the region and, thus, would lead to cumulative beneficial impacts on the region's businesses and industries, which would in turn reflect positively on employment and income in the HSDRRS area. Cumulatively, the expenditures in the region for construction, maintenance, and future levee lifts have provided billions of dollars to the economy of the region since Hurricane Katrina. Although this can never replace the value of lost property, productivity, and lives, the expenditures are a significant beneficial cumulative impact of the HSDRRS. No long-term adverse cumulative socioeconomic impacts would occur from HSDRRS construction and borrow site excavation.

Present and future actions by the USACE and other local, state, and Federal agencies would contribute to an overall long-term cumulative benefit to socioeconomic resources, as many projects in the area are tied directly to both regional recovery projects and projects to enhance flood risk reduction, or contribute to wetlands and coastal restoration. Storm damage reconstruction, redevelopment, coastal and wetlands restoration, and flood risk reduction projects all benefit socio-economic resources and EJ communities over the long-term. In the short-term, other regional projects can create adverse impacts to businesses and communities from construction activities and could cause traffic congestion and construction noise and air quality issues. For a more detailed assessment of the cumulative socio-economic and EJ impacts of present and future regional actions, see the EJ Appendix.

Redevelopment Projects

Rebuilding schools, hospitals and clinics, and fire and police protection facilities in the hurricane-affected areas is having a positive effect on overall socioeconomic resources such as increased housing values and population increases and would provide a better business climate within the project area. These same reconstruction projects would also enhance community cohesion and result in overall positive socioeconomic benefits to all within the system, including minority and low-income communities. Additional short-term benefits on community and regional growth would result as local, state, Federal agencies and non-profits in the area spend money in the region on storm damage reconstruction. The overall economic benefit from these projects, when combined with the $14 billion spent on the HSDRRS, would result in long-term beneficial impacts in the region in terms of jobs, materials and supplies, and other expenditures.

Coastal and wetlands projects

Coastal and wetland projects including marsh restoration projects, could create positive impacts for the seafood industry and create more job opportunities within the project area and region. Additionally, for those low-income populations that practice subsistence fishing, the improvement in aquatic habitat would have indirect beneficial impacts on minority and low-income communities.

Flood risk reduction projects

Could contribute to additional temporary adverse impacts on residents and businesses from construction activities. Flood risk reduction projects also create socioeconomic benefits in the region due to increased jobs, and spending on supplies and materials in the area would offset any short-term impacts on low-income and minority communities in the project area.

Finally, there would be beneficial effects on jobs, and material and equipment expenditures in the project area and region from large transportation projects. Additionally, transportation projects that bisect neighborhoods, such as the IHNC Lock Project, can adversely impact community cohesion. However, all Federally funded projects are required to evaluate the socioeconomic impacts, including evaluating Environmental Justice issues, and would seek to avoid disproportionate impacts or would mitigate the impacts. Alternatively, regional transportation projects would aid in reducing traffic congestion and provide a better quality of life for working commuters, which is a beneficial cumulative impact on residents of the region, regardless of race or economic status.

4.2.17.2.1 Summary of All Cumulative Impacts

Cumulatively, the disruption of waterways from construction activities, the changes in commercial and recreational fishing activities and previous closures of water bodies in the region from the BP oil spill, and temporary closures of waterways from bridge construction and lock replacement projects would cause direct adverse impacts on industries that rely heavily on barge traffic and on commercial fisheries. Large construction projects have short-term socioeconomic impacts regionally on residents and businesses from increased noise, dust, and traffic congestion. Periodic lane and road closures that delay and idle traffic have indirect cumulative economic adverse impacts due to time lost from other economic-generating activities. All of these projects have the potential to disproportionately impact low-income and minority communities. However, although there would be adverse cumulative impacts on socioeconomic resources within the project area, most of these impacts would be short-term and occur only during ongoing construction activities of the HSDRRS and other regional projects.

Many Federal agencies (e.g., DoD, FEMA, HUD) have authorized spending in the hurricane-affected areas. Short-term and long-term benefits on community and regional growth would result as local, state, and Federal agencies and non-profits in the region continue to spend money in the region on storm damage reconstruction, redevelopment, coastal and wetlands restoration, and other flood risk reduction projects. These tens of billions of dollars of investments all have an economic multiplier effect which, when combined with the $14 billion spent on the HSDRRS, results in long-term beneficial impacts in the region in jobs, sales of materials and supplies, housing values, and other expenditures. Additionally, the greater level of risk reduction provided by the HSDRRS and other risk reduction projects regionally would cumulatively improve economic conditions in the long-term through reduced insurance costs and greater investment. Thus, the long-term regional cumulative impacts on socioeconomic resources would be predominantly beneficial and are considered by the majority in the region and the Nation as essential.

4.2.18 HAZARDOUS, TOXIC AND RADIOLOGICAL WASTE (HTRW)

4.2.18.1 AFFECTED ENVIRONMENT

Methodology. A HTRW Investigation was completed for each HSDRRS project area by using the industry standard for HTRW Investigations: American Society for Testing and Materials (ASTM), E1527-05 Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment (ESA) Process. The main objective of the Phase I ESA was to document any Recognized Environmental Conditions (RECs) in the work area. The term Recognized Environmental Conditions means the presence or likely presence of any hazardous substances or petroleum products in, on, or at a property: (1) due to any release to the environment; (2) under conditions indicative of a release to the environment; or (3) under conditions that pose a material threat of a future release to the environment. De minimis conditions are not RECs (ASTM E1527-05).

When a REC could not be avoided due to specific construction requirements or in the event of an unplanned discovery of HTRW materials during construction, construction work that could affect the contaminated materials was stopped. At that time, it was determined whether local, state, or Federal coordination was required and the USACE either further investigated the REC to characterize the nature and extent of the contamination and determine the appropriate resolution, or took actions to avoid any possible contaminants.

While investigating potential borrow sites, a preliminary site approval was first completed, followed by a site visit. The area was visually inspected for the presence of obvious HTRW issues. If no HTRW concerns were observed, the area was cleared to proceed with geotechnical borings to identify soil characteristics; a Phase I ESA was completed to determine if any RECs existed. According to the ASTM standard, a Phase I ESA is presumed valid for 6 months following completion. Therefore, if the Phase I ESA was older than 6 months, an addendum or new Phase I ESA conducted to update the original Phase I ESA, prior to borrow excavation.

Existing Conditions. Construction on applicable levee and alignment reaches were investigated by a Phase I ESA. In many cases a new Phase I ESA was performed prior to initiation of construction due to the time lapse between when the initial Phase I was completed and construction was initiated. Tables 4-58 outlines each environmental document for flood risk reduction, borrow and mitigation by sub-basin/parish/county and whether RECs were discovered or not. The documents are available on the CEMVN

Website: https://www.mvn.usace.army.mil/Missions/Environmental/NEPA-Compliance-Documents/HSDRRS-Projects/

Table 4-58: IERs and REC discovered by Sub-basin, Parish and County

IERs	PROJECT TITLE	SUB-BASIN/PARISH/COUNTY	RECs
FLOOD RISK REDUCTION			
IER-1	Labranche Wetlands Levee	St. Charles Sub-basin; St. Charles Parish	Yes
IERS-1.b	Labranche Wetlands Levee (LPV 04.2B Access Road and Ditch Relocation)	St. Charles Sub-basin; St. Charles Parish	No
IER-2	LPV, West Return Flood Wall	Jefferson & St. Charles Parish	Yes
IERS- 2.a	LPV, West Return Flood Wall	Jefferson & St. Charles Parish	No
IER-3	LPV, Lakefront Levee	Jefferson East Bank Sub-Basin Jefferson Parish	No
IERS-3.a	Jefferson East Bank	Jefferson East Bank Sub-Basin Jefferson Parish	No
IER-4	New Orleans Lakefront Levee	Orleans Parish, Louisiana	No
IER-5	Permanent protection system for the outfall canals project on 17th St, Orleans Ave, and London Ave Canals	Orleans East Bank Sub-basin Jefferson Parish & Orleans Parish	Yes
IERS-5.a	Expanded ROW for the permanent protection system for the outfall canals project on 17th street, Orleans Ave, and London Ave Canals	Orleans East Bank Sub-basin Jefferson & Orleans Parish	Yes
IER-6	Lake Pontchartrain and Vicinity, New Orleans East Citrus Lakefront Levee	Orleans Parish	No
IERS-6	LPV, East Citrus Lakefront Levee	Orleans Parish	No
IER-7	LPV, New Orleans East Lakefront to Michoud Canal	Orleans Parish	Yes
IERS-7	LPV, New Orleans East Lakefront to Michoud Canal	Orleans Parish	No (except for LPV 109)
IERS- 8, 9, 10a	LPV, Chalmette Loop Levee and Caernarvon Floodwall	Orleans Parish & St. Bernard Parish	No
IER-8	Bayou Bienvenue & Bayou Dupre Control Structures	St. Bernard Parish	No
IER-9	Caernarvon Floodwall	Chalmette Loop Sub-basin St. Bernard Parish	N0
IER-10	Chalmette Loop Levee	Chalmette Loop Sub-basin St. Bernard Parish	No
IER-11	Improved Protection on the Inner Harbor Navigational Canal Protection	New Orleans East Sub-basin Orleans Parish & St. Bernard Parish	Yes
IER-11 Tier 2	Tier 2 Pontchartrain Improved Protection on the IHNC	New Orleans East Sub-basin Orleans Parish & St. Bernard Parish	Yes
IER-11 Tier 2	Tier 2 Borgne Improved Protection on the IHNC	*New Orleans East Sub-basin* Orleans Parish & St. Bernard Parish	Yes
IER-12	GIWW, Harvey, and Algiers Levees	Gretna Algiers Sub-basin Jefferson, Orleans & Plaquemines Parish	Yes
IERS-12.a	GIWW, Harvey and Algiers Levees and Floodwalls	Gretna Algiers Sub-basin Jefferson, Orleans & Plaquemines Parish	No
SEA# 581	Jean Lafitte National Historical Park and Preserve Augmentation Features	Jefferson Parish	No

IER-13	Hero Canal Levee and Eastern Tie-In	Belle Chasse Sub-basin Plaquemines Parish	Yes
IERS-13a	Temporary Closure of Hero Canal	Belle Chasse Sub-basin Plaquemines Parish	No
IER-14	Westwego to Harvey Levee	Harvey Westwego Sub-basin Jefferson Parish	Yes
IERS-14a	Westwego to Harvey Levee	Harvey Westwego Sub-basin Jefferson Parish	Yes
IER-15	Lake Cataouatche Levee	Jefferson Parish	No
IERS-15a	Lake Cataouatche Levee	Jefferson Parish	No
IER-16	Western Terminus Levee	Jefferson & St. Charles Parish	No
IERS-16a	Western Terminus Levee	Lake Cataouatche Sub-basin Jefferson & St. Charles Parishes	No
IER-17	Company Canal Floodwall	Jefferson Parish	No
IER-27	Outfall Canal Remediation on the 17th St, Orleans Ave and London Ave Canals	Orleans East Bank Sub-basin Jefferson & Orleans Parishes	Yes
IERS-27.a	Outfall Canal Remediation on the 17th St, Orleans Ave, and London Ave Canals	Jefferson & Orleans Parishes	NA
IER-33	WBV AND Mississippi River Levees, Co-Located Levees	Orleans & Plaquemines Parishes	Yes
BORROW			
IER-18	GF Borrow Material	Jefferson, Orleans, Plaquemines, St. Charles & St. Bernard Parish	Yes
IER -19	Pre-Approved CF Borrow Material	Iberville, Jefferson, Orleans, Plaquemines & St. Bernard Parishes & Hancock County, MS	No
IER-22	GF Borrow Material # 2	Jefferson & Plaquemines Parishes & Hancock County, MS	Yes
IER-23	Pre-Approved CF Borrow Material # 2	Plaquemines, St. Bernard, St. Charles Parishes & Hancock County, MS	No
IER-25	GF Borrow Material # 3	Jefferson, Orleans & Plaquemines Parishes	Yes
IER-25.a	GF Borrow Material # 3	Jefferson, Orleans & Plaquemines Parishes	Yes
IER-26	Pre-Approved CF Borrow Material # 3	Jefferson, Plaquemines & St. John the Baptist Parishes and Hancock County, MS	No
IER-28	GF Borrow Material # 4	Jefferson, Plaquemines, & St. Bernard Parishes	Yes
IER-29	CF Borrow Material # 4	Orleans, St. John the Baptist Parish & St. Tammany Parishes	No
IER-30	CF Borrow Material # 5	St. Bernard Parish & St. James Parish & Hancock County, MS	No
IER-31	CF Borrow Material # 7	East Baton Rouge, Jefferson, Lafourche, Plaquemines, St. Bernard, St. Tammany Parishes & Hancock County, MS	Yes
IER-32	CF Borrow Material # 6	Ascension, Plaquemines & St. Charles Parishes	Yes
IER-35	CF Borrow Material # 8	Jefferson, St. John the Baptist & Terrebonne Parishes	Yes
MITIGATION			

PIER-36	LPV HSDRRS Mitigation	Orleans, Plaquemines, St. Bernard, St. Charles, St John the Baptist, & St. Tammany Parishes	No
PIER-36 SIER 1	Bayou Sauvage, Turtle Bayou & New Zydeco Ridge Restoration Project	St. Tammany & Orleans Parishes	No
PIER-37	WBV HSDRRS Mitigation	Jefferson, Lafourche, Plaquemines, & St. Charles Parishes	Yes
SPIER-37a	WBV Storm damage and Risk Reduction Mitigation	Jefferson Parish	Yes
EA #546 SPIER 36 S 1	EA Supplement PIER 36 Supplement 1 Bayou Sauvage, Turtle Bayou & New Zydeco Ridge	St. Tammany and Orleans	No
SEA #548 Tier 1 of PIER #37 NPS Joint EA	WBV Lake Cataouatche Borrow Area Expansion and Access Features, JLNHPP Mitigation Features	Jefferson	No
SEA #572	EA Supplement WBV HSDRRS BLH-wet and swamp mitigation Lafourche Parish, Louisiana	Lafourche	Yes

Flood Risk Reduction Projects by Parish and Sub-basin

HSDRRS reaches detailed in the IERs and Supplements that had HTRW issues are briefly discussed below.

St. Charles Sub-basin *(IER #1, IERS 1.a and 1.b) -* It was found that this site had the presence of dumped materials and abandoned vehicles, an oil or gas refining plant and pipeline adjacent to the project area. The records review revealed one site (Motiva Enterprises, Norco Refinery) near the Labranche Wetlands Levee project that could have impacted the project area, due to the site history and proximity. This refinery has been in operation since 1916 and has contributed to sediment contamination in Bayou Trepagnier. LDEQ and Motiva Enterprises have reached a cooperative agreement to remediate the sediment contamination in the portion of Bayou Trepagnier impacted by the project. This cleanup process was not complete before construction commenced. Therefore, a no-work zone was established for this area, and no work in the future will be conducted within that designated "no work" area until the site remediation process is complete.

Jefferson East Bank Sub-basin. *LPV, West Return Flood Wall (IER #2, IERS 2.a).* RECs were documented within this area. Site reconnaissance indicated an abandoned drum on the unprotected (canal) side of the levee. On the protected side of levee, there was evidence of dumping, old tires, and abandoned vehicles. CEMVN avoided and did not encounter any HTRW during construction.

LPV, Lakefront Levee (IER #3). RECs that were noted were avoided or removed when possible.

Gretna-Algiers Sub-basin (IER #12, IERS #12.a. IERS 12/13) (also within Orleans Parish)

Numerous RECs were identified, with most of the RECs located along the Harvey and Algiers Canals were in areas of commercial industry. The Harvey Canal and Algiers Canal areas have been heavily industrialized since World War II. There is widespread low-level contamination of soil throughout the area, and it is often better not to disturb such material, as it poses less risk when left in place than when disturbed. For this reason, the Algiers Canal sediment was tested for contamination in the areas for dredging, as well as other sample sites and a dredged material and disposal plan for Algiers Canal was completed. An oil well was identified in the central portion of the site resulting in a "No work Area".

Harvey Westwego Sub-basin (IER #14 and IERS #14.a) - Numerous RECs were document, but none were considered significant and all were avoided.

Lake Cataouatche Sub-basin (IER #16 and IERS #16.a) - RECs were identified in the expanded project footprint involving oil and gas utilities that were relocated. The RECs included pipelines belonging to United Gas, Shell Pipeline Company, LGS Gas, Evangeline Gas, and Gulf South, and other utilities, such as a fiber-optic cable laid by Qwest Communications. There was no evidence of HTRW problems associated with these pipelines, but due to the nature of these RECs, the potential existed for problems to arise. No further study of HTRW was conducted for the relocation areas associated with the HSDRRS Western Tie-In project. No problems arose during construction.

Orleans East Bank Sub-Basin. LPV Outfall Canal Closure Structures, 17th St, Orleans Ave. and London Ave. Canal (IER #5, IERS 5a and IER #27, IERS 27a). Projects included actions around the 17th Street, Orleans Avenue, and London Avenue canals within both Jefferson and Orleans Parishes.

The Phase I ESA evaluated the Sites of Concern (SOCs) within 0.125 mile of the centerline of the 17th Street, Orleans Avenue, and London Avenue canals and identified the findings of the previous investigation as the RECs for the canals. The three outfall canals were inspected to assess current conditions and to determine if any changes had occurred since the November 2006 Phase I ESAs. Initial site investigations were prepared for additional project features. The project corridors were inspected to assess current conditions, and the investigation included visual inspection and review of environmental data. Relevant and significant findings and recommendations indicate that the Orleans Avenue and London Avenue Canals records reported some of the commercial facilities in the southern portion of the corridors along the drainage canals have had environmental compliance issues. A LUST facility requiring no further action was also identified adjacent to the sites.

An ASTM E 1903-97 Phase II ESA was completed for each of the three permanent pump station locations on the outfall canals in March 2009. This Limited Phase II Assessment included sediment sampling of the proposed permanent pump station locations for each of the three outfall canals. Contaminants of concern (COC) within the canal sediments were compared with the State of Louisiana RECAP Standards for evaluation of the risk to human health and the environment. While the RECAP Screening Standards are not directly applicable to the sediment matrix, the standards provide a good indication of the level of contamination and associated risk of chemical concentrations in the sediments. COC concentrations of low risk were determined to exist in the sediments in each of the canals. Reference the appendix for further details.

<u>New Orleans East Sub-basin.</u> *LPV, Improved Protection on the IHNC (IERs 11 Tier 1, 2, 11.d Pontchartrain, Tier 2, 11.b, 11.c Borgne).* For IER #11 Tier 1, numerous Phase I ESAs were prepared for the USACE, and a Phase II ESA was conducted to further analyze suspected contaminants. The Tier 2 IERs document that further HTRW investigations were performed to describe the conditions within the selected location ranges and to aid in avoidance of RECs and hazardous waste during the USACE construction activities.

The Phase I ESAs documented RECs for the IER #11 Tier 2 Pontchartrain action areas, and the Phase II ESAs were conducted to further analyze suspected contaminants. Relevant and significant findings and recommendations are available in the HTRW appendix.

LPV, New Orleans East Citrus Lakefront Levee (IER #6). ASTM E 1527-05 RECs were documented within the LPV 105 and 106 reaches within 1,000 feet of the levee. No RECs were observed within the footprint. There were no RECs discovered within the LPV-107 reach.

LPV, New Orleans East Lakefront to Michoud Canal (IER #7). A Phase I ESA was completed, and RECs were documented. A site reconnaissance revealed no new additional HTRW concerns. RECs discovered within LPV 109 reach were within 1000 feet of the levee. Four underground storage tanks at Schaffer's Grocery were documented as "active" as of 23 March 2001. RECs were also identified within 1000-ft of the levee. Former BOC Gases facility (metals, petroleum products and potentially solvents), Canal Pump House No. 1 (known throughout this document as Pump Station No. 15) located approximately midway along the northeast-trending stretch of the levee (petroleum products and potentially solvents), and one abandoned portable toilet (human wastes). There were no RECs identified within or near the LPV 110 reach.

WBV and Mississippi River Levees Co-Located Levees (IER #33, IERS 33a) (Also located in Plaquemines Parish). Eleven RECs were found in the vicinity of the project area.
One well, Serial Number 98293, plugged and abandoned in 1963, is on the property, within the Soil Mixing work area. A No-Excavation Zone of 300-foot radius was designated in the immediate vicinity of well # 98293. Surface activities, such as soil mixing, did not affect nor was it affected by the plugged oil well. No other RECs were found.

<u>Chalmette Loop Sub-basin</u>. *LPV, Caernarvon Floodwall (IER #9)* – Seven RECs were documented. A Phase II ESA was completed to evaluate the nature and extent of some

of the RECs identified in the Phase I ESA. Chemical data were collected near the RECs, including 14 soil samples and two sediment samples. Evaluation of the data indicated that release of contaminants had occurred on the property; however, levels of most detected contaminants were low. Contaminant concentrations exceeding the LDEQ RECAP guidelines for non-industrial screening standards were limited to three locations, consistent with industrial activities within the alternative alignments. Based on the data collected during the 2008 report, RECs identified were either avoided or removed prior to project construction. No new RECs were noted and no additional HTRW impacts were identified.

LPV, Chalmette Loop Levee (IER #10, IERS #8, 9, 10a). No RECs were identified or areas of concern for the project areas. The action covered by IERS 8,9,10.a posed no additional impacts from HTRW above those described in IER 8, IER 9, and IER 10 therefore an additional HTRW Phase I ESA was not performed.

Belle Chasse Sub-basin. *Hero Canal Levee and Eastern Terminus (IER13, IERS #13a, IERS 12/13).* Five RECs were found north of the Hero Canal in the vicinity of the project area. The most notable being an active landfill, with the potential for landfill materials to exist within the alternative to the chosen levee/floodwall alignment. A Phase II ESA was conducted in the vicinity of the landfill area to investigate HSDRRS alternative impacts. Due to CEMVN avoiding any potential RECs and based on the Phase I ESA no direct impacts occurred with this project.

Harvey Westwego Sub-basin. *Westwego to Harvey Levee (IER 14, IERS 14.a).* Several RECs were identified; however, none of them were significant. An abandoned well was identified within the footprint of the levee right of way. The subsequent field inspection did not reveal any HTRW associated with the well.
Lake Cataouatche Sub-basin. Lake Cataouatche Levee (IER 15, IERS 15.a), Western Terminus Levee (IER 16, IERS 16.a) and Company Canal Floodwall (IER 17). Several RECs were identified but none were within the project footprint.

Mitigation

There were no RECs identified within or near any of the mitigation sites.

Borrow IERs .

During investigations of potential borrow sites, a preliminary site approval was completed, and a Phase I ESA was performed at the borrow site. In many cases, no RECs were found within the ROW, while in other cases, RECs were identified on nearby or adjacent properties. Table 4-59 denotes the borrow IERs sorted by parish/county in which there were no RECs associated with the HSDRRS borrow project footprint or the sampling result summaries when further investigation was warranted. A discussion follows the table for all HSDRRS borrow sites with HTRW issues in or near the site footprint.

Table 4-59: Borrow Site REC investigation and Sampling Summaries

IER #	Investigation/Date	Findings	Discussion
Orleans Parish			
18	Phase I ESA May 30, 2007	No RECs	Maynard borrow area
19	Phase I ESA February 19, 2007	No RECs	Eastover site borrow area
25, 25.a	Phase I ESA May 9, 2008 Phase I ESA May 28, 2008 Phase I ESA Update May 2011	One REC and One Historical REC noted One REC and One Historical REC noted No RECs	Stumpf Borrow Site and Stumpf Phase II Borrow Site
29	Phase I ESA January 2008	No RECs	Eastover Phase II borrow area
Jefferson Parish			
18	Phase I ESA June 22, 2007	Three RECs within project area.	Churchill Farms Pit A borrow area - Three RECs: a stockpile of nitromethane, ASTs for diesel fuel, and an old oil well site. The REC locations were mapped, and areas avoided.
19	Phase I ESA August 10, 2006/ September 13, 2007	No RECs	ESAs for River Birch Phase 1 and 2 sites
26	Phase I ESA August 9, 2007 Phase I ESA Update May 13, 2009	No RECs	South Kenner Road site
31	Phase I ESA March 2009	No RECs	River Birch Landfill Expansion property
35	Phase I ESA January 30, 2008 Phase I ESA Update April 25, 2011	Potential RECs on site No RECs	Assumption Land Company Borrow Site Waggaman, Jefferson Parish, LA
St. Bernard Parish			
23	Phase I ESA July – September 2007	No RECs	Phase I ESAs for 1025 Florissant Hwy. site completed on September 11, 2007 and the Acosta site on July 04, 2007
30	Phase I ESA July 2008	No RECs	Contreras Dirt property
31	Phase I ESA July 29, 2009	No RECs	Acosta 2 site borrow area
Parishes/County Outside of HSDRRS Project Area			
St. Charles Parish			
18	Phase I ESA July 23, 2007	Three RECs were avoided.	Bonnet Carré Spillway borrow site
23	Phase I ESA July 23, 2007	No RECs	3C Riverside borrow site

IER #	Investigation/Date	Findings	Discussion
32	Phase I ESA July 24, 2008	No RECs	3C Riverside Phase 3 borrow site
St. John the Baptist Parish			
35	Phase I ESA December 17, 2010	No RECs	Robert Brothers Farms borrow site Wallace, St. John the Baptist Parish
35	Phase I ESA Update April 25, 2011	No RECs	Robert Brothers Farms borrow site Wallace, St. John the Baptist Parish
Plaquemines Parish			
22	Phase I ESA January 29, 2008	Several concerns within project area were avoided.	Westbank N borrow site
31	Phase II ESA April 7, 2010	Sampling Results <Minimum Detection Limits or <RECAP Industrial Limits	Idlewild Stage 2: soil samples indicated tested parameters that were either below the laboratory minimum detection limits or below the respective LDEQ RECAP Industrial Soil standards for all contaminants, except for arsenic.
32	Phase I ESA October 29, 2008 Phase II ESA October 30, 2009 Phase I ESA February 3 and 13, 2009	Two RECs noted. No RECs	Idlewild Stage 1: soil and groundwater samples collected during Phase II ESA. The sample results were below the laboratory minimum detection limits or below the respective LDEQ RECAP Industrial Groundwater standards. Citrus Lands and Plaquemines Dirt & Clay borrow sites
St. James Parish			
30	Phase I ESA July 15, 2008	No RECs	Big Shake borrow area
St. John the Baptist Parish			
26	Phase I ESA January 2008	No RECs	Willow Bend site borrow area
29	Phase I ESA February 12, 2009	No RECs	Willow Bend Phase II borrow site
St. Tammany Parish			
29	Phase I ESA July 23, 2008	No RECs	Tammany Holding borrow area
Terrebonne Parish			
35	Phase I ESA July 13, 2010	No RECs	Houma Excavation Borrow Site Montegut, Terrebonne Parish, LA
Hancock County			
19	Phase I ESA September 15, 2006	No RECs	Pearlington Dirt Phase 1 ESA was revisited prior to use.
23	Phase I ESA November 9, 2007	No RECs	Pearlington Dirt Phase 2
31	Phase I ESA March 2008 Addendum September 2009	No RECs	Port Bienville site Phase I ESA was completed in March 2008 and an addendum done in September 2009.

Orleans Parish. The Phase I ESA for the Maynard site was completed on June 4, 2007. There were no RECs within the borrow area itself, but soil and groundwater sampling were recommended on the western portion because of concerns regarding the Fletrich Transportation Systems facility formerly located near the site. No sampling was conducted since the RECs would not be impacted by construction activities.
The Phase I ESA for the proposed Stumpf Phase I borrow site was completed on May 9, 2008. One REC and one historical REC were noted. On May 29, 2008 a Phase I ESA was completed for the Stumpf Phase II borrow site. One REC and one historical REC were noted. In May 2011, an update memorandum for the Stumpf site was produced by CEMVN in regard to HTRW. No RECs that would affect project personnel or the public were found. No further investigation of HTRW is recommended.

Jefferson Parish. The Phase I ESA for Churchill Farms Pit A was completed on June 22, 2007. Three RECs were found: a stockpile of nitromethane, ASTs for diesel fuel, and an old oil well site.

St. Bernard Parish. The Phase I ESA for Churchill Farms Pit A was completed on June 22, 2007. Three RECs were found: a stockpile of nitromethane, ASTs for diesel fuel, and an old oil well site.

Plaquemines Parish. The Phase I ESA for Westbank N was completed on January 29, 2008. Several concerns were noted from past drilling operations in the central portion of the site, stained soils observed underneath a backhoe located in the northeastern portion of the site, a downed pole-mounted transformer located in the northeastern portion of the site, several 55-gallon drums and 5-gallon containers observed scattered across the north-central portion of the site (no stains, odors, or dead vegetation were observed around these containers), and an approximately 100-gallon diesel AST observed in the north-central portion of the site. The locations of these RECs were mapped and were avoided during excavation. Additional concerns were noted from the reported application of herbicide for at least 10 years over the entire site by the current occupant, and from debris piles in the north-central portion of the site. Concerns were also noted from the reported disposal of incinerator ash on the eastern adjoining property and from the former Belle Chasse Landfill facility located approximately 0.25 mile east of the site. The potential off-site RECs are outside of the proposed construction footprint and would not be impacted by excavation activities.

A Phase I ESA was prepared for the Idlewild State 1 contractor-furnished borrow area on October 29, 2008. Two environmental concerns were found. The first concern was an old petroleum well located near the northwest corner of the Stage 2 site, which is not part of the Stage 1 site. Soil sampling was conducted in the vicinity of the well if material near the well is to be used for borrow, and soil sampling for pesticides and high levels of metals within the Stage 1 site was also recommended. Additional Phase II investigation and testing at the Idlewild Stage 1 site was performed on October 30,

2009. Laboratory analysis of 35 shallow groundwater samples and seven soil samples collected on October 27, 2009, indicated that tested parameters were either below the laboratory minimum detection limits or below the respective LDEQ RECAP Industrial Groundwater standards.

Based on the Phase II ESA on April 7, 2010_for Idlewild Stage 2 CF borrow site, soil samples taken indicated test parameters were either below the laboratory minimum detection limits or below the respective LDEQ RECAP Industrial Soil standards for all contaminants, except for arsenic. This site was avoided for use as borrow material.

St. Charles Parish. The Phase I ESA for Bonnet Carré North site was completed on July 23, 2007. Three possible RECs were found near the area. Seven pressurized pipelines are in the area for petroleum, butadiene, ethylene, propane, propylene, and butane. Several plugged and abandoned oil wells are located on the Spillway property. However, the locations of these areas were mapped and avoided during borrow activities. Concern was noted regarding the possible presence of contaminants in the soil within the floodway because water from the Mississippi River flows over the site during spillway openings, potentially depositing contaminants within the area.

A Phase I ESA was completed on January 26, 1999, for the 3C Riverside property. The report concluded that previous RECs on the property have been cleaned and removed. No current RECs were found. A second Phase I ESA for a portion of the property as a borrow source was evaluated in a Phase I ESA dated July 23, 2007, and no RECs were found. A third Phase I ESA for the 3C Riverside Phase III borrow area was completed on July 24, 2008, and no RECs were found.

4.2.18.2 ENVIRONMENTAL CONSEQUENCES

4.2.18.2.1 <u>HSDRRS Construction Impacts</u>

Some Phase I ESAs did identify RECs within the ROW, on adjacent or adjoining properties, and outside, but near, the project areas. All these RECs were easily remediated or avoided and did not affect the HSDRRS, personnel working on the project, nor the public. RECs identified adjacent to the ROW were often in areas with litter, trash, white goods (e.g., appliances), or discarded vehicles. Contaminant sources were presumed to include historic industrial use of the property, anthropogenic sources, and the movement of contaminants by Hurricanes Rita and Katrina.

When Phase II ESAs were performed, soils, groundwater, or surface water were analyzed for COCs and contaminate levels and compared to LDEQ RECAP Standards to determine their significance and risk to the project. RECAP addresses risks to human health and the environment posed by the release of chemical constituents. RECAP screening standards represent contaminant concentrations within a specific environmental medium that are protective of human health and the environment (LDEQ 2003).

Because RECs were avoided no impacts from HTRW occurred. When a REC was not avoided, the non-Federal sponsor handled the remediation. The potential to create

HTRW materials during the construction process is always present because of storage, fueling, and lubrication of equipment and motor vehicles associated with construction, however, a Spill Prevention Control and Counter Measures (SPCC) Plan is followed as part of standard plans and specifications and materials such as fuel, lubricants, and oil were managed and stored in accordance with all Federal, state, and local laws and regulations. Details of these specific actions following the SPCC plan are described below. Other mitigation measures followed are discussed in section 5.0.

Specific Risk Reduction Construction Impacts

Areas in which special consideration were determined are presented below as applicable. Any contaminated soils excavated were disposed of according to applicable Federal and state laws and regulations. Other than those described in the CED Phase I, no additional HTRW impacts were noted because they were either avoided or material was disposed of properly.

St. Charles. Sediment contamination in the portion of Bayou Trepagnier that was potentially impacted by the nearby project had the potential to cause negative impacts on the project and personnel. A no-work zone was designated for this area until the site remediation process was completed. The remediation process agreed upon by LDEQ and Motiva Enterprises was completed in March 2012. No other RECs within the project footprint were located and, based on the avoidance of the Bayou Trepagnier sediments, the probability of encountering HTRW was low, and the direct and indirect impacts from HTRW were negligible.

Orleans East Bank. Based on the 2009 sampling event, in conjunction with the numerous Phase I and II ESAs performed at the 17th Street, Orleans Avenue, and London Avenue Canals, the following conditions exist:

- 17th Street Canal - sediments in the canal outlet, in the area where the permanent pump station was constructed, contain low concentrations of lead, PAH, and petroleum.

- Orleans Avenue Canal - sediments in the canal outlet, where the permanent pump station was constructed, contain low levels of benzo(k)fluoranthene, arsenic, barium, chromium, and lead.

- London Avenue Canal - sediments in the canal outlet, where the permanent pump station was constructed, contain low levels of petroleum, arsenic, barium, chromium, and lead contamination

COCs within the three canal sediments were compared with the RECAP Standards, and no contaminants were detected in the 2009 sampling above the limiting RECAP screening standard(s) for evaluation of the risk to human health and the environment. Based on these comparisons, COC concentrations of low risk were determined to exist in the sediment in each of the canals. Temporary indirect impacts on water quality from sediment resuspension during construction were low, but potentially occurred.

In 2013, the contractor hired to construct the PCCP project conducted additional sampling throughout the project area to further characterize soils to be excavated for the purpose of disposal planning. This sampling revealed elevated hydrocarbons above the lowest limiting RECAP standard within a portion of London Avenue Canal. Once excavated, these soils were properly disposed of at a permitted landfill. Future excavation within the London Avenue Canal is known to contain soil with elevated hydrocarbons which likewise will be properly disposed of in a permitted landfill.

Excavation conducted at the 17th Street Canal in 2014 revealed numerous creosote-treated pilings. The pilings and the surrounding soil were removed from the 17th Street Canal permanent pumps project site and properly disposed of at an industrial waste landfill. This excavation also uncovered asbestos pipe, which was removed and properly disposed of at a permitted landfill.

Additional sampling was conducted at the London Avenue Canal site. Soil samples collected from a proposed stockpile site along the canal bank were analyzed for constituents of concern. The analytical results indicated PCB levels above the limiting non-industrial RECAP standards. Soils which had been excavated from this area of contamination were also sampled and found to contain PCBs above the limiting non-industrial RECAP standard. These sediments were segregated and stockpiled and are currently stored on site awaiting disposal by CPRA. Other sediment containing non-industrial level PCBs on the eastern side of London Avenue Canal will remain in place as these areas do not require excavation for construction of the PCCP project. The presence of these PCBs will be properly documented in real estate records by CPRA via a conveyance notice.

An expanded rip-rap design was developed for the London Avenue Canal area. Due to earlier discovery of elevated PCBs along the canal bank, canal bottom sediments were sampled and analyzed. The levels of PCBs from some of these samples were also above the limiting non-industrial RECAP standards. This area of sediments will be excavated and properly disposed of in a permitted landfill.

<u>New Orleans East</u>. *IER 11 Tier 2 Pontchartrain.* Results of four TCLP analyses of composite samples from each side of the bank indicated that the material in each of the investigation areas was classified as non-hazardous for disposal in a proper facility. However, the locations of elevated concentrations required appropriate personal protective equipment and necessary precautions to limit any potential exposures for construction workers during the construction phase. Based on the Phase I and Phase II ESA reports, and because the RECs would be avoided during implementation of the HSDRRS action, the probability of encountering HTRW in the project area was low, and the direct and indirect impacts from HTRW were negligible.

<u>IER and IER Supplemental 11 Tier 2 Borgne.</u> Based on the results of the investigation, contaminants had not migrated onto the project site from either the U.S. Filter or BOC facilities. The site does not present an unacceptable risk to construction personnel or to

the environment. Further environmental investigation of this site was not warranted at this time. The probability of encountering HTRW in the project area was low, and the direct and indirect impacts from HTRW were negligible.

Chalmette Loop. Two minor spills were reported during construction of the HSDRRS at LPV-144 (IER 8) and LPV-146 (IER 10). Both spills were considered minor and involved biodegradable hydraulic vegetable-based fluid. The spills were cleaned up immediately as part of the SPCC Plan, and no permanent impacts from HTRW occurred as a result.

During construction of the Bayou Dupre floodgate, creosote timber pilings and adjacent soil were removed and stockpiled at the construction site. Additional HTRW assessment was required and soil sampling and analysis were performed to determine soil disposal options. Eight discrete soil samples and two composite samples were taken from the two soil stockpile locations. Each soil sample was tested for TPH-diesel and oil ranges and semi-volatile organic compounds. The analysis determined that material from one of the soil stockpile locations was suitable to be reused, while the material from the other stockpile location contained elevated diesel petroleum hydrocarbons. Although some of the material could have been disposed of on-site, all the material was disposed of off-site at the River Birch Landfill. Approximately 8,000 cy of earthen material were disposed of at the River Birch Landfill.

Belle Chasse. The HSDRRS project discussed in IER 13 is removed from both the area of the active landfill and the industrial sites along Walker Road, and none of the identified RECs lie within the project footprint. Additionally, sediment testing performed in and along Hero Canal did not indicate any COCs. The probability of encountering HTRW in the project area was low; therefore, no direct or indirect impacts were expected. During construction of the HSDRRS action described in IER 13, the construction contractors encountered debris during excavation activities that contained stumps, logs, household trash, tires, and miscellaneous material such as plastic pipe and steel cables. USACE Engineering was notified immediately, and a HTRW investigator studied the debris material and determined that no HTRW impacts were caused by leaving the debris *in situ* at the excavation site.

Gretna Algiers. The chosen HSDRRS action avoided the most problem-prone areas and decreased the probability of encountering HTRW during the course of construction. Within the HSDRRS footprint, the probability of encountering a REC was very low; therefore, no direct or indirect impacts were expected.

A spill occurred in Plaquemines Parish at the Planters Pump Station during the HSDRRS construction in February 2011. Approximately 2 gallons of biodegradable hydraulic grade vegetable oil was discharged into the Algiers Canal. The area was protected by an oil boom as part of the SPCC plan, and no material was discharged off-site; therefore, water quality was not impacted due to the HTRW release.

Harvey Westwego. RECs identified in previous site investigations was avoided or removed; therefore, no direct or indirect impacts resulted. During construction, a spill occurred in Jefferson Parish at the Westwego #2 Pump Station in March 2011. An unknown amount of No. 2 diesel fuel oil was discharged into the Keyhole Canal (a tributary to Bayou Segnette) at the pump station. The leak was secured and reported (National Response Center Incident Report #971473) as part of the SPCC plan. The amount of fuel discharged was unknown, and the construction contractor secured the leak. Local officials determined that the fuel oil material dispersed, and the impacts on water quality from the HTRW were negligible.

Lake Cataouatche. Because alignment relocation work occurred around oil and gas transmission pipelines, the potential exists for an unplanned discovery of HTRW materials during construction. However, under the HSDRRS project, specific HTRW concerns from pipelines were avoided; therefore, no direct or indirect impacts resulted.

Borrow IERs Impacts.

Table 4-60 denotes the borrow IERs in which there were RECs (on-site or off-site) associated with the borrow project footprint, sorted by parish. In all cases, the locations of the RECs were mapped and were avoided during construction. As such, the probability of encountering HTRW in the project area was low; therefore, no direct or indirect impacts occurred. Additionally, the off-site RECs that were outside of the borrow area footprint were also mapped for avoidance, although these RECs were not impacted by excavation. Therefore, the probability of encountering HTRW in the borrow sites was low, and no direct or indirect impacts occurred.

A discussion follows Table 4-60 for all borrow sites for which special consideration was determined by the USACE.

Specific Borrow Impacts Within the HSDRRS

More borrow sites were environmentally cleared than were needed for HSDRRS construction. Therefore, in many cases, impacts from borrow material excavation at borrow sites have not occurred, and will likely not occur in the future. All the borrow sites are described, regardless of past or future use status, to provide an overview of all the potential impacts from HSDRRS construction.

Table 4-60: Borrow IERs with RECs near Project Footprint

IER* #	Investigation/Date	Findings	Impact Discussion**
Jefferson Parish			
18	Phase I ESA June 22, 2007	Three RECs located within the project area	**Churchill Farms Pit A** - the locations of the RECs were mapped and were avoided.
18	Phase I ESA July 21, 2007	Two RECs located within the project area	Westbank Site G - the locations of the RECs were mapped and would be avoided.

IER* #	Investigation/Date	Findings	Impact Discussion**
22	Phase I ESA September 11, 2007	On-site and off-site RECs located within or near the project area	Westbank I - the locations of the on-site RECs were mapped and would be avoided. The off-site RECs were outside of the construction footprint and would not be impacted by excavation.
25	Phase I ESA January 30, 2008	On-site and off-site RECs located within or near the project area	Westbank E - the locations of the on-site RECs were mapped and would be avoided. The off-site RECs were outside of the proposed construction footprint and would not be impacted by excavation.
28	Phase I ESA October 10, 2007	Two RECs located within or near the project area	Westbank E Access Route - the location of the on-site REC was mapped and would be avoided. The off-site REC could be easily removed and disposed of as necessary prior to construction.
Orleans Parish			
18	Phase I ESA June 4, 2007	Off-site REC located near the project area	**Maynard Site** – the REC location is off-site, and sampling did not occur as construction did not impact the REC.
18	Phase I ESA April 4, 2007	On-site and off-site RECs located within or near the project area	Cummings North - the locations of the on-site REC (illegal dumping of solid waste) was mapped and would be either removed or avoided during construction. The off-site REC, a Type II landfill was outside of the proposed construction footprint and would not be impacted by excavation.
25	Phase I ESA May 1, 2008	One historical REC located near the project area	**Stumpf Phase I** – This site was used as a staging area for construction equipment, vehicles, and offices.
25	Phase I ESA May 28, 2008	One REC and one historical REC located near the project area	Stumpf Phase 2 – the REC location is off-site and mapped to ensure avoidance. The historical REC was also mapped and is off-site. Construction should not impact the RECs.
St. Bernard Parish			
18	Phase I ESA May 21, 2007	REC located within the project area	Dockville Site – the locations of the past oil drilling operations REC were mapped and would be avoided.
Plaquemines Parish			
18	Phase I ESA June 18, 2007	Three off-site REC located near the project area	Belle Chasse Site – all REC locations were off-site and were mapped for avoidance; although construction should not impact the REC.
Parishes Outside of HSDRRS Project Area			
St. Charles Parish			
32	Phase I ESAs January 26, 1999; July 23, 2007; July 24, 2008	No current RECs within the property	**3C Riverside** property – previous RECs were cleaned and removed per all three Phase I ESAs.
Plaquemines Parish			
22	Phase I ESA January 29, 2008	On-site and off-site RECs located within or	Tabony Site - the locations of the on-site RECs were mapped and would be avoided. The off-site RECs (drums and containers and former drilling

IER* #	Investigation/Date	Findings	Impact Discussion**
		near the project area	operation) were outside of the proposed construction footprint and would not be impacted by excavation.
31	Phase II ESA April 7, 2010	On-site REC near former well within project area	**Idlewild Stage 2** – arsenic levels near a former well were above LDEQ RECAP Industrial Soil standards. If the soils do not meet RECAP Corrective Action Approval, the soil must be remediated in the area by the landowner, prior to use by the USACE.
32	Phase I ESA November 12, 2008	One REC located within the project area	Nairn Site – no RECs were located on-site except for an unknown fill material at tract "D". The location was mapped and would be avoided.
Jefferson Parish			
18	Phase I ESA June 22, 2007	Three RECs located within the project area	Churchill Farms Pit A - the locations of the RECs were mapped and were avoided.
18	Phase I ESA July 21, 2007	Two RECs located within the project area	Westbank Site G - the locations of the RECs were mapped and would be avoided.
22	Phase I ESA September 11, 2007	On-site and off-site RECs located within or near the project area	Westbank I - the locations of the on-site RECs were mapped and would be avoided. The off-site RECs were outside of the construction footprint and would not be impacted by excavation.
25	Phase I ESA January 30, 2008	On-site and off-site RECs located within or near the project area	Westbank E - the locations of the on-site RECs were mapped and would be avoided. The off-site RECs were outside of the proposed construction footprint and would not be impacted by excavation.
28	Phase I ESA October 10, 2007	Two RECs located within or near the project area	Westbank E Access Route - the location of the on-site REC was mapped and would be avoided. The off-site REC could be easily removed and disposed of as necessary prior to construction.
Orleans Parish			
18	Phase I ESA June 4, 2007	Off-site REC located near the project area	Maynard Site – the REC location is off-site, and sampling did not occur as construction did not impact the REC.
18	Phase I ESA April 4, 2007	On-site and off-site RECs located within or near the project area	Cummings North - the locations of the on-site REC (illegal dumping of solid waste) was mapped and would be either removed or avoided during construction. The off-site REC, a Type II landfill was outside of the proposed construction footprint and would not be impacted by excavation.
25	Phase I ESA May 1, 2008	One historical REC located near the project area	Stumpf Phase I – the REC location was mapped and is off-site. Construction should not impact the REC.
25	Phase I ESA May 28, 2008	One REC and one historical REC located near the project area	Stumpf Phase 2 – the REC location is off-site and mapped to ensure avoidance. The historical REC was also mapped and is off-site. Construction should not impact the RECs.

IER* #	Investigation/Date	Findings	Impact Discussion**
St. Bernard Parish			
18	Phase I ESA May 21, 2007	REC located within the project area	Dockville Site – the locations of the past oil drilling operations REC were mapped and would be avoided.
Plaquemines Parish			
18	Phase I ESA June 18, 2007	Three off-site REC located near the project area	Belle Chasse Site – all REC locations were off-site and were mapped for avoidance; although construction should not impact the REC.
Parishes Outside of HSDRRS Project Area			
St. Charles Parish			
32	Phase I ESAs January 26, 1999; July 23, 2007; July 24, 2008	No current RECs within the property	3C Riverside property – previous RECs were cleaned and removed per all three Phase I ESAs.
Plaquemines Parish			
22	Phase I ESA January 29, 2008	On-site and off-site RECs located within or near the project area	Tabony Site - the locations of the on-site RECs were mapped and would be avoided. The off-site RECs (drums and containers and former drilling operation) were outside of the proposed construction footprint and would not be impacted by excavation.
31	Phase II ESA April 7, 2010	On-site REC near former well within project area	Idlewild Stage 2 – arsenic levels near a former well were above LDEQ RECAP Industrial Soil standards. If the soils do not meet RECAP Corrective Action Approval, the soil must be remediated in the area by the landowner, prior to use by the USACE.
32	Phase I ESA November 12, 2008	One REC located within the project area	Nairn Site – no RECs were located on-site except for an unknown fill material at tract "D". The location was mapped and would be avoided.

* - More than one borrow site could be described in a single IER

****Bold Text indicates borrow pits that were excavated or used as staging for HSDRRS.**

Jefferson Parish. The Phase I ESA for Westbank D borrow site indicated that the site is located adjacent to the River Birch C&D Landfill. Additionally, a REC indicating a plugged and abandoned gas condensate well, located in the central portion of the site along the western border, was suspected of potential negative impact on the subject site. Soil sampling was recommended at the well site and at the northwest corner of the site, where leachate from the landfill potentially affected the site. Soil testing would be done before any excavation proceeds. The locations of the RECs were mapped, and the areas would be avoided. Because the RECs would be avoided, the probability of encountering HTRW in the project area would be low and the direct impacts from HTRW would be negligible. Temporary indirect impacts from encountering landfill leachate during construction are low but may potentially occur. As of October 2015, Westbank D was not utilized for the HSDRRS construction.

Orleans Parish. IERS 25.a was completed as an “after the fact” environmental assessment to address the placement of 105,000 cubic yards of recycled embankment material (REM) on a 22.41-acre portion of the Stumpf Phase I borrow area. REM is a term used for the return of excess soil cement to the ground surface during soil cement column installation. REM is typically used for engineering applications such as road construction or levee fill material to reinforce embankment stability. REM is not considered to be HTRW material. The May 2008 Phase I ESA and the May 2011 Phase I ESA update were incorporated into IERS 25.a. No RECs were identified in either report.

St. Bernard Parish. A Phase I ESA identified a REC at the 910 Bayou Road borrow site as a former agricultural property, which may have residues of pesticides or herbicides in the soil. Pesticides and herbicides degrade over time, although the subsequent degradation by-product may be more toxic than the parent compound. Because approximately 3-feet of topsoil would be removed during site excavation, it was determined that any present pesticides or herbicides, or their degradation products would likely not be found in the borrow material. Therefore, the probability of encountering HTRW was considered low, and the direct and indirect impacts from HTRW would be negligible. The 910 Bayou Road borrow site was not utilized for the HSDRRS construction.

Plaquemines Parish**.** The Phase I ESA for Westbank N described several on-site RECs. The locations of these RECs were mapped and were avoided during excavation. Additionally, as discussed above, the Westbank N site also had on-site concerns from the reported application of herbicide for at least 10 years over the entire site by the current occupant. Impacts from this REC were the same as described for the 910 Bayou Road site. Other concerns were indicated from debris piles in the north-central portion of the site. The debris piles were removed before excavation.

Concerns were noted from the reported disposal of incinerator ash on the eastern adjoining property and the former Belle Chasse Landfill facility located approximately 0.25 mile east of the site. Both of these possible RECs were outside of the construction footprint and would not be impacted by excavation. The probability of encountering

HTRW in the borrow project area was low, and the direct and indirect impacts from HTRW would be negligible. As of October 2015, the Belle Chasse borrow site was not utilized for the HSDRRS construction.

A Phase II ESA for the borrow site **Idlewild Stage 2**, which was used for construction, indicated that soil samples near a former well were above LDEQ RECAP Industrial Soil standards for arsenic. This site was avoided for use as borrow material.

Specific Borrow Impacts Outside of the HSDRRS

East Baton Rouge Parish**.** The Phase I ESA for the Lilly Bayou borrow site identified one active and one plugged abandoned oil well. No other RECs were found on the property and no additional investigation of HTRW was recommended. The areas around the two oil wells were avoided and marked as no-work zones. Because the RECs would be avoided, the probability of encountering HTRW in the project area was low, and direct impacts from encountering any HTRW were negligible.

St. Charles Parish**.** The Phase I ESA for Bonnet Carré North, which was utilized for HSDRRS construction, encountered three nearby possible RECs. The locations of these areas were mapped and were avoided during borrow excavation activities. Some concern was noted regarding the possible presence of contaminants in the soil within the floodway, because water from the Mississippi River flows over the site during spillway openings. However, as described for 910 Bayou Road site impacts described previously, approximately 3-feet of topsoil was removed by bulldozers during site excavation, so metals or other contaminants were not found in the borrow material. Therefore, with avoidance, the probability of encountering HTRW was low, and the direct and indirect impacts from HTRW were negligible.

Plaquemines Parish. Two borrow sites with HTRW concerns include the Conoco Phillips and the Idlewild Stage 1 sites. At the Conoco Philips site there were two potential RECs. The first REC included numerous leaking drums and containers, miscellaneous unlabeled drums and containers, stained soil, hydrocarbon odor, waste tires, and batteries, all observed within the equipment storage area at the northeast corner of the property. Releases from the leaking drums and containers potentially had impacted the subject property. The second potential REC was a large number of dead and dying cattle present at the site. Outstanding HTRW questions were resolved, and there was a low probability of encountering HTRW during the course of this project, and no further investigation of HTRW was recommended. The probability of encountering HTRW in the project area was low, and the direct and indirect impacts from HTRW would be negligible. The Conoco Philips borrow site was not used for the HSDRRS construction as of October 2015.

Additional Phase II investigation and testing was done at the Idlewild Stage 1 site in October 2009, and it was determined that contaminant levels were either below the laboratory minimum detection limits or below the respective LDEQ Industrial Groundwater RECAP standards. No further HTRW study was recommended.

Therefore, the probability of encountering HTRW in the project area was low, and the direct and indirect impacts from HTRW were negligible.

4.2.18.2.2 HSDRRS 2057 Impacts

If future levee lifts occur within existing ROWs, any REC previously identified in the Phase I ESAs for levee construction would be reflected in the project documents. As such, any RECs previously identified could be remediated or avoided and would be unlikely to affect future HSDRRS work, personnel working on the project, or the public. However, new Phase I ESAs would be required within 6 months prior to the start of any of the levee lifts to ensure that no additional RECs were found. The probability of encountering HTRW in the project area would be low and RECs would be avoided or remediated; therefore, no direct or indirect impacts would be expected.
Should newly borrow sites be needed for future levee lifts, these sites would need environmental compliance to ensure that no RECs or HTRW issues would be encountered at these borrow sites. Therefore, although the location and number of new borrow sites are unknown, no direct or indirect impacts would be expected from HTRW.

For both borrow site excavation and levee lift construction, spills and the potential to produce HTRW are a possibility. Storage, fueling, and lubrication of equipment and motor vehicles associated with construction activities would be conducted in a manner that affords the maximum protection against spill and evaporation. Fuel, lubricants, and oil would be managed and stored in accordance with all Federal, state, and local laws and regulations. Used lubricants and used oil would be stored in marked, corrosion-resistant containers and recycled or disposed in accordance with appropriate requirements. Construction contractors would be required to develop and follow a Spill Prevention Control and Countermeasures Plan.

Cumulative Impacts

The potential to create HTRW materials during construction activities is always present. The appropriate manner for minimizing HTRW would be as previously discussed in the HSDRRS projects impacts. These measures would limit impacts from HTRW. The USACE, the local non-Federal sponsor, and their contractors would adhere to these mitigation measures and SPCC plans regarding, storage, fuel and oil usage, and disposal. Therefore, no HTRW direct or indirect cumulative impacts would be expected.

Flooding in residential and commercial areas often results in the mixing of surface waters with sewage, contamination of drinking water supplies, and mobilization of HTRW. As floodwaters recede, these constituents all enter surface waters, causing temporary reductions in surface water quality, and could cause soil and sediment contamination within the project area. A reduced risk of flooding and storm damage afforded by the HSDRRS would offer long-term beneficial HTRW impacts by lessening risk of storm surge devastation in the region.

Ongoing and future regional projects would likely contribute to cumulative beneficial impacts on HTRW, since many projects in the area, which include ecosystem restoration, infrastructure improvements, and a large-scale rebuilding and reconstruction effort, would identify, evaluate, and potentially remediate existing HTRW issues. However, storm reconstruction, redevelopment, and transportation projects could also temporarily adversely impact natural resources, such as water quality in surface waters, because of the mobilization of HTRW due to stormwater runoff from construction sites and dredging. The cumulative effects of these projects on HTRW problems would be temporary and minor. Coastal and wetlands restoration, as well as flood risk reduction projects, could potentially cause contaminated sediment resuspension, which would result in adverse direct and indirect HTRW impacts during construction.

Redevelopment

Redevelopment projects might have temporary impacts from the disturbance and mobilization of HTRW, due to such things as demolition and other ground-disturbing activities; however, in general, these projects are in existing footprints and, as such, the chance of encountering HTRW would be low. Also, depending on the type of financing procured for these projects, most would require a Phase I ESA, which should minimize or eliminate encountering HTRW within the project footprints. Community revitalization has been a central focus in rebuilding areas affected by the storm. Stabilization of soils and passive capping of areas by driveways and parking structures can act to limit the mobilization of HTRW and would have a positive impact on any HTRW concerns.

Coastal and Wetlands Restoration

Coastal and wetlands restoration projects, including the restoration and creation of marshes, would have positive impacts on HTRW problems in the HSDRRS project area. Present and future regional coastal and wetlands restoration projects are being proposed or constructed by CWPPRA and other agencies. The marshes and wetlands created would act as contaminant sinks for dissolved HTRW and would help to remediate HTRW by acting as biological reactors that would enhance degradation of contaminants.

The coastal and wetlands restoration projects are designed to protect the coastline from erosion and improve water resources in the region, although they could have the unintended consequences of causing contaminant sediment resuspension in areas with contaminated sediments. The resuspension of contaminated sediments could cause negative direct and indirect HTRW impacts, both during construction activities and after construction is complete, on biological resources through the uptake of contaminants in the water column.

Flood Risk Reduction Projects

Levee modification along the Mississippi River, the MRGO deep draft deauthorization, and other flood risk reduction projects could also temporarily affect HTRW in a manner similar to the HSDRRS construction activities. However, as with the HSDRRS, other flood risk reduction infrastructure being built as part of the SELA and NOV projects would not likely affect HTRW because these projects would be rebuilt in areas currently used for flood risk reduction. In addition, Phase I ESAs would be performed, which would identify and minimize HTRW impacts in the project areas. New canals constructed as part of the SELA project could contribute to HTRW mobilization should excavated sediments be contaminated. However, these projects, along with other flood risk reduction projects, would reduce the risk of flooding and storm surge damage throughout the region, which in turn would offer long-term beneficial impacts by reducing the likelihood of discharging pollutants in stormwater. Flooding in residential and commercial areas frequently results in the mixing of surface waters with sewage, contamination of drinking water supplies, and mobilization of HTRW. As floodwaters recede, these constituents enter surface waters, causing temporary reductions in surface water quality, and could cause soil and sediment contamination within the HSDRRS project area. Overall, the construction of flood risk reduction projects would cause direct and indirect beneficial impacts on HTRW.

Transportation

Like the impacts described for the HSDRRS construction, there were temporary adverse effects on HTRW from transportation projects. However, Phase I ESAs are required for all Federal and state funds utilized in transportation projects and, as such, minimize or eliminate encountering HTRW impacts during construction. The IHNC Lock Project identified dredged material not suitable for aquatic disposal. The project would place this material in a confined disposal facility to ensure that there are no HTRW impacts. Other transportation projects in the region include repairs to city infrastructure. These projects would be expected to have minor and temporary effects on HTRW from construction and ground-disturbing activities.

4.2.18.2.2 Summary of All Cumulative Impacts

The cumulative effects of regional projects on HTRW would be temporary and minor and primarily during construction activities. Implementation of Federal, state, and local laws and regulations would minimize any potential HTRW impacts. Therefore, no long-term HTRW direct or indirect cumulative impacts would be expected within the region.

SECTION 5

MITIGATION

This section describes the CEMVN mitigation plan for compensating for unavoidable impacts on relevant resources resulting from constructing the HSDRRS to the 100-year level of risk reduction (LORR).

5.1 OVERVIEW

It is the USACE's policy to work diligently to reduce impacts on the human and natural environment. The CEMVN made a concerted effort to avoid and minimize environmental impacts to the maximum extent practicable during design and construction the HSDRRS. Implementation of avoidance and minimization efforts on relevant resources were ongoing throughout the construction effort. Where avoidance was not possible, the impacts were minimized to the greatest extent possible. None the less, unavoidable impacts have occurred to wetlands (fresh, intermediate, and brackish marsh, swamp) and bottomland hardwoods (BLH-wetlands and dry).

The CEMVN is required to offset unavoidable impacts to wetlands and BLH through compensatory mitigation by replacing the lost habitat's functions and services equally and in-kind within the same hydrologic (watershed) basin as where the impacts occurred. Compensatory mitigation to address adverse effects on fish and wildlife and their habitats was determined in consultation with the Federal and State of Louisiana fish and wildlife agencies in accordance with the Fish and Wildlife Coordination Act of 1958 (48 Stat. 401, as amended; 16 United States Code [USC] 661 et. seq). Specifically, the goals of the Fish and Wildlife Coordination Act are to:

- prevent loss of and damage to wildlife resources,
- provide for development and improvement of wildlife resources,
- describe damages to wildlife and measures for mitigating,
- consider wildlife conservation and rehabilitation equally with other water resources development programs,
- develop, protect, raise, and stock all species of wildlife, resources thereof, and their habitat, and
- control losses from disease or other causes.

In addition, the Water Resources Development Acts (WRDA) 1986 Section 906, as amended:

- requires mitigation for the losses to fish and wildlife resources caused by USACE water resources projects,
- requires mitigation to occur prior to or concurrent with construction, and
- requires impacts on BLH to be mitigated in-kind to the extent possible.

Section 2036 of WRDA 2007 further states that:

- mitigation of other habitat types is to occur to not less than in-kind conditions to the extent possible,
- mitigation plans are to be consistent with the standards and policies of the regulatory program, and
- annual consultation with resource agencies and reporting would be required.

The Council on Environmental Quality regulations (40 CFR 1508.20) define mitigation as:

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

5.1.1 MITIGATION PLANS

The CEMVN described and evaluated its proposed mitigation plan to address the overarching mitigation requirements and compensate for unavoidable habitat losses caused by the construction of the LPV and WBV HSDRRS in Programmatic Individual Environmental Reports (PIERs #36 and #37). The LPV Programmatic Mitigation IER (PIER 36) was finalized with a signed Decision Record November 22, 2013 and the WBV Programmatic Mitigation IER (PIER 37) was finalized with a signed Decision Record June 13, 2014.

These documents assessed mitigation plans that include both programmatic and constructible features. The constructible features, which consisted of the purchase of mitigation bank credits, were implemented as soon as the mitigation plans were approved. The programmatic features consisted of Corps constructed projects that required further evaluation and agency coordination before being constructible because feasibility level of design for them had not been completed. NEPA documents tiering off these programmatic documents contained the feasibility level of design necessary to complete the required evaluation and agency coordination for the Corps constructed projects to make them constructible. Table 5-1 lists programmatic and tiered NEPA documents describing the plans to satisfy the HSDRRS mitigation requirements. The plan is described in detail in Section 5-3.

Table 5-1: Mitigation Plan

IER/IERS/EA	TITLE	MITIGATION PLAN	DESIGN
LPV			
PIER 36	PIER 36, Bayou Sauvage, Turtle Bayou, and New Zydeco Ridge Restoration Project, St. Tammany and Orleans Parishes, LA.	Constructible: Mitigation Bank (BLH-wet/dry)	MB credits from 1 or more banks to satisfy 93.85 AAHUs for BLH-wet/dry
		Programmatic: Milton Marsh Restoration (Non-Refuge (NR) IM)	115 acres IM; borrow 55 acres, 800,000 cy
		Bayou Sauvage Marsh Restoration (NR/R BM)	302 acres BM; borrow – 184 acres, 2.7 mcy
		Bayou Sauvage PS Refuge BLH-wet/IM restoration	155.3 acres BLH-wet; 141.9 acres IM; borrow – 300 acres, 2.6 mcy
		Fritchie FL Refuge BLH-wet enhancement	51 acres BLH-wet
PIER 36, SIER 1	PIER 36 Bayou Sauvage, Turtle Bayou & New Zydeco Ridge Restoration Project, St. Tammany & Orleans Parishes, LA	Bayou Sauvage FS BM (BSFS4 and BSFS5) and new zydeco ridge marsh component	118.06 AAHU Non-refuge BM; 8.79 AAHU Refuge BM
		Turtle Bayou PS IM	41.29 AAHU Refuge IM
		New Zydeco ridge BLH-wet	83.92 AAHU Refuge PS BLH-wet; 8.91 AAHU Refuge FS BLH-wet
SEA 546	Bayou Sauvage, Turtle Bayou & New Zydeco Ridge Restoration Project, St. Tammany and Orleans Parishes, LA	Bayou Sauvage, Turtle Bayou & New Zydeco Ridge Restoration Project	18.4 AAHU mitigated at NZR BM restoration project expanding it to approximately 60 acres

WBV			
PIER 37	WBV HSDRRS Mitigation, Jefferson, LaFourche, Plaquemines and St. Charles Parishes, LA	Constructible: MB* (protected side BLH-wet/dry)	MB credits to satisfy 261.96 AAHUs for BLH-wet/dry
		Programmatic: Lake Boeuf Restoration (general FS BLH-wet)	221.9 acres BLH-wet; borrow – 0 cy
		Programmatic: Lake Boeuf Restoration (general FS swamp)	319.9 acres swamp; borrow – 0 cy
		Jean Lafitte Restoration (general FS fresh marsh)	146.7 acres Fresh Marsh; borrow 600,00 cy
		Jean Lafitte Restoration (Park/404c FS BLH-wet)	12.2 acres of BLH-wet; borrow – 480,000 cy
		Jean Lafitte Restoration (Park/404c FS swamp)	20.5 acres of swamp; borrow – 176,600 cy)
		Jean Lafitte Restoration (Park/404c fresh marsh)	20.4 acres of fresh marsh; borrow – 150,000 cy

SPIER 37a	SPIER Mitigation for Protected Side Bottomland Hardwoods Dry, WBV HSDRRS, Jefferson Parish, LA	Constructible: MB (satisfied) PS BLH-wet	7.27 AAHU general PS BLH-wet
		Constructible: Avondale Gardens General PS BLH-dry	193 AAHUs; 920-acre site
		Programmatic: Lake Boeuf BLH-wet Restoration** General FL BLH-wet	72.04 AAHUs, 221.90-acre site
		Programmatic: Lake Boeuf Swamp Restoration** General FS Swamp	134.52 AAHUs, 319.80-acres
		JLNHPP, General FS FM (approved)***	65.92 AAHU, 138-acres
		JLNHPP/404© FS BLH-wet (approved)***	5.2 AAHU, 8.2-acres
		JLNHPP Park/404© FS Swamp (approved)***	8.42 AAHU, 106 acres
		JLNHPP/404© FS FM (approved)***	3.03 AAHU, 20.40-acres
PIER 37, Tier 1 EA	Jean Laffite National Historical Park and Preserve Mitigation Features, WBV, HSDRRSS Mitigation, Jefferson Parish, LA	JLNHPP General FS FM	65.92 AAHU, JL1B5 & JL15
		JLNHPP Park/404c FS BLH-wet	3.12 AAHU, JL14A
		JLNHPP Park/404c FS Swamp	7.19 AAHU, JL7
		JLNHPP Park/404c FS FM	3.03 AAHU, JL1B4
SEA 548, TIER 1 EA	Lake Cataouatche Borrow Area Expansion and Access Features JLNHPP Mitigation Features, WBV, HSDRRS Mitigation, Jefferson Parish, LA	JLNHPP Park/404c FS FM Design Modification to JL1B4 and JL1B5 for FM	55.54 AAHU FM, Yankee Pond on JLNHPP; expansion of borrow area
SEA 572	WBV, HSDRRS, Flood-Side BLH-Wet and Swamp Mitigation, Lafourche Parish, LA	Highway 307 FS BLH-wet and FS swamp	72.04 FS BLH-wet, 133 acres and 134.52 AAHU FS Swamp, 287 acres, No outside borrow

* MB – mitigation bank; R = refuge; NR = non-refuge

** CEMVN considers these projects to not be implementable; consequently, projects to compensate for these habitat losses are undergoing reformulation

*** Previously approved in PIER 37

5.2 IMPACT ASSESSMENT

Impacts to wetlands and bottomland hardwoods were assessed in cooperation with an interagency team comprised of members from USFWS, NMFS, LDWF and LDNR.

Early in the HSDRRS planning process, CEMVN estimated that up to 4,000 acres of unavoidable impacts could occur to wetland and BLH habitat for which compensatory mitigation would be required. As the engineering and design progressed and measures to avoid and minimize impacts were incorporated, the acres impacted significantly decreased to approximately 1,800.44 acres (938.63 average annual habitat units (AAHUs)) for all habitat types on protected and flood side of the HSDRRS.

Impacts as stated in the IERs were based off the 35 percent level of design and in many cases represented the worst-case scenario footprint. Through advanced engineering and design and a concerted effort to avoid and minimize impacts to the environment to the maximum extent possible, the impacts were significantly reduced as the projects proceeded to 100 percent design. Consequently, to accurately capture the impacts caused by construction of the HSDRRS, the mitigation team, in cooperation with the resource agencies, revised the original impact estimates utilizing the 95-100 percent design plans. The IER discrepancy memorandum is located in Appendix C-2 of the LPV PIER #36 and WBV PIER #37. Additionally, following the identification of the selected mitigation plan, the revised impacts estimates were revisited a second time and verified by the USFWS. Some correction of the National Park Service impacts based on the Omnibus Act of 2009 occurred, which resulted in further adjustment to the estimated impacts.

5.2.1 MITIGATION FOR PRIOR HURRICANE PROTECTION SYSTEM WORK

5.2.1.1 Task Force Guardian

The USACE established Task Force Guardian (TFG) immediately after Hurricane Katrina hit the Louisiana and Mississippi coasts. TFG's main mission was to repair and restore the levees and floodwalls in the GNO metropolitan area to pre-Katrina conditions. With the emergency declaration by the President, NEPA compliance for emergency repairs was documented in EA #433 "U.S. Army Corps of Engineers Response to Hurricanes Katrina and Rita in Louisiana" with a signed FONSI 24 July 2006. The habitat impacts as a result of TFG construction occurred prior to but within similar reaches as the LPV HSDRRS construction. During review of the LPV HSDRRS habitat impacts, additional TFG impacts were identified within reaches LPV108, LPV145, and LPV146 that required mitigation. Table 5-2 presents the acres and AAHUs by habitat type by reach that were impacted. These impacts are mitigated along with the LPV HSDRRS mitigation sites.

Table 5-2: TFG Impacts

TFG	Protected Side	
LPV Reach	BLH Dry	
	Acres	AAHUs
108	16.65	8.96
145	122.00	30.85
146	79.92	2.98
Total	218.57	42.79

WBV Original Construction

Changes to the previously authorized WBV Hurricane Protection Project as assessed in EA 437 entitled "West Bank and Vicinity, New Orleans, Louisiana Hurricane Protection Project, Lake Cataouatche Levee Enlargement Highway 90 to Cataouatche Pump Stations" and EA 439 entitled "West Bank and Vicinity, New Orleans, Louisiana Hurricane Protection Project: Westwego to Harvey Canal Highway 45 Borrow Pits, Jefferson Parish, Louisiana" incurred impacts requiring mitigation. Because the impacts assessed in EAs #437 and #439 used a 100-year period of analysis and because the mitigation plan for those impacts was not fully developed in those EAs, a decision was made to re-assess those impacts using a 50-year period of analysis and to mitigate them along with the WBV HSDRRS impacts (which were also assessed using a 50-year period of analysis). Table 5-3 lists the impacts by habitat type for these two NEPA documents and Table 5-4 includes the total impact for HSDRRS and prior hurricane protection system construction. A summary discussion of these EAs can be found in section 1.4.2 and in appendix C-1 of PIER 37.

Table 5-3: Additional WBV Original Construction Impacts1

	PS BLH-Dry		FS BLH-Wet		FS Swamp	
EA	**Acres**	**AAHUs**	**Acres**	**AAHUs**	**Acres**	**AAHUs**
439			21.50	15.10	88.50	50.71
437	162.10	58.95				
PS Total	162.10	58.95				
FS Total			21.50	15.10	88.50	50.71

[1]FS indicates Flood side while PS indicates Protected Side

The results of reviewing impacts based on the 100 percent design, inclusion of the TFG and the WBV original construction impacts effort are reflected in Table 5-4 and Table 5-5 for LPV and WBV respectively. The tables also list the acres and AAHUs impacts by IER, habitat type and whether the impact occurred on the or protected side (PS) or the flood side (FS) of the levees. Table 5-5 lists the total acres of HSDRRS impacts requiring compensatory mitigation by sub-basin for both the LPV and WBV HSDRRS components.

Table 5-4: LPV HSDRRS Impacts Based on 95-100 percent Design Plans

	Protected Side										Flood Side											
IER+	Fresh/Inter Marsh		Brackish Marsh		Swamp		BLH wet***		BLH dry***		Fresh/ Inter Marsh		Brackish Marsh		Swamp		BLH wet		BLH dry		TOTAL	
	Acres	AAHUs	Acres	AAHUs	Acres	AAHUs	Acres	AAHUs	Acres	AAHUs	Acres	AAHUs	Acres	AAHUs	Acres	AAHUs	Acres	AAHUs	Acres	AAHUs	Acres	AAHUs
1	0	0	0	0	104.02	49.99	0	0	0	0	0	0	0	0	82.68	52.66	0	0	0	0	186.70	102.65
2	0	0	0	0	0	0	0	0	0	0	0	0	19.60	8.58	10.65	5.36	0	0	0	0	30.25	13.94
3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	89.50	42.50	0	0	0	0	167.43	85.17	0	0	0	0	52.27	18.95	0	0	32.65	13.36	0	0	341.85	159.98
8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0	2.05	0.33	0	0	0	0	1.21	0.69	8.75	2.3	12.01	3.32
10	89.02	40.92	0	0	0	0	32.76	14.06	0	0	5.93	3.24	98.45	64.62	0	0	26.56	11.66	0	0	252.72	134.50
11	0	0	0	0	0	0	0	0	2.46	0.41	0	0	80.74	34.7	0	0	0	0	9.48	1.59	92.68	36.70
18 *	0	0	0	0	0	0	0	0	44.74	14.65	0	0	0	0	0	0	0	0	0	0	44.74	14.65
27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
TFG	0	0	0	0	0	0	16.65	8.96	201.92	33.83	0	0	0	0	0	0	0	0	0	0	218.57	42.79
Total	186.49	86.99	0	0	104.02	49.99	216.84	108.19	249.12	48.89	7.98	3.57	251.06	126.85	93.33	58.02	60.41	25.71	18.23	3.89	1179.52	508.53

+ Includes IERs, supplements and TFG EA

* Maynard Borrow Site

Table 5-5: WBV HSDRRS Impacts Based on 95 percent - 100 percent Design Plans

	Protected Side										Flood Side											
IER*	Fresh/ Intermediate Marsh		Brackish Marsh		Swamp		BLH wet		BLH dry		Fresh/ Intermediate Marsh		Brackish Marsh		Swamp		BLH wet		BLH dry		TOTAL**	
	Acres	AAHUs	Acres	AAHUs	Acres	AAHUs	Acres	AAHUs	Acres	AAHUs	Acres	AAHUs	Acres	AAHUs	Acres	AAHUs	Acres	AAHUs	Acres	AAHUs	Acres	AAHUs
12	0	0	0	0	0	0	0	0	181.31	121.47	0	0	0	0	32.93	15.39	2.38	1.98	0	0	216.62	138.84
13	0	0	0	0	0	0	0.76	0.18	16.96	10.37	0	0	0	0	31.59	10.00	8.85	3.66	0	0	58.16	24.21
14	0	0	0	0	0	0	3.64	2.41	0	0	0	0	0	0	85.30	49.54	11.40	9.08	0	0	100.34	61.03
15	0	0	0	0	0	0	5.98	4.06	8.56	2.21	14.50	3.20	0	0	0	0	3.95	2.64	0	0	32.99	12.11
16**	0	0	0	0	0	0	0	0	0	0	132.92	65.92	0	0	0	0	86.78	42.27	0	0	219.70	108.19
17	0	0	0	0	0	0	5.77	2.76	0	0	0	0	0	0	17.77	16.07	0	0	0	0	23.54	18.83
33a***	0	0	0	0	0	0	0	0	80.00	48.93	0	0	0	0	0	0	82.00	50.13	0	0	162.00	99.06
18 ****	0	0	0	0	0	0	0	0	29.90	10.62	0	0	0	0	0	0	0	0	0	0	29.90	10.62
EA 437/439	0	0	0	0	0	0	0	0	368.93	193	0	0	0	0	88.5	50.71	131.09	71.65	0	0	588.52	315.36
TOTAL	*0*	*0*	*0*	*0*	*0*	*0*	*16.15*	*9.41*	*685.66*	*386.60*	*147.42*	*69.12*	*0*	*0*	*256.09*	*141.71*	*326.45*	*181.41*	*0*	*0*	*1431.77*	*788.25*

* includes IER, supplements and original WBV EA 437/439
** Does not include Section 16a
*** IER 33 reflects impacts as stated in the IER. Impacts have not been revised based on 100% plans
**** Church Hill Farms borrow site

Table 5-6: HSDRRS Impacts by Sub-basin*

IER*	Sub-basin/Parish	Acres	AAHUs
1	St. Charles	186.70	102.65
2	Jefferson East Bank	30.25	13.94
7	New Orleans East	341.85	159.98
9	Chalmette Loop	12.01	3.32
10	Chalmette Loop	252.72	134.5
11	New Orleans East	92.68	36.7
12	Gretna-Algiers	216.62	138.84
13	Belle Chase	58.16	24.21
14	Harvey-Westwego	97.13	58.89
15	Lake Cataouatche	32.44	12.11
16	Lake Cataouatche	219.70	108.19
17	Lake Cataouatche	23.54	18.83
18 (Maynard)		44.74	14.65
18 (Church Hill)		29.9	10.62
33	Belle Chase	162	99.06
	Total	**1800.44**	**938.63**

* does not include TFG or original WBV construction numbers

5.2.2 AVOIDANCE AND MINIMIZATION MEASURES

The IERs described mitigation measures, which addressed efforts to avoid and minimize impacts to the natural and human environment through implementation of environmental design commitments.

The interagency team provided input throughout the planning, design and construction phases. They reviewed draft plans and specifications and submitted recommendations for approved projects. In agreement with the USFWS, USACE ensured every effort would be made to reduce impacts by using sheet pile and/or floodwalls to increase levee heights, wherever feasible. It was decided that any approved borrow sites with wetlands would be avoided and priority would be placed on utilizing commercial sources, previously approved borrow sources with completed environmental clearances, agricultural/non-forested lands. Proposed changes in the project design and construction, especially those that impacted wetlands or fish and wildlife habitat were coordinated in advance with the interagency team. For specific information regarding environmental design commitments and best management practices implemented, refer to the individual NEPA document hyperlinks provided in Section 2, table 2-1.

5.2.2.1 Environmental Design and Construction Considerations by Resource

5.2.2.1.1 Water Quality

Silt currents and mechanized dredging were used to avoid excessive disturbance of soils. Fill material was certified to be free from contamination before use by physical testing, chemical analysis, and/or manufacturers.

Mitigation measures employed:

- A rock dike was constructed across the IHNC to prevent flow and turbidity plumes from moving into Lake Pontchartrain. Turbidity was monitored during rock dike and cofferdam construction to ensure that construction-generated turbidity was not significantly higher that ambient turbidity in Lake Pontchartrain.
- A rock dike was constructed to slow velocities during construction.
- Turbidity readings were conducted three times per workday at locations not to exceed 500-feet upstream and downstream from the point of discharge to ensure that at no time a difference of 50 nephelometric turbidity units (NTUs) was exceeded. No increases in turbidity above the stated limits were observed.
- Material for containment dikes were dredged from within the containment area. Following completion of disposal, the containment dikes were degraded to marsh elevation.
- Dewatering/overflow pipes and breaches were discharged into degraded marsh for marsh nourishment purposes.
- Pump elevation did not exceed a height of +4 NGVD with final settling height of +2.5 NGVD.
- Conducted and coordinated an HTRW phase I and II assessment with the NWR prior to any dredging and/or placement.
- A temporary gap between the Bayou Dupre structure and the T-wall tie-in was maintained during construction to allow for continued water exchange at the project site.
- Material removed during IER 12 project construction (i.e., dredging Algiers Canal, repositioning the WBV levee landward to accommodate the GIWW gate, and dredging along the GIWW bank line to install the flow control structure) was tested to determine the presence of contaminants and the material's suitability as borrow material for levee construction. The material was beneficially by constructing a geocrib area adjacent to Lake Salvador and the JLNHPP. Approximately 700,000 cubic yard or material was excavated and used to construct wetlands.
- A water exchange structure was constructed across the Outer Cataouatche Canal (IER 16). The structure maintains, to the greatest extent practicable, pre-project hydrological characteristics. To account for possible closures due to maintenance, two culverts were constructed to assure constant, uninterrupted water exchange.

5.2.2.1.2 Fisheries and Essential Fish Habitat

NMFS made design recommendations for the IER 11 Tier 2 Borgne gates to ensure that fisheries access was maintained to the maximum extent practicable during construction. Design parameters included: minimization of the potential for turbidity-causing sediment erosion during construction and project life; the ability to rapidly reopen the structure in case of loss of power; design the structure to remain open except during storm events of sufficient magnitude that flooding is expected, design the structure to not exceed a 2.6 feet per second (fps) water flow during peak flood or ebb tides; minimize the creation of steep environmental gradients; and to maintain a water flow that is comparable to the waterway's capacity prior to construction. CEMVN implemented the recommendations and installed four 48-inch culverts within the Bayou Bienvenue cofferdam during construction of the gate structure to allow for hydrologic exchange and potential fish passage.

For many of the IERs, flood risk reduction structures placed within waterways included shoreline baffles and/or ramps (e.g., rock rubble, articulated concrete mat) that slope up to the structure invert to enhance organism passage. Various ramp designs were considered with continued coordination with the interagency team to ensure that fish passage features were fully incorporated. For example, constructed ramps for IER 12 and 13 were sloped with riprap.

5.2.2.1.3 Wildlife and Migratory Birds

A general wildlife mitigation measure implemented was to limit the removal of trees from forested wetlands to the fall or winter, when practicable, to minimize impacts on nesting migratory birds within the project area. Alternatively, if trees were removed during bird nesting season, pre-construction surveys for nesting birds would be conducted, and all eggs and nestlings within the project area relocated before the start of construction. There were no nesting birds encountered when trees were removed therefore there was no need to relocate any eggs or nestlings.

Tree protection language in the construction plans and specifications included:

- Trees shall be protected from wounds to the bark, limbs, and foliage.
- The critical root zone shall be protected from compaction and grading.
- Changes in temporary site drainage and ponding shall be minimized to the extent practicable.

Tree clearing mitigation measures for nesting migratory birds and bald eagle nesting were recommended IERs 1, 2, 7, 11 Tier 2 Borgne, 9, 10, 12, 13, 15, and 17. Contractors were monitored for compliance with these tree mitigation measures.

Within the St. Charles sub-basin, near the LaBranche wetlands levee, a historic colonial nesting wading bird rookery was identified and mitigation measures were stipulated during construction activities (IER 1). A Nesting Prevention Plan was created and implemented to deter nesting and the inadvertent “take” of nests or of birds within a 1,000-foot buffer zone. This 1,000-foot buffer encompassed the known historic rookery. These nesting prevention measures were conducted 7 days per week from dawn to dusk throughout the nesting season (February 15 to September 1). The measures implemented included auditory deterrents and visual repellents. At the rookery site more intense measures were taken, including the constant presence of a bird abatement team member. However, despite these actions, nesting (yellow-crowned night heron still occurred at the project area. The CEMVN then began a process to document, report, and monitor nests for the yellow-crowned night heron. Personnel from the USFWS and the USACE made periodic site visits to observe the reported nests. All active nests were monitored until the end of nesting season. Some of the nests were unsuccessful, apparently due to predation, and the USFWS concluded that a “take” was not justified for any of the lost nests due to the construction activities for the HSDRRS project.

Within Jefferson East Bank sub-basin, on January 27, 2011, a colonial nesting site was identified, across from the Parish Line Canal between Veterans Boulevard and the Louis Armstrong International Airport (IER 2). As part of the mitigation measure, a USACE employee visited the site on January 28, 2011, to determine if the colonial nesting birds were utilizing the area for nesting purposes. It was determined that although the birds were possibly using the site as a resting area, the site had not been previously used for nesting purposes. Under guidance from the USACE and the USFWS, the construction contractor submitted an acceptable Nesting Prevention Plan that would deter birds from nesting within 1,000-feet of the construction activities. The plan included auditory deterrents such as clapping, yelling, and an hourly discharge from propane cannons, along with visual repellants such as streamers. The contractor performed a visual inspection of the site three times per day, 7 days per week from dusk to dawn, for the duration of the construction activities. The contractor provided weekly reports of these inspections.

If there was a potential for bald eagles to be nesting in the vicinity of the project area, personnel were educated and informed to identify, avoid and immediately report any such nests within 1,000-ft of the levee centerline to CEMVN environmental staff as was the case for St. Charles sub-basin and Jefferson East Bank sub-basin (IER 1, 2). Two bald eagle nests were observed approximately 660-feet from the LaBranche wetland levee construction activities near the Louis Armstrong New Orleans International Airport (IER 1) and a nest was observed near the West Return Floodwall. No nesting activity was observed during the construction period.

As detailed in the IER 11 Tier 2 Borgne, in order to minimize the impact of T-walls on wildlife movement, nine wildlife ramp openings (roller gates) were constructed, which facilitates terrestrial wildlife movement across the T-wall. Three openings were located in each reach LPV-145, LPV-146, and LPV-148. Ramps were constructed at these roller gate openings to provide a gradual transition for wildlife using the gates as an access point through the floodwall. Gates remain open except in the event of a named storm.

5.2.2.1.4 Protected, Threatened and Endangered Species

In the Jefferson East Bank, Orleans, Orleans East and Chalmette Loop sub-basins (IERs 2, 3, 5, 6, 7, 11), standard manatee protection measures were implemented to minimize the potential for the HSDRRS component construction to cause adverse impacts on manatees during the construction period (approximately 2.5 years). The procedures included the following:

- All contract personnel associated with the project would be informed of the potential presence of manatees and the need to avoid collisions with manatees and would be reminded that the observation of water-related activities for the presence of manatees was the contract personnel's responsibility.

- Temporary signs would be posted prior to and during all construction/dredging activities to remind personnel to be observant of manatees during active construction/dredging operations or within vessel movement zones (i.e., the work area). At least one sign would be placed where visible to the vessel operator.

- Siltation barriers, if used, would be made of material in which manatees could not become entangled and would be properly secured and monitored.

- If a manatee is sighted within 100-yards of the active work zone, the following special operating conditions would be implemented: moving equipment will not be operated within 50-feet of a manatee; all vessels will operate in no-wake/idle speeds zones within 100-yards of the work area; and siltation barriers, if used, would be secured and monitored.

- Once the manatee leaves the 100-yard buffer zone around the work area of its own accord, special operating conditions would be no longer necessary, but careful observation would be resumed.

- Any manatee sighting would be immediately reported to the USFWS, the LDWF, and the LNHP.

Mitigation measures specifically detailed in IER 3 were used to minimize the potential for construction to cause adverse impacts on Gulf sturgeon and their critical habitat. The CEMVN adhered to a dredging/construction window for the project on the eastern side of the Lake Pontchartrain Causeway so that construction activities in the project area occurred during the months of May through September. Also, the bucket drop procedure developed by the USFWS was employed to encourage any Gulf sturgeon in the vicinity to leave the area.

In the New Orleans East Sub-basin, the IER 11 Tier 2 Pontchartrain HSDRRS project component construction required:

- Manatee, Gulf sturgeon, and sea turtle protection measures were implemented during construction and operation as outlined in IER 11 Tier 2 Pontchartrain.

- As a precautionary measure, before the cofferdam was dewatered for construction activities to commence, the area was surveyed for the presence of Gulf sturgeon using a hummingbird side scanner, gill nets, and an electro shocker. This survey was completed during cofferdam dewatering.

- The construction contractor advised CEMVN when the cofferdam was scheduled for dewatering and the CEMVN coordinated with the interagency team to have biologists on hand, if necessary, to relocate Gulf sturgeon to appropriate habitat. No sturgeons were observed, and additional consultation with NMFS was not necessary

Additional mitigation measures established for the New Orleans East sub-basin (IERs 7, 11b, 11c Tier 2 Borgne, 11d Tier 2 Pontchartrain), included the planting of submerged aquatic vegetation if natural revegetation of the area to preconstruction conditions was not observed through post-construction surveys. The recovery of the SAV beds in the shallower portions (i.e., less than 3-feet depth) of Lake Pontchartrain from the western end of the IER 6 project to 6,000-feet east of Paris Road was monitored (IER 7). The SAVs returned and no additional planting was required.

In order to minimize the potential for the HSDRRS construction activities to cause impacts on sea turtles (IER 11 Borgne), construction conditions recommended by NMFS in their August 12, 2008 letter were followed. No observations or collisions with sea turtles occurred during construction.

5.2.2.1.5 Recreational Resources

As noted in IER 3 for the flotation channel stockpiling work in the Jefferson East Bank Sub-basin, appropriate navigation aids were placed in Lake Pontchartrain to delineate the hazard of the stockpiled dredged sediment for the project work.

As detailed in IERs 7 and 11 Tier 2 Borgne, impacts on Bayou Sauvage NWR were avoided when feasible. The CEMVN coordinated with NWR personnel during the planning and compatibility determination process (compatibility determinations are documents written, signed and dated by the NWR manager and the regional chief of refuges that signify whether proposed or existing uses of the NWR are compatible with their establishing purposes and the mission of the NWR System). A Special-Use Permit was obtained prior to any entrance onto the refuge, and coordination continue until construction was complete and prior to any subsequent maintenance. A compatibility determination will be needed prior to work being conducted in the area.

Areas on the Bayou Sauvage NWR where soil borings have been taken were assessed to ensure accuracy of the anticipated impact area (0.18 acre) and determine recovery impacts (IER 7). Guidelines on the deposition of dredge material within the Bayou Savage NWR are provided for construction activities in IER 11 Tier 2 Borgne. The

CEMVN ensured that impacts and encroachments onto public lands are avoided. Unavoidable impacts and encroachments, when permissible by the appropriate managing agency, minimized and appropriately mitigated.

Coordination was conducted with the LDWF, Scenic Rivers Program regarding any permits or conditions that may be required to perform work in Bayou Bienvenue. Also, to further minimize recreational boater access and associated marsh impacts, signs indicating restricted access were posted during construction around the maintenance channel, channel plugs, and adjacent marsh.

5.2.2.1.6 Noise

Construction equipment was routinely checked to ensure that the equipment operated properly.

Much of the HSDRRS construction was performed 24 hours a day 7 days a week in order to meet the aggressive schedule for providing risk reduction to the Greater New Orleans Metropolitan Area. In order to limit noise emissions to sensitive receptors from the HSDRRS pile-driving construction activities for certain reaches of the HSDRRS, certain restrictions were developed as indicated in table 5-7.

Table 5-7: Noise Restrictions from Pile Driving Work from the HSDRRS Project Components1

IER* & Sub-basin	Reach	Exceptions to Permissible Hours
St. Charles		
1/S 1	LPV-03d.2	Daylight hours only
Jefferson East Bank		
2/S 2	All reaches	Pile driving limited to 7 am to 10 pm
3/S 3	LPV-17.2, LPV-10.2, LPV-11.2, LPV-12.2, LPV-17.2	No pile driving between 9 pm and 6 am
Orleans East Bank		
4	All reaches	No pile driving between 9 pm and 6 am
5	All reaches	Pile driving limited to 7 am to 10 pm: LPV-101.02; 7 am to 9 pm Monday-Friday, 8 am to 9 pm Saturday, no work Sunday
New Orleans East		
6/S 6	LPV-107	No pile driving between 9 pm and 6 am
7/ S 7	LPV-109.02b	No pile driving between 9 pm and 6 am
Chalmette Loop		
10	all reaches	No pile driving between 9 pm and 6 am
Belle Chasse		
13	WBV-09a, WBV-09b	No pile driving between 9 pm and 6 am
Gretna-Algiers		
12/S 12	WBV-09b	No pile driving between 9 pm and 6 am
Harvey-Westwego		

14/S 14.a	WBV-14.b	No pile driving between 9 pm and 6 am
Lake Cataouatche		
16/S 16.a	WBV-73, WBV-75, WBV-77	No pile driving between 9 pm and 6 am

*S – Supplemental

1 Information based on restrictions in CEMVN construction contracts

5.2.2.1.7 Socioeconomic Resources

Although there is no requirement through regulations to minimize socioeconomic impacts from the construction of the HSDRRS, adverse impacts on socioeconomic resources were minimized primarily by designing the footprint of a large portion of the risk reduction work within the existing alignment ROWs, thereby reducing the need to acquire additional property or to “take” property.

Additionally, the plans and specifications submitted by construction contractors for any design build proposals or early contractor involvement, such as work described in IERs 5 and 11 (Tier 2 Pontchartrain and Borgne), generally had provisions to limit or avoid any indirect consequences for the socioeconomic resources within the HSDRRS project areas.

5.2.2.1.8 Cultural Resources

Through consultation with the SHPO and THPO and per Section 106 of the NHPA, the CEMVN avoided and minimized impacts on cultural resources. Where cultural resources were identified, a no work zone was established to protect the cultural resource. Based on the determination made by the SHPO, specific conditions were followed by the CEMVN. When unrecorded cultural resources were found to exist, construction did not start in the area containing the cultural resources until a CEMVN archaeologist was notified and final coordination with the SHPO and THPO was completed (per the CEMVN-PM-RN/SHPO Standard Operating Procedure). This mitigation measure was implemented by incorporating contract language into construction specifications that required the contractors’ employees to report the detection of any cultural resources discovered during the course of construction activities, if discovered, stopping work in the immediate area of the cultural resource, and notifying CEMVN staff of the discovery so appropriate action could be taken.

5.2.2.1.9 Air Quality

The construction equipment and haul trucks will have catalytic converters and mufflers to reduce exhaust emissions. Routine maintenance of all vehicles and other construction equipment was implemented to ensure that emissions are within the appropriate design standards. Dust suppression methods were implemented to minimize dust emissions at construction sites and at borrow sites.

5.2.2.1.10 Transportation

Traffic coordination meetings were held frequently between the CEMVN, LADOTD, RPC, and State Police. The meetings discussed traffic situations, conditions, and traffic management strategies to avoid and minimize impacts.

Construction of IER 11 Tier 2 Borgne project components required that the USCG and the navigation industry continue to play an active role in the navigation computer simulations of ships passing through the GIWW gate, and the CEMVN maintained its commitment to provide safe navigation on the GIWW through the structure. The CEMVN committed to work collaboratively with the USCG during the computer simulations to ensure that risk is taken into consideration during the design process. However, because of the expedited schedule for the IER 11 Tier 2 Borgne project, multiple barges were needed in the channel for cranes driving piles, material storage and staging, and the moving of materials to various work locations. There were always multiple pile-driving crews working on the face of the wall. In addition, multiple supply barges were towed to the working barges in order to continue operations without stopping work. There were also similar operations going on in the canal at two to three locations, requiring the passage of large crane barges and other equipment side-by-side. This means that it was not be feasible to limit the channel strictly to one-way traffic as recommended by LDNR to minimize the project footprint.

5.2.2.1.11 HTRW

For all HSDRRS construction activities, Phase I ESAs were conducted, and subsequent testing was performed if necessary, to determine the location of potential HTRW sites within and proximate to the HSDRRS ROW. Where HTRW sites were discovered, they were avoided during construction activities to the greatest extent practicable. Several design mitigations measures have been made through inclusion in the solicitation package for design-build projects. These mitigation measures were intended to avoid or minimize the impacts of the HSDRRS actions, to the maximum extent practicable. In addition, construction mitigation measures have been implemented, including the designation of no-work zones, to avoid or minimize disturbance of any contaminated sediments or other HTRW within project areas. Management of petroleum, oils, and lubricants during construction included proper labeling and storage, and utilization in a manner to prevent and avoid spills.

A no-work zone in the vicinity of Bayou Trepagnier on both the flood side and protected side of the existing levee was adhered to until Motiva's remediation of contaminants in this area was complete (IER 1 and IER Supplemental 1).

5.3 COMPENSATORY MITIGATION PLANNING

The goal of the Mitigation Program is to compensate for unavoidable losses on wetlands and BLH incurred during construction of the LPV and WBV HSDRRS in accordance with relevant laws and policies. The compensatory mitigation plan replaces the lost functions and services of the impacted habitat through restoration or enhancement activities designed to create/increase/improve the habitat functions and services at specific mitigation sites. Impacts to a National Wildlife Refuge (NWR) would be mitigated in kind on the refuge impacted as per the Department of Interior (DOI) Policy (FR Vol. 64, No. 175, 10 Sep 1999). Impacts to JLNHPP would be mitigated in kind on the JLNHPP as per the National Park Service (NPS) Director's Order 77-1 requiring impacts occurring on a National Park to be mitigated "on lands managed by the NPS, with the following recommended priority order: 1) within the same wetland system as the impacted wetland; 2) within the same watershed; or 3) in another watershed with the same NPS unit." Additionally, all unavoidable adverse impacts to the Bayou aux Carpes CWA Section 404(c) area was mitigated within that area and/or on the JLNHPP as committed to by the CENVN District Commander in his November 4, 2008 letter to the Regional Administrator for EPA Region 6. This commitment was also cited in EPA's May 27, 2009 Final Determination for the modification of the Section 404(c) determination for Bayou aux Carpes.

Although the compensatory mitigation effort may not be at the site of the actual impact, consistent with Section 2036 of WDRA 2007, a priority was made to locate any mitigation within the same watershed, to the maximum extent practicable. Under the Mitigation Program, impacts on wetlands and BLH generated from the LPV HSDRRS projects would be mitigated within the Lake Pontchartrain Basin (Figure 5-1), and the impacts generated from the WBV HSDRRS component would be mitigated in the Barataria Basin, between Bayou Lafourche and the Mississippi River (Figure 5-2).

5.3.1 HABITAT BASED METHODOLOGY

The Mitigation team established the following initial screening criteria for mitigating wetlands and BLHs:

- comply with environmental laws, regulations, and policies (i.e., WRDA, CWA, USACE guidance);
- determine any HTRW risk;
- locate within LPV or WBV mitigation basin, to the greatest extent practicable;
- replace in kind (replace impact AAHUs by habitat type);
- determine technical viability (e.g., depth of water, salinity lines);
- screen out projects that are potential future protection or restoration projects (e.g., authorized but not funded);
- have independent utility (not dependent on the completion of other projects);
- can be scaled to meet mitigation requirements only;
- no stand-alone BLH-dry projects (BLH-dry requirements will be mitigated contiguous with mitigation for other habitat types) or stand-alone marsh nourishment projects;
- BLH-dry, BLH-wet, and swamp projects must be contiguous with an existing resource- managed area;
- flood-side mitigation projects must be part of projects that consist of multiple habitat types unless contiguous with another resource-managed area;
- must meet 100 percent of the mitigation requirements for the impacted resources- managed land use type (e.g., impacts on wetlands located in

JLNHPP must be mitigated in JLNHPP) and for the specific impacted habitat types (e.g., impacts on BLH must be mitigated by restoration or creation of BLH).

A “habitat-based methodology” in the form of the wetland value assessment (WVA) model was used to assess impacts from construction of the HSDRRS work and future benefits to be obtained through the compensatory mitigation projects. The WVA model computes the difference in the habitat value over time (period of analysis) between not constructing the mitigation projects (future without) and constructing the project (future with project conditions). The difference is expressed as net average annual habitat units (AAHUs). For example, if the net change between the future without project condition (FWOP) and future with project (FWP) over the 50-year period of evaluation is a +0.2 over 100 acres, then that project would produce 20 AAHUs of ecological benefit. The same version of the model was used to calculate both the impacts from constructing the HSDRRS work and future benefits to be obtained through the implementation of the mitigation. Refer to section 4.2.3.2 for a more detailed explanation of the WVA model.

5.3.2 MITIGATION PROCESS

The HSDRRS improvements incurred impacts to PS and FS wet and dry BLH forests; swamp; freshwater, intermediate, and brackish marsh; and open water. In compliance with WRDA 2007, Section 2036, these impacts are being mitigated in the watershed impacted. Impacts generated from construction of the LPV HSDRRS (Table 5-7) are being mitigated within the Lake Pontchartrain Basin except as limited by the coastal zone and limited to exclude the barrier islands because the LPV HSDRRS impacts occurred within the coastal zone and the HSDRRS construction did not impact barrier island habitats. Impacts generated from construction of the WBV HSDRRS (Table 5-8) are being mitigated in the Barataria Basin except as limited to the intermediate/brackish marsh interface because the WBV HSDRRS construction only impacted fresh marsh which can be mitigated with either a fresh or intermediate marsh project.

Table 5-8: LPV HSDRRS Mitigation Requirements1.

Habitat Impacts	Acres*	AAHUs
BLH-wet	89.87	41.07
BLH-dry	18.95	65.43
Swamp	108.01	197.35
Fresh Marsh	38.6	11.46
Intermediate Marsh	45.7	100.15
Brackish Marsh	226.47	118.06
Refuge Intermediate Marsh	86.34	41.29
Refuge Brackish Marsh	24.59	8.79
Refuge BLH-wet FS	22.85	8.91
Refuge BLH-wet PS	147.88	74.96
TOTAL	**960.93**	**465.74**

FS indicates Flood side while PS indicates Protected Side
* Totals do not include TFG (EA #433) mitigation requirements; totals differ from what was presented in the PIER as they include the refinement discussed above. See Mitigation discrepancy memorandum in Appendix X

Table 5-9: WBV Mitigation Requirements1*

Habitat Type	ACRES*	AAHUs Impacted
General (PS) BLH-Wet/Dry	206.83	134.05
General (FS) BLH-Wet	109.59	56.55
General (FS) Swamp	155.18	83.81
General (FS) Fresh Marsh	132.9	65.92
Park/404(c) (FS) BLH-Wet	3.77	3.08
Park/404(c) (FS) Swamp	12.4	7.19
Park/404(c) (FS) Fresh Marsh	13.95	3.2
TOTAL	647.58	361.07

[1]FS indicates Flood side while PS indicates Protected Side
*Totals do not include EA #437 and EA #439 mitigation requirements for the original WBV construction. ; totals differ from what was presented in the PIER as they include the refinement to impacts as discussed above. See Mitigation discrepancy memorandum in Appendix X

Potential HSDRRS impacts to National Wildlife Refuge (NWR) and National Park Service (NPS) lands are referred to in this document as “Refuge” or “Park” impacts whereas impacts to lands outside the NWR or NPS system are considered “non-Refuge”, ‘non-Park’, or general impacts. The main difference between these two impact types is that Department of Interior Policy (FR Vol. 64, No. 175, 10 Sep 1999) requires impacts to NWR habitats be mitigated on the NWR impacted, within the authorized NWR acquisition boundary of that refuge, or on another NWR within the same refuge complex. Similarly, NPS Director’s Order 77-1 requires impacts occurring on a National Park (Park) be mitigated on lands managed by the NPS. Likewise, all unavoidable adverse impacts to the EPA’s Bayou aux Carpes 404c area would be mitigated within that area and/or on Jean Lafitte National Historical Park and Preserve as committed to by the CEMVN District Commander in his July 27, 2009 letter to the Regional

Administrator for EPA Region 6 (see Appendix H of PIER 37). This commitment was also cited in EPA's May 27, 2009 Final Determination for the modification of the Section 404c determination for Bayou aux Carpes.

Additionally, mitigation for impacts to habitats on the flood-side of the levee system will occur on the flood-side of the existing levee system. Mitigation of protected side impacts can occur on either the protected-side or the flood-side of the existing levee system. This is possible because FS habitats have an added hydrologic component that allows a greater diversity of species to thrive while still supporting the species that utilize that habitat. The result is an increase in habitat functions and services for flood-side habitat over and above what protected-side habitat would provide. Similarly, impacts to fresh marsh habitats could involve restoring or enhancing intermediate marsh since intermediate marsh provides similar functions and services for many of the same species utilizing fresh marsh.

5.3.2.1 Scoping And Public Meetings

The CEMVN collaborated and coordinated with Federal, state, and local agencies throughout the mitigation planning process, and engaged the public to ensure all reasonable alternatives for satisfying the mitigation requirements were identified.

The scoping process required by the NEPA is designed to provide an early and open means for determining the scope of issues (problems, needs, and opportunities) to be identified and addressed in the NEPA document. As part of the scoping process, public meetings were held at multiple locations within the LPV and WBV basins in an effort to obtain potential compensatory mitigation measures from the general public.

The first of these public meetings was a series of listening sessions in August 2009, followed by a series of meetings in May 2010. Community members were provided the opportunity to suggest specific ways impacts on the region's wetlands and non-jurisdictional BLH systems could be alleviated. Each of these listening sessions and meetings began with a presentation on the nearby HSDRRS construction projects followed by a brief overview of the Mitigation Program. After each presentation, the floor was opened to questions, suggestions, and ideas from the public regarding where, and how best, to mitigate for wetland and non-jurisdictional BLH impacts.

Suggestions for mitigation measures were received from the general public; non-governmental organizations; the non-Federal sponsor, Coastal Protection and Restoration Authority Board (CPRAB); and other state and Federal resource agencies. In addition, the Project Delivery team (PDT) also examined (within the basin) existing watershed plans, searched for potential measures beyond what was already submitted, and evaluated implementation options during the value engineering study that could produce sufficient credits to meet the mitigation requirement.

In total, the scoping process resulted in the identification of over 400 possible mitigation measures in each basin. Figures 5-1 and 5-2 show the location of all mitigation measures suggested to or developed by the PDT. USACE approved mitigation banks with perpetual conservation servitudes within the LPV and WBV basins currently in compliance with their mitigation banking instrument (MBI) and able to service the habitat types impacted were also considered as potential mitigation measures.

5.3.2.2 Screening Criteria

Screening criteria were developed by the PDT in accordance with the Implementation Guidance derived from video teleconference factsheets and the CEMVN Commander's Intent to pare down the 400 proposed mitigation measures to a manageable list of measures for further analysis (USACE, 2010). For detailed information on the screening criteria, see Appendix E and F of PIER 36 and PIER 37 respectively.

The screening criteria were developed to achieve large contiguous tracts of land for the purposes of obtaining greater ecological output within the watershed and to produce cost efficiencies that would be experienced during construction and OMRR&R phases. The screening criteria encouraged the grouping of measures of one habitat type with measures of a different habitat type or with other resource managed areas in the same geographical area to form large contiguous tracts of resource managed land. Proposed measures had to meet the following criteria and those that did not meet all the criteria were eliminated from further consideration.

Screening criteria common to both LPV and WBV HSDRRS Mitigation Projects.

- Proposed measures could not convert existing wetlands to uplands
- Proposed measures had to be compliant with applicable laws and policies
- Proposed measures had to be located within LPV Mitigation Basin
- Proposed measures had to be free of known Hazardous, Toxic, or Radioactive Waste (HTRW)
- Proposed measures had to provide for in-kind replacement of impact AAHUs by habitat type (exception: BLH-Dry can be mitigated as BLH-Wet)
- Proposed measures had to be technically viable (e.g. salinity suitable for target habitat type)
- Proposed mitigation measures could not be measures already considered in the Future Without Project Condition
- Proposed measure had to have independent utility (not dependent on implementation of or modification to other projects)
- Proposed measures had to be easily scaled to meet changing mitigation acreage requirements
- Proposed measures could not be a stand-alone BLH-Dry habitat type (requirements allowed for BLH-Dry to be mitigated contiguous with mitigation for other habitat types, and mitigated on flood side or protected side of levee)
- Proposed mitigation measures could not be stand-alone un-confined marsh nourishment measures
- Proposed mitigation measures could not be preservation of an existing habitat type.

LPV specific screening criteria:

- Proposed mitigation measures for BLH-Wet and swamp had to be contiguous with (or within) an existing resource-managed area or with the project area of another proposed mitigation measure
- Proposed mitigation measures for BLH-Dry, BLH-Wet, and swamp habitat types had to be part of proposed mitigation measures that consist of at least 100 contiguous acres of forested habitat unless contiguous with the project area of a proposed marsh mitigation measure or contiguous with or within another resource-managed area
- Proposed mitigation measures that address mitigation requirements for impacts to the Bayou Sauvage NWR had to be located within the boundary or acquisition boundary of a NWR.
- Proposed mitigation measures had to meet 100 percent (%) of the mitigation requirement by habitat type according to the following groupings unless contiguous with the project area of other proposed mitigation measures:

    - 100% non-refuge BLH-Wet FS + PS (mitigate FS)
    - 100% non-refuge Swamp FS + PS (mitigate FS)
    - 100% non-refuge Brackish Marsh FS + PS and 100% refuge Brackish Marsh FS (mitigate FS)
    - 100% non-refuge Fresh/Intermediate Marsh FS + PS (mitigate FS)
    - 100% refuge BLH-Wet PS (mitigate PS)
    - 100% refuge BLH-Wet FS (mitigate FS)
    - 100% refuge Fresh/Intermediate Marsh PS (mitigate PS)

WBV specific screening criteria:

- Measures that address mitigation requirements for impacts to JLNHPP and 404(c) area must be located wholly within the boundary or acquisition boundary of the JLNHPP;
- Protected side BLH-Wet measures must be contiguous with or within an existing resource-managed area (BLH-Wet protected side impacts may be mitigated protected side or flood side);
- Flood side BLH-Wet measures must be contiguous with or within an existing resource-managed area or with the project area of another proposed mitigation measure;
- Swamp measures must be contiguous with (or within) an existing resource-managed area or with another proposed mitigation measure;
- Flood side mitigation measures must be part of proposed mitigation projects that consist of multiple habitat types unless contiguous with or within another resource-managed area and;
- Meet 100% of the mitigation requirement by habitat type according to the following groupings (FS stands for flood side; PS stands for protected side):

- 100% General BLH-Wet PS (mitigate PS or FS)
- 100% General BLH-Wet FS (mitigate FS)
- 100% General Swamp FS (mitigate FS)
- 100% General Fresh Marsh FS (mitigate FS)
- 100% park/404(c) BLH-Wet FS (mitigate FS)
- 100% park/404(c) Swamp FS (mitigate FS)
- 100% park/404(c) Fresh Marsh FS (mitigate FS)

Mitigation requirements were initially evaluated at the 35 percent design level based on worst-case scenarios. As the projects advanced through further design stages, a concerted effort was applied to avoid and minimize environmental impacts to the extent practicable reducing impacts significantly as the projects were finalized. Consequently, the mitigation PDT, working in cooperation with resource agencies, revised the original estimates.

Mitigation alternatives were compared and evaluated to determine the best project for a particular habitat using a range of selection criteria including risk and reliability, environmental considerations, time range of ecological success, watershed and ecological site considerations, cost effectiveness, and other considerations (*e.g.,* real estate costs, operations and maintenance costs, etc.). Furthermore, as tentatively selected mitigation plan alternatives were created, further adjustments were made to estimated project impacts.

5.3.2.3 Borrow

In order to raise the HSRRS to the 100-year, large quantities of borrow were required. Approximately 93 million cubic yards (cy) of material was estimated to be required for the construction borrow program.

The first stages of borrow procurement for the HSDRRS work utilized identification of sites with appropriate material for acquisition by the Federal Government (Government). Once the sites were either acquired or an easement over them obtained, they were then provided to the HSDRRS construction contractors as potential borrow sources. Mitigation for habitat impacts if these sites are utilized was the responsibility of the Government. Reference the borrow IERs for a discussion of specific habitat impacts. See Table 2-1 for hyperlinks to the IERs.

5.3.2.3.1 <u>Wetland Borrow environmental Design and Construction Commitments</u>

Wetlands near or within potential borrow sites were delineated by the CEMVN Regulatory Functions Branch during initial investigations of potential borrow areas. At times, due to these delineations, potential borrow sites were eliminated from further consideration or the management plans for a borrow site were revised to avoid all wetlands.

As detailed in the IERs, the borrow contractor was required to secure all proper local, state, and Federal permits. The USACE required the implementation of construction BMPs and a Quality Assurance/Quality Control program to ensure that the BMPs were followed during construction. The contractor was responsible for obtaining any NPDES permits required. Stormwater permits were obtained as per standard operating procedures. Specifically, the following was required per contract plans and specifications:

- Silt fencing and hay bales would be installed around the perimeter of the borrow areas to control runoff.

- To make optimal use of available material, excavation would begin at one end of the borrow area and be made continuous across the width of the areas to the required borrow depths, to provide surface drainage to the low side of the borrow pit as excavation proceeds.

- Excavation for semi-compacted fill would not be permitted in water, nor shall excavated material be scraped, dragged, or otherwise moved through water. In some cases, the borrow areas may need to be drained with the use of a sump pump.

- Upon abandonment, site restoration would include placing the stockpiled overburden back into the pit and grading the slopes to the specified cross-section figures. Abrupt changes in grade shall be avoided, and the bottom of the borrow pit shall be left relatively smooth and sloped from one end to the other. Although this mitigation measure was required by many of the borrow IERs, this was not done at any of the contractor-furnished borrow sites, as the USACE cannot dictate these construction methods to private landowners.

- The borrow area management plan of the Stumpf Phase 1 (300 acres) and Phase 2 (515 acres) borrow areas maintained a 100 ft vegetated buffer along canals designated as Section 404 jurisdictional waters of the U.S. Canal crossings were constructed in such a way to maintain the existing hydrology in the area, and BMPs were implemented to ensure no indirect impacts on the canals. Placement of 105,000 cubic yards of recycled embankment material (REM) occurred on a 7.93-acre portion of the Phase 1 location and approximately 14.48 acres adjacent to the previously authorized Phase 1 location. Bottomland hardwood forest was impacted and required an additional 12.2 acres of bottomland hardwood forest credits purchased from the Paradis Mitigation Bank on September 20, 2011.

5.3.2.3.2 <u>Bottomland Hardwood Environmental Design and Construction Commitments</u>

GF Borrow: St. Charles and Orleans Sub-basin (IER 18).

Currently, the CEMVN and the local non-Federal sponsor compensated for approximately 25.27 AAHUs of BLH habitat resulting from excavation activities at borrow sites as shown in table 5-10.

Table 5-10: BLH AAHUs Required

IER 18 Borrow Areas	Parish	Acres/AAHUs BLH Needed
Maynard	Orleans	44.74 (14.65)
Churchill Farms Pit A	Jefferson	29.9 (10.62)
Bonnett Carre' Spillway	St. Charles	0 (0.00)
Total		**74.64 (25.27)**

GF Borrow: Orleans East Bank Sub-basin (IER 25, IERS 25.a).

Approximately 6.19 AAUHs of BLH was required for compensatory mitigation at the IER 25 borrow sites as shown in table 5-11. The Stumpf borrow site was used a staging area for HSDRRS construction and not borrow.

Table 5-11: BLH AAHUs Required

IER 25 Borrow Areas	Parish	Acres/AAHUs of Non-jurisdictional BLH Needed
Stumpf Phase 1 and Phase 2	Orleans	22.41 (6.19)
Total		**22.41 (6.19)**

CF Borrow: IER 29.

Approximately 6.29 AAUHs BLH were required compensatory mitigation at the borrow sites and distributed as shown in table 5-11. All three of these borrow sites have been used for HSDRRS construction. The private contractor provided mitigation to compensate for the unavoidable, project-related loss of forested lands. The verification of purchased mitigation credits was provided to the CEMVN by the mitigation bank.

Table 5-12: Non-jurisdictional BLH AAHUs Required

IER 29 Borrow Areas	Parish	Acres/AAHUs of Non-jurisdictional BLH Needed
Eastover Phase II	Orleans	1.56 (0.33)
Tammany Holding	St. Tammany	0 (0.00)
Willow Bend/Willow Bend Phase II	St. John the Baptist	10.79 (5.96)
Total		6.29)

CF Borrow: IER 30.

There were no impacts to BLH resulting from the borrow sites for HSDRRS in IER 30. There was approximately 189.4 AAHUs of mitigation obtained by Contreras Dirt (DK Aggregates) site prior to excavation for landfill construction. Based on USFWS recommendations, the CEMVN investigated the Contreras sites further to ensure there were no additional wetland impacts resulting from potential hydrologic modifications caused by borrow material excavation to impact nearby, jurisdictional wetlands outside of the project areas. Only the Contreras and Big Shake borrow sites were used for HSDRRS construction.

CF Borrow: IER 31.

The borrow sites did not have BLH impacts. Compensatory mitigation of 112.66 AAHUs of BLH for construction of landfills at the Acosta, Idlewild and River Birch sites was the responsibility of the respective landowners/contractors and completed prior to excavation. CEMVN obtained verification of appropriate mitigation prior to authorizing excavation of borrow material. Based on USFWS recommendations, the CEMVN investigated the borrow sites further to ensure there were no additional wetland impacts resulting from potential hydrologic modifications caused by borrow material excavation to impact nearby, wetlands outside of the project areas.

CF Borrow: IER 32.

The borrow sites did not have BLH impact. Only the Plaquemines Dirt and Clay, Citrus Lands, and the 3C Riverside Phase 3 borrow sites were used for HSDRRS construction. Compensatory mitigation of 84.6 AAHUs for the 3C Riverside location was completed by the landowners before excavation (CEMVN's CWA Section 404 regulatory program permit number MVN 2009-0698-EBB), CEMVN required verification of appropriate mitigation prior to excavation. Based on USFWS recommendations, the CEMVN investigated the borrow sites further to ensure there were no additional wetland impacts resulting from potential hydrologic caused by borrow modifications material excavation to impact nearby, jurisdictional wetlands outside of the project areas.

5.3.3 MITIGATION PLAN

5.3.3.1 LPV Mitigation Plan

As stated in the PIER 36 document, constructible features that could be implemented immediately were the purchase of mitigation bank credits to fully mitigate for swamp and BLH-wet impacts. Mitigation bank credits sufficient to fully mitigate 108.01 AAHUs of swamp impacts were purchased in the LPV basin.

Table 5-1 represents the Mitigation document; habitat impacts and the respective mitigation project. Table 5-9 demonstrates the impacts by habitat type flood side or protected side of the levee. The tables include the TFG impacts. Programmatic features assessed in the PIER and further refined and assessed in subsequent supplements to make them constructible include:

Table 5-13: LPV Mitigation Plan

Habitat Type	AAHU Impacted	Mitigation Project	Project Acres	Status
Non-Refuge BM	118.06	Bayou Sauvage FS BM & New Zydeco Ridge – marsh component		Constructed 6/20. Draft monitoring plan 2/21
Refuge BM	8.79			Constructed 4/20
Refuge IM	41.29	Turtle Bayou PS IM		Constructed 8/19. Draft monitoring plan 2/21
Refuge PS BLH-wet	83.29	New Zydeco Ridge BLH-wet		Constructed 4/20. Draft monitoring plan 8/21
Refuge FS BLH-wet	8.91			

BM = Brackish Marsh; IM = intermediate marsh; BLH = bottomland hardwoods; PS = protected side; FS = flood side

Bayou Sauvage Floodside Brackish Marsh (BSFBM). This restoration project is in the far south-eastern lobe of Lake Pontchartrain, east of Interstate 10. The project plan consisted of two areas of open water/broken marsh, which were filled and/or restored to provide a healthy marsh platform. The most northern currently proposed marsh footprint BSFS4 located immediately east of Hwy 11, fronting the community of Irish Bayou in Orleans Parish, Louisiana could not be implemented, therefore approximately 60-acres (18.4 AAHUs) was moved to the New Zydeco Ridge Brackish Marsh restoration project (SEA #546).

The southern proposed marsh footprint is 280 (BSFS5) acres and is located approximate 2.5 miles south, south-east of the northern polygon on Bayou Sauvage NWR. The southern site is approximately 0.5 miles north of Chef Menteur Highway (Hwy 90). Restoration was accomplished through dedicated dredging of material borrowed from Lake Pontchartrain via hydraulic cutterhead dredge. Access impacts consisted of .5 acres and .41 AAHUs of brackish marsh. Initial target elevation for dredge fill was approximately to elevation +2.5-feet NAVD88, ultimately reaching a target marsh elevation ranging from +1.5 to +1.0-feet NAVD88. The site required total perimeter retention dikes to hold dredge material and allow for vertical accretion. The retention dikes were gapped a year after the final lift, upon settlement and dewatering of the created marsh platform. The marsh platform and the shoreline protection feature along Irish Bayou were planted.

The implementation of BSFS5 resulted in the creation of approximately 84.8 AAHUs of brackish marsh within the Bayou Sauvage National Wildlife Refuge (BSNWR). The brackish marsh mitigation requirement is 126.85 AAHUs (8.79 refuge, 118.06 general). This leaves an anticipated outstanding balance of 23.7 AAHUs of brackish marsh mitigation that was mitigated adjacent to the NZR BLH-Wet project.

Turtle Bayou Protected-Side Intermediate Marsh (TBPIM). This restoration project is located on the Bayou Sauvage NWR in eastern Orleans Parish, Louisiana. The site is immediately west of LA Hwy 11, north of and adjacent to Turtle Bayou, and east of I-10. The project consists of creating approximately 126 acres of intermediate marsh within an open water area immediately north of Turtle Bayou.

Restoration was accomplished through dedicated dredging of material borrowed from Lake Pontchartrain via hydraulic cutterhead dredge. This work was coupled with the restoration work proposed for BSFBM. The dredge material was obtained from a borrow site in east Lake Pontchartrain. Access impacts consisted of approximately 10.13 acres and 3.36 AAHUs of intermediate marsh on the protected side of the levees and 2.11 acres and .77 AAHUs of brackish marsh on the flood side of the levees.

The dredge material was placed confined to a slurry elevation of + 4-ft NAVD88. Spill box weirs were constructed to control the pool level within the restoration area and the earthen dikes and closures were gapped and/or degraded as necessary to facilitate development. The dikes and closures were constructed to approximate elevation + 5.5-feet NAVD88. TBPIM has a mitigation potential of 0.39 AAHU per acre and provides mitigation for the 41.29 AAHU LPV HSDRRS refuge impacts and 3.36 AAHUs of TBPIM protected side access impacts to intermediate marsh through the creation of at least 120 acres of protected side intermediate marsh within the proposed 130-acre project area.

New Zydeco Ridge (NZR). BLH-Wet Component. The NZR BLH-Wet restoration project is located on the north shore of Lake Pontchartrain in the north east quadrant of the lake, immediately adjacent to U.S. Highway 90, and approximately 5 miles east of Slidell, Louisiana on the Big Branch NWR. The project consisted of creating approximately 159 acres of BLH-Wet within a designated shallow open water area immediately north of Salt Bayou. Restoration was accomplished through dedicated dredging of material borrowed from Lake Pontchartrain via hydraulic cutterhead dredge. The dredge material was obtained from a borrow site in east Lake Pontchartrain. Access impacted approximately 3.75 acres and 1.51 AAHUs of brackish marsh. For the BLH-Wet construction scenario, initial target elevation for dredge fill would be to approximate elevation +5.5 NAVD88, to ultimately hit a target elevation ranging from +3.0 to +3.5 NAVD88. Total perimeter retention was required to retain dredge material and allow for vertical accretion. Spill boxes or weirs were constructed at predetermined locations within the retention dike to allow for effluent water release from within the marsh creation area.

With a mitigation potential of 0.6 AAHU per acre, the BLH-Wet restoration project provides more than the required 92.83 AAHU of Refuge BLH-Wet impacts through restoration of 159 acres of floodside BLH-Wet within the proposed project area. The estimated 93.94 AAHU provided by this BLH-Wet restoration project fulfills the 83.92 AAHU of protected side BLH-Wet refuge impacts as well as the 8.91 AAHU of floodside BLH-Wet refuge impacts that resulted from LPV construction activities.

Intermediate/Brackish Marsh Component. To mitigate for the permanent impacts to approximately 159 acres of EFH from construction of the NZR BLH-wet project, a WVA was conducted to determine the habitat unit loss from conversion of open water and submerged aquatic vegetation (SAV) to non-tidally influenced BLH-wet habitat. The WVA assessed a loss of approximately 21.2 AAHUs of EFH, therefore, approximately 66.25 acres south of the proposed BLH-Wet restoration footprint was restored to intermediate/brackish marsh habitat (mitigation potential of 0.32 AAHU/acre) on the refuge where the impacts occurred (first priority of the USFWS). The NZR marsh feature fully compensates for the unavoidable impacts to EFH by converting relatively low quality shallow open water to emergent intermediate/brackish marsh habitat (also a type of EFH).

Additionally, to mitigate the 23.7 AAHUs of brackish marsh impacts the BSFSM project could not produce (see section BSFSM section above) and the 2.69 AAHUs of brackish marsh impacts that was incurred from access to the mitigation projects during construction (.77 AAHUs flood side impacts at TBPIM, .41 AAHUS at BSFSM, and 1.51 AAHUS at NZR), approximately 82.3 acres of brackish marsh was created at NZR. The total project footprint for the NZR intermediate/brackish project is approximately 148.6 acres.

The PIER 36, SIER 1 BSFS4 brackish marsh project could not be implemented as assessed so changes were made and assessed in SEA #546. The project would take the 18.4 AAHUs of outstanding mitigation that could not be accomplished at the BSFS4 site and expand the NZR brackish marsh restoration project by 60 acres. The NZR projects are located on the north shore of Lake Pontchartrain in the northeast quadrant of the lake, northwest of U.S. Highway 90 and approximately 5 miles east of Slidell, LA on the Big Branch NWR. The project is bounded on the east by U.S. Highway 90, on the North by U.S. Highway 190, on the west by Interstate 10, and on the south by Lake Pontchartrain. The NZR projects created approximately 159 acres of BLH-wet habitat and 160 acres of intermediate/brackish marsh habitat.

The earthen perimeter dike(s) around the marsh creation area(s) were constructed to an elevation +4.0 feet NAVD88 with a 5-foot crown and 1V on 3H side slopes. The retention dike around the BLH-Wet creation area was constructed to elevation +7.0 feet NAVD88 with a 5-foot crown and 1V on 3H side slopes. This varies from the original NZR design in which the retention dikes were to be constructed with a 1V on 4H side slope. Cross dikes between the marsh creation cell(s) and the BLH creation cell were constructed to elevation +5.5 feet NAVD88 to allow effluent from the BLH cell to spill into the marsh creation cell(s). Spill boxes were constructed at pre-determined locations within the retention dike to allow for effluent water release from within the marsh creation area(s). Borrow for dike construction was obtained from the interior of the marsh/BLH creation footprints. Specifics on the interior borrow ditch design can be found in SIER 1. The marsh creation area(s) were filled to an elevation of approximately +3.0 feet NAVD88 to the target marsh elevation ranging from +1.0 feet to +1.5 feet NAVD88.

Borrow Site and Access Corridor - The original borrow site for NZR measured 289 acres and was broken into 2 primary (sites #1) and 2 secondary (sites #2) borrow areas due to differential lake bottom elevations. The primary and secondary borrow sites #1 are in deeper water (7 to 18 feet deep), thus a dredging depth of -20 feet NAVD88 is being used to obtain a suitable quantity of material. Primary and secondary borrow sites #2 are in shallower water (4 to 9 feet deep), therefore dredge depths vary with primary borrow site # 2 having a dredge depth of -18' NAVD88 and secondary borrow site #2 having a dredge depth of -16' NAVD88. The total fill material dredged from borrow sites was 3,600,000 cubic yards.

Due to the elimination of one of the Bayou Sauvage Flood Side Brackish Marsh features approved in SIER 1, the borrow site for the Bayou Sauvage/Turtle Bayou restoration areas was downsized by 41 acres, shrinking that borrow area from its original size of 459 acres down to 418 acres. At the same time, the borrow site for NZR was expanded by 41 acres to ensure enough borrow for the NZR brackish marsh expansion. Together, the two borrow areas for the revised restoration actions totaled 748 acres, the same total size as evaluated in SIER 1. Although the New Zydeco borrow site

5.3.3.2 WBV Mitigation Plan

Under the WBV mitigation plan, 11.6 mitigation bank credits to satisfy the mitigation obligation of 7.3 AAHUs of protected side BLH-wet/dry impacts were purchased in the WBV basin.

Table 5-1 represents the habitat impacts and the respective mitigation project. Table 5-10 demonstrates the impacts by habitat type flood side or protected side of the levee. The tables include the impacts resulting from impacts of the original WBV construction (EA #437 and #439). The initial Lake Boeuf Restoration projects proposed in the PIER #37 and SPIER 37a were determined to not be constructible and were therefore replaced by a project at Highway 307 assessed in SEA #572. Programmatic features assessed in the PIER and further refined and assessed in subsequent supplements to make them constructible include:

Table 5-14: WBV HSDRRS Mitigation Plan

Habitat Type	AAHU	Mitigation Project	Project Acres	Status
General PS BLH-Dry enhancement	193	Avondale Gardens	920	Constructed 11/2019. Final monitoring plan 11/19
General FS BLH-wet	72.04	Highway 307	133	Constructed 8/2021
General FS Swamp	134.52		287	Constructed 8/21. Draft monitoring plan underway
General FS Fresh Marsh	65.92	JELA General FM JL1B5 & JL15 Park BLH-wet JL14A Park swamp JL7 Park FM JL1B4	138	Constructed 11/19. Draft monitoring plan 5/20
Park/404(c) FS BLH-wet (Hwy 45)	3.12		12.16	Constructed. Draft monitoring plan 10/19
Park/404(c) FS Swamp (Milaudon)	71.9		20.44	Construction 2016. Draft monitoring plan 9/20
Park/404(c) FS Fresh Marsh	3.03		20.40	Constructed. Draft monitoring plan 5/20

5.3.3.2.1 Avondale Gardens.

This project involved enhancing an existing degraded BLH habitat as mitigation for general PS BLH-Dry impacts. The feature is located on the Westbank of Jefferson Parish, Louisiana near Bayou Segnette State Park. Two locations were initially identified within the project area, BLH West and BLH East (Appendix A-5 of the SPIER). The project was implemented at the BLH West site. However, if conditions at the BLH West site are not favorable for construction and/or for the long-term success and sustainability of the project or if negotiations with landowner(s) favor purchase of the East site, the project may be implemented at the BLH East site. At the selected site, approximately 920 acres of predominantly invasive and nuisance species would be eradicated, and the area cleared and grubbed then planted with native, high quality tree and shrub species. Large native trees and shrubs would be preserved during the mechanical clearing process to the greatest degree practicable.

5.3.3.2.2 Highway 307 FS BLH-wet and Swamp Restoration Projects.

The project is in Lafourche Parish along Highway 307 between Raceland and Des Allemandes. The entire footprint consists of approximately 521 acres of agricultural fields. Within the 521 acres, approximately 133 acres would be used for BLH-Wet restoration (Appendix A-5 of SEA #572). The 133 acres includes additional acreage to account for any potential changes in project size due to the completion of final WVAs, final engineering design, and required maintenance corridors. Elevations within the portion of the project area where BLH would be restored are either at or above the elevation conducive to BLH-Wet establishment (+2.5 feet to 3.25 feet NAVD88), therefore outside borrow was not required. The entire project area is contained within a perimeter water retention dike, certain portions of which may require degradation to reconnect the restoration project with adjacent swamp/BLH habitat. The dikes would be degraded in such a way to ensure de minimis impacts. Ditches adjacent to the dikes may be filled or partially filled during dike degradation.

Most of the acres required for BLH-wet restoration are anticipated to be planted at the existing elevation within the site once the water retention dikes are degraded. Since most of the project footprint is existing agricultural fields, little vegetative would be required. The material would be stockpiled and burned on site. The project would be planted with BLH species.

The exact footprint of the project features was established based on existing LIDAR data, which clearly mapped and confirmed existing elevations. Features were designed (1) to avoid cultural sites, (2) to minimize required earth moving from high to low areas, (3) minimize the need for retention dike realignment to maintain the integrity of all fields, and (4) accommodate the potential for swamp restoration which is also being considered within this footprint.

5.3.3.3 Jean Lafitte National Historic Park and Preserve Restoration Projects

5.3.3.3.1 *JL1B5 and JL15 General Fresh Marsh Projects.*

This mitigation project involved the restoration of fresh marsh habitats at two locations on JELA in Jefferson Parish.

Feature JL1B5 was built in an open water portion of Yankee pond, and occupies approximately 91.2 acres (87.6 acres of marsh restoration + 3.6 acres of dikes), and produce approximately 49 AAHUs of fresh marsh benefits.

Approximately 8,400 linear feet (ft) of retention dike were constructed. Approximately 3,100-ft of dike was armored/capped with along the eastern boundary of the feature adjacent to Bayou Segnette. Borrow for these retention dikes were excavated with a marsh buggy from within the marsh creation footprint. The borrow ditch was offset a minimum of 40-ft from the dike to assure dike stability.

Marsh restoration at this feature required approximately 600,000 cy of material hydraulically dredged from Lake Cataouatche. The borrow site was situated a minimum 2,000 ft from the lake shoreline and material was dredged using a hydraulic cutter- head dredge. The borrow material was hydraulically pumped from the borrow site to the mitigation feature via 18,000 -ft of pipeline routed through Lake Cataouatche to the western bank of Bayou Segnette Waterway (BSWW), then along the BSWW to Yankee Pond.

Floating pipeline (discharge pipe on pontoons) was used in the BSWW. The main navigation channel in the BSSW ranged from 300 to 450-ft wide. The portion of the slurry pipeline routed adjacent to the west bank of the BSWW included a pipeline corridor width of 100 ft.

The initial target marsh elevation (elevation of slurry fill) for this feature was +3.5 ft. The construction period was approximately 5 to 6 months. There was an idle period of approx. 1 year upon completion of construction to allow the marsh platform to settle to the desired final target elevation of approximately +1.0 to +1.5 ft. The final construction phase occurred following settlement and dewatering of the created marsh platform. In the final construction phase, all perimeter dikes except for the one bordering Bayou Segnette (e.g. the eastern dike) were degraded with a marsh buggy such that the crest of the dikes would be the same as the final target elevation of the marsh platform. The dike segment along the eastern edge of feature JL1B5 was reshaped and armored with a 2-foot stone cap to elevation +3.0 ft. During this process, fish dips" (essentially armored gaps) were constructed in the armored dike segment. The fish dips allow water exchange and provide aquatic organism access to the marsh feature.

Each fish dip has a bottom width of approximately 25-feet, a bottom elevation no greater than 0-feet NAVD88, and 1V:3H side slopes. There is approximately one fish dip for every 500-ft of armored dike (i.e. 500-foot spacing).
Trenasses were constructed to serve as tidal creeks to facilitate water exchange and create shallow water interspersion features within JL1B5. The trenasses were rutted to a lower than marsh elevation by performing two passes of a marsh buggy along the desired alignment. The trenasse width are the width of marsh buggy (approx. 10-12-feet). The final phase of construction activities (degrading dikes, constructing trenasses and fish dips, installation of dike armoring) would take approximately 3 to 4 months.

The marsh platform is vegetating naturally. Consequently, no planting is required.

Feature JL15 was situated in an area along the shoreline of Lake Salvador where prior work has already established a marsh platform that was previously an open water portion of the lake. Feature JL15 encompasses a total of approximately 55.5 acres (50.4 acres of marsh + 5.1 acres of dikes) and produced approximately 26.7 AAHUs of fresh marsh benefits. Portions of this feature is on federally owned property within the Park, while the remaining portions is on lands not currently owned by the federal government.

As part of the proposed project, existing low quality BLH species (black willow) were eradicated, the existing rock armament of the lakeside dike was augmented, and several fish dips were constructed in the dike. Low quality BLH species on the dike itself were not removed. The new fish dips were designed to prevent interior erosion from lake wave action and provide water exchange and aquatic organism access to the marsh feature. The JL15 construction activities (herbicide application, refurbishment of rock dike, constructing fish dips) took approximately 5 months. As with JL1B5, the platform is revegetating naturally.

5.3.3.3.2 JL1B4 Park Fresh Marsh Project.

The JL1B4 project involved restoring 20.4 acres of fresh marsh habitat from open water in the southwest corner of Yankee Pond and produces approximately 11.4 AAHUs of fresh marsh benefits on JELA. Although this project produces more AAHUs than necessary to mitigate the AAHUs of marsh impacted within the Park (3.03), the number of acres impacted versus the number of acres restored is also a consideration. NPS policy requires at least a 1 acre to 1-acre ratio when mitigating impacts to NPS lands. Since 14.5 acres of impact to JELA fresh marsh occurred during construction of the WBV HSDRRS, this 20.4-acre project is more than sufficient to meet the 1:1 ratio required for mitigation by the NPS.

This project is adjacent to and merges with the JL1B5 feature to create one overall marsh restoration project occupying approximately 108 acres. Consequently, the armored dike was constructed along the eastern edge of JL1B5 to provide protection to both the JL1B5 and JL1B4 features. Approximately 2,000 linear ft of retention dike was required for JL1B4. Retention dikes were constructed in the same manner as those for the JL1B5 feature. A low-level weir was constructed in the southwest corner of the restoration project to allow for effluent water release from within the marsh restoration area and nourish the existing marsh adjacent to the west side of JL1B4.

Marsh restoration required approximately 150,000 cy of borrow material which was hydraulically dredged from Lake Cataouatche. The borrow site was adjacent to the borrow site for the JL1B5 feature and was approximately 1,500 ft X 300 ft (roughly 10.3 acres) with a maximum depth of 10 ft. All other construction details was the same as those specified for the JL1B5 feature. The marsh platform is revegetated naturally.

5.3.3.3.3 JL7 Park/404c Swamp Project.

The JL7 project involved restoring the hydrologic connection and natural sheet flow across existing impounded swamp habitat to compensate for Park/404c swamp impacts. The project produced approximately 8.4 AAHUs of swamp benefits on JELA but also incurs an additional .97 AAHUs of BLH impacts through construction of the project at the JL14A site.

Existing spoil berms along the north side of the Millaudon and Horseshoe Canals were gapped to improve exchange of surface water between swamp habitats in the area. Spoil berm gaps were excavated at 3 locations along Millaudon Canal and 3 locations along Horseshoe Canal. The spoil berms were degraded approximately 4.5 ft, to elevation -1.5 NAVD88. This bottom elevation allows water movement in the adjacent swamp to mimic the tidal range experienced in the adjacent canals and discourages re-growth of woody plant species in the gaps. Gaps constructed on Millaudon Canal were excavated to a bottom width of 25 ft, approximately 60 ft long with 1:3 side slopes. Gaps constructed on Horseshoe Canal were excavated to a bottom width of 100 ft and extend approximately 60 ft into the project area with 1:3 side slopes. The project required excavation of approximately 470 cy for each cut along Horseshoe Canal and 140 cy for each cut along the Millaudon Canal.

Materials and vegetative debris excavated were placed immediately south of the gaps in the adjacent canals using marsh tracked excavators or excavators on small modular barges to stay within the canal and avoid additional impacts to spoil bank habitat.

Construction equipment would access the project site via an access roadway along an existing levee from Tusa Drive off Barataria Blvd. After reaching the levee, construction equipment would follow the West Bank Hurricane Protection Levee west to Horseshoe Canal or north to Millaudon Canal. The proposed construction access route would require building temporary earthen access ramps on either side of the levees within the existing levee ROW for equipment movement over the existing levee. Construction equipment, consisting of long reach marsh buggies, would then access the gap locations by traveling adjacent to the spoil berm, within the banks of the canal, on the north side of the canals. If modular barges are used instead of marsh buggies, the barges would be brought in by trailer from Barataria Blvd. and would be connected to form a work platform in the canal. Equipment would then construct the gaps from the barges.

5.3.3.3.4 *JL14A Park/404c BLH-Wet Project*

The JL14A project would involve restoring BLH-Wet habitat from open water areas on JELA and would produce approximately 5.2 AAHUs of BLH-Wet benefits. This would satisfy the 3.12 AAHUs of WBV HSDRRS construction impacts, the .97 AAHUs of impact from construction of the JL7 mitigation feature, and the 1.06 AAHUs of impact from the 2007 encroachments discussed in Section 1 of the EA.

This project would require filling 8.1 acres of an existing borrow pit to elevations conducive to BLH establishment. The existing bottom elevation of the borrow pit is likely around -20.0 ft. The pit would first be filled with 15 ft of sand to elevation -5 ft. A 5- 6 ft clay cap would then be placed on top of the sand fill, followed by 1.5 – 2 ft of topsoil to the initial target elevation of 2.5 - 3 ft. Clearing of vegetation and debris from within the pits, and trimming of overhanging trees along the edge of the mitigation project may be required prior to placement of fill.

The proposed project would require approximately 210,000 cy of sand, 80,000 cy of clay, and 30,000 cy of topsoil hauled from off-site commercial, contractor furnished, and/or government furnished borrow pits. The potential government-furnished and contractor-furnished sites were evaluated pursuant to NEPA and other laws in Individual Environmental Reports (IERs) Nos. 18, 19, 22-26, 28-32 and 35. Those IER's and their Decision Records are incorporated herein by reference.

Construction equipment, including dump trucks, would access the project site via an existing levee access roadway situated about 0.3 miles south of Tusa Drive off Barataria Blvd. After reaching the levee, construction equipment would follow the West Bank Hurricane Protection Levee west to JL14. A temporary road would be required along the floodside berm of the levee. Approximately 100 – 20 cy dump trucks would access the site per day during the estimated 210-day construction duration for this project.

The initial construction phase is estimated to be less than 2 years. Once the mitigation project has reached the desired target grade, the project would be planted with native canopy and mid-story BLH species as discussed in the mitigation work plan contained in Appendix D of the PIER 37, TIER 1 EA.

5.3.4 MITIGATION PLANTING, MONITORING AND ADAPTIVE MANAGEMENT

General success criteria and monitoring including planting guidelines for the mitigation projects are available in Appendix J of the PIER 36 and PIER 37. Specific success criteria and monitoring for the Bonnet Carré projects are available in appendix K and L of the PIER 36 and PIER 37.

The purpose of adaptive management activities in the life cycle of the mitigation project is to address ecological and other uncertainties that could prevent successful implementation of a project. Adaptive management (AM) also establishes a framework for decision making that utilizes monitoring results and other information, as it becomes available, to update project knowledge and adjust management/mitigation actions. Hence, early implementation of AM and monitoring allows for a project that can succeed under a wide range of conditions and can be adjusted as necessary. Furthermore, careful monitoring of project outcomes both advances scientific understanding and helps adjust operations changes as part of an iterative learning process. See appendix N for PIER 36 and PIER 37 for the AM Plan.

5.3.4.1 Monitoring Program

An effective monitoring program is required (WRDA 2007, Section 2036) to determine if the project outcomes are consistent with the identified success criteria. A Monitoring Plan has been developed for each habitat type within the TSMP. See appendix J for the Monitoring Plan. The plan identifies success criteria and targets, a general schedule for the monitoring events and the specific content for the monitoring reports that measure progress towards meeting the success criteria.

5.3.5 FUTURE MITIGATION MEASURES

CEMVN remains committed to fully mitigate for unavoidable impacts from the operations and maintenance of the HSDRRS. Future mitigation efforts could be needed if:

- a risk reduction feature was modified in some manner that expanded the right of way or resulting in additional impacts to wetlands or BLH;

1) operating requirements of risk reduction structures that have a potential to result in additional unforeseen impacts;

- monitoring and adaptive management indicate additional mitigation is necessary to replace the lost functions and values resulting from construction of the HSDRRS.

- A review of the as-built plans results in a final computation of impacts necessitating an expansion of the mitigation projects in order to fully mitigation for all HSRRS impacts. For any habitat type where mitigation has already been constructed, an expansion of that mitigation project would be considered. Other options to that expansion providing adequate compensatory mitigation would also be analyzed. Any expansion and option to that expansion would be presented to the public in an additional NEPA document.

SECTION 6
COORDINATION AND CONSULTATION

With the very large five-parish HSDRRS project area came the necessity to have substantial public awareness, agency and public coordination and cooperation. Coordination and consultation with local, State and Federal agencies was conducted in accordance with the commitments made in the Federal Register (Federal Register Volume 72, Number 48, Tuesday, March 13, 2007) announcing CEQ's approval of the NEPA alternative arrangements and environmental laws and regulations.

6.1 PUBLIC INVOLVEMENT

Public involvement in the NEPA process is standard practice for the USACE and in the spirit of maximizing transparency and public involvement CEMVN developed and maintained a process to communicate proposed projects and their potential impacts to the public. However, the size and timeline for completion of the HSDRRS required CEMVN to greatly expand upon the public involvement framework previously established for projection planning. Further, CEMVN recognized that public involvement was a key component to the success of the HSDRRS planning efforts. To maximize public opportunity to access information and provide input, the CEMVN utilized public meetings, partnering sessions, special presentations, field trips, workshops, and websites.

The public involvement process began on March 13, 2007, when the USACE published the NEPA Alternative Arrangements in the Federal Register and described what the IERs and the CED entailed. Public involvement continued and was actively sought during the preparation of the IERs and the CED Phase I using websites, mailing lists, and news releases. Scoping for the HSDRRS and the NEPA Alternative Arrangements process was initiated through the placement of advertisements and public notices in the *USA Today* and the New Orleans *Times-Picayune* newspapers. Nine public scoping meetings were held throughout the project area between March and April 2007. A public scoping meeting for the CED was held on September 2, 2009. Overall, a total of 11 general categories of questions were recorded from the participants attending the public scoping meetings. A summary of the scoping meetings, comments received, and responses are in Appendix E.

HSDRRS and Alternative Arrangement information was made readily available to the public through the creation of a website, www.nolaenvironmental.gov, dedicated to providing the public a "one-stop-shop" location to find information regarding public notices, meetings, calendar of events and documents. The website was used as a repository for environmental reports, coordination/compliance documents, and design information, as well as information regarding other flood risk reduction projects in southeast Louisiana. The website has since been closed however, the information regarding the HSDRRS efforts remains available to the public at https://www.mvn.usace.army.mil/Missions/HSDRRS/ . Environmental reports are available at https://www.mvn.usace.army.mil/HSDRRS-Projects/.

Since March 2007, the CEMVN hosted approximately 200 monthly public meetings at locations throughout the GNO metropolitan area. The CEMVN released public notices in local and national newspapers, news releases, emails, and mail notifications to stakeholders prior to each public meeting. The public was able to provide oral comments during the meetings or provide written comments in person, by mail and via the public website. A 30-day public comment period followed each meeting in which the public was provided the opportunity to provide input. In addition, comments were accepted anytime during the IER process. Each draft IER was posted to the https://www.mvn.usace.army.mil/Environmental/NEPA/ website for a 30-day public review period. Other information readily available included:

- CEMVN website www.mvn.usace.army.mil which was created to provide specific design information for the HSDRRS projects;
- IER draft and final documents, as well as other supporting documents such as the Clean Water Act 404(b)(1) analyses, coastal zone consistency determinations; United States Fish and Wildlife (USFWS) Coordination Act Reports; Hazardous, and Toxic, Radioactive Waste (HTRW) environmental site assessments (ESA) among other environmental compliance documents;
- Scheduled field trips to show the public and resource agencies the location and design of various project features; over 6,500 field trips were hosted by CEMVN;
- Electronic versions of newsletters, entitled *Task Force Hope Status Report*, were published twice per month. Since 2006 over 94 newsletters highlighting the upcoming HSDRRS efforts were available on www.mvn.usace.army.mil and distributed at public meetings;

Once an IER Decision Record was signed and construction began, the CEMVN transitioned the IER meetings into construction update meetings where the public was able to provide comments. Other methods used to inform the public included:

- email to AskTheCorps@usace.army.mil;
- social networking sites such as Facebook™ and Twitter™;
- Flickr®, a photo sharing website that hosts photographs of the ongoing HSDRRS project construction work; and
- a construction impact hotline (the telephone number is 877-427-0345) presented in mailings and public meetings and often passed out on magnetic stickers for use by residents within the project area.

The draft CED phase I was released for 60-day public review on February 5, 2013. The public and Stakeholders were able to submit comments up until April 8, 2013. Comments were received from 12 stakeholders, four Federal agencies, two State agencies, and two local agencies. Public meetings pertaining to the CED occurred on March 27, 28, and 29, 2007, April 3, 4, 5, 10, 11, and 12, 2007, September 2, 2009, and

March 14 and 26, 2013. The Final CED Phase I was released for a 30-day public review on May 22, 2013.

Comments received on the CED Phase 1 and CEMVN responses are in Appendix D.

1. Public Comments
    a. Dennis Strecker, letter dated February 7, 2013
    b. Thomas Thompson, letter dated February 7, 2013
    c. John Koeferl, email dated February 22, 2013
    d. Edward Chauppetta, letter dated March 19, 2013
    e. Roy Arrigo, email dated March 20, 2013
    f. Ray Garofalo, State Representative District 103, oral comment at public meeting on March 26, 2013
    g. Bethany Garfield, oral comment at public meeting on March 26, 2013
    h. Rudy Newbeck, oral comment at public meeting on March 26, 2013
    i. Margaret Longstreet, oral comment at public meeting on March 26, 2013
    j. RESTORE, letter dated March 30, 2013
    k. Louisiana Audubon Council, letter dated April 8, 2013
    l. Gulf Restoration Network, letter dated April 8, 2013

2. Agency Comments
    a. Louisiana Department of Environmental Quality, email dated March 1, 2013
    b. U.S. Environmental Protection Agency, letter dated March 19, 2013
    c. City of Waveland, oral comment at public meeting on March 26, 2013
    d. Jason Smith, Jefferson Parish Department of Environmental Affairs, voicemail
    e. message dated March 27, 2013
    f. NMFS, letter dated April 2, 2013
    g. USFWS, letter dated April 5, 2013
    h. Louisiana Coastal Protection and Restoration Authority, email dated April 5, 2013
    i. National Park Service, letter dated April 15, 2013

The draft CED phase II was released for 60-day public review on May 14, 2021. The public and Stakeholders were provided 60 days to review and provide comments. Comments were received from two State agencies and one member of the public. Comments received and the CEMVN responses are included in Appendix D.

1) Public Comments
    a) Crystal Bowman, email dated May 25, 2021
    b) Thomas Thompson, email with letter dated July 5, 2021

2) Agency Comments
    a) Louisiana Department of Environmental Quality, emailed dated June 7, 2021
    b) Louisiana Department of Natural Resources, Letter dated July 13, 2021

6.2 AGENCY COORDINATION

Each IER and supplemental IER has been coordinated with appropriate congressional, Federal, state, and local agencies, as well as non-governmental agencies and other interested parties. An interagency team was established for each IER in which Federal and State agency staff played an integral role in the project planning and alternative analysis phases of the projects. The list of interagency team members are listed in Appendix J.

Monthly meetings with resource agencies were held to discuss specific project details as well as determine the potential for direct and indirect impacts of the proposed actions. Table 6-1 list the coordinated agencies. These agencies, as well as other interested parties, are receiving copies of this CED.

Table 6-1: Agency Coordination and Consultation

Federal	State	Local
Federal Emergency Management Agency	Coastal Protection and Restoration Authority of Louisiana	Jefferson Parish
Natural Resources Conservation Service	Department of Cultural, Recreation, and Tourism	Orleans Parish
National Park Service	Department of Environmental Quality	New Orleans Flood Protection Authority
National Ocean Atmospheric Association	Department of Health and Hospitals	Plaquemines Parish
NOAA National Marine Fisheries Service	Department of Natural Resources (DNR)	Port of New Orleans
U.S. Coast Guard	Department of Transportation and Development	St. Bernard Parish
U.S. Environmental Protection Agency	Department of Wildlife and Fisheries	St. Charles Parish
U.S. Fish and Wildlife Service	Governor's Executive Assistant for Coastal Activities	Office of the Mayor of New Orleans
Federal Highways Administration	State Historic Preservation Officer	New Orleans Sewerage and Water Board
U.S. Geological Survey	Offices of the members of the La. Congressional delegation	SLFPA*-West
SLFPA-East	East Jefferson Levee Board	

* SLFPA - Southeast Louisiana Flood Protection Association

In addition, Native American Tribal Nations were brought into the coordination and public involvement effort, as listed in Table 6-2

Table 6-2: Tribal Nations Consulted

TRIBAL NATIONS
Alabama Coushatta Tribe of Texas
Caddo National of Oklahoma
Chitimacha Tribe of Louisiana
Choctaw Nation of Oklahoma
Coushatta Tribe of Louisiana
Jena Band of Choctaw
Mississippi Band of Choctaw Indians
Seminole Nation of Oklahoma
Seminole Tribe of Florida
Tunica-Biloxi Tribe of Louisiana
Quapaw Tribe of Oklahoma

Typical coordination for the IERs included:

- Louisiana Department of Natural Resources (LDNR) concurrence with the determination that the proposed action was consistent, to the maximum extent practicable, with the Louisiana's Coastal Zone Management Program.
- Louisiana Department of Environmental Quality (LDEQ) CWA Section 401 Water Quality Certification.
- Section 404(b)(1) Public Notice, public review, and approval of the Section 404(b)(1) Evaluation.
- Section 106 consultation with the Louisiana State Historic Preservation Officer (SHPO).
- Section 106 consultation with affected Native American Tribes.
- U.S. Fish and Wildlife Service (USFWS) Coordination Act recommendations (CAR) and resolution of differences.
- LDEQ comments and resolution on the air quality impact analysis;
- National Marine Fisheries Service (NMFS) essential fish habitat recommendations and resolution.
- USFWS concurrence of Endangered Species Act effects determination for species under its jurisdiction.
- NMFS concurrence with Endangered Species Act effects determination for species under its jurisdiction.

Formal coordination began with the USFWS early in 2007. They provided a programmatic Coordination Act Report (CAR) in early 2008 (Appendix Q). The programmatic CAR contains specific recommendations for minimizing adverse impacts on the natural environment from HSDRRS projects. The CEMVN utilized these recommendations when designing the IER proposed actions, to the greatest extent practicable. Below is a listing of the Programmatic CAR recommendations and the USACE response:

Recommendation 1: To the greatest extent possible, situate flood protection so that destruction of wetlands and non-wet bottomland hardwoods are avoided or minimized.

CEMVN Response 1: The proposed action alternative will utilize the authorized level of hurricane and storm damage risk reduction footprint and minimize impacts to wetlands.

Recommendation 2: Minimize enclosure of wetlands with new levee alignments. When enclosing wetlands is unavoidable, acquire non- development easements on those wetlands, or maintain hydrologic connections with adjacent, un-enclosed wetlands to minimize secondary impacts from development and hydrologic alteration.

CEMVN Response 2: The proposed action does not enclose any additional wetlands and its alignment remains along the same route as the existing alignment.

Recommendation 3: Avoid adverse impacts to bald eagle nesting locations and wading bird colonies through careful design project features and timing of construction.

CEMVN Response 3: Concur. Bald eagle nests have been recorded and will be avoided within the vicinity of LPV 148.

Recommendation 4: Forest clearing associated with project features should be conducted during the fall or winter to minimize impacts to nesting migratory birds, when practicable.

CEMVN Response 4: No forest clearing will occur with implementation of the proposed action.

Recommendation 5: The project's first Project Cooperation Agreement (or similar document) should include language that includes the responsibility of the local-cost sharer to provide operational, monitoring, and maintenance funds for mitigation features.

CEMVN Response 5: USACE Project Partnering Agreements (PPA) do not contain language mandating the availability of funds for specific project features but require the non-Federal sponsor to provide certification of sufficient funding for the entire project. Further, mitigation components are considered a feature of the entire project. The non-Federal Sponsor is responsible for Operation, Maintenance, Repair, Replacement and Rehabilitation (OMRR&R) of all project features in accordance with the OMRR&R manual that the USACE provides upon completion of the project.

Recommendation 6: Further detailed planning of project features (e.g., Design Documentation Report, Engineering Documentation Report, Plans and Specifications, or other similar documents) should be coordinated with the USFWS, NMFS, LDWF, USEPA, and LDNR. The USFWS shall be provided an opportunity to review and submit recommendations on all the work addressed in those reports.

CEMVN Response 6: Concur.

Recommendation 7: The CEMVN should avoid impacts to public lands, if feasible. If not feasible, the CEMVN should establish and continue coordination with agencies managing public lands that may be impacted by a project feature until construction of that feature is complete and prior to any subsequent maintenance.

CEMVN Response 7: Concur.

Recommendation 8: If applicable, a General Plan should be developed by the CEMVN, the USFWS, and the managing natural resource agency in accordance with Section 3(b) of the FWCA for mitigation lands.

CEMVN Response 8: Concur.

Recommendation 9: If mitigation lands are purchased for inclusion within a NWR, those lands must meet certain requirements; a summary of some of those requirements; a summary of some of those requirements is provided in appendix A (to the draft Fish and Wildlife Coordination Act Report.) Other land managing natural resource agencies may have similar requirements that must be met prior to accepting mitigation lands; therefore, if they are proposed as a manager of a mitigation site, they should be contacted early in the planning phase regarding such requirements.

CEMVN Response 9: Concur.

In addition to the programmatic CAR for the system wide HSDRRS effort, each IER and IER supplemental document had a CAR that accounted for the impacts of its proposed action. Table 6-3 lists the date for each Final CAR. Again, as with the Programmatic CAR, USFWS coordinated all final IER-specific CARs with NMFS and LDWF and incorporated their comments.

Table 6-3: Listing of USFWS Final CARs

IER/SIER/EA	TITLE	CAR DATE
FLOOD RISK REDUCTION		
St. Charles Sub-basin		
IER #1	CAR for IER Lake Pontchartrain and Vicinity, St. Charles Parish, Louisiana	1/4/2008

IER/SIER/EA	TITLE	CAR DATE
IERS #1.a* IERS #1.b*	CAR for IER Lake Pontchartrain and Vicinity, St. Charles Parish, Louisiana	7/22/2008
	CAR for IER Lake Pontchartrain and Vicinity, St. Charles Parish, Louisiana	6/23/2011
Jefferson East Bank Sub-basin		
IER #2 IERS #2 IERS#2.a*	CAR for IER Lake Pontchartrain and Vicinity West Return Floodwall, Jefferson and St. Charles parishes, Louisiana	7/15/2008
	CAR for Supplemental IER Lake Pontchartrain and Vicinity West Return Floodwall, Jefferson and St. Charles parishes, Louisiana	9/9/2009
	CAR for Supplemental IER Lake Pontchartrain and Vicinity West Return Floodwall, Jefferson and St. Charles parishes, Louisiana	1/25/2012
IER #3	CAR for IER Lake Pontchartrain and Vicinity Jefferson East Bank, Jefferson, Louisiana	7/21/2008
IERS #3.a*	CAR for Supplemental IER Lake Pontchartrain and Vicinity Jefferson East Bank, Jefferson, Louisiana	10/9/2009
Orleans East Bank Sub-basin		
IER #4	CAR for IER Lake Pontchartrain and Vicinity Orleans East Bank, New Orleans, Louisiana	3/6/2009
IER #5 IERS #5.a*	CAR for Lake Pontchartrain and Vicinity Outfall Canal Closure Structures, 17th Street Canal, Orleans Avenue Canal and London Avenue Canal, Orleans and Jefferson Parish, Louisiana	6/6/2009
	CAR for Supplemental Lake Pontchartrain and Vicinity Outfall Canal Closure Structures, 17th Street Canal, Orleans Avenue Canal and London Avenue Canal, Orleans and Jefferson Parish, Louisiana	1/14/2014
IER #27 IERS #27.a	CAR for Supplemental ER #27, Proposed Outfall Canal Remediation on the 17th Street, Orleans Avenue and London Avenue Canals, Jefferson and Orleans parishes, Louisiana	10/1/2010
	CAR for IER #27, Proposed Outfall Canal Remediation on the 17th Street, Orleans Avenue and London Avenue Canals, Jefferson and Orleans parishes, Louisiana	4/11/2011
New Orleans East Sub-basin		
IER #6	CAR for IER Lake Pontchartrain and Vicinity Orleans Parish, Louisiana	5/29/2009
IERS #6	CAR for Supplemental IER Lake Pontchartrain and Vicinity Orleans Parish, Louisiana	10/9/2009
IER #7	CAR for IER #7 New Orleans East Lakefront to Michoud Canal, Orleans Parish, Louisiana	6/15/2009
IERS #7	CAR for Supplemental IERS #7 New Orleans East Lakefront to Michoud Canal, Orleans Parish, Louisiana	6/15/2009
IER #11 Tier 1 Pontchartrain and Borgne	CAR for IER #11, Tier 1 Pontchartrain and Borgne for the Improved Protection on the IHNC, Orleans and St. Bernard parishes, Louisiana	11/26/2007
IER #11 Tier 2 Borgne	CAR for IER #11 Tier 2 Borgne Supplemental, Orleans and St. Bernard Parishes, Louisiana	10/9/2008
IERS #11.a Tier 2 Borgne*	CAR for IER #11.a Tier 2 Borgne Supplemental, Orleans and St. Bernard Parishes, Louisiana	9/18/2009
IERS #11.b Tier 2 Borgne*	CAR for IER #11.b Tier 2 Borgne Supplemental, Orleans and St. Bernard Parishes, Louisiana	11/17/2010

IER/SIER/EA	TITLE	CAR DATE
IERS #11.c Tier 2 Borgne*	CAR for IER #11c Tier 2 Borgne Supplemental, Orleans and St. Bernard Parishes, Louisiana	10/20/2010
IER #11-Tier 2 Pontchartrain	CAR for IER #11, Tier 2 Pontchartrain for the IHNC, Orleans and St. Bernard parishes, Louisiana	3/29/2010
IERS #11.d Tier 2 Pontchartrain	CAR for IER #11.d, Tier 2 Pontchartrain for the IHNC, Orleans and St. Bernard parishes, Louisiana	3/29/2010
Chalmette Loop Sub-Basin		
IER #8	CAR for IER #8 for the project entitled "Bayou Dupre Control Structure Replacement Project, St. Bernard Parish, Louisiana"	5/28/2009
IER #9	CAR for IER Lake Pontchartrain and Vicinity Orleans East Bank, Caernarvon Canal, New Orleans, Louisiana	1/25/2010
IER #10	CAR for IER Lake Pontchartrain and Vicinity Orleans East Bank, Chalmette Loop Levee, New Orleans, Louisiana	5/19/2009
IERS #8,9,10.a*	CAR for IER #8, #9, #10 for the East Bank Caernarvon Canal and Chalmette Loop Levee, New Orleans, Louisiana"	2/25/2013
Belle Chasse Sub-Basin		
IERS #12 / 13*	CAR for IER #12/13 for the Westbank and Vicinity of New Orleans Hurricane Protection Project, East of Algiers Canal, Hero Canal to Oakville Tie-In in Plaquemines Parish, Louisiana	1/3/2011
IER #13	CAR for IER #13 for the Westbank and Vicinity of New Orleans Hurricane Protection Project, East of Algiers Canal, Hero Canal to Oakville Tie-In in Plaquemines Parish, Louisiana	11/24/2009
IER #13 Addendum*	CAR for IER #13 for the Westbank and Vicinity of New Orleans Hurricane Protection Project, East of Algiers Canal, Hero Canal to Oakville Tie-In in Plaquemines Parish, Louisiana	3/20/2009
IERS #13a*	CAR for IER #13a for the Westbank and Vicinity of New Orleans Hurricane Protection Project, East of Algiers Canal, Hero Canal to Oakville Tie-In in Plaquemines Parish, Louisiana	4/15/2011
IER #33*	Mississippi River Co-Located Levees	12/30/2010
IERS #33.a*	Mississippi River Co-Located Levees	1/9/2012
Gretna-Algiers Sub-Basin		
IER #12	CAR for IER #12 Improved Protection from Harvey to Algiers, Jefferson, Orleans and Plaquemines parishes, Louisiana	2/18/2009
IERS #12* addendum	CAR for IER #12 Improved Protection from Harvey to Algiers, Jefferson, Orleans and Plaquemines parishes, Louisiana	7/24/2010 and 10/29/2010
IERS #12.a*	CAR for IER #12 Improved Protection from Harvey to Algiers, Jefferson, Orleans and Plaquemines parishes, Louisiana	1/3/2011
EA #581*	JLNHPP Augmentation Features Supplemental EA and National Historic Preservation Act Assessment of Effects, WBV, HSDRRS Augmentation	4/1/2021
Harvey-Westwego Sub-basin		
IER #14	CAR for IER #14 for the Westwego to Harvey Levee, Jefferson Parish Louisiana.	8/18/2008

IER/SIER/EA	TITLE	CAR DATE
IERS #14.a	CAR for Supplement IER #14 for the Westwego to Harvey Levee, Jefferson Parish, Louisiana	1/13/2010
Lake Cataouatche Sub-basin		
IER #15	CAR for IER #15 for the Lake Cataouatche Levee, Jefferson Parish Louisiana	7/28/2008
IERS #15.a^ addendum	Lake Cataouatche Levee	2/14/2011
IER #16	CAR for IER #16 and IERS #16, Westbank and Vicinity, Western Tie-in, Jefferson and St. Charles parishes, Louisiana*	6/8/2009
IERS #16.a	CAR for IER #16 and IERS #16, Westbank and Vicinity, Western Tie-in, Jefferson and St. Charles parishes, Louisiana*	8/11/2010
IER #17	CAR for IER #7 for the Company Canal Floodwall, Jefferson Parish Louisiana	12/22/2008
BORROW SITES		
IER #18	CAR for IER #18 for the excavation for government-furnished borrow - 1418/1420 Bayou Road; 1572 Bayou Rd; Dockville; 910 Bayou Road; 4001 Florissant; Triumph; Belle Chase; Maynard; Cummings North; Churchill Farms Pit A; Westbank Site G; Bonnet Carre North	11/15/2010
IER #19	CAR for IER #19, Contractor-furnished Borrow Material Jefferson, Orleans, St. Bernard, Iberville, and Plaquemines Parish, Louisiana, and Hancock County, Mississippi - River Birch Phase I; Phase II; Pearlington Dirt Phase I; Eastover; Kimble #2; Sylvia Guillot; Gatien-Navy Camp Hope; DK Aggregates; St. Gabriel Redevelopment	11/15/2010
IER #22	CAR for IER #22 Government-furnished Borrow Material #2 Jefferson and Plaquemines parishes, Louisiana -Brad Buras; Tabony; Westbank F; Westbank I; Westbank N	11/15/2010
IER #23	CAR for IER #23 Pre-Approved Contractor-furnished Borrow Material #2 St. Bernard, St. Charles, and Plaquemines parishes, Louisiana, and Hancock County, Mississippi -1025 Florissant; Acosta; 3C Riverside; Myrtle Grove; Pearlington Dirt Phase 2	11/15/2010
IER #25 IERS #25.a*	CAR for IER #25 Government-furnished Borrow Material #3 Jefferson, Orleans, and Plaquemines parishes, Louisiana - Stumpf Phase 1; Stumpf Phase 2; Westbank D; Westbank E Phase 1 & 2; Tac Carrere	11/15/2010
	CAR for Supplement IER #25 Government-furnished Borrow Material #3 Jefferson, Orleans, and Plaquemines parishes, Louisiana	1/3/2012
IER #26	CAR for IER #26 Pre-Approved Contractor-furnished Borrow Material #3 Jefferson, Plaquemines, and St. John the Baptist parishes, Louisiana, and Hancock County, Mississippi - South Kenner Road; Willswood; Meyer; Willow Bend; Frierson	11/15/2010
IER #28	CAR for IER #28 Government-furnished Borrow Material #4, Jefferson, Plaquemines, and St. Bernard parishes, Louisiana - Johnson/Crovetto; Bazile; Westbank F Access Routes	7/27/2009
IER #29	CAR for IER #29, Pre-approved Contractor-furnished Borrow Material #4, Orleans, St. Charles, St. John the Baptist, and St. Tammany parishes, Louisiana -Eastover Phase II; Tammy Holding; Willow Bend Phase II	9/3/2009

IER/SIER/EA	TITLE	CAR DATE
IER #30	CAR for IER #30 Contractor-furnished Borrow Material #5, St. Bernard, and St. James parishes, Louisiana, and Hancock County, Mississippi - Big Shake; Henley; Contreras Dirt Z; Contreras Cell E; Contreras Cell F	9/23/2009
IER #31	CAR for IER #31 Contractor-furnished Borrow Material #7, East Baton Rouge, Jefferson, Lafourche, Plaquemines, St. Bernard, and St. Tammany parishes, Louisiana, and Hancock County, Mississippi - Acosta 2; Idlewild Stage 2; King Mine; Levis; Port Bienville; Raceland Raw Sugars; River Birch Landfill Expansion; Scarsdale; Spoil Area	8/30/2010
IER #32	CAR for IER #32 Contractor-furnished Borrow Material #6, Ascension, Plaquemines, and St. Charles parishes, Louisiana - Bocage; Citrus Lands; Conoco Philips; Idlewild Stage 1; Nairn; Plaquemines Dirt & Clay; 3C Riverside Phase 3	1/20/2010
IER #35*	Contractor Furnished Borrow #8 - Assumption Land Company; Houma Excavation; RBEND II; Robert Brothers Farm site 1; Robert Brothers Farm site 2; Assumption Land Company	12/1/2011
PIER #36*	Programmatic LPV HSDRRS Mitigation	10/28/2013
PIER #36 Tiered IER 1*	Milton Island Marsh Restoration	5/22/2014
PIER #36 Supplement 1 (SIER 1)*	PIER 36 Bayou Sauvage, Turtle Bayou & New Zydeco Ridge Restoration	9/2/2015
EA #546 SPIER 36 Supplement 2 *	EA Supplement PIER 36 Supplement 2 Bayou Sauvage, Turtle Bayou & New Zydeco Ridge	6/29/2016
PIER #37*	Programmatic WBV HSDRRS Mitigation	5/27/2014
PIER #37 Tiered IER 1 NPS Joint EA*	WBV HSDRRS Mitigation Jean Lafitte National Historical Park and Preserve Mitigation Features	12/14/2015
SPIER #37a*	Mitigation for Protected Side Bottomland Hardwoods Dry WBV HSDRRS	2/24/2016
SEA #548 Tier 1 of PIER #37 NPS Joint EA*	WBV Lake Cataouatche Borrow Area Expansion and Access Features, JLNHPP Mitigation Features	10/21/2016
SEA #572 *	BLH-wet and swamp mitigation, Lafourche Parish, Louisiana	5/31/2019

* Indicates the document was not included in the CED Phase I

The USFWS issued a CAR for the CED, Phase I on May 17, 2013. NMFS provided a comment letter on the draft CAR on November 2, 2012. The revised draft CAR for the CED Phase I contains specific recommendations for minimizing adverse impacts on the natural environment and for mitigation of impacts on wetlands and bottomland hardwoods (Appendix Q). The USFWS' recommendations and the CEMVN responses to the recommendations as they were addressed in the CED Phase I are included below:

Recommendation 1. To the greatest extent possible, situate final flood protection features so that destruction of wetlands and non-wet bottomland hardwoods are avoided or minimized.

CEMVN Response 1: The project will utilize the authorized level of risk reduction footprint and minimize impacts on wetlands.

Recommendation 2. Avoid adverse impacts to bald eagle nesting locations and wading bird colonies through careful design project features and timing of construction. Forest clearing associated with project features should be conducted during the fall or winter to minimize impacts to nesting migratory birds, when practicable.

CEMVN Response 2: The clearing of forested wetlands would be conducted in the fall or winter, if practicable, to avoid and minimize impacts on nesting migratory birds. If colonial-nesting wading birds are anticipated to nest in forested areas slated for clearing during the nesting season, the USACE would likely employ other measures to avoid impacts on active colonial-nesting wading bird nests, viable eggs in such nests, and nesting young, such as implementation of a colonial-nesting wading bird nesting prevention/abatement plan. Any such plan would first be coordinated with USFWS.

Recommendation 3. If a proposed project feature is changed significantly or is not implemented within one year of the date of our Endangered Species Act consultation letter, we recommend that the Corps reinitiate coordination with this office to ensure that the proposed project would not adversely affect any federally listed threatened or endangered species or their habitat.

CEMVN Response 3: Concur

Recommendation 4. The Corps shall fully compensate for any unavoidable losses of wetland habitat or non-wet bottomland hardwoods caused by project features.

CEMVN Response 4: The USACE intends to compensate for unavoidable losses of wetland habitat and non-jurisdictional BLH (BLH-Dry) resulting from HSDRRS construction to the extent practicable. Note that mitigation for BLH-Dry impacts resulting from the use of contractor-furnished borrow sites is the responsibility of the site owners or contractors rather than the USACE.

Recommendation 5. For mitigation areas that would be non-tidal for a brief period (till restoration of tidal connectivity) mitigation for this temporal loss would be required. However, mitigation that would not have tidal connectivity restored for several years should not be a component of any mitigation plan.

CEMVN Response 5: Mitigation for impacts on marsh habitats would typically involve restoration of marsh habitats. The USACE agrees that such mitigation features would likely be non-tidal for a limited period until tidal connectivity is restored and understands that mitigation for this temporal loss is necessary. Such a temporal loss would be captured in WVA marsh community models. The USACE is presently not contemplating any marsh mitigation projects that would lack tidal connectivity for several years and agrees that such projects should be avoided. However, USACE-constructed mitigation projects slated as compensation for HSDRRS impacts on jurisdictional BLH habitats, BLH habitats, and swamp habitats would not rely on tidal connectivity to achieve the appropriate habitat functions and values. Thus, your recommendation is deemed not applicable to such projects.

<u>Recommendation 6:</u> Further detailed planning of project features (e.g., Design Documentation Report, Engineering Documentation Report, Plans and Specifications, Water Control Plans, or other similar documents) should be coordinated with the Service, NMFS, LDWF, Environmental Protection Agency (EPA) and Louisiana Department of Natural Resources (LDNR). The Service shall be provided an opportunity to review and submit recommendations on the all work addressed in those reports.

<u>CEMVN Response 6:</u> The USFWS and other resource agencies will be provided an opportunity to review and comment on the proposed HSDRRS construction plans and mitigation plans during the project feasibility study and Pre-Construction Engineering and Design.

<u>Recommendation 7.</u> The Corps should avoid impacts to public lands, if feasible. If not feasible the Corps should establish and continue coordination with agencies managing public lands that may be impacted by a project feature until construction of that feature is complete and prior to any subsequent maintenance. Points of contacts for the agencies potentially impacted by project features are Kenneth Litzenberger, Project Leader for the Service's Southeast National Wildlife Refuges and Neal Lalonde (985) 822-2000, Refuge Manager for the Bayou Sauvage National Wildlife Refuge (NWR), Office of State Parks contact Mr. Brent Evans at 1-888-677-1400, National Park Service (NPS), contact Superintendent Carol Clark, (504) 589-3882 extension 137 (Carol_Clark@nps.gov) or Chief of Resource Management Guy Hughes (504) 589-3882 extension 128, (Guy_Hughes@nps.gov) and for the 404(c) area contact the previously mentioned NPS personnel and Ms. Barbara Keeler (214) 665-6698 with the EPA.

<u>CEMVN Response 7:</u> Concur

<u>Recommendation 8.</u> If applicable, a General Plan should be developed by the Corps, the Service, and the managing natural resource agency in accordance with Section 3(b) of the FWCA for mitigation lands.

<u>CEMVN Response 8:</u> Concur

<u>Recommendation 9.</u> If mitigation lands are purchased for inclusion within a NWR those lands must meet certain requirements; a summary of some of those requirements is provided in Appendix A. Other land-managing natural resource agencies may have similar requirements that must be met prior to accepting mitigation lands; therefore, if

they are proposed as a manager of a mitigation site they should be contacted early in the planning phase regarding such requirements.

CEMVN Response 9: The Non-Federal sponsor is responsible for operation and maintenance of the HSDRRS projects, including the mitigation features. Where mitigation features are located on Federal lands, the appropriate agency and the non-Federal sponsor would need to coordinate management of the mitigation project. Where mitigation projects are to be constructed on lands within a Federal agency's jurisdiction, that agency will be consulted regarding any requirements that will be applicable to those lands.

Recommendation 10: If the local project-sponsor is unable to fulfill the financial mitigation requirements for operation and/or maintenance of mitigation lands, then the Corps should provide the necessary funding to ensure mitigation obligations are met on behalf of the public interest.

CEMVN Response 10: Project Partnership Agreements (PPAs) between the Federal government and the non-Federal sponsor (CPRA in this case) have been executed for the LPV and WBV HSDRRS projects, and these PPAs provide the requisite high level of confidence that the non-Federal sponsor will fulfill its obligations to operate and to maintain the HSDRRS mitigation projects. If the non-Federal sponsor fails to perform, CEMVN has the right to complete, operate, maintain, repair, rehabilitate, or replace any project feature, including mitigation features. However, such an action would not relieve the non-Federal sponsor of its responsibility to meet its obligations and would not preclude the Federal government from pursuing any remedy at law or equity to ensure the non-Federal sponsor's performance.

Recommendation 11. Any proposed change in mitigation features or plans should be coordinated in advance with the Service, NMFS, LDWF, EPA and LDNR.

CEMVN Response 11: Mitigation for the habitat losses caused by the HSDRRS projects would be coordinated through mitigation IERs. Any material changes to the mitigation plan after the IERs would be coordinated in advance.

Recommendation 12. The Service encourages the Corps to finalize mitigation plans and proceed to mitigation construction so that it will be concurrent with project construction and revising the impact and mitigation period-of analysis to reflect additional temporal losses would not be required.

CEMVN Response 12: The USACE shares your goal of implementing mitigation as quickly as possible. If delays are experienced such that mitigation project implementation takes longer than what was previously estimated, the USACE will work with the resource agencies to determine whether such delays could necessitate extending the current period of analysis associated with the habitat impacts and whether additional temporal loss to the habitats in question would result in a larger mitigation requirement.

Recommendation 13. For on-refuge impacts the Service prefers and recommends implementation of the Bayou Sauvage brackish marsh alternative because this alternative ranks higher in long-term sustainability and property management feasibility over other brackish marsh alternatives. Additionally, the Service does not support the selection of the Golden Triangle mitigation alternative. However, NMFS believes that implementation of the Golden Triangle mitigation project may afford storm wave reduction benefits to the Surge Barrier and does not object to mitigating impacts in the Golden Triangle Furthermore, the Service supports the mitigation of on-refuge flood-side bottomland hardwood impacts on either side of the levee (flood or protected) and recommends that the Corps, in consultation with the Service, develop acceptable mitigation for such impacts.

CEMVN Response 13: The USFWS's position concerning the Bayou Sauvage mitigation alternative and the Golden Triangle mitigation alternative is noted. The USFWS's reference to NMFS's position regarding the Golden Triangle mitigation alternative is also noted, although the USACE does not necessarily agree that this alternative would provide any significant wave reduction benefits to the Surge Barrier. Currently, the Bayou Sauvage mitigation alternative for mitigating LPV HSDRRS impacts on brackish marsh habitats is the Tentatively Selected Plan. The USACE will continue to coordinate with USFWS and other resource agencies in developing mitigation plans for LPV HSDDRS impacts to on-refuge flood side BLH impacts.

Recommendation 14. The Service has informally expressed concerns via emails dated May 4, 2011, and June 9, 2011, regarding the mitigation of alternatives along State Highway 45 that were developed to mitigate impacts to NPS lands. The Service recommends that the Corps continue coordinating the development of mitigation plans and address our concerns.

CEMVN Response 14: This comment/recommendation pertains to preliminary mitigation plan concepts for mitigating impacts on swamp and jurisdictional BLH (BLH-Wet) habitats located within the Barataria Preserve Unit of JLNHPP and within the Bayou aux Carpes Clean Water Act Section 404(c) area (the 404c area). The specific preliminary design plans referenced were developed by the Project Delivery Team (PDT) during the Alternatives Evaluation Process (AEP). Certain mitigation features contained in these plans involved restoring swamp and/or BLH-wet habitats in existing man-made open water areas including canals and borrow pits by filling these features and then planting native canopy and mid-story species. The proposed method of fill in certain features involved first placing a layer of sand, then capping this layer with a layer of clay soil to bring the feature to the final desired elevation. USFWS expressed concerns regarding the proposed approach to filling the mitigation features, noting that staff had observed problems with the survival and growth of trees planted in areas that employed a similar fill scheme. However, the proposed approach to fill placement has been successful in other projects involving restoration of forested habitats (e.g., mine reclamation projects, wetland mitigation projects in other regions). Other experts

(NRCS, ERDC) thus far consulted on the proposed fill scheme have not voiced any concerns with this design concept, commenting that the final layer of clayey soil need only be 1.5 to 3.5 feet thick.

CEMVN is still in the process of developing more specific mitigation plans for WBV HSDRRS impacts on Park/404c habitats. This process includes examining various approaches to filling open water habitats slated for swamp and BLH-Wet restoration. CEMVN will continue to coordinate with USFWS, other resource agencies, and the PDT in the development of these plans.

Recommendation 15. The Corps in cooperation with the natural resource agencies is still evaluating alternative enhancement measures for the EPA Bayou aux Carpes 404(c) designated wetlands. Enhancement measures, which would ensure the integrity of the 404(c) area is maintained, are a condition of the 404(c) modification. The service encourages the Corps to select and implement the preferred enhancement alternative(s).

CEMVN Response 15: In 2009, the "1985 Clean Water Act Section 404(c) Final Determination for Bayou aux Carpes" was modified to allow construction of certain portions of the WBV HSDRRS that would impact habitats in the 404c area. The modification called for mitigation of direct impacts on habitats (e.g. impacts within the "footprint" of HSDRRS features constructed in the 404c area). It also called for the evaluation of various additional features (e.g. features/actions in addition to mitigation features provided for the direct impacts) that might provide environmentally beneficial hydrologic and wetland effects to the 404c area. These additional features/activities were referred to as "enhancement" features and as "augmentation" features. As stated in the 2009 modification, the USACE agreed to fund and implement the enhancement/augmentation features "…if the results of ongoing investigations indicate that they will contribute environmental benefits." The modification stated that "…project augmentation measures will be considered by the interagency team to enhance wetland functions and values of the site and provide added compensation for any unavoidable impacts."

The 2009 modification did not specifically identify potential enhancement/augmentation features or activities; however, IER 12 did include a listing of potential enhancement/augmentation features. Potential enhancement/augmentation features and activities are still being developed and evaluated by the USACE and the Interagency Team. This group has not yet formulated a final array of alternatives and has not yet completed an evaluation of such alternatives for things like potential benefits and impacts, effectiveness, costs, and feasibility; thus, there presently are no final "preferred enhancement alternatives". The USACE will continue developing and evaluating potential alternatives in coordination with the Interagency Team.

Recommendation 16. The Service recommends that the Corps work with the natural resource agencies to incorporate proposed modifications and finalize the "GUIDELINES – WET BOTTOMLAND HARDWOOD HABITAT ENHANCEMENT, SWAMP HABITAT

RESTORATION, AND SWAMP HABITAT ENHANCEMENT" and the untitled document for marsh mitigation.

CEMVN Response 16: The guidelines cited by USFWS, which now include guidelines for fresh marsh and intermediate marsh mitigation, were originally developed as very generalized guidelines for use in developing and evaluating potential LPV and WBV HSDRRS mitigation alternatives involving USACE-constructed projects. The main objective for these guidelines was to help ensure consistency between LPV and WBV mitigation alternatives as regards things such as future with project WVA models, mitigation design concepts, and estimated mitigation costs (i.e., construction, implementation, maintenance, monitoring and reporting, etc.). Programmatic IERs and Tiered IERs are being prepared for the LPV HSDRRS mitigation project and for the WBV HSDRRS mitigation project. In cases involving USACE-constructed mitigation projects, these documents (Programmatic IERs or Tiered IERs) will contain project-specific information pertaining to the proposed mitigation work plan, mitigation success criteria, mitigation monitoring and reporting, mitigation management/maintenance, and, if necessary, proposed adaptive management plan for each Tentatively Selected Plan. In cases where the Tentatively Selected Plan is to purchase credits from a mitigation bank, the Programmatic IERs or Tiered IERs will also provide similar project-specific information for the highest ranked USACE-constructed mitigation alternative that would be used if it were ultimately determined that purchase of mitigation bank credits is no longer the best alternative. The project-specific mitigation information developed will supersede the cited general guidelines. The USACE will continue to coordinate with USFWS, other resource agencies, and other members of the PDT in preparing components of the project-specific mitigation programs.

Recommendation 17. The Service recommends that the Corps maintain full responsibility for any mitigation project for a minimum of 4-years post planting. The Corps should maintain full responsibility for all marsh mitigation projects until the projects are found to be fully compliant with success and performance requirements. Those requirements should be developed in cooperation with the resource agencies and included in the mitigation IERs.

CEMVN Response 17: Presently, the USACE intends to issue a Notice of Construction Completion for authorized USACE-constructed mitigation projects to the non-Federal sponsor upon the successful completion of mitigation construction activities (e.g. project would shift from the "construction" phase to the "OMRR&R" phase at this point). However, the USACE would retain the primary responsibility for the completion of certain mitigation activities necessary to meet the project's initial success criteria. These activities would vary depending on the specifics of the mitigation plan and its associated success criteria. Note that while the USACE would be responsible for completion of mitigation construction and certain activities after the Notice of Construction Completion, all these activities would be subject to standard cost-sharing provisions and the availability of funds. After initial success criteria are reached, the USACE will continue to support the non-Federal sponsor's operation and maintenance of the mitigation project features as follows; if the project is not achieving its performance milestones, USACE will consult with the non-Federal sponsor and other agencies to consider operational changes to the mitigation plan and/or adaptive management measures to be implemented in accordance with relevant guidance, cost-sharing requirements and subject to availability of funds. Mitigation success criteria for all proposed USACE-constructed mitigation projects have been and will continue to be developed in coordination with the resource agencies. Those mitigation IERs seeking authorization to implement USACE-constructed mitigation projects will contain detailed mitigation plans, including applicable mitigation success criteria and monitoring programs to gage the success/performance of such projects.

Recommendation 18. The Service recommends that the continued coordination of the development of Water Control Plans until all plans are finalized and for any future changes to the plans.

CEMVN Response 18: Concur

Recommendation 19. At this time none of the mitigation planning documents describe in detail actions needed by the Corps and/or the local sponsor if mitigation is failing as planned. The Service recommends that this important component of the mitigation plan be developed.

CEMVN Response 19: Currently, mitigation planning is ongoing. For USACE-constructed mitigation features, the mitigation plan will contain a contingency plan for taking corrective actions in cases in which monitoring demonstrates that mitigation measures are not achieving ecological success. The USACE will continue to coordinate with USFWS, other resource agencies, and other members of the PDT in preparing components of the project-specific mitigation programs, including the preparation of AMPs and guidance for addressing unforeseen threats to mitigation success.

Recommendation 20: The Service recommends that impacts associated with contractor provided borrow sources and status of mitigation implementation be provided to the Service.

CEMVN Response 20: BLH was impacted at the Willow Bend, Eastover Phase 2, and Stumpf Phase 1 Contractor furnished borrow pits. The BLH was impacted during single events associated with a specific levee construction contracts and mitigation credits were purchased for the impacts that resulted due to the individual contracts. The impacts on BLH were a onetime event and future use of the pits did not further impact additional BLH. Evidence of mitigation credits purchased for impacts at Willow Bend, Eastover Phase 2 and Stumpf Phase 1 were provided to the USFWS via email on June 15, 2012. Table 6-4 provides information regarding BLH impacts, and mitigation credits purchased.

Table 6-4: Bottomland Hardwood Mitigation for Contractor-Furnished Borrow*

Levee Reach	Contractor	Borrow Area	Acres	AAHUs	Mitigation Status
WBV-14.c.2	Phylway	Willow Bend "Mine Area 2"	8.82	4.87	Credits purchased 7/28/2010 (Paradis)
WBV-14.e.2	Phylway	Willow Bend "Mine Area 2 Expansion"	1.97	1.09	Credits purchased 7/28/2010 (Paradis)
WBV-15.a.2	Phylway	Willow Bend "Mine Area 2"	1.97	1.09	Credits purchased 5/31/2011 (Paradis)
WBV-09.a	Kiewit	Willow Bend "Mine Area 2"	1.97	1.09	Credits purchased 5/31/2011 (Paradis)
WBV-12	Gulf Intracoastal Constructors	Willow Bend "Mine Area 2"	1.97	1.09	Credits purchased 5/31/2011 (Paradis)
Supply Contract	Chapel Hill	Eastover Phase 2 "Extra Acreage"	1.56	0.33	Credits purchased 5/31/2011 (Paradis)
Supply Contract	Chapel Hill	Eastover Phase 2 "Access Roads"	2.3	0.48	Credits purchased 7/22/2010 (Paradis)
LPV 109	Archer Western	Eastover Phase 2 "Acreage along Paris Road"	21.94	4.57	Access road not constructed. No impact on BLH.
Supply Contract	Chapel Hill	Stumpf Phase 1 (Stockpile)	22.41	6.19	Access road not constructed. No impact on BLH.
WBV-09.a	Kiewit	Idlewild Stage 2	80.56	54.63	USACE purchased mitigation credits from Paradis, covered in Supplemental IER 25a. Idlewild Stage 2 borrow area has never been used
WBV-MRL.-1.1	Cycle Construction	Idlewild Stage 2	80.56	80.56	BLH has not been impacted. USACE is in on-going discussions with the landowner regarding mitigation requirements.

*updated on December 5, 2012

SECTION 7
COMPLIANCE

7.1 RELEVANT LAWS AND REGULATIONS

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.

A list of the relevant laws and regulations, including the agency tasked with the jurisdiction for each and the respective permit, license, compliance, or other review, is detailed in Table 7-1. The coordination/consultation and the dates on which concurrence was obtained to satisfy the relevant laws and regulations for each specific IER, IERS or EA are listed below.

Table 7-1: Relevant Laws and Regulations Providing Guidance

Relevant Laws and Regulations	Agency	Permit, License, Compliance, or Review/Status	Action Requiring Permit, Approval, or Review
Sound/Noise			
Noise Control Act of 1972 (42 USC 4901 et seq.), as amended by Quiet Communities of 1978 (P L 95-609)	USEPA	Compliance with surface carrier noise emissions	Construction and operations
Air			
Clean Air Act and amendments of 1990 (42 USC 7401(q)) 40 CFR 50, 52, 93.153(b)	USEPA	Compliance with NAAQS and emission limits and/or reduction measures	Construction and operations
Water			
Clean Water Act of 1977 (33 USC 1342) 40 CFR 122	USEPA	Section 402(b) National Pollutant Discharge Elimination System General Permit for Stormwater Discharges for Construction Activities	Construction sites with greater than 1 acre of land disturbed

Relevant Laws and Regulations	Agency	Permit, License, Compliance, or Review/Status	Action Requiring Permit, Approval, or Review
EO 11988 (Floodplain Mgmt), as amended by EO 12608	WRC*, FEMA, and CEQ	Compliance	Construction in or modification of floodplains
EO 11990 (Protection of Wetlands), as amended by EO 12608	USACE and USFWS	Compliance	Construction in or modification of wetlands
Clean Water Act of 1977 (33 USC 1341 et seq.) 40 CFR 121	LDEQ	Section 401 Water Quality Certification	Potential discharge into waters of the state (including wetlands and washes)
Clean Water Act of 1977 (33 USC 1344) 40 CFR 230	USACE	Section 404(b)(1)	Discharge of dredge or fill material to a watercourse
Clean Water Act of 1977 (33 USC 1344) 40 CFR 230	USEPA	Section 404(c)	USEPA may exercise a veto over the specification by the USACE or by a state of a site for the discharge of dredged or fill material
Coastal Zone Management Act of 1972 (16 USC 1456(c)) Section 307	LDNR	Consistency Determination	Consistency with the Louisiana Coastal Mgmt Program
Soils			
Resource Conservation and Recovery Act of 1976 (42 USC 6901(k)), as amended by Hazardous and Solid Waste Amendments of 1984 (P L 98-616; 98 Statute 3221)	USEPA	Proper management, permit for remediation	Current operation involving hazardous waste and/or remediation of contamination site
Comprehensive, Environmental Response, Compensation, Liability Act of 1980 (42 USC 9601), as amended by Emergency Planning and Community Right-To-Know-Act of 1986 (42 USC 11001 et seq.)	USEPA	Development of emergency response plans, notification, and cleanup	Release or threatened release of a hazardous substance
Farmland Protection Policy Act of 1981 (7 USC 4201 et seq.) 7 CFR 657-658	NRCS	NRCS determination via Form AD-1006	Prime and unique farmlands
Soil Conservation Act (16 USC 590(a) et seq.)	NRCS	Compliance	Soil conservation of Federal lands

Natural Resources			
Endangered Species Act of 1973, as amended (16 USC 1531) Sections 7 and 9 50 CFR 17.11-17.12	USFWS, NMFS	Compliance by lead agency and/or consultation to assess impacts and, develop mitigation measures	Identification of threatened and endangered species and their critical habitats
Migratory Bird Treaty Act of 1918 (16 USC 703) 50 CFR Chapter 1	USFWS	Compliance by lead agency and/or consultation to assess impacts and, develop mitigation measures	Protection of migratory birds
Bald and Golden Eagle Act of 1940, as amended (16 USC 688(d)) 50 CFR 22.3	USFWS	Compliance by lead agency and/or consultation to assess impacts and obtain permit	Protection of bald and golden eagles
Fish and Wildlife Conservation Act (16 USC 2901)	USFWS, NMFS	Compliance	Conserve and promote conservation of non-game fish and wildlife and their habitats
Marine Mammal Protection Act of 1972 (16 USC 1361)	NMFS	Compliance by lead agency and/or consultation to assess impacts and develop mitigation measures	Protection of marine mammals
EO 13112 (Invasive Species)	USACE and Port of New Orleans	Compliance	Restrict the introduction of exotic organisms into natural ecosystems
Health and Safety			
Occupational Safety and Health Act of 1970 (29 USC 651) 29 CFR 1975	OSHA	Compliance with guidelines, including Material Safety Data Sheets	Health and safety standards
Cultural/Archaeological			
NHPA (16 USC 470 et seq.) 36 CFR 800 Army Regulation 200-4, Cultural Resources Management Presidential Memorandum regarding Government-to-Government Relations (April 29, 1994) EO 13007 (Indian Sacred Sites)	USACE, SHPO, ACHP, and Tribes	Section 106 Consultation	Assessment of cultural resources and avoidance of disturbance of historic properties

Native American Graves Protection and Repatriation Act 43 CFR 10	USACE, SHPO, ACHP, and Tribes	Compliance	Protection of Native American sites, graves, and sacred objects
Archaeological Resources Protection Act of 1979 (16 USC 470(a)(a)-470(ii)) 43 CFR 7	Affected land-managing agency	Permits to survey and excavate/ remove archaeological resources on Federal lands; Native American tribes with interests in resources must be consulted prior to issue of permits	Investigation and excavation of cultural resources on Federal lands such as JLNHPP and Bayou Sauvage NWR.
Socioeconomic			
EO 13045 (Protection of Children from Environmental Health Risks and Safety Risks)	USEPA	Compliance	Identify and assess environmental health risks and safety risks that may disproportionately affect children
EO 12898 (Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations)	USEPA	Compliance	Identify and address disproportionately high and adverse human health or environmental effects on minority and low-income populations

* WRC = Water Resources Council

Table 7-2: Clean Water Act of 1977, Section 404 (b)(1) and 401 Water Quality Certification (WQC)

IER/IERS/EA	TITLE	401 WQC	404(b)(1)
St. Charles Sub-basin			
IER #1 IERS #1.a IERS #1.b	La Branche Wetlands Levee https://www.mvn.usace.army.mil/LaBranche-Wetlands-Levee/	JP 080327-02/ AI 156863/ CER 20080001 4/18/2008	6/9/2008
	La Branche Wetlands Levee https://www.mvn.usace.army.mil/LaBranche-Wetlands-Levee/	WQC 080327-02/ AI 156863/ CER 20080002 4/20/2009	6/10/2009
	La Branche Wetlands Levee https://www.mvn.usace.army.mil/LaBranche-Wetlands-Levee/	WQC 083727-02/ AI 156863/ CER 20110002 4/19/2011	6/72011
Jefferson East Bank Sub-basin			
IER #2	West Return Floodwall https://www.mvn.usace.army.mil/West-Return-Floodwall	WQC 080430-01/ AI 157567/ CER 20080001 5/19/2008	7/18/2008
IERS #2 IERS#2.a	West Return Floodwall https://www.mvn.usace.army.mil/West-Return-Floodwall	WQC 080430-01/ AI 157567/ CER 20090001 8/6/2009	10/1/2009
	West Return Floodwall https://www.mvn.usace.army.mil/West-Return-Floodwall	No WQC Rqd	N/A
IER #3 IERS #3.a	Lakefront Levee https://www.mvn.usace.army.mil/Lakefront-Levee	WQC 080512-01/ AI 157821/ CER 20080001 5/27/2008	7/25/2008
	Lakefront Levee https://www.mvn.usace.army.mil/Lakefront-Levee	WQC 080512-01/ AI 157821/ CER 20090001 10/21/2009	12/18/2009

IER/IERS/EA	TITLE	401 WQC	404(b)(1)
Orleans East Bank Sub-basin			
IER #4	New Orleans Lakefront Levee, West of Inner Harbor Navigation Canal https://www.mvn.usace.army.mil/New-Orleans-Lakefront-Levee	No WQC Required	N/A
IER #5 IERS #5.a*	Outfall Canal Closure Structures, 17th Street Canal, Orleans Avenue Canal and London Avenue Canal https://www.mvn.usace.army.mil/Permanent-Protection-System	WQC 081110-01/ AI 161807/ CER 20080001 1/26/2009	6/30/2009
	Outfall Canal Closure Structures, 17th Street Canal, Orleans Avenue Canal and London Avenue Canal https://www.mvn.usace.army.mil/Permanent-Protection-System	WQC 081110-01/ AI 161807/ CER 20130001 12/11/2013	6/30/2014
IER #27 IER S#27.a*	Outfall Canal Remediation on the 17th Street, Orleans Avenue, and London Avenue Canals https://www.mvn.usace.army.mil/Outfall-Canal-Remediation	No WQC Required	Not required
	Outfall Canal Remediation on the 17th Street, Orleans Avenue, and London Avenue Canals https://www.mvn.usace.army.mil/Outfall-Canal-Remediation	No WQC Required	Not required
New Orleans East Sub-basin			
IER #6 IERS #6	Citrus Lakefront Levee https://www.mvn.usace.army.mil/Citrus-Lakefront-Levee	WQC 090306-01/ AI 163529/ CER 20090001 4/6/2009	6/25/2009
	Citrus Lakefront Levee https://www.mvn.usace.army.mil/Citrus-Lakefront-Levee	No WQC Required	Not required

IER/IERS/EA	TITLE	401 WQC	404(b)(1)
IER #7 IERS #7	New Orleans East Lakefront to Michoud Canal https://www.mvn.usace.army.mil/New-Orleans-East-Levee	WQC 090306-01/ AI 163529/ CER 20090001 4/6/2009	6/25/2009
	New Orleans East Lakefront to Michoud Canal https://www.mvn.usace.army.mil/New-Orleans-East-Levee	no WQC revision required	Not required
IER #11 Tier 1	Improved Protection on the Inner Harbor Navigation Canal https://www.mvn.usace.army.mil/IHNC-Navigable-Floodgates	No WQC required	Not required
IERS #11-Tier 2 P** IER #11-Tier 2 B*** IERS #11.a Tier 2 B IERS #11.b Tier 2 B* IERS #11.c Tier 2 B* IERS #11.d Tier 2 P*	Improved Protection on the Inner Harbor Navigation Canal, Orleans and St. Bernard Parish https://www.mvn.usace.army.mil/IHNC-Navigable-Floodgates	WQC091102-02/ AI 158513/ CER 20090001 12/28/2009	4/1/2010
	Improved Protection on the Inner Harbor Navigation Canal https://www.mvn.usace.army.mil/IHNC-Navigable-Floodgates	WQC 08616-01/ AI 158513/ CER 2008001 7/11/2008	10/21/2008
	Improved Protection on the Inner Harbor Navigation Canal with Vertical lift gate in lieu of a sector gate on Bayou Bienvenue and vehicular lift bridge system https://www.mvn.usace.army.mil/IHNC-Navigable-Floodgates	WQC 08616-01/ AI 158513/ CER 2008001 7/11/2008	10/21/2008
	Improved Protection on the Inner Harbor Navigation Canal https://www.mvn.usace.army.mil/IHNC-Navigable-Floodgates	No WQC required	Not required
	Improved Protection on the Inner Harbor Navigation Canal https://www.mvn.usace.army.mil/IHNC-Navigable-Floodgates	WQC 08616-01/ AI 158513/ CER 2008001 7/11/2008	10/21/2008

IER/IERS/EA	TITLE	401 WQC	404(b)(1)
	Improved Protection on the Inner Harbor Navigation Canal https://www.mvn.usace.army.mil/IHNC-Navigable-Floodgates	WQC 091102-02/ AI 158513/ CER 20090001 12/28/2009	4/6/2010
Chalmette Loop Sub-Basin			
IER #8;	Bayou Dupre Control Structure https://www.mvn.usace.army.mil/Bayou-Bienvenue-Bayou-Dupre-Control-Structures	WQC 081222-01/ AI 162387/ CER 20080001 3/8/2009	6/23/2009
IER #9	Caernarvon Floodwall https://www.mvn.usace.army.mil/IER-9	WQC 090708-02/ AI 165754/ CER 20090001 9/21/2009	2/8/2010
IER #10	Chalmette Loop Levee https://www.mvn.usace.army.mil/Chalmette-Loop-Levee	WQC 081222-01 /AI 162387/ CER 20080001 2/8/2009	5/26/2009
IERS #8,9,10.a*	LPV Chalmette Loop Levee https://www.mvn.usace.army.mil/Chalmette-Loop-Levee	Not required	Not required
Belle Chasse Sub-Basin			
IERS #12/13*	12/13 Waterline WBV, GIWW, Harvey and Algiers Levees and Floodwalls and Hero Canal Levee and Eastern Tie-in Plaquemines Parish, LA	WQC 090128-01/ AI 162810/ CER 20100001 8/31/2010	12/4/2009
	WBV Hero Canal Levee Eastern Tie-In Plaquemines Parish https://www.mvn.usace.army.mil/IER2012-13a.pdf	WQC 090128-01/ AI 162810/ CER 20090001 3/6/2009	12/4/2009
IER #13	Hero Canal Levee and Eastern Terminus 12/13 Waterline WBV https://www.mvn.usace.army.mil/Hero-Canal-Levee-Eastern-Terminus	WQC 090128-01/ AI 162810/ CER 20090001 3/6/2009	12/4/2009
IER #13 Addendum IERS #13a*	Hero Canal Levee and Eastern Terminus 12/13 Waterline WBV https://www.mvn.usace.army.mil/Hero-Canal-Levee-Eastern-Terminus	Not required	Not required

IER/IERS/EA	TITLE	401 WQC	404(b)(1)
IER #33* IER S #33.a*	WBV and Mississippi River Co-Located Levees https://www.mvn.usace.army.mil/MRL-Co-Located-Levees	WQC 101109-03/ AI 101235/ CER 20100007 12/17/2010	11/26/2010
	WBV and Mississippi River Co-Located Levees https://www.mvn.usace.army.mil/MRL-Co-Located-Levees	WQC 101109-03/ AI 101235/ CER 20110001 11/7/2011	10/?/2011
Gretna-Algiers Sub-Basin			
IER #12 IERS #12 addendum* IERS #12.a*	GIWW, Harvey and Algiers Canal Levee and Floodwalls https://www.mvn.usace.army.mil/Harvey-Algiers-Canal-Levee-Floodwall	WQC 080825-02/ AI 160206/ CER 20080001 12/16/2008	02/18/2009
	GIWW, Harvey and Algiers Canal Levee and Floodwalls https://www.mvn.usace.army.mil/Harvey-Algiers-Canal-Levee-Floodwall	WQC 080825-02/ AI 160206/ CER 20080001 12/16/2008	12/18/2009
	GIWW, Harvey and Algiers Canal Levee and Floodwalls https://www.mvn.usace.army.mil/Harvey-Algiers-Canal-Levee-Floodwall	WQC 080825-02/ AI 160206/ CER 20110001 1/20/2011	02/22/2011
SEA #581	Jean Lafitte National Historical Park and Preserve Augmentation Features Supplemental EA and National Historic Preservation Act Assessment of Effects, WBV, HSDRRS Augmentation	WQC 080825-02/AI 160206/ CER 210209-01 2/12/2021	3/11/2021
Harvey-Westwego Sub-basin			
IER #14 IERS #14.a	Westwego to Harvey Levee https://www.mvn.usace.army.mil/Harvey-to-Westwego-Levee	JP 080213-04/ AI 156035/ CER 20080001	3/4/2008
	Westwego to Harvey Levee	WQC 080213-04/ AI 156035/	2/9/2010

IER/IERS/EA	TITLE	401 WQC	404(b)(1)
	https://www.mvn.usace.army.mil/Harvey-to-Westwego-Levee	CER 20090001 8/4/2009	
Lake Cataouatche Sub-basin			
IER #15 IERS #15.a addendum*	Lake Cataouatche Levee https://www.mvn.usace.army.mil/Lake-Cataouatche-Levee	JP 080213-05/ AI 156034/ CER 20080001 3/4/2008	6/12/2008
	Lake Cataouatche Levee https://www.mvn.usace.army.mil/Lake-Cataouatche-Levee	WQC 080213-05/ AI 156034/ CER 20100001 6/23/2010	4/21/2011
IER #16 IERS #16.a	Western Terminus Levee https://www.mvn.usace.army.mil/Western-Terminus-Levee	WQC 090212-06/ AI 163172/ CER 20090001 3/6/2009 WQC 090212-06/ AI 163172/ CER 20100001 4/14/2010	6/12/2009
	Western Terminus Levee https://www.mvn.usace.army.mil/Western-Terminus-Levee	WQC 090212-06/ AI 163172/ CER 20100001 4/14/2010	7/24/2010
IER #17	Company Canal Floodwall https://www.mvn.usace.army.mil/Company-Canal-Floodwall	WQC 080522-02/ AI 158048/ CER 20080001 7/14/2008	1/21/2009
MITIGATION			
PIER #36*	Programmatic LPV HSDRRS Mitigation https://www.mvn.usace.army.mil/PIER-36	No WQC required	Not required
PIER #36 Tier 1* PIER #36, SIER 1* SEA #546 PIER 36*	PIER 36 Bayou Sauvage, Turtle Bayou & New Zydeco Ridge Restoration https://www.mvn.usace.army.mil/SIER1.pdf	WQC 140825-02 11/12/2014	7/1/2016

IER/IERS/EA	TITLE	401 WQC	404(b)(1)
	EA Supplement PIER 36 Supplement 2 Bayou Sauvage, Turtle Bayou & New Zydeco Ridge https://www.mvn.usace.army.mil/SEA546.pdf	WQC 140825-02 11/12/2014; 6/22/2016	7/1/2016
PIER #37* PIER #37 Tiered IER 1 NPS Joint EA* SPIER #37a* SEA #548 Tier 1 of Pier #37 NPS Joint EA* SEA #572*	Programmatic WBV HSDRRS Mitigation https://www.mvn.usace.army.mil/PIER-37	No WQC required	Not required
	WBV HSDRRS Mitigation JLNHPP Mitigation Features https://www.mvn.usace.army.mil/PIER37.pdf	WQC 151207-02 12/8/2015	12/3/2015
	Mitigation for Protected Side BLH-Dry WBV HSDRRS https://www.mvn.usace.army.mil/WBVSPIER37a.pdf	No WQC required	Not required
	WBV Lake Cataouatche Borrow Area Expansion and Access Features, JLNHPP Mitigation Features https://www.mvn.usace.army.mil/WBVTIER1SEA548.pdf	WQC 151207-02 8/10/2016 USACE 10/20/2016 NPS	9/14/2016
	BLH-wet and swamp mitigation, Lafourche Parish, LA https://www.mvn.usace.army.mil/SEA572.pdf	No WQC required	Not required

* Not included in CED Phase I
**None of the borrow sites required water quality certification

Table 7-3. Coastal Zone Management Act of 1972, Coastal Zone Consistency (CZC)

IER/IERS/EA	TITLE	CZC
St. Charles Sub-basin		
IER #1 IERS #1.a IERS #1.b	La Branche Wetlands Levee	C20080104 21-Apr- 2008
	La Branche Wetlands Levee	C20080104 8-May- 2009
	La Branche Wetlands Levee	C20080104(mod 4) 16-May-2011
Jefferson East Bank Sub-basin		
IER #2 IERS #2 IERS#2.a	West Return Floodwall	C20080223 23-May-2008
	West Return Floodwall	C20080223(mod 1) 15-Sep-2009
	West Return Floodwall	C20080233 Mod 3 31-Oct-2011
IER #3 IERS #3.a	Lakefront Levee	C20080227 23-May-2008
	Lakefront Levee	C20080227(mod 1) 16-Sep-2009
Orleans East Bank Sub-basin		
IER #4	New Orleans Lakefront Levee, West of Inner Harbor Navigation Canal	C20080597 20-Jan-2009
IER #5 IERS #5.a	Outfall Canal Closure Structures, 17th Street Canal, Orleans Avenue Canal and London Avenue Canal	C20080112 17-Nov-2008
	Outfall Canal Closure Structures, 17th Street Canal, Orleans Avenue Canal and London Avenue Canal	C20080112 mod 4 17-Jan-2014
IER #27 IERS #27.a	Outfall Canal Remediation on the 17th Street, Orleans Avenue, and London Avenue Canals	C20100164 21-Jul-10
	Outfall Canal Remediation on the 17th Street, Orleans Avenue, and London Avenue Canals	C20100164 10-Jan-11
New Orleans East Sub-basin		
IER #6 IERS #6	Citrus Lakefront Levee	C20090065 11-Mar-2009
	Citrus Lakefront Levee	C20090065 (mod1) 22-Jan-2010
IER #7 IERS #7	New Orleans East Lakefront to Michoud Canal	C20090033 11-Mar-2009
	New Orleans East Lakefront to Michoud Canal	C20090033(mod 1) 28-Apr-2010

IER/IERS/EA	TITLE	CZC
IER #11 Tier 1 Pontchartrain and Borgne	Improved Protection on the Inner Harbor Navigation Canal (IHNC)	C20070619 28-Mar-2008
IER #11 Tier 2 Borgne	Improved Protection on the IHNC	C20080280 1-Aug-2008
IERS #11.a Tier 2 Borgne	Improved Protection on the IHNC	C20080280 9-Sep-2009
IERS #11.b Tier 2 Borgne	Improved Protection on the IHNC	C20100126 23-Jul-2010
IERS #11.c Tier 2 Borgne	Improved Protection on the IHNC	C20080280 29-Nov-2010
IERS #11 Tier 2 Pontchartrain	Improved Protection on the IHNC	C2009045 9-Nov-2009
IERS #11.d Tier 2 Pontchartrain	Improved Protection on the IHNC	C20090495 Mod 1 9-Dec-2011
Chalmette Loop Sub-Basin		
IER #8	Bayou Dupre Control Structure	C20080057 17-Apr-2008 26-Jan-2009
IER #9	Caernarvon Floodwall	C20090245 2-Jul-2009
IER #10	Chalmette Loop Levee	C20080556 24-Dec-2008
IERS #8,9,10.a	Chalmette Loop Levee	C20120320 13 Nov-2012
Belle Chasse Sub-Basin		
IERS #12 / 13	Hero Canal Levee and Eastern Terminus 12/13 Waterline WBV	C20100293 26-Oct-10
IER #13 Addendum	Hero Canal Levee and Eastern Terminus 12/13 Waterline WBV	C20090082 13-Mar-09
IERS #13a	Hero Canal Levee and Eastern Terminus 12/13 Waterline WBV	C20090082 Mod 6 5-Apr-2011
IER #33	Mississippi River Co-Located Levees	C20100339 7-Dec-10
IERS #33.a	Mississippi River Co-Located Levees	C20100339 Mod 2 16-Dec-11

IER/IERS/EA	TITLE	CZC
Gretna-Algiers Sub-Basin		
IER #12 IERS #12 addendum IERS #12.a	GIWW, Harvey and Algiers Canal Levee and Floodwalls	C20080483 17-Dec-2008
	GIWW, Harvey and Algiers Canal Levee and Floodwalls	C20070509 Mod 1 6-Aug-2010 and C20080483 Mod 2 17-Nov-2010
	GIWW, Harvey and Algiers Canal Levee and Floodwalls	C20080483 Mod 3 26-Jan-2011
SEA #581	Jean Lafitte National Historical Park and Preserve Augmentation Features Supplemental EA and National Historic Preservation Act Assessment of Effects, WBV, HSDRRS Augmentation	C20210028 35-March-2020
Harvey-Westwego Sub-Basin		
IER #14 IERS #14.a	Westwego to Harvey Levee	C20080048 10-Mar-2008
	Westwego to Harvey Levee	C20080048 10-Nov-2009
Lake Cataouatche Sub-basin		
IER #15 IERS #15.a addendum	Lake Cataouatche Levee	C20080049 10-Mar-2008
	Lake Cataouatche Levee	C20080049 Mod 5 20-Apr-2011
IER #16 IERS #16.a	Western Terminus Levee	C20080324 18-Apr-2009
	Western Terminus Levee	C20080324 4-May-2009
IER #17	Company Canal Floodwall	C20080289 11-Sep-2008
BORROW SITES		
IER 18	Government Furnished Borrow #1	
	1418/1420 Bayou Road; 1572 Bayou Road; 910 Bayou Road; 4001 Florissant	C20070071 12-Mar-07
	Triumph	Jul-06
	Belle Chase; Maynard; Cummings North; Churchill Farms Pit A; Westbank Site G;	C20070200 25-Sep-07
	Bonnet Carre North	C20070304 22-Jul-07

IER/IERS/EA	TITLE	CZC
IER #19	Pre-Approved Contractor Furnished Borrow #1	
	River Birch Phase I	P2003054
	River Birch Phase II	P20061802
	Pearlington Dirt Phase I	DMR-070125
	Eastover; Sylvia Guillot; Gatien-Navy Camp Hope; St. Gabriel Redevelopment	Not within Coastal Zone
	Kimble #2	P20061684
	DK Aggregates	P20061819 21- Dec-06
IER #22	Government Furnished Borrow #2	
	Brad Buras; Westbank F; Westbank I	C20070323 3-Sep-07
	Tabony	C20070468 11-Oct-07
	Westbank N	C20070509 30-Nov-07
IER #23	Contractor Furnished Borrow #2	
	1025 Florissant	P20060763 10-Jul-06
	Acosta	P20070851 15-Jun-07
	3C Riverside	P20070558 28-Jun-07
	Myrtle Grove	N/A
	Pearlington Dirt Phase 2	DMR-070125 25-Jan-07
IER #25 IERS #25.a	Government Furnished Borrow #3	
	Stumpf Phase 1; Westbank D; Tac Carrere	C20080076 24-Apr-08
	Stumpf Phase 2	C20080336 22-Sep-08
	Westbank E Phase 1 & 2	C20070509 30-Nov-07
	Stumpf Stockpile Clearance Supplement	C20080076 26-Aug-11
IER #26	Pre-Approved Contractor Furnished Borrow #3	
	South Kenner Road	P20071264; 27-Jun-08
	Willswood	P20071574; 22-Jul-08
	Meyer	P20080039; 22-Apr-08
	Willow Bend	P20080242; 28-Apr-08
	Frierson	DMR-080030; 1-Aug-07

IER/IERS/EA	TITLE	CZC
IER #28	Government Furnished Borrow #4	
	Johnson/Crovetto	C20080336 22-Sep-08
	Bazile	C20080700 4-Mar-09
	Westbank F Access Routes	C20080700 4-Mar-2009
IER #29	Contractor Furnished Borrow #4	
	Eastover Phase II	P20070642
	Tammy Holding	P20021241
	Willow Bend Phase II	P20080242
IER #30	Contractor Furnished Borrow #5	
	Big Shake	P20080985
	Henley	DMR-090028
	Contreras Dirt Z; Contreras Cell E; Contreras Cell F	P20061819; 21-Dec-06
IER #31	Contractor Furnished Borrow #7	
	Acosta 2	P20079851; 15-Jun-07 P20079851; 16-Aug-07
	Idlewild Stage 2	P20090517
	King Mine	DMR-070269;19-Dec-06
	Levis	C20080700; 4-Mar-09 P20060363 ST06-23
	Port Bienville	P20070631
	Raceland Raw Sugars	DMR-080030
	River Birch Landfill Expansion	P20080485
	Scarsdale	P20090224
	Spoil Area	P20090799
IER #32	Contractor Furnished Borrow #6	
	Bocage	P20080865; 30-Jun-08
	Citrus Lands	P20090080 (state) CZM-2009-10
	Conoco Philips	P20090238
	Idlewild Stage 1	P20090188 (state) CZM-2009-2 (parish)
	Nairn	P20090185 (state) CZM-2009-9 (parish)

IER/IERS/EA	TITLE	CZC
	Plaquemines Dirt & Clay	P20090144 (state) CZM-2009-9 (parish)
	3C Riverside Phase 3	P20090069
IER #35	Contractor Furnished Borrow #8	
	Assumption Land Company	P20110343 P20110343 (parish)
	Houma Excavation	P20110451 P20110451(parish)
	RBEND II	P20101602
	Robert Brothers Farm site 1 and site 2	P20101502 and P20110438
	MITIGATION	
PIER #36	Programmatic LPV HSDRRS Mitigation	C20120046 Mod 2 3-Jun-13
PIER #36 Tiered IER 1	Milton Island Marsh Restoration	C20120046 Mod 3 29-May-14
PIER #36 Supplement 1 (SIER 1)	Bayou Sauvage, Turtle Bayou & New Zydeco Ridge Restoration	C20120046 Mod 6 15-Oct-2015
EA #546 SPIER 36 Supplement 1	Bayou Sauvage, Turtle Bayou & New Zydeco Ridge	C20120046 Mod 07 21-Jun-16
Programmatic IER #37	Programmatic WBV HSDRRS Mitigation	C20140014 25-Feb-14
PIER #37 Tiered IER 1 NPS Joint EA	WBV HSDRRS Mitigation JLNHPP Mitigation Features	C20120324 Mod 2 21-Aug-15
SPIER #37a	Mitigation for Protected Side Bottomland Hardwoods Dry WBV HSDRRS	C20140014 Mod 02 7-Dec-2015
SEA #548 Tier 1 of PIER #37 NPS Joint EA	WBV Lake Cataouatche Borrow Area Expansion and Access Features, JLNHPP Mitigation Features	C20140014 Mod 01 21-Aug-2015
SEA #572	BLH-wet and swamp mitigation, Lafourche Parish, Louisiana	C20140014 Mod 05 23-Jul-2019

Table 7-3: Endangered Species Act of 1973 Section 7 Consultation and USFWS Coordination Act Report Coordination

NEPA Document	Title	Endangered Species Act (ESA) Date
St. Charles Sub-basin		
IER #1 IERS #1.a IERS #1.b	La Branche Wetlands Levee https://IER-1-LaBranche-Wetlands-Levee-St-Charles-Parish-Louisiana	4/8/2008 4/3/2009 4/21/2011
Jefferson East Bank Sub-basin		
IER #2 IERS #2 IERS#2.a	West Return Floodwall https://IER-2-West-Return-Floodwall-Jefferon-and-St-Charles-Parishes-Louisiana	5/5/2008 8/20/2009 9/14/2011
IER #3 IERS #3.a	Lakefront Levee https://IER-3-Lakefront-Levee-Jefferson-Parish-Louisiana	2/22/2008 8/20/2009
Orleans East Bank Sub-basin		
IER #4	New Orleans Lakefront Levee, West of Inner Harbor Navigation Canal	1/20/2009
IER #5 IERS #5.a	Outfall Canal Closure Structures, 17th Street Canal, Orleans Avenue Canal and London Avenue Canal	12/6/2007 12/23/2013
IER #27 IERS #27a	Outfall Canal Remediation on the 17th Street, Orleans Avenue, and London Avenue Canals	8/13/2010 1/7/2011
New Orleans East Sub-basin		
IER #6 IERS #6	Citrus Lakefront Levee	1/30/2007 11/16/2009
IER #7 IERS #7	New Orleans East Lakefront to Michoud Canal https://www.mvn.usace.army.mil/New-Orleans-East-Levee	12/6/2007 1/30/2007 1/22/2010
IER #11 Tier 1 Pontchartrain and Borgne	Chalmette Loop Levee https://www.mvn.usace.army.mil/Chalmette-Loop-Levee	3/26/2008
IER #11 Tier 2 Borgne	Chalmette Loop Levee https://www.mvn.usace.army.mil/Chalmette-Loop-Levee	6/27/2008
IERS #11.a	Improved Protection on the Inner Harbor Navigation Canal	6/27/2008

NEPA Document	Title	Endangered Species Act (ESA) Date
Tier 2 Borgne IERS #11b Tier 2 Borgne IERS #11.c Tier 2 Borgne	https://www.mvn.usace.army.mil/IHNC-Navigable-Floodgates	7/24/2010 10/1/2010
IER #11-Tier 2 Pontchartrain IERS #11.d Tier 2 Pontchartrain	Improved Protection on the Inner Harbor Navigation Canal https://www.mvn.usace.army.mil/IHNC-Navigable-Floodgates	2/2/2009 8/31/2009
Chalmette Loop Sub-Basin		
IER #8	Bayou Dupre Control Structure https://Bayou-Bienvenue-Bayou-Dupre-Control-Structures	5/28/2009
IER #9	Caernarvon Floodwall https://www.mvn.usace.army.mil/IER-9	12/22/2009
IER #10	Chalmette Loop Levee https://www.mvn.usace.army.mil/Chalmette-Loop-Levee	5/15/2009
IERS #8,9,10.a	Chalmette Loop Levee Supplemental https://www.mvn.usace.army.mil/Chalmette-Loop-Levee	9/21/2012
Belle Chasse Sub-Basin		
IERS #12 / 13	12/13 Waterline WBV	8/2/2010
IER #13 IER #13 Addendum IERS #13a	Hero Canal Levee and Eastern Terminus 12/13 Waterline WBV https://www.mvn.usace.army.mil/Hero-Canal-Levee-Eastern-Terminus	3/10/2009 3/9/2009 3/2/2011
IER #33 IERS #33a	Mississippi River Co-Located Levees https://www.mvn.usace.army.mil/MRL-Co-Located-Levees	10/29/2010 11/8/2011
Gretna-Algiers Sub-Basin		
IER #12 IERS #12 addendum IERS #12.a	GIWW WCC GIWW, Harvey and Algiers Canal Levee and Floodwalls https://www.mvn.usace.army.mil/Harvey-	6/25/2008 6/28/2010

NEPA Document	Title	Endangered Species Act (ESA) Date
	Algiers-Canal-Levee-Floodwall	12/13/2010
SEA #581	Jean Lafitte NHPP Augmentation Features, WBV, HSDRRS Augmentation https://www.mvn.usace.army.mil/SEA581/	11/12/2020
Harvey-Westwego Sub-basin		
IER #14 IERS #14.a	Westwego to Harvey Levee https://www.mvn.usace.army.mil/Harvey-to-Westwego-Levee	7/31/2008 9/2/2009

Lake Cataouatche Sub-basin		
IER #15	Lake Cataouatche Levee https://www.mvn.usace.army.mil/Lake-Cataouatche-Levee	5/22/2008
IERS #15.a addendum	Lake Cataouatche Levee https://www.mvn.usace.army.mil/Lake-Cataouatche-Levee	3/2/2011
IER #16 IERS #16.a	Western Terminus Levee https://www.mvn.usace.army.mil/Western-Terminus-Levee	11/28/2007 5/7/2010
IER #17	Company Canal Floodwall https://www.mvn.usace.army.mil/Company-Canal-Floodwall	11/21/2008
Borrow		
IER #18	Government Furnished Borrow #1 https://www.mvn.usace.army.mil/IER-18	
	1418/1420 Bayou Road; 1572 Bayou Rd; Dockville	3/15/2007
	910 Bayou Road; 4001 Florissant	3/7/2007
	Triumph	8/20/2007
	Belle Chase	4/17/2007
	Maynard	5/29/2007
	Cummings North	4/5/2007
	Churchill Farms Pit A	4/17/2007
	Westbank Site G	5/24/2007
	Bonnet Carre North	5/29/2007
IER #19	Pre-Approved Contractor Furnished Borrow #1 https://www.mvn.usace.army.mil/IER-19	

	River Birch Phase I	6/28/2004
	River Birch Phase II	2/7/2007
	Pearlington Dirt Phase I	9/15/2006
	Eastover	3/20/2007
	Kimble #2	8/20/2007
	Sylvia Guillot	1/29/2007
	Gatien-Navy Camp Hope	8/20/2007
	DK Aggregates	12/21/2006
	St. Gabriel Redevelopment	3/8/2007
IER #22	Government Furnished Borrow #2 https://www.mvn.usace.army.mil/IER-22	
	Brad Buras	6/28/2007
	Tabony	9/14/2007
	Westbank F	9/19/2009
	Westbank I	9/28/2007
	Westbank N	9/19/2007
IER #23	Contractor Furnished Borrow #2 https://www.mvn.usace.army.mil/IER-23	
	1025 Florissant	8/9/2007
	Acosta	7/2/2007
	3C Riverside	7/27/2007
	Myrtle Grove	1/29/2007
	Pearlington Dirt Phase 2	1/14/2008
IER #25	Government Furnished Borrow #3 https://www.mvn.usace.army.mil/IER-25	
	Stumpf Phase 1	4/10/2008
	Stumpf Phase 2	5/21/2008
	Westbank D	4/25/2008
	Westbank E Phase 1 & 2	4/25/2008
	Tac Carrere	4/10/2008
IER Supplemental #25.a	Government Furnished Borrow #3: Stumpf Stockpile Clearance Supplement https://www.mvn.usace.army.mil/IER-25	12/12/2011
IER #26	South Kenner Road	1/22/2008
	Willswood	7/2/2007
	Meyer	6/19/2007

	Willow Bend	1/25/2008
	Frierson	2/26/2008
IER #28	Government Furnished Borrow #4 https://www.mvn.usace.army.mil/IER-28	
	Johnson/Crovetto	6/3/2008
	Bazile	3/2/2009
	Westbank F Access Routes	3/3/2009
IER #29	Contractor Furnished Borrow #4 https://www.mvn.usace.army.mil/IER-29	
	Eastover Phase II	1/29/2008
	Tammy Holding	6/25/2008
	Willow Bend Phase II	1/25/2008
IER #30	Contractor Furnished Borrow #5 https://www.mvn.usace.army.mil/IER-30	
	Big Shake	7/17/2008
	Henley	7/22/2008
	Contreras Dirt Z	6/12/2008
	Contreras Cell E	6/12/2008
	Contreras Cell F	6/12/2008
IER #31	Contractor Furnished Borrow #7 https://www.mvn.usace.army.mil/IER-31	
	Acosta 2	7/6/2009
	Idlewild Stage 2	2/23/2009
	King Mine	8/6/2008
	Levis	7/30/2008
	Port Bienville	4/25/2008
	Raceland Raw Sugars	9/21/2009
	River Birch Landfill Expansion	2/27/2009
	Scarsdale	4/18/2008
	Spoil Area	2/27/2009
IER #32	Contractor Furnished Borrow #6 https://www.mvn.usace.army.mil/IER-32	
	Bocage	6/18/2008
	Citrus Lands	1/29/2009
	Conoco Philips	3/18/2009
	Idlewild Stage 1	2/23/2009
	Nairn	2/23/2009
	Plaquemines Dirt & Clay	2/23/2009

	3C Riverside Phase 3	4/1/2008
IER #35	Contractor Furnished Borrow #8 https://www.mvn.usace.army.mil/IER-35	
	Assumption Land Company	4/7/2011
	Houma Excavation	4/20/2011
	RBEND II	11/29/2011
	Robert Brothers Farm site 1	12/9/2010
	Robert Brothers Farm site 2	4/20/2011
	MITIGATION	
PIER #36	Programmatic LPV HSDRRS Mitigation	N/A
PIER #36 Tiered IER 1	Milton Island Marsh Restoration	5/13/2014 9/8/2014
PIER #36 SIER 1	PIER 36 Bayou Sauvage, Turtle Bayou & New Zydeco Ridge Restoration	8/19/2015 9/28/2015
EA #546 SPIER 36 Supplement 2	EA Supplement PIER 36 Supplement 2 Bayou Sauvage, Turtle Bayou & New Zydeco Ridge	8/19/2015 5/26/2016
PIER #37	Programmatic WBV HSDRRS Mitigation	N/A
PIER #37 Tiered IER 1 NPS Joint EA	WBV HSDRRS Mitigation Jean Lafitte National Historical Park and Preserve Mitigation Features	7/7/2015
SPIER #37a	Mitigation for Protected Side Bottomland Hardwoods Dry WBV HSDRRS	7/27/2015
SEA #548 Tier 1 PIER 37; NPS Joint EA	WBV Lake Cataouatche Borrow Area Expansion and Access Features, JLNHPP Mitigation Features	8/1/2016
SEA #572	BLH-wet and swamp mitigation, Lafourche Parish, Louisiana	7/27/2015

Table 7-4: National Historic Preservation Act, Section 106 Consultation with State Historic Preservation Office Cultural Resource Concurrence and Tribal Nation Coordination

NEPA Document	Date	Cultural Resource Concurrence (SHPO)	Date	Tribal Nation Coordination
St. Charles Sub-basin				
IER #1 La Branche Wetlands Levee	8/3/2007	Letter from Pam Breaux, SHPO, to Elizabeth Wiggins, CEMVN, indicating concurrence	4/17/2007 4/17/2007 4/20/2007 4/23/2007 11/29 2007	Letters of concurrence received from the Alabama-Coushatta tribe of TX, (4/17/2007), Seminole Tribe of FL (4.17.07), Choctaw Nation of OK (4.20.09), MS Band of Choctaw Indians (4.23.07 and 11.29.07). Others did not respond after 30 days. No response implies concurrence per 36 CFR 800.3 (c)(4).
IERS #1.a La Branche Wetlands Levee	12/33/2007	Letter of concurrence	4/17/2009 4/17/2009 4/20/2009 3/27/2009	Letters of concurrence (4.17.09) from Alabama-Coushatta Tribe of TX; Seminole Tribe of FL (4.17.09); Choctaw Nation of OK (4.20.09); Quapaw Tribe of Oklahoma (email dated 3.27.09). All above in Appendix C, Interagency Correspondence - IER1S. Report (p. 31) lists MS Band of Choctaw as the concurrence letter received (8/3/07). Others did not respond after 30 days. No response implies concurrence per 36 CFR 800.3 (c)(4).
IERS #1.b La Branche Wetlands Levee Supplemental	8/3/2007	Letter of concurrence	4/17/2007 4/17/2007 4/20/2007 4/23/2007 11/29 2007	Letters of concurrence received from the Alabama-Coushatta tribe of TX, (4/17/2007), Seminole Tribe of FL (4.17.07), Choctaw Nation of OK (4.20.09), MS Band of Choctaw Indians (4.23.07 and 11.29.07). Others did not respond after 30 days. No response implies concurrence per 36 CFR 800.3 (c)(4).

Jefferson East Bank Sub-basin				
IER #2 West Return Floodwall	2/15/2008	Letter of concurrence	1/9/2008 1/9/2008 1/15/2008	Tribal Concurrence letters from Tunica-Biloxi Tribe of LA, Choctaw Nation of Oklahoma, Mississippi Band of Choctaw Indians. Others did not respond after 30 days. No response implies concurrence per 36 CFR 800.3 (c)(4).
IERS #2 West Return Floodwall	2/15/2008	Letter of concurrence.	1/15/2008 1/9/2008 1/15/2008 10/16/2009	Letters of concurrence from Mississippi Band of Choctaw Indians, Tunica-Biloxi Tribe of Louisiana, the Choctaw Nation of Oklahoma, and Alabama-Coushatta Tribe of Texas. Others did not respond after 30 days. No response implies concurrence per 36 CFR 800.3 (c)(4).
IERS#2.a West Return Floodwall Supplemental	2/15/2008	Letter of concurrence	1/9/2008 1/9/2008 1/15/2008	Tribal Concurrence letters from Tunica-Biloxi Tribe of LA, Choctaw Nation of Oklahoma, Mississippi Band of Choctaw Indians. Others did not respond after 30 days. No response implies concurrence per 36 CFR 800.3 (c)(4).
IER #3 Jefferson Parish Lakefront Levees	1/7/2008 and 3/20/2008	Letters of concurrence	Dec 2007 March 2008 April 2008	Tribal Concurrence letters from Choctaw Nation of OK (2), Chitimacha Tribe of LA, and Quapaw Tribe of OK. Others did not respond after 30 days. No response implies concurrence per 36 CFR 800.3 (c)(4).
IERS #3.a	1/7/2008	Letter of concurrence.	12/26/2007 12/27/2007	Letters of concurrence received from Choctaw Nation of Oklahoma and the Chitimacha Tribe of Louisiana. Others did not respond after 30 days. No response implies concurrence per 36 CFR 800.3 (c)(4).
Orleans East Bank Sub-basin				

IER #4 Orleans Lakefront	1/26/2009	Letter of concurrence	10/23/2008 11/5/2008 11/5/2008 11/24/2008	Tribal Concurrence letters from Caddo Nation of OK, Alabama-Coushatta Tribe of TX, Seminole Nation of OK, and Seminole Tribe of FL. Others did not respond after 30 days. No response implies concurrence per 36 CFR 800.3 (c)(4).
IER #5 Permanent Pump Stations	3/17/2008	Letter of concurrence.	10/6/2008 10/11/2008 10/17/2008 5/26/2009	Tribal Concurrence letters from Seminole Nation of OK, Seminole Tribe of FL, Caddo Nation of OK, and Choctaw Nation of OK. Others did not respond after 30 days. No response implies concurrence per 36 CFR 800.3 (c)(4).
IERS #5.a	3/17/2008	Letter of concurrence	10/6/2008 10/11/2008 10/17/2008 5/26/2009	Tribal Concurrence letters from Seminole Nation of OK, Seminole Tribe of FL, Caddo Nation of OK, and Choctaw Nation of OK. Others did not respond after 30 days. No response implies concurrence per 36 CFR 800.3 (c)(4).
IER #27	9/2/2010	Letter of concurrence	8/20/2010 8/26/2010	Tribal Concurrence letters from Seminole Tribe of FL, and Alabama-Coushatta Tribe of TX. Others did not respond after 30 days. No response implies concurrence per 36 CFR 800.3 (c)(4).
IERS #27.a	9/2/2010	Letter of concurrence	8/20/2010 8/26/2010	Tribal Concurrence letters from Seminole Tribe of FL, and Alabama-Coushatta Tribe of TX. Others did not respond after 30 days. No response implies concurrence per 36 CFR 800.3 (c)(4).

New Orleans East Sub-basin				
IER #6	9/19/2008	Letter of concurrence	8/14/2008 8/15/2008 9/4/2008	Tribal Concurrence letters from Seminole Tribe of FL, Seminole Nation of OK, Alabama-Coushatta Tribe of TX, Seminole Tribe of FL. Others did not respond after 30 days. No response implies concurrence per 36 CFR 800.3 (c)(4).
IERS #6	9/19/2008	Letter of concurrence	8/14/2008 8/15/2008 9/4/2008	Tribal Concurrence letters from Seminole Tribe of FL, Seminole Nation of OK, Alabama-Coushatta Tribe of TX, Seminole Tribe of FL. Others did not respond after 30 days. No response implies concurrence per 36 CFR 800.3 (c)(4).
IER #7	2/17/2009 and 2/25/2009	Letters of concurrence	1/26/2009 1/27/2009 2/5/2009 2/12/2009	Tribal Concurrence letters from Seminole Tribe of FL, Jena Band of Choctaw Indians, Choctaw Nation of OK, Alabama-Coushatta Tribe of TX, and Seminole Tribe of FL. Others did not respond after 30 days. No response implies concurrence per 36 CFR 800.3 (c)(4).
IERS #7	2/17/2009 and 2/25/2009	Letters of concurrence	1/26/2009 1/27/2009 2/5/2009 2/12/2009	Tribal Concurrence letters from Seminole Tribe of FL, Jena Band of Choctaw Indians, Choctaw Nation of OK, Alabama-Coushatta Tribe of TX, and Seminole Tribe of FL. Others did not respond after 30 days. No response implies concurrence per 36 CFR 800.3 (c)(4).
IER #11-Tier 1		Programmatic document executed with Tier 2 documents		Programmatic document and Section 106 consultation completed with Tier 2 documents

IER #11-Tier 2	6/17/2008	Letter of concurrence.	5/29/2008 6/16/2008 5/20/2008	Tribal Concurrence letters from Choctaw Nation of OK, Alabama-Coushatta Tribe of TX, Caddo Nation of OK. Others did not respond after 30 days. No response implies concurrence per 36 CFR 800.3 (c)(4).
IERS #11.a Tier 2 Borgne	1/3/1904	Letter of concurrence	5/29/2008 6/16/2008 5/20/2008	Tribal Concurrence letters from Choctaw Nation of OK, Alabama-Coushatta Tribe of TX, Caddo Nation of OK. Others did not respond after 30 days. No response implies concurrence per 36 CFR 800.3 (c)(4).
IERS #11.b Tier 2 Borgne	9/13/2010	Letter of concurrence	no Tribal correspondence	No Tribal correspondence
IERS #11.c Tier 2 Borgne		No additional correspondence necessary		No additional correspondence necessary.
IERS #11 Tier 2 Borgne	2/20/2009	Letters of concurrence	2/19/2009 3/3/2009	Tribal Concurrence letters from Choctaw Nation of OK and Alabama-Coushatta Tribe of TX. Others did not respond after 30 days. No response implies concurrence per 36 CFR 800.3 (c)(4).
IERS #11.d Tier 2 Pontchartrain		No additional correspondence necessary		No additional correspondence necessary.
Chalmette Loop Sub-Basin				
IER #8	11/19/2007	Letter of concurrence	11/29/2007	Tribal Concurrence letter from Mississippi Band of Choctaw Indians. Others did not respond after 30 days. No response implies concurrence per 36 CFR 800.3 (c)(4).
IER #9	12/7/2007	Letter of concurrence	Email dated 11/29/2007	Tribal concurrence from MS Band of Choctaw Indians. Others did not respond after 30 days. No response implies concurrence per 36 CFR 800.3 (c)(4).

IER #10	1/20/2009	Letter of concurrence	11/24/2008 10/24/2008 11/12/2008 11/4/2008 10/17/2008 4/27/2009 4/24/2009	Tribal Concurrence letters from Seminole Tribe of FL, Seminole Nation of OK, Choctaw Nation of OK, Alabama-Coushatta Tribe of TX, Caddo Nation of OK, Seminole Tribe of FL, and Alabama-Coushatta Tribe of TX. Others did not respond after 30 days. No response implies concurrence per 36 CFR 800.3 (c)(4).
IERS #8,9,10.a		No further coordination necessary.		No further coordination necessary.
Belle Chasse Sub-Basin				
IERS #12 / 13	9/2/2010	Letter of concurrence	8/25/2010 8/26/2010	Tribal concurrence from Seminole Tribe of Florida and Alabama Coushatta.
IER #13	3/30/2009	letter of concurrence	2/5/2009 2/24/2009 2/18/2009	Tribal concurrence letters received from the Choctaw Nation of Oklahoma, Alabama Coushatta Tribe of Texas, and the Quapaw Tribe of Oklahoma. No other Indian Tribes responded. No response after 30 days from other tribes implied concurrence per 36 CFR 800.3 (c)(4).
IER #13 Addendum	3/30/2009	Letter of concurrence	2/5/2009 2/24/2009 2/18/2009	Tribal concurrence letters received from the Choctaw Nation of Oklahoma, Alabama Coushatta Tribe of Texas, and the Quapaw Tribe of Oklahoma. No other Indian Tribes responded. No response after 30 days from other tribes implied concurrence per 36 CFR 800.3 (c)(4).
IERS #13a	3/30/2009	Concurrence from SHPO		No correspondence

IER #33	12/22/2010	Letter of concurrence	12/16/2010 12/16/2010 12/16/2010 12/16/2010 12/16/2010 12/20/2010 12/14/2010	Caddo Nation of Oklahoma, Chitimacha Tribe of Louisiana, Coushatta Tribe of Louisiana, Quapaw Tribe of Oklahoma, Seminole Tribe of Florida, Alabama-Coushatta Tribe of Texas, Choctaw Nation of Oklahoma. All listed Tribes provided concurrence to no adverse effects.
IERS #33.a	12/15/2011	Execution of a Programmatic Agreement.	12/15/2011	Section 106 Coordination completed by Execution of a Programmatic Agreement.
Gretna-Algiers Sub-Basin				
IER #12	8/1/2008	Letter of concurrence	7/8/2008 1/22/2009	Tribal concurrence letter from Seminole Tribe of FL and Alabama-Coushatta Tribe of Texas. Others did not respond after 30 days. No response implies concurrence per 36 CFR 800.3 (c)(4).
IERS #12 addendum	8/1/2008	Letter of concurrence	7/8/2008	Seminole Tribe of Florida concurrence with no historic properties affected.
IERS #12.a	8/1/2008	Letter of concurrence	7/8/2008	Seminole Tribe of Florida concurrence with no historic properties affected.
EA #581	2/8/2021	Letter of concurrence	2/25/2021	Choctaw Nation of Oklahoma concurred. Others did not respond after 30 days. No response implies concurrence per 36 CFR 800.3(c)(4).
Harvey-Westwego Sub-Basin				
IER #14	1/23/2008	Letter of concurrence.	12/26/2007 12/27/2007	Tribal letters of concurrence from Choctaw Nation of Oklahoma and the Chitimacha Tribe of Louisiana. Others did not respond after 30 days. No response implies concurrence per 36 CFR 800.3 (c)(4).

IERS #14.a Harvey to Westwego	8/13/2009	Letters of concurrence	7/29/2009 7/30/2009 8/14/2009	Tribal concurrence letters from Seminole Tribe of FL, Choctaw Nation of OK, and Alabama-Coushatta Tribe of TX
Lake Cataouatche Sub-basin				
IER #15	12/11/2007	Letter of concurrence	Email - 11/29/2007	Mississippi Band of Choctaw Indians. Others did not respond after 30 days. No response implies concurrence per 36 CFR 800.3 (c)(4).
IERS #15.a addendum	2/22/2010	Letter of concurrence	5/4/2010	Alabama Coushatta Tribe of Texas.
IER #16	3/24/2008 12/11/2008 1/29/2009	Letter of concurrence	Letters received from March 2008 - January 2009.	Alternative 2 alignment: Choctaw Nation of OK concurrence letter (3/31/08); Alternative 3 alignment: Seminole Nation of OK (10/24/08), Alabama Coushatta Tribe of TX (11/5/08), and the Seminole Tribe of FL (11/24/08) concurred; Alternative 3 expanded: Alabama Coushatta Tribe of TX (1/22/09), and the Tunica-Biloxi Tribe of LA (1/26/09) concurred. Others did not respond after 30 days. No response implies concurrence per 36 CFR 800.3 (c)(4).
IERS #16.a	5/20/2010	Letter of concurrence	5/4/2010 5/10/2010 5/24/2010 7/22/1010	Tribal Concurrence letters from Alabama-Coushatta Tribe of TX, Choctaw Nation of OK, Alabama-Coushatta Tribe of TX, and Seminole Tribe of FL. Others did not respond after 30 days. No response implies concurrence per 36 CFR 800.3 (c)(4).

IER #17	5/1/2008	Letter of concurrence.	11/19/2008 11/14/2008	Tribal Concurrence letters from Alabama-Coushatta Tribe of TX and Seminole Nation of OK in Appendix. IER 17 Final, page 79, says Mississippi Band of Choctaw, Chitimacha Tribe of Louisiana, Choctaw Nation of Oklahoma and Seminole Tribe of Florida sent letters of concurrence, but no dates included. Others did not respond after 30 days. No response implies concurrence per 36 CFR 800.3 (c)(4).
Borrow Pits				
IER #18 Government Furnished Borrow #1				
IER #18 1418/1420 Bayou Road	9/14/2007	No identifying number provided		Not consulted (see Table 5, IER 18, page 43)
IER #18 1572 Bayou Road	9/14/2007	No identifying number provided		Not consulted (see Table 5, IER 18, page 43)
IER #18 910 Bayou Road	3/29/2007	No identifying number provided		Not consulted (see Table 5, IER 18, page 43)
IER #18 4001 Florissant	1/22/2007	No identifying number provided		Not consulted (see Table 5, IER 18, page 43)
IER #18 Dockville	6/6/2007	No identifying number provided		Not consulted (see Table 5, IER 18, page 43)
IER #18 Triumph	11/7/2005	No identifying number provided		Not consulted (see Table 5, IER 18, page 43)
IER #18 Belle Chase	5/31/2007	No identifying number provided	5/7/2007 5/3/2007 5/3/2007	Tribal Concurrence letters from Mississippi Band of Choctaw Indians, Choctaw Nation of OK, and Quapaw Tribe of OK. Others did not respond after 30 days. No response implies concurrence per 36 CFR 800.3 (c)(4).

IER #18 Maynard	6/7/2007	No identifying number provided	5/11/2007 5/22/2007	Tribal Concurrence letters from Mississippi Band of Choctaw Indians and Choctaw Nation of OK. Others did not respond after 30 days. No response implies concurrence per 36 CFR 800.3 (c)(4).
IER #18 Cummings North	10/5/2006 and 5/8/2007	No identifying number provided		Not consulted (see Table 5, IER 18, page 43)
IER #18 Churchill Farms Pit A	8/14/2007	No identifying number provided	7/30/2007 7/30/2007	Tribal Concurrence letters from Choctaw Nation of OK and Seminole Nation of OK. Others did not respond after 30 days. No response implies concurrence per 36 CFR 800.3 (c)(4).
IER #18 Westbank Site G	8/14/2007	No identifying number provided	7/30/2007 7/30/2007	Tribal Concurrence letters from Choctaw Nation of OK and Seminole Nation of OK. Others did not respond after 30 days. No response implies concurrence per 36 CFR 800.3 (c)(4).
IER #18 Bonnet Carre North	6/18/2007	No identifying number provided	6/12/2007 5/31/2007	Tribal Concurrence letters from Mississippi Band of Choctaw Indians and Choctaw Nation of OK. Others did not respond after 30 days. No response implies concurrence per 36 CFR 800.3 (c)(4).
IER #19 Contractor Furnished Borrow #1				
IER #19 River Birch Phase I	12/14/2006	No identifying number provided		Nothing found in document except a reference to need for a cultural resources report and tribal concurrence (p.13).
IER #19 River Birch Phase II	12/14/2006	No identifying number provided		Nothing found in document except a reference to need for a cultural resources report and tribal concurrence (p.13).
IER #19 Pearlington Dirt Phase I	12/22/2006	No identifying number provided		Nothing found in document except a reference to need for a cultural resources report and tribal concurrence (p.13).

IER #19 Eastover	3/15/2007	No identifying number provided		Nothing found in document except a reference to need for a cultural resources report and tribal concurrence (p.13).
IER #19 Kimble #2	10/10/2006	No identifying number provided		Nothing found in document except a reference to need for a cultural resources report and tribal concurrence (p.13).
IER #19 Sylvia Guillot	2/6/2006	No identifying number provided		Nothing found in document except a reference to need for a cultural resources report and tribal concurrence (p.13).
IER #19 Gatien-Navy Camp Hope	9/8/2006	No identifying number provided		Nothing found in document except a reference to need for a cultural resources report and tribal concurrence (p.13).
IER #19 DK Aggregates	4/10/2007	No identifying number provided		Nothing found in document except a reference to need for a cultural resources report and tribal concurrence (p.13).
IER #19 St. Gabriel Redevelopment	4/17/2007	No identifying number provided		Nothing found in document except a reference to need for a cultural resources report and tribal concurrence (p.13).
IER #22 Government Furnished Borrow #2				
IER #22 Brad Buras	7/31/2007	No identifying number provided	7/10/2007 7/12/2007	Tribal Concurrence from Mississippi Band of Choctaw Indians and Quapaw Tribe of Ok. Others did not respond after 30 days. No response implies concurrence per (per 36 CFR 800.3 (c(4)). -- 10/10/2007.
IER #22 Tabony	3/10/2008	No identifying number provided	12/27/2007 12/5/2007	Tribal Concurrence from Chitimacha Tribe of LA and Choctaw Nation of OK. Others did not respond after 30 days. No response implies concurrence per (per 36 CFR 800.3 (c(4)). -- 12/28/2007
IER #22 Westbank F	2/4/2008	No identifying number provided	1/14/2008	Tribal Concurrence from Mississippi Band of Choctaw Indians. Others did not respond after 30 days. No response implies concurrence per (per 36 CFR 800.3 (c(4)).) -- 2/19/2008.

IER #22 Westbank I	11/28/07 and 12/6/07	No identifying number provided	10/15/2007 10/25/2007 10/23/2007 11/8/2007	Tribal Concurrence from Chitimacha Tribe of LA, Choctaw Nation of OK, and Seminole Tribe of FL (2 dates). Others did not respond after 30 days. No response implies concurrence per (per 36 CFR 800.3 (c(4)) -- 111/21/2007.
IER #22 Westbank N	12/26/2007	No identifying number provided	12/27/2007 1/15/2008 12/5/2007	Tribal Concurrence from Chitimacha Tribe of LA, MS Band of Choctaw Indians, and Choctaw Nation of OK. Others did not respond after 30 days. No response implies concurrence per (per 36 CFR 800.3 (c(4)). 1/2/2008.
IER #23 Contractor Furnished Borrow #2				
IER #231025 Florissant	10/26/2006	No identifying number provided	12/21/2007	No response after 30 days from other tribes implied concurrence (per 36 CFR 800.3 (c(4)) - dated 12/21/2007
IER #23 Acosta	10/19/2007	No identifying number provided	10/15/2007.	Tribal Concurrences from Choctaw Nation of OK. Others did not respond after 30 days. No response implies concurrence per 36 CFR 800.3 (c(4).
IER #23 3C Riverside	12/6/2007	No identifying number provided	11/30/2007	Letter of concurrence from Choctaw Nation of OK on 11/30/2007. No response after 30 days from other tribes implied concurrence per 36 CFR 800.3 (c(4).
IER #23 Myrtle Grove	12/19/2006	No identifying number provided	12/21/2007	No response after 30 days from other tribes implied concurrence per 36 CFR 800.3 (c(4).
IER #23 Pearlington Dirt Phase 2	11/22/2006	No identifying number provided	12/5/2007 11/5/2007	Tribal Concurrences from Choctaw Nation of OK and Mississippi Band of Choctaw Indians, Jena Band of Choctaw Indians, Tunica-Biloxi Tribe of LA, Chickasaw Nation
IER #25 Government Furnished Borrow #3				

IER #25 Stumpf Phase 1	6/11/2008	No identifying number provided	6/13/2008	No response after 30 days from tribes implied concurrence per 36 CFR 800.3 (c)(4).
IER #25 Stumpf Phase 2	6/11/2008	No identifying number provided	6/13/2008	No response after 30 days from tribes implied concurrence per 36 CFR 800.3 (c)(4).
IER Supplemental #25.a GF Borrow #3: Stumpf Stockpile	6/11/2008	Coordination for no historic properties affected.	6/13/2008	No response after 30 days from tribes implied concurrence per 36 CFR 800.3 (c)(4).
IER #25 Westbank D	5/7/2008	No identifying number provided	5/23/2008	No response after 30 days from tribes implied concurrence per 36 CFR 800.3 (c)(4).
IER #25 Westbank E Phase 1 & 2	5/7/2008	No identifying number provided	5/23/2008	No response after 30 days from tribes implied concurrence per 36 CFR 800.3 (c)(4).
IER #25 Tac Carrere	4/23/2008	No identifying number provided	4/9/2008 4/3/2008	Tribal Concurrence from Chitimacha Tribe of LA and Choctaw Nation of OK. Others did not respond after 30 days. No response implies concurrence per 36 CFR 800.3 (c)(4).
IER #26 Pre-Approved Contractor Furnished Borrow #3				
IER #26 South Kenner Road	5/5/2008	No identifying number provided	4/21/2008 4/28/2008	Tribal Concurrence from Mississippi Band of Choctaw Indians and Choctaw Nation of Oklahoma. Others did not respond after 30 days. No response implies concurrence per (per 36 CFR 800.3 (c(4)) -- 5/12/2008.
IER #26 Willswood	5/5/2008	No identifying number provided	4/28/2008 4/29/2008	Tribal Concurrence from Choctaw Nation of Oklahoma (2 dates). Others did not respond after 30 days. No response implies concurrence per (per 36 CFR 800.3 (c(4)) -- 5/12/2008.

IER #26 Meyer	4/3/2008	No identifying number provided	4/3/2008	Tribal Concurrence from Choctaw Nation of Oklahoma. Others did not respond after 30 days. No response implies concurrence per (per 36 CFR 800.3 (c(4)) --4/14/2008.
IER #26 Willow Bend	3/6/2008	No identifying number provided	3/5/2008	Tribal Concurrence from Choctaw Nation of Oklahoma. Others did not respond after 30 days. No response implies concurrence per (per 36 CFR 800.3 (c(4)) -- 3/28/2008
IER #26 Frierson	11/27/2007	No identifying number provided	1/14/2008 3/5/2008	Tribal Concurrence from Mississippi Band of Choctaw Indians and Choctaw Nation of Oklahoma. Others sent notices did not respond after 30 days. No response implies concurrence per (per 36 CFR 800.3 (c(4)) -- 2/18/2008.

IER #28 Government Furnished Borrow #4				
IER #28 Johnson/Crovetto	9/23/2008	No identifying number provided	9/10/2008 9/10/2008	Tribal Concurrence from Alabama Coushatta Tribe of TX and Seminole Nation of OK. Others did not respond after 30 days. No response implies concurrence per (per 36 CFR 800.3 (c(4)).
IER #28 Bazile	11/20/2008	No identifying number provided	11/4/2008 11/14/2008 10/17/2008 10/24/2008 11/24/2008	Tribal Concurrence from Alabama Coushatta Tribe of TX, Choctaw Nation of OK, Caddo Nation of OK, Seminole Nation of OK, and Seminole Tribe of FL. Others did not respond after 30 days. No response implies concurrence per (per 36 CFR 800.3 (c(4)).

IER #28 Westbank F Access Routes	2/4/2008	No identifying number provided	1/14/2008	Tribal Concurrence from Mississippi Band of Choctaw Indians. Others did not respond after 30 days. No response implies concurrence per (per 36 CFR 800.3 (c(4)).
IER #29 Contractor Furnished Borrow #4				
IER #29 Eastover Phase II	5/8/2008	No identifying number provided	4/23/2008	Tribal Concurrence from Choctaw Nation of OK. Others did not respond after 30 days. No response implies concurrence per (per 36 CFR 800.3 (c(4)).
IER #29 Tammy Holding	1/6/2009	No identifying number provided	9/17/2008 and 10/20/2009	Tribal Concurrence from Choctaw Nation of OK and Seminole Nation of FL. Others did not respond after 30 days. No response implies concurrence per (per 36 CFR 800.3 (c(4)).
IER #29 Willow Bend Phase II	10/22/2008 and 6/24/2010	New letter from SHPO to CEMVN	10/8/2008 and 10/1/2008	Tribal Concurrence from Choctaw Nation of OK and Caddo Nation of OK. Others did not respond after 30 days. No response implies concurrence per (per 36 CFR 800.3 (c(4)).
IER #30 CF Borrow #5				
IER #30 Big Shake	6/15/2009	No identifying number provided	6/15/2009, 5/26/2009, and 6/17/2009	Tribal Concurrence from Alabama Coushatta Tribe of TX, Caddo Nation of OK, and Seminole Tribe of FL. Others did not respond after 30 days. No response implies concurrence per (per 36 CFR 800.3 (c(4)).
IER #30 Henley	6/24/2009	No identifying number provided		The tribes sent letters did not respond after 30 days. No response implies concurrence per (per 36 CFR 800.3 (c(4)).
IER #30 Contreras Dirt Z	6/10/2009 and 7/10/2009	No identifying number provided	5/26/2009 5/26/2009 5/12/2009 5/27/2009	Tribal Concurrence from Choctaw Nation of OK, Caddo Nation of OK, Quapaw Tribe of OK, and Seminole Tribe of FL. Others did not respond after 30 days. No response implies concurrence per (per 36 CFR 800.3 (c(4)).

IER #30 Contreras Cell E	6/10/2009	No identifying number provided	5/26/2009 5/26/2009 5/12/2009 5/27/2009	Tribal Concurrence from Choctaw Nation of OK, Caddo Nation of OK, Quapaw Tribe of OK, and Seminole Tribe of FL. Others did not respond after 30 days. No response implies concurrence per (per 36 CFR 800.3 (c(4)).
IER #30 Contreras Cell F	7/10/2009	No identifying number provided	6/15/2009 5/19/2009 6/17/2009	Tribal Concurrence from Alabama Coushatta Tribe of TX, Caddo Nation of OK, and Seminole Nation of OK. Others did not respond after 30 days. No response implies concurrence per (per 36 CFR 800.3 (c(4)).
IER #31 Contractor Furnished Borrow #7				
IER #31 Acosta 2	6/24/2010	No identifying number provided	5/28/2010	Tribal Concurrence from Alabama Coushatta Tribe of TX. Others did not respond after 30 days. No response implies concurrence per (per 36 CFR 800.3 (c(4)).
IER #31 Idlewild Stage 2	5/14/2009	No identifying number provided	7/16/2009 6/19/2009 6/24/2009	Tribal Concurrence from Alabama Coushatta Tribe of TX, Caddo Nation of OK, and Seminole Tribe of FL. Others did not respond after 30 days. No response implies concurrence per (per 36 CFR 800.3 (c(4)).
IER #31 King Mine	3/9/2009	No identifying number provided	3/9/2009 and 2/14/2009	Tribal Concurrence from Choctaw Nation of OK and Quapaw Tribe of OK. Others did not respond after 30 days. No response implies concurrence per (per 36 CFR 800.3 (c(4)).
IER #31 Levis	6/28/2010	No identifying number provided		Tribes did not respond after 30 days. No response implies concurrence per (per 36 CFR 800.3 (c(4)).
IER #31 Port Bienville	6/28/2010	No identifying number provided	6/10/2010	Tribal Concurrence from Choctaw Nation of OK. Others did not respond after 30 days. No response implies concurrence per (per 36 CFR 800.3 (c(4)).

IER #31 Raceland Raw Sugars	6/1/2010	No identifying number provided		Tribes did not respond after 30 days. No response implies concurrence per (per 36 CFR 800.3 (c(4)).
IER #31 River Birch Landfill Expansion	8/1/2008	No identifying number provided		Tribes did not respond after 30 days. No response implies concurrence per (per 36 CFR 800.3 (c(4)).
IER #31 Scarsdale	6/25/2010	No identifying number provided	5/28/2010	Tribal Concurrence from Alabama Coushatta Tribe of TX. Others did not respond after 30 days. No response implies concurrence per (per 36 CFR 800.3 (c(4)).
IER #31 Spoil Area	6/25/2010	No identifying number provided		Tribes did not respond after 30 days. No response implies concurrence per (per 36 CFR 800.3 (c(4)).
IER #32 Contractor Furnished Borrow #6				
IER #32 Bocage	6/30/2009	No identifying number provided	7/2/2009, 6/10/2009, 7/13/2009, and 5/27/2009	Tribal Concurrence from Alabama-Coushatta Tribe of TX, Caddo Nation of OK, Choctaw Nation of OK, and Seminole Tribe of FL. Others did not respond after 30 days. No response implies concurrence per (per 36 CFR 800.3 (c(4)).
IER #32 Citrus Lands	5/8/2009	No identifying number provided	7/23/2009	Tribal Concurrence from Choctaw Nation of OK. Others did not respond after 30 days. No response implies concurrence per (per 36 CFR 800.3 (c(4)).
IER #32 Conoco Philips	11/9/2009	No identifying number provided	11/21/2009	Tribal Concurrence from Alabama-Coushatta Tribe of OK. Others did not respond after 30 days. No response implies concurrence per (per 36 CFR 800.3 (c(4)). Others did not respond after 30 days.
IER #32 Idlewild Stage 1	5/14/2009	No identifying number provided	7/16/2009 6/19/2009 7/24/2009	Tribal Concurrence from Alabama-Coushatta Tribe of OK, Caddo Nation of OK, and Seminole Tribe of FL. Others did not respond after 30 days. No response implies concurrence per (per 36 CFR 800.3 (c(4)).

IER #32 Nairn	4/23/2008	No identifying number provided	4/9/2008 4/3/2008	Tribal Concurrence from Chitimacha Tribe of LA and Choctaw Nation of OK. Others did not respond after 30 days. No response implies concurrence per (per 36 CFR 800.3 (c(4)).
IER #32 Plaquemines Dirt & Clay	4/23/2008	No identifying number provided	4/9/2008 4/3/2008	Tribal Concurrence from Chitimacha Tribe of LA and Choctaw Nation of OK. Others did not respond after 30 days. No response implies concurrence per (per 36 CFR 800.3 (c(4)).
IER #32 3C Riverside Phase 3	9/8/2008	No identifying number provided	9/10/2008 10/20/2009	Tribal Concurrence from Alabama-Coushatta Tribe of OK, and Seminole Tribe of FL. Others did not respond after 30 days. No response implies concurrence per (per 36 CFR 800.3 (c(4)).
IER #35 Contractor Furnished Borrow #8				
IER #35 Assumption Land Company	5/7/2008 4/12/2011	No historic properties affected.		No response implies concurrence per (per 36 CFR 800.3 (c(4)).
IER #35 Houma Excavation	4/13/2011	No historic properties affected.		No response implies concurrence per (per 36 CFR 800.3 (c(4)).
IER #35 RBEND II	7/1/2011	No historic properties affected.		No response implies concurrence per (per 36 CFR 800.3 (c(4)).
IER #35 Robert Brothers Farm site 1 and site 2	7/22/2011	No historic properties affected.		No response implies concurrence per (per 36 CFR 800.3 (c(4)).
Mitigation				
Programmatic IER #36 HSDRRS Mitigation	6/18/2013	Execution of a Programmatic Agreement	June 18, 2013	Execution of a Programmatic Agreement signifies that Section 106 consultation was completed.
PIER #36 Tiered IER 1 Milton Island Marsh Restoration	6/18/2013	Coordinated according to Stipulations of the PA	June 18, 2013	Section 106 is being coordinated according to Stipulations of the PA

PIER #36 SIER 1 Bayou Sauvage, Turtle Bayou & New Zydeco Ridge Restoration	6/18/2013	Section 106 is coordinated according to Stipulations of PA	June 18, 2013	Section 106 is being coordinated according to Stipulations of the PA
SEA #546 SPIER 36 Supplement 1 Supplement 1 Bayou Sauvage, Turtle Bayou & New Zydeco Ridge	6/18/2013	Section 106 is being coordinated according to Stipulations of the PA	June 18, 2013	Section 106 is being coordinated according to Stipulations of the Ptic Agreement
PIER #37 HSDRRS Mitigation	6/18/2013	Section 106 is coordinated according to Stipulations of the PA	June 18, 2013	Section 106 is being coordinated according to Stipulations of the Programmatic Agreement
PIER #37 Tiered NPS Joint EA WBV HSDRRS Mitigation JLNPP Mitigation Features	12/3/2015	Coordination completed by NPS with agreement of USACE.	11/9/2015 11/24/2015 Dec 8, 2015	Caddo Nation of Oklahoma, Jena Band of Choctaw, Choctaw of Oklahoma agreement for no historic properties affected.
SPIER #37a Mitigation for PS BLH Dry WBV HSDRRS	6/18/2013	Coordinated according to Stipulations of the PA	June 18, 2013	Section 106 is being coordinated according to Stipulations of the PA
SEA #548 Tier 1 of PIER #37 NPS Joint EA WBV HSDDRS Mitigation JLNHPP Mitigation Features	12/3/2015	Coordination for no adverse effect to historic resources, completed by NPS with USACE agreement	11/9/2015 11/24/2015 12/8/2015	Caddo Nation of Oklahoma, Jena Band of Choctaw, Choctaw of Oklahoma agreement for no historic properties affected.
SEA #572 BLH-wet and swamp mitigation, Lafourche Parish	3/27/2020	No Adverse Effect	4/8/2020	No response implies concurrence per 36 CFR 800.3 (c(4)

SECTION 8

OPERATION AND MAINTENANCE REQUIREMENTS

8.1 OVERVIEW

The non-Federal sponsors (NFS) are responsible for the operation, maintenance, repair, replacement, and rehabilitation (OMRR&R) of the HSDRRS including the mitigation components which are considered a feature of the project The O&M manuals are developed in accordance with USACE applicable laws, regulations, and policies. NFS must operate and maintain the HSDRRS in accordance with the operations and maintenance manuals. For the NFS to operate and maintain the system correctly, the operating personnel must receive adequate training in the proper operation and maintenance of specific portions of the HSDRRS. The CEMVN has developed HSDRRS project OMRR&R manuals and water control plans to provide the NFS with the necessary tools and information to maintain the system within the Federal standards.

8.2 THE HSDRRS PROJECT SYSTEM MANAGEMENT PLAN

Louisiana Coastal Restoration and Protection Authority Board (CPRAB), as the NFS under the project partnership agreement (PPA) with the Department of the Army, has responsibility for OMRR&R of the HSDRRS. CPRAB has entered into cooperative endeavor agreements or other sub-agreements, in accordance with the laws of the State of Louisiana for performance of CPRAB's obligations under the PPA; these cooperative endeavor agreements or other sub-agreements do not relieve CPRAB of its primary responsibility for its obligations as the NFS. CPRAB has informed the government that they have entered into such cooperative endeavor agreements or sub-agreements with the Southeast Louisiana Flood Protection Authority-East (SLFPA-East), the Department of Transportation and Development (LDOTD), East Jefferson Levee District (EJLD), Jefferson Parish Drainage Department, Orleans Levee District, New Orleans Sewerage and Water Board, Lake Borgne Basin Levee District (LBBLD), Pontchartrain Levee District, Southeast Louisiana Flood Protection Authority-West (SLFPA-West), West Jefferson Levee District (WJLD), Algiers Levee District (ALD), Plaquemines Parish Government (PPG), St Charles Parish Government.

8.3 OPERATIONS AND MAINTENANCE MANUALS

The HSDRRS project OMMRR&R manuals are broken down into regional plans and then structure- or feature-specific plans. These manuals provide information for operating and maintaining features of the New Orleans metropolitan area HSDRRS including: Authorization; Location; Pertinent Information; Construction History; Project Performance; Project Partnership Agreement; Operation; Emergency Operation; Maintenance and Inspection; Surveillance; Repair, Replacement and Rehabilitation; Notification of Distress; and As-Built Information.

<u>Volume 1:</u> The OMRR&R Manual Volume 1 for both the LPV and the WBV addresses their respective components of HSDRRS. Within the LPV and WBV components, there

are flood risk reduction features and water control features whose authorized purpose does not pertain to hurricane surge and for that reason are not considered a part of the HSDRRS. For that reason, they are not included in the OMRR&R manual. Operation and maintenance of those features, including the MRL, SELA, IHNC Lock, Algiers and Harvey Locks, and Davis Pond Diversion are discussed in detail in their respective OMRR&R manuals.

Volume 1 includes a description of the project – how it works as a system to diminish the risk of damage from storm surge. It includes in the appendices:

- The PPA between the CPRAB and the U.S. Army Corps of Engineers (USACE), executed 22 September 2008, is to construct the LPV project for hurricane storm damage reduction. This PPA includes Amendment No. 1, executed 12 March 2010, for construction of pumps and closure structures on the 17th Street, Orleans Avenue, and London Avenue Canals. In addition, a PPA was executed on 1 April 2008 for design and construction of the Inner Harbor Navigation Canal (IHNC) hurricane risk reduction work.
- Regulatory requirements for modification and/or improvements by the NFS and permits for construction by third party applicants including environmental compliance;
- Project maps, which lay out the entire LPV system, showing the spatial relationship between contracts; and
- References the water control documents, which provide the background and decision procedures for water control operations.

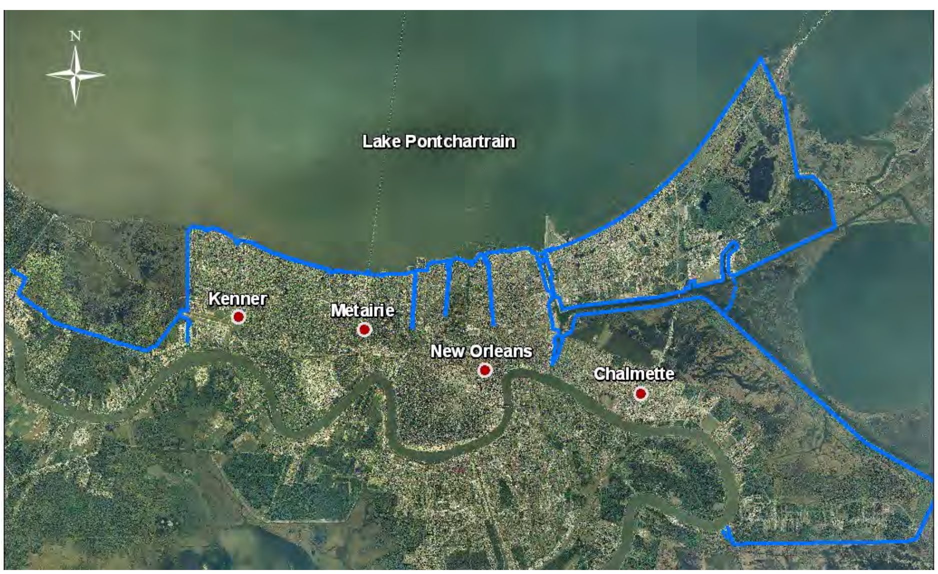


Figure 8-1: Lake Pontchartrain and Vicinity HSDRRS Perimeter

WBV Volume 1: This WBV OMRR&R Manual is organized the same and works in concert with the LPV Manual. Together, they provide a consistent set of instructions and expectations for operating and maintaining the HSDRRS. This OMRR&R Manual provides complete instructions for the NFS to maintain, repair, replace, and rehabilitate the WBV Project, prepare for storm events, and for operations during and after a storm. Volume includes a description of the project and contains the following appendices:

- the PPA between the CPRAB and the USACE;
- regulatory requirements for modification and/or improvements by the NFS and permits for construction by third party applicants, including environmental compliance;
- project maps, which lay out the entire WBV system, showing the spatial relationship between contracts; and
- references the water control documents, which provide the background and decision procedures for water control operations.

Figure 8-1: West Bank and Vicinity HSDRRS Perimeter

<u>Volume 2</u> contains general information that provides the primary guidance for operation and maintenance of the most common features of the HSDRSS, such as levees, floodwalls and closure gates. Interim volume 2 documents are approved, but the final documents are not yet approved.

<u>Volume 3</u> contains a section for each HDRSS contract with details about that contract and any special operation and maintenance instructions that are unique to that feature. Volume 3 also contains the environmental commitments found within the IERs.

Table 8-1: OMRR&R Manual Contents and Completion Status

OMRR&R in Three Volumes:	Contents	Completion Status

Volume 1- LPV and WBV Systems	Separate Documents, one pertaining to the LPV, the other to the WBV, addressing each system as a single flood protection area.	Complete
	Water Control Documents - Instructions for determining when to close gates and operate pumps.	Complete and approved
Volume 2 – General Information for HSDRRS Features	General information for operation and maintenance for the HSDRRS features.	Complete but not yet approved
Volume 3 – Construction Contracts	OMRR&R information organized by specific construction contract; including construction details, as-built drawings, photographs, warranties, operation instructions, maintenance requirements, manufacturer's product data, record keeping requirements, repair and replacement instructions. Includes design files on compact disc.	FY-18

OMRR&R documentation is regarded as "living" and is subject to editing and revisions as conditions change and lessons are learned. Some construction and commissioning activities continue as the HSDRSS OMRR&R manual is adopted. Amendments to Volumes 1 and 2 are anticipated to be modified as new information required to properly operate and maintain the system becomes available. The Volume 3 documents will be updated as each system component is completed, and notices of construction completed are mailed to the NFS. The NFSs are encouraged to work with USACE to update, revise, and/or develop supplements to the HSDRRS OMRR&R manuals through lessons learned and as field conditions evolve. For all proposed changes to OMRR&R documentation, New Orleans District Commander notification, review, and approval is required prior to adoption and implementation.

8.4 WATER CONTROL DOCUMENTS

The water control documents provide the background and instruction for determining when to close and open gates across bodies of water. The water control documents also provide instructions for pump operations during gate closures. The step-by-step instructions are based on water levels and forecasts of surge, precipitation and wind speeds. The water control instructions refer to every sluice gate, sector gate, and vertical lift gate and stop log, or bulkhead structure on the perimeter line of defense. They also refer to those pump stations that convey the interior drainage past each of the perimeter structures when the perimeter structure is closed. Tables 8-2 and 8-3 show the relationship of the water control documents and the water control structures. Figure 8-3 shows the locations of the HSDRSS water control structures.

Table 8-2: LPV Water Control Documents

Master Water Control Documents
Master Water Control Plan for Drainage Structures for St. Charles Floodgates
Master Water Control Plan for St Bernard Floodgates
Master Water Control Plan for IHNC Basin
Structures
Cross Bayou Drainage Structure (LPV-07b.2)
St. Rose Drainage Structure (LPV-07c.2)
Almedia and Walker Drainage Structures (LPV-07d.2)
Bayou Dupre Control Structure (LPV-144)
Caernarvon Control Structure (LPV-149)
Bayou Bienvenue Control Structure
Seabrook Gate Complex (IHNC-01)
Lake Borgne Storm Surge Barrier (including the Sector Gate, Barge Gate and the Bayou Bienvenue Lift Gate) (IHNC-02)

Table 8-3: WBV Water Control Documents

Master Water Control Documents
Master Water Control Manual Harvey Algiers System
Master Water Control Plan Western Tie In
Master Water Control Plan Eastern Tie In
Structures
Bayou Segnette Complex (WBV-16.2)
West Closure Complex (WBV-90)
Harvey Canal Sector Gate (WBV-46.1)
Sellers Canal Floodgate and Drainage Structure (WBV-74)
Western Tie In Drainage Structure (WBV-72a)
Hero to Oakville Drainage Structure and Pump Station (WBV-9a)
Hero Canal Stop Log Structure (WBV-9b)

The master water control documents include all required manuals, plans and standing instructions for the applicable structures in that master document.

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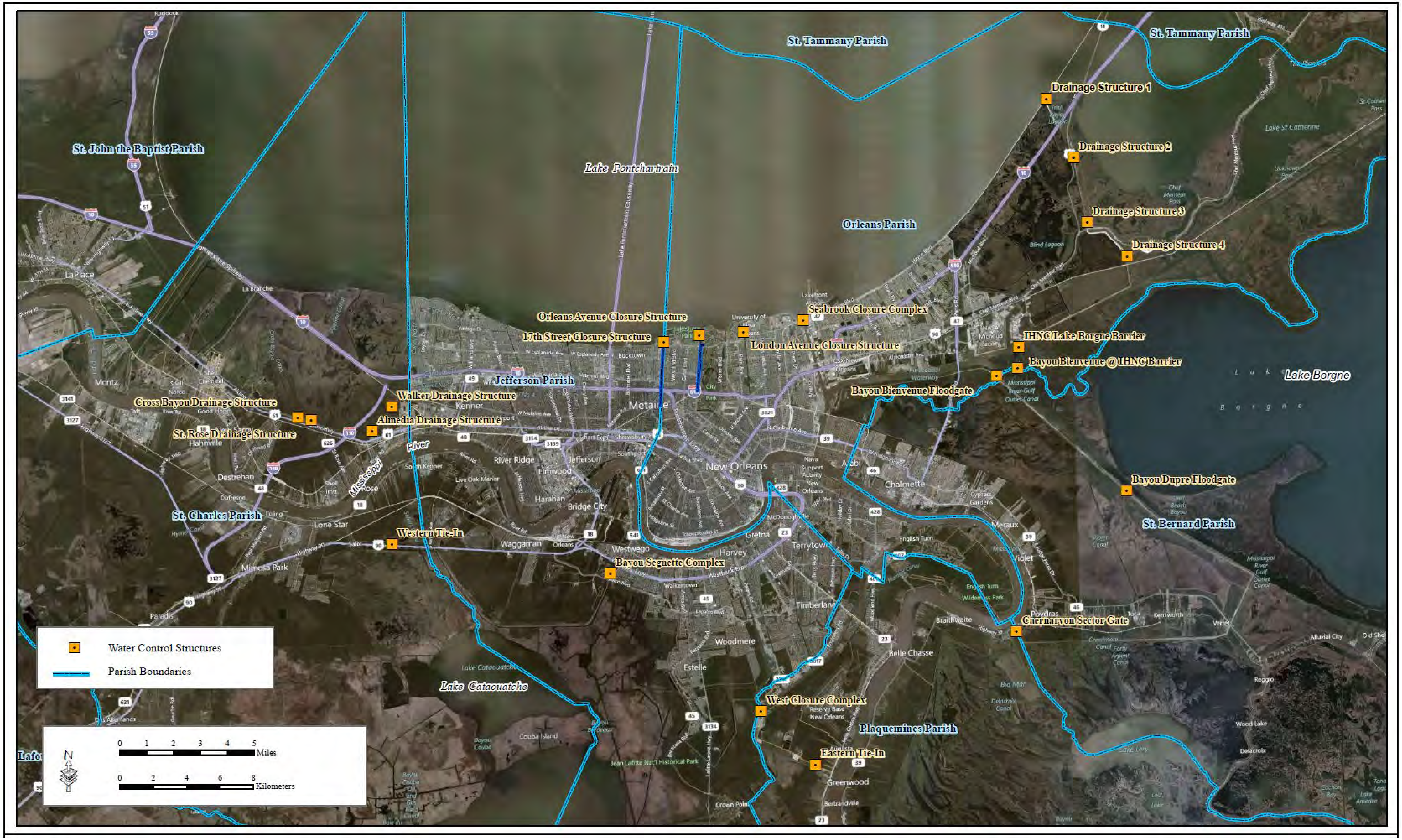

Figure 8-2: Water Control Structure Locations

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8.5 ENVIRONMENTAL COMMITMENTS AND COMPLIANCE

As noted above, the HSDRRS OMRR&R manuals are broken down into regional plans and then structure- or feature-specific plans (Volume 3). Volume 3 refers to the environmental commitment language found within the IERs, as described in this document's first three chapters. Specific environmental commitments include, but not limited to, licensing and permit requirements, a Section 404 permit, cultural resources surveys, coordination with the LA SHPO, State of LA Water Quality Certification, Compliance with the LA Coastal Zone Management Program, Endangered Species Act Coordination, and Fish and Wildlife Act Coordination. The local sponsor should coordinate their activities with the USACE; however, additional coordination may be required with the following agencies: USACE-Regulatory; LA Department of Natural Resources, Interagency Affairs; LA Department of Environmental Quality; LA SHPO; LA Department of Wildlife and Fisheries, Natural Heritage Program; U.S. Fish and Wildlife Service, Louisiana Field Office; National Marine Fisheries Service, Protected Resources; U.S. Environmental Protection Agency, Region 6.

SECTION 9
SUMMARY

The intensity of impacts is classified as negligible, minor, moderate, or major. The impacts assessed for borrow is limited to borrow sites excavated up to October 2015, which is when the majority of construction was complete. The summary of impacts covers all HSDRRS work covered by IERs and applicable EAs completed after the end of alternative arrangements if they are directly related to completion of HSDRRS projects, such as Mitigation EA's. It is anticipated that mitigation changes would be covered by additional supplemental NEPA documents and that monitoring results and adaptive management actions would be disclosed in technical reports released in the future.

9.1 SUMMARY OF HSDRRS CONSTRUCTION IMPACTS

Table 9-1 summarizes the intensity of the permanent adverse impacts of implementing the HSDRRS actions by sub-basin. Table 9-2 summarizes the intensity of permanent impacts of resulting from implementing the HSDRRS borrow actions and excavation prior to October 2015, by parish/county, for those borrow sites located outside the HSDRRS project area.

Most resources analyzed in the IERs and the CED were impacted during active construction, and most impacts were either temporary or short term, and limited to the length of the period of construction. In general, most of the impacted resources have or will return to the pre-construction or near pre-existing conditions now that a majority of the work is complete. Some armoring is still ongoing and impacts from those actions are ongoing until work is concluded. The following is a summary of the HSDRRS construction impacts.

9.1.1 SOILS

Erosion of soils from stormwater runoff at construction and staging areas occurred. There was a permanent loss of biological productivity of soils from the larger footprint of HSDRRS structures, but most of these impacts occurred on previously disturbed soils. HSDRRS impacts on prime farmland soils, which are relatively undisturbed, were both adverse due to a permanent loss of the soils, and beneficial due to a reduction in risk of future flooding. The impacts due to construction of additional risk reduction structures and expansion of existing levees in these urban areas had little adverse effect on previously disturbed soils. Areas within the HSDRRS that are designated prime farmland soils are beneficially impacted by the HSDRRS, as the land used as farmland, rangeland, forestland, and wildlife habitat has a reduced risk of flooding. There was a permanent loss of approximately 165.3 acres of prime farmland soils from the HSDRRS construction and a loss of approximately 910.59 acres of prime farmland soils from borrow site excavation. The total loss of approximately 1,075.89 acres of prime farmland soils is a minor impact for southeast Louisiana and the region, and constitutes

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Table 9-1: Intensity of the HSDRRS Permanent Adverse Impacts by Sub-basin[1]

Resource	Negligible Impacts									Minor Impacts									Moderate Impacts									Major Impacts								
	St. Charles	Jefferson East	Orleans East	New Orleans East	Chalmette Loop	Belle Chasse	Gretna-Algiers	Harvey Westwego	Lake Cataouatche	St. Charles	Jefferson East	Orleans East	New Orleans East	Chalmette Loop	Belle Chasse	Gretna-Algiers	Harvey Westwego	Lake Cataouatche	St. Charles	Jefferson East	Orleans East	New Orleans East	Chalmette Loop	Belle Chasse	Gretna-Algiers	Harvey Westwego	Lake Cataouatche	St. Charles	Jefferson East	Orleans East	New Orleans East	Chalmette Loop	Belle Chasse	Gretna-Algiers	Harvey Westwego	Lake Cataouatche
Soils		X	X				X	X		X			X	X	X			X																		
Water Quality			X								X								X			X	X	X	X	X	X									
Wetlands			X																X	X		X	X	X	X	X	X									
Uplands; BLH-dry	X	X	X					X					X	X	X	X		X																		
Fisheries		X					X	X		X		X		X	X	X	X	X		X		X														
Wildlife		X		X						X		X			X	X	X	X					X													
EFH	X	X				X	X	X	X			X		X								X														
T&E Species	X	X	X	X	X	X	X	X	X																											
Cultural	X	X	X	X	X	X	X	X	X																											
Recreational	X				X	X	X				X	X	X				X	X																		
Aesthetics										X	X		X	X	X		X				X				X		X									
Air Quality	X	X	X	X	X	X	X	X	X																											
Noise	X	X	X	X	X	X	X	X	X																											
Transportation																			X	X	X	X	X	X	X	X	X									
Socioeconomic	X	X	X	X	X	X	X	X	X																											
HTRW	X	X	X	X	X	X	X	X	X																											

Note: Within the CED, Cultural Resources, Socioeconomics and EJ, and Air Quality were presented by parishes within the HSDRRS project area.
1 For HSDRRS actions described by IERs and Supplemental IERs, and construction contracts implemented by October 2015
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Table 9-2: Intensity of the HSDRRS Construction Permanent Adverse Impacts outside the HSDRRS Project Area (Borrow Sites)[1]

Negligible Impacts

Resource	Ascension	East Baton Rouge	Iberville	Lafourche	Plaquemines	St. Bernard	St. Charles	St. James	St. John the Baptist	St. Tammany	Hancock
Soils	X	X		X			X				
Water Quality	X	X	X	X	X	X	X	X	X		X
Wetlands	X	X	X	X	X	X	X	X	X	X	X
Uplands/BLH-dry	X	X	X	X							
Fisheries	X	X	X	X	X	X	X	X	X	X	X
Wildlife	X	X	X	X		X	X		X	X	
EFH	X	X	X	X	X	X	X	X	X	X	X
T&E Species	X	X	X	X	X	X	X	X	X	X	X
Cultural	X	X	X	X	X	X	X	X	X	X	X
Recreational	X	X	X	X	X	X	X	X	X	X	X
Aesthetics	X	X	X	X	X	X	X	X	X	X	X
Air Quality	X	X	X	X	X	X	X	X	X	X	X
Noise	X	X	X	X	X	X	X	X	X	X	X
Transportation	X	X	X	X							
Socioeconomic	X	X	X	X	X	X	X	X	X	X	X
HTRW	X	X	X	X	X	X	X	X	X	X	X

Minor Impacts

Resource	Ascension	East Baton Rouge	Iberville	Lafourche	Plaquemines	St. Bernard	St. Charles	St. James	St. John the Baptist	St. Tammany	Hancock
Soils			X		X	X		X	X	X	X
Water Quality										X	
Wetlands											
Uplands/BLH-dry					X	X	X	X	X	X	X
Fisheries											
Wildlife					X			X			X
EFH											
T&E Species											
Cultural											
Recreational											
Aesthetics											
Air Quality											
Noise											
Transportation											
Socioeconomic											
HTRW											

Moderate Impacts

Resource	Ascension	East Baton Rouge	Iberville	Lafourche	Plaquemines	St. Bernard	St. Charles	St. James	St. John the Baptist	St. Tammany	Hancock
Soils											
Water Quality											
Wetlands											
Uplands/BLH-dry											
Fisheries											
Wildlife											
EFH											
T&E Species											
Cultural											
Recreational											
Aesthetics											
Air Quality											
Noise											
Transportation					X	X	X	X	X	X	X
Socioeconomic											
HTRW											

Major Impacts

Resource	Ascension	East Baton Rouge	Iberville	Lafourche	Plaquemines	St. Bernard	St. Charles	St. James	St. John the Baptist	St. Tammany	Hancock
Soils											
Water Quality											
Wetlands											
Uplands/BLH-dry											
Fisheries											
Wildlife											
EFH											
T&E Species											
Cultural											
Recreational											
Aesthetics											
Air Quality											
Noise											
Transportation											
Socioeconomic											
HTRW											

[1] For HSDRRS actions described by IERs and Supplemental IERs, and construction contracts implemented by October 2015.

a loss of less than 1 percent of available prime farmland soils. The loss of these prime farmland soils is permanent and will result in a reduction in the available productive farmland regionally; however, the cumulative loss of prime farmland soils associated with the HSDRRS risk reduction projects and required borrow is less than 1 percent and does not represent a significant impact to prime farmlands throughout the region.

9.1.2 WATER QUALITY

Construction impacts included temporary increases in turbidity, water temperature, and sedimentation, potential increases in contaminants from petroleum, oil, and lubricant spills, and decreases in DO within waterways near the HSDRRS project areas. During construction activities, several small spills occurred that involved petroleum products and hydraulic grade vegetable oil; however, all spills were contained and cleaned up. There were several reaches where the base of the earthen levee was expanded, or the levee realignment was redirected into open water of a bayou or lake. These actions temporarily impacted water quality through increased sedimentation during construction activities, but impacts ceased once the levee sediments stabilized and were armored. Dredging activities and stockpiling of dredged materials caused a temporary increase in suspended sediments in the water column. Hydrology was temporarily impacted due to cofferdam use at temporary canal closures. Hydro-modification at gated structures and floodwalls caused permanent impacts on water quality through changes in water velocity, salinities, and by altering or eliminating aquatic habitat and associated water quality functions. Construction activities increased the number of impervious surfaces on formerly undeveloped landscapes. This decreased the surface area that can capture and absorb rainfall, resulting in a larger percentage of rainfall runoff during storm events. Overall, HSDRRS construction had a negligible to moderate permanent impact on water quality, see Table 4-11 for specifics by IER, Table 9-1 for intensity for HSDRRS sub-basins and Table 9-2 for parishes outside the HSDRRS where borrow excavation occurred.

9.1.3 WETLANDS

There was a direct loss of approximately 1,421.95 acres (725.12 AAHUs) of wetlands as a result of HSDRRS construction (see Table 4-16, which was a moderate adverse impact on wetlands. The permanent loss of wetlands occurred on freshwater marsh, intermediate marsh, brackish marsh, saline marsh, BLH-wet, and cypress-tupelo swamp habitats, and was a moderate permanent impact in all sub-basins, except in the Orleans East Bank sub-basin, where only negligible permanent impacts on wetlands occurred. However, compensatory mitigation will offset the direct loss of wetland functions in kind. Temporary impacts on wetlands occurred through minor changes in hydrology from hydro-modification in the project area. Construction indirectly impacted wetlands due to changes in hydrology and inundation levels. No direct impacts on wetlands occurred at the borrow sites.

9.1.4 UPLANDS AND BOTTOMLAND HARDWOODS-DRY

The total area of permanent and temporary impacts on uplands from HSDRRS construction was approximately 5,011.34 acres. Impacts to BLH-dry habitat was approximately 1,096.23 acres and considered negligible to minor impacts when compared to the hundreds of thousands of acres of uplands and BLH-dry, both developed and undeveloped, in the study area (see Tables 9-1 and 9-2). There were 1,299.43 acres of temporary impacts on uplands/scrub-shrub resulting from HSDRRS construction and permanent impacts to 74.64 acres of BLH-dry resulting from borrow site excavation. Impacts on uplands occurred primarily on existing levees and in developed areas. Some mature vegetation was lost as a result of construction, but a majority of this vegetation was composed of landscape trees and shrubs. These areas are currently maintained grass or reverting to pre-construction conditions. Borrow excavation was the primary cause for the loss of upland habitat. The excavated areas that are no longer used have converted to open water ponds. The permanent impacts to uplands resulting from borrow excavation is considered minor when compared to the total acres of habitat within the study area. Mitigation bank credits were purchased for impacts on 74.64 acres (25.27 AAHUs) of BLH-dry at contractor-furnished borrow sites prior to impacting the sites.

9.1.5 FISHERIES

Impacts on fisheries and fish habitats included effects on migratory movements, active/passive transport of eggs and larvae, nursery habitat recruitment of larvae and juveniles, changes in water characteristics (e.g., temperature, salinity, turbidity, and DO), organism access to habitats (e.g., protection from predators and food availability), and hydrology and velocity. A loss of estuarine marsh and open water habitats likely increase habitat fragmentation, altered hydrology, and affected habitat quality, resulting in long-term minor impacts on fisheries. Construction impacts adversely affected water quality, resulting in short-term displacement of less tolerant aquatic species in some waterways. Lake bottom losses due to construction activities in Lake Pontchartrain impacted foraging habitat for finfish and shrimp. Construction activities that occurred within waterways displaced motile aquatic species by causing them to avoid the area and find refuge in adjacent suitable habitat. Once construction activities ceased and water quality improved, these aquatic species likely returned. The construction of the cofferdams within waterways, such as Bayou Bienvenue and the IHNC, temporarily hindered the movement of fish and other aquatic organisms through the area until the cofferdam was removed. Overall, the permanent impacts on fisheries from HSDRRS construction were minor to moderate for New Orleans East and Jefferson East bank sub-basins.

An increase in organic material from hydrological improvements associated with levee drainage and crossings would result in beneficial impacts by enhancing primary productivity (e.g., microbial, plankton, and emergent vegetation) supporting the trophic structure and stamina needed for fisheries to recover and remain sustainable. The installation of rock shoreline, fronting protection, and breakwaters would provide more productive habitat for fisheries by improving edge habitat along shorelines that were previously an unvegetated levee toe or a concrete/sheet pile floodwall.

9.1.6 ESSENTIAL FISH HABITAT

Dredging, filling, levee realignment, and hydro-modification associated with the construction of the HSDRRS had minor permanent impacts on EFH and federally managed species. Dredging activities suspended sediments in the water column, which caused an increase in turbidity and also affected light levels throughout the water column. Dredging of canals and waterways permanently altered the channels' cross-sectional area and bottom material. Sediment resuspension from dredging activities, for example at Jefferson East Bank and New Orleans East, blanketed lake bottom sediments and disturbed benthic organisms, such as rangia clams. Surface soils disturbed by construction were transported to adjacent water bodies during rain events, creating processes and impacts similar to those for dredging activities. Impacts on EFH varied by sub-basin, but overall, permanent adverse impacts on EFH from HSDRRS construction were minor, except for the New Orleans East sub-basin, where impacts were moderate as result of construction of the Borgne barrier and access channel.
In areas where hard fill was added, edge habitat was increased and created, and is now used by federally managed species for foraging and/or spawning. The hard fill has beneficial impacts on EFH by providing protection to larval and juvenile fishes, nursery habitat, and by providing additional edge habitat for foraging by larger fish. The hard substrate also provides habitat for sessile filter feeders. Over time, the filter feeders enhance the water quality of the nearshore environment. Finally, an increase in rocky material benefitted local assemblages of nekton that are important to sustaining federally managed fisheries, especially blue crab.

9.1.7 WILDLIFE

Construction activities had temporary impacts on various types of wildlife due to construction equipment noise, movement and the alteration of foraging habitat within the HSDRRS project area. Small mammals, reptiles, fish, nesting and wading birds are some of the wildlife that were likely impacted during construction of the HSDRRS projects. Typically, the wildlife displaced by the construction activities returned to the area following construction. In many cases, the disturbed habitat was within the footprint of an existing levee or floodwall and was of fairly low quality.

Dredging activities in canals and waterways, dredged material stockpiling, and construction of foreshore protection and wave attenuation features (Jefferson East Bank New Orleans East sub-basins) caused temporary indirect and direct impacts on wildlife inhabiting the terrestrial shoreline, primarily ducks and wading birds. Also, the installation of gates, pump stations, and other closure structures caused impacts on open water fish habitat during construction activities. Permanent impacts from HSDRRS construction on wildlife and wildlife habitat were mostly minor, except for the Chalmette Loop where a permanent 22 mile floodwall restricts access for crossing. However wildlife access gates or openings were included in the design and wildlife are currently using the access points.

9.1.8 THREATENED AND ENDANGERED SPECIES

Along Lake Pontchartrain and Lake Borgne, minor adverse short-term impacts occurred from temporary disturbances to foraging areas for the West Indian manatee, Gulf sturgeon, Kemp's Ridley sea turtle, loggerhead sea turtle, and green sea turtle. Within the aquatic habitat of the LaBranche wetlands, adverse impacts potentially occurred on foraging areas for the West Indian manatee; however, there was a low probability that manatees were present during construction. As described in the IERs, Supplements, and EAs, no permanent impacts occurred on threatened and endangered species from the HSDRRS construction; 23 documents reported that effects on threatened or endangered species may occur, but adverse effects were not likely to occur. It was determined that, for the remaining 38 NEPA documents, no adverse effects would occur. Concurrence was received from the USFWS on all HSDRRS actions in accordance with Section 7 of the Endangered Species Act, and there has been no take of threatened or endangered species in construction areas; therefore, impacts were determined to be negligible.

9.1.9 CULTURAL RESOURCES

The HSDRRS was subjected to an archaeological survey prior to any ground-disturbing activities. The cultural resources survey areas exceeded the size of the preliminary APE, allowing USACE archaeologists to adjust the APE as needed to avoid any damage to historic properties with potential eligibility for the NRHP. Section 106 consultation with the Louisiana SHPO was completed for all HSDRRS IERs, Supplements and EAs, and impacts on cultural resources were avoided during HSDRRS construction. In letters sent to the Louisiana SHPO and THPO of the 12 federally recognized tribes with an interest in the region, the USACE provided project documentation, evaluated cultural resources potential in the project area, and found that the HSDRRS actions had no impact on historic properties with the implementation of the USACE mitigation measures. Section 106 consultation for the HSDRRS projects was then concluded. No unrecorded cultural resources were determined to exist within the project boundaries, and final coordination with the SHPO and Indian Tribes was completed. Implementation of the HSDRRS projects had beneficial indirect impacts by providing an added level of flood risk reduction to known and unknown archaeological sites in the project vicinity on the protected side of the levees, thereby reducing the damage caused by flood events.

9.1.10 RECREATIONAL RESOURCES

Construction-related noise and vibration caused localized impacts on the overall recreational experience, including impacts on recreational features associated with biking, walking, jogging, wildlife viewing, boating, and recreational fishing in areas near Lake Pontchartrain. The Coconut Beach volleyball complex in Orleans Parish was closed and permanently relocated to Jefferson Parish because of the construction of the permanent pump station. Temporary impacts from HSDRRS construction also included transportation detours from road closures but lasted only as long as construction took place, and most of the levee work was finished in summer of 2011. However, overall recreational opportunities returned to pre-construction conditions in most sub-basins.

The location and size of flood risk reduction structures, such as floodgates, fronting protection, and pump station outflows, temporarily impacted recreational boat access and resulted in detours. Boat access to the IHNC via Lake Pontchartrain during construction of the Seabrook gate complex was suspended. In general, temporary impacts on recreational boating were most evident during times when several waterways were closed concurrently. Overall, the permanent impacts on recreational resources from HSDRRS construction were negligible to minor.

9.1.11 AESTHETICS

Impacts from the numerous construction sites and traffic congestion in the project area temporarily affected the viewsheds until construction was completed. Staged equipment and supplies on bike and walking paths, green space, and levees temporarily impacted access and availability of green space and paths during construction, reducing the ability for visitors to enjoy viewsheds. The vistas along Lake Pontchartrain in portions of Orleans East and the Chalmette Loop were adversely impacted, both in the short term during construction, and permanently due to the loss of visual viewshed opportunities with the building of floodwalls where previously there was only levee. The establishment of a borrow area contrasted with the surrounding natural landscapes and this was most acute where they were forested and now an open pit or pond. Overall, the permanent impacts on visual resources from the HSDRRS were minor to moderate. However, a reduction in the frequency of flooding and storm surge devastation in the region would allow vistas and viewsheds to remain undamaged and reduce the risk of damage to structures.

9.1.12 AIR QUALITY

Air emissions associated with the HSDRRS were temporary and only lasted during the time period required for completion of construction activities. An air quality emissions analysis was conducted to estimate and determine the amount of air emissions generated during construction of the HSDRRS projects and findings show the average annual emissions for SO_2 did not exceed the 100 tons per year threshold and did not affect the attainment status for any of the parishes in the New Orleans metropolitan area.

St. Bernard Parish is currently in non-attainment status for SO_2 emissions; however, the HSDRRS Chalmette Loop construction in St. Bernard Parish was completed prior to St. Bernard Parish being designated as a non-attainment area for SO_2. Because of this timing, there was some concern that the SO_2 emissions created by the HSDRRS work contributed to the designation of non-attainment status for SO_2 in St. Bernard Parish. Discussions between the USACE and the LDEQ were held to address this concern, and three major facilities were identified as contributing to the high levels of SO_2 in the air of St. Bernard Parish. All three facilities are permitted to release between 500 and 7,010 tons of SO2 per year. An Emission Inventory (EI) has also been completed to accurately assess current emissions for all sources of SO_2 (point, non-point, on-road mobile, and non-road mobile sources) for St. Bernard Parish during the time of HSDRRS construction and results indicate a downward trend in both point source, non-point and mobile source emissions of SO_2. Due to the nature and length of the USACE HSDRRS construction projects, the LDEQ did not feel that the HSDRRS had any significant effect to the air quality of the parish. The Chalmette Loop floodwall and access road is complete; therefore, there will be no further impact to the SO_2 levels in St. Bernard and the air quality would not noticeably change from current conditions. The status of attainment would not be altered. As there are no violations of air quality standards and no conflicts with the SIPs, the impacts on air quality from the implementation of the HSDRRS were minor.

Standard construction BMPs were used during the construction of the HSDRRS, such as proper and routine maintenance of vehicles and construction equipment to ensure that emissions were within the design standards, and dust suppression methods were used to minimize fugitive dust. Impacts on air quality in the region resulting from the implementation of the HSDRRS were temporary and minor. No permanent impacts on air quality occurred. Based on these evaluations, analysis, and BMPs implemented, impacts on air quality of the HSDRRS were less than significant. No permanent adverse impacts on air quality occurred from HSDRRS construction.

9.1.13 NOISE

Noise emissions associated with the HSDRRS were temporary and only lasted during the time period required for completion of construction activities. Approximately 2,814 acres of land within the JLNHPP and 8,051 acres of land within Bayou Sauvage National NWR are within the minimum recommended noise abatement criterion for NPS lands. Several state and city parks are located near the HSDRRS, including Bayou Segnette State Park, London Park, Ozone Park, Zephyr Park, Woodlake Park, St. Bernard State Park, Lake Shore Park, Pontchartrain Park, Linear Park, and Williams Boulevard Park, and had the potential to experience noise emissions greater than 57 dBA. Approximately 8,114 single-family homes, 268 apartment buildings, 20 churches, 26 schools, including the University of New Orleans, and three hospitals are located near the edge of the project corridors. These sensitive noise receptors experienced noise emissions greater than 65 dBA, which are normally considered unacceptable. Contractors often worked 24 hours a day, 7 days a week. There were no permanent adverse noise impacts from construction; however, the operations of the new pump stations could result in longer lasting noise pollution when the pumps are in full operation.

9.1.14 TRANSPORTATION

Overall, adverse temporary impacts on transportation occurred due to road closures and increased congestion from delivery trucks during the construction period. Increased construction traffic caused temporary congestion and traffic delays, and potentially increased traffic accidents. Permanent minor impacts on transportation occurred due to road and bridge degradation from use for material delivery and movement of construction equipment. Construction of the HSDRRS components caused adverse temporary impacts on local waterborne transportation in the Chalmette Loop and Belle Chasse sub-basins. Navigation within Hero Canal was restricted to vessels that passed through the 56 feet wide gate, and waterborne access through the Company Canal and the Harvey Canal had some adverse temporary impacts when construction activities were conducted on a marine plant or temporary work platforms located over water. However, the reduced risk of flooded and submerged roads would cause beneficial impacts on local roadways and highways by maintaining traffic flows during storm events and reducing the frequency of maintenance, repair, or reconstruction.

9.1.15 SOCIOECONOMIC RESOURCES AND ENVIRONMENTAL JUSTICE

Adverse impacts on businesses, industries, and related employment and housing, as well as any disproportionate impacts on minority and low-income communities within the HSDRRS project area, were temporary and occurred during construction activities. No permanent socioeconomic impacts occurred. These construction-related impacts occurred due to general traffic congestion, road and highway closures, noise, and closures of navigation channels. Long-term benefits from reduced risk of hurricane and storm damage to structures and infrastructure will be realized for all residents and businesses in the GNO metropolitan area, regardless of race or income level.
The HSDRRS would induce spending on reconstruction and redevelopment of housing and businesses, and allow FEMA NFIP certification, thereby providing an economic benefit to the community. Lower flood insurance premium costs to participate in the NFIP for properties in the HSDRSS area would encourage long-term investment in the region and aid in a strong and sustainable recovery of the population in the region. Greater numbers of former residents may return with the knowledge that there is a greater level of risk reduction. The added safety would also ensure long-term beneficial impacts on the businesses and industries within the project area, which would reflect positively on employment and income within the HSDRRS.

9.1.16 HAZARDOUS, TOXIC AND RADIOACTIVE WASTER (HTRW)

All potential HTRW contamination within the HSDRRS was identified and evaluated prior to initiating construction. All identified RECs, such as litter, trash, white goods (e.g., appliances), discarded vehicles, and other miscellaneous materials, were avoided to the extent possible. If avoidance was not possible, remediation was the responsibility of the non-Federal sponsor. During construction, if an unidentified HTRW substance was found, the construction activity stopped until the risk was evaluated, and an appropriate response was determined. When a Phase II ESA was performed, soils, groundwater, and/or surface water were analyzed for COCs. The contaminate levels were then compared to LDEQ RECAP Standards to determine their significance and risk to the project. There were no permanent impacts from HTRW substances as a result of HSDRRS construction.

The potential to create HTRW during the construction process is always a possibility. Fuel, lubricants, and oil were managed, stored, and recycled or properly disposed in accordance with the SPCC Plan. All Federal, State, and local laws and regulations were strictly followed. As result of the HSDRRS, there is a reduced risk for the potential mixing of floodwaters with sewage, contamination of drinking water supplies, and the mobilization of HTRW in the future. When flooding occurs, these constituents can enter surface waters, causing temporary reductions in surface water quality and can result in soil and sediment contamination. The HSDRRS reduces the risk of flood-related contamination.

9.1.17 MITIGATION MEASURES

The CEMVN implemented avoidance and minimization measures to avoid and reduce the potential for adverse impacts to relevant resources however, not all impacts could be avoided. The total impacts requiring compensatory mitigation is 1431.77 acres (788.25 AAHUs). The CEMVN described the mitigation plan in two Programmatic documents that included both constructible and programmatic features. As planning advanced and projects were designed additional NEPA documents were prepared that tiered off the programmatic parent NEPA document. To date, all required mitigation sites have been acquired and most of the sites have been constructed and currently being monitored for adaptive management and ultimately success. The remaining mitigation site to be constructed is the Highway 307 WBV Floodside BLH-wet and Swamp mitigation site in Lafourche parish, LA.

Reference Section 5 for the Mitigation Plan and impacts associated with construction of the mitigation sites.

9.2 SUMMARY OF HSDRRS 2057 CONSTRUCTION IMPACTS

The USACE has determined that additional levee lifts of the HSDRRS would be required in the future to continue to provide the 100-year LORR. The need for future levee lifts is based on future subsidence and sea-level rise and loading of the foundation that consolidates the soil at the construction sites. For the purpose of this document, these levee lifts are identified as HSDRRS 2057 construction requirements. The authorization for construction of the HSDRRS did not authorize future levee lifts required to sustain the 1 percent LORR over the long term. Section 3017 of WRRDA 2014 authorized USACE to carry out measures necessary to address consolidation, settlement, and sea level rise if the necessary work is determined to be technically feasible, environmentally acceptable and economically justified. The BBA-18 provided appropriations to conduct the general reevaluation report necessary to inform this determination. Draft reports with integrated EISs were released for public comment for LPV and WBV December 13, 2019. The final reports are anticipated for release in 2021.

Earthen levees were constructed at the 2011, 100-year LORR elevation, while hardened structures, such as floodwalls, floodgates, vertical lift gates, and sector gates, were constructed to the 2057, 100-year LORR design elevations. Levees would be "lifted" or raised as needed, if authorized and funded, to maintain their elevation at the 100-year LORR required for NFIP FEMA certification to accommodate consolidating soils, subsidence, and sea-level rise.

Initial rough order of magnitude estimates suggests the work would require 9 million cy of additional borrow at a cost of approximately $820 million. These estimates would be refined during the completion of the general reevaluation study. Until this study is complete, and a determination as to whether there is a Federal interest in future lifts, the USACE cannot construct future levee lifts.

The CPRAB, as the non-Federal sponsor, can construct future lifts with their own funds through the USACE Section 408 program and is considering doing so to sustain the design heights of several reaches until 2025. Absent future construction of additional levee lifts by either the USACE or CPRAB and the local levee districts, risk associated with flooding from a tropical event in the metro New Orleans area would increase over time. Section 3.3.3 describes Section 408 additional levee lifts under consideration by the CPRAB.

While the HSDRRS 2057 levee lifts were not authorized, they are analyzed below as part of the future cumulative impact's analysis. Table 9-3 provides a summary of the anticipated HSDRRS 2057 impacts.

Table 9-3: Intensity of Permanent Adverse Impacts of the HSDRRS 2057 Construction

Resource	Negligible Impacts	Minor Impacts	Moderate Impacts	Major Impacts
Soils		X		
Water Quality		X		
Wetlands			X	
Uplands and BLH-dry		X		
Fisheries		X		
EFH		X		
Wildlife		X		
Threatened and Endangered Species	X			
Cultural Resources	X			
Recreational Resources	X			
Aesthetics		X		
Air Quality	X			
Noise	X			
Transportation		X		
Socioeconomics and Environmental Justice	X			
HTRW	X			

9.2.1 SOILS

Approximately 9 mcy of borrow material (i.e., suitable soils) would be required to build the future levee lifts. This is less than the 17.3 mcy that was used for the HSDRRS construction. Additional soils, including prime farmland, would be permanently lost through borrow site excavation; it is likely that some soils designated as prime farmland soils would be used for the future levee lifts. These impacts would be minimized by implementing BMPs as described by SWPPPs at the levee lift construction sites. Due to the volume of prime farmland soils already removed for HSDRRS construction, the removal of prime farmland soils from borrow areas regionally would be a significant impact and a significant loss of prime farmland soils. The borrow sites from which future material would be removed are not known, and borrow sites approved for HSDRRS construction would not necessarily be used for future levee lifts. Soil erosion at construction sites would occur from stormwater runoff.

9.2.3 WATER QUALITY

Short-term impacts on water quality would occur due to sedimentation and turbidity from soil movement during construction and would be similar to HSDRRS construction impacts. Further, there is the potential for contaminants from petroleum, oil, and lubricant spills, and decreases in DO within waterways near levees subject to additional lifts. Temporary, minor water quality impacts would occur due to increased nutrient loading, SOD, and miscellaneous debris. Construction-related impacts would also affect lake bottoms, canal bottoms, drainage waterways, and open water, and cause permanent minor impacts on water quality. Dredging of Lake Pontchartrain and material stockpiling for access to foreshore protection and wave attenuation features in the New Orleans East sub-basin could increase turbidity, disrupt water bottoms, and destroy SAV.

Impacts would be minimized by adopting BMPs and SWPPPs. There would be less wetland habitat and more open water adjacent to the HSDRRS in 2057, and as result, less wetland habitat and more open water habitat could be eliminated during future maintenance and improvements. In addition, there would be less habitat present capable of ameliorating water quality impacts of HSDRRS 2057 construction activities.

9.2.4 WETLANDS

Some wetland and BLH loss is anticipated to occur with future levee lifts and improvements on foreshore protection within the New Orleans East sub-basin. The area of wetland and BLH loss is difficult to estimate at this time, but approximately 154 acres of wetlands could be impacted as a result of future levee lifts. However, all lost wetland functions would be fully mitigated. The permanent impacts on wetlands from future levee lifts would be moderate.

9.2.5 UPLANDS AND BOTTOMLAND HARDWOODS-DRY

Impacts on uplands would occur on turf grass on levee slopes and developed areas within the HSDRRS project area. An additional 9 mcy of borrow are anticipated to be needed for future levee lifts. That material would likely be removed from existing upland habitats, converting those upland areas to open water, and causing a permanent minor impact on uplands and reducing forage and breeding habitat for wildlife. However, until borrow sites are selected, the locations of these impacts are not known. No substantial impacts on upland habitats are anticipated within the footprint of levees because enlargements will be restricted to the base of levees already impacted by recent HSDRRS construction from future levee lifts and HSDRRS structural maintenance activities.

9.2.6 FISHERIES

No direct impacts on fisheries are anticipated from future levee lifts and HSDRRS structure maintenance. Indirect impacts on fisheries could occur during construction from increased sedimentation and turbidity of water from soil erosion. These indirect impacts would be short-term. Waterway impacts could occur from the dredging and dredged material stockpiling in Lake Pontchartrain. The associated repair or construction of foreshore protection and wave attenuation features (New Orleans East sub-basin) that were described in IERs Nos. 6 and 7, but determined to be unnecessary to provide the 100-year risk reduction for the HSDRRS construction, may be raised in elevation before 2057. Permanent impacts on fisheries from HSDRRS 2057 construction would be minor.

9.2.7 ESSENTIAL FISH HABITAT

Wetlands located on the flood side of levees enlarged by future levee lifts would be permanently impacted, which could cause a permanent loss of EFH. Short-term construction related EFH impacts would include damage to SAV, disturbance to sediments, and increased turbidity and sedimentation in and adjacent to EFH. Some additional open water and EFH impacts could occur if dredging activities and dredged material stockpiling in Lake Pontchartrain and the associated repair or construction of foreshore protection and wave attenuation features (New Orleans East sub-basin) are determined to be necessary to provide 100-year risk reduction for HSDRRS 2057. These impacts were previously described in IERs No. 6 and No. 7 but were determined to be unnecessary to meet the HSDRRS 100-year level of risk reduction and, therefore, were not previously constructed. No other impacts on EFH are anticipated from future levee lifts.

9.2.8 WILDLIFE

Construction activities associated with future levee lifts would have temporary impacts on wildlife due to construction equipment noise and movement. Some wildlife habitat at the toe of existing levees would be permanently lost with increased levee footprints. Wildlife habitat would be permanently lost at borrow sites to accommodate the additional estimated 9 mcy of material needed for future levee lifts. These permanent impacts on wildlife and wildlife habitat would be minor. Prior to construction of future HSDRRS projects, coordination with USFWS would occur for reaches located near bald eagle nests or nesting bird colonies.

9.2.9 THREATENED AND ENDANGERED SPECIES

No permanent impacts would likely occur on any species currently listed as threatened or endangered, or their supporting critical habitats due to future levee lifts. Short-term construction-related direct impacts, such as decreased DO levels, excessive turbidity due to construction runoff and sedimentation, increased water temperature, nutrient loading, and reduced visibility, would be expected in waters of the project area during construction. Dredging activities and dredged material stockpiling in Lake Pontchartrain for the repair or construction of foreshore protection and wave attenuation features may be necessary by 2057 to provide the 100-year level of risk reduction. The dredging and stockpiling of material in Lake Pontchartrain for foreshore protection features would temporarily impact foraging areas for the Gulf sturgeon, Kemp's ridley sea turtle, loggerhead sea turtle, and green sea turtle. West Indian manatee, Gulf sturgeon and sea turtle BMPs, SWPPP measures, and SPCC Plans, as well as implemented on construction sites in the future, would minimize levels of sedimentation, debris, or spills reaching waterways and any impacts to threatened or endangered species.

9.2.10 CULTURAL RESOUCES

The potential APE for future levee lifts would be surveyed and all historic resources potentially eligible for the NRHP would be avoided. Section 106 consultation with the Louisiana SHPO would be completed prior to any future ground-disturbing activities. Therefore, no adverse impacts would occur on cultural resources.

9.2.11 RECREATIOAL RESOURCES

Future levee lifts would cause short-term impacts on levee-top recreational features associated with biking, walking, jogging, and wildlife viewing. No permanent impacts on recreational resources are anticipated.

9.2.12 AESTHETICS

Construction material and equipment associated with future levee lifts would temporarily affect the viewsheds until construction was completed. Dredging in Lake Pontchartrain for foreshore protection and wave attenuation feature access channels would temporarily impact the viewshed from the lakeshore in New Orleans East. Minor permanent impacts on visual resources are anticipated from future levee lifts, additional borrow site excavation, and potential foreshore protection and wave attenuation construction as previously described in IERs No. 6 and No. 7.

9.2.13 AIR QUALITY

Air emissions associated with future levee lifts would be temporary and only occur during the time period required for completion of construction activities. The air impacts and emissions would be less than from the HSDRRS construction since the number of simultaneous construction contracts would be substantially reduced for future levee lifts. Ambient air quality would return to background levels after construction completion. Impacts associated with the future levee lifts and structural maintenance may be temporarily moderate but would be negligible in the long term. No permanent impacts on air quality are anticipated. However, if the New Orleans Metropolitan Maintenance Area becomes non-compliant, future levee lifts could have adverse impacts on air quality.

9.2.14 NOISE

Noise emissions associated with future levee lifts would be temporary and would only occur during the time period required for completion of construction activities. No permanent noise impacts from HSDRRS 2057 construction would occur. However, those noise emissions could impact sensitive receptors of approximately 2,757 single-family homes, 120 apartment buildings, 13 churches, 10 schools, and three hospitals that are currently present in the project area during the construction period for levee lifts, and could occur up to 24 hours a day, 7 days a week.

9.2.15 TRANSPORTATION

Increased construction traffic would cause temporary congestion and traffic delays, and a reduction in LOS would occur at specific road segments near active levee lifts and borrow excavation. Minor permanent impacts on transportation would occur from future levee lifts due to degradation of infrastructure from additional truck traffic.

9.2.16 SOCIOECONOMIC RESOURCES AND ENVIRONMENTAL JUSTICE

No substantial permanent economic impact would occur from future levee lifts. The maintenance of the 100-year level of risk reduction would provide increased safety for businesses, residences, and other economic investments for the life of the HSDRRS.

9.2.17 HAZARDOUS, TOXIC AND RADIOACTIVE WASTE (HTRW)

If future levee lifts occur within existing ROWs, new Phase I ESAs would be required within 6 months prior to the start of any of the levee lifts to ensure that no additional RECs were found. New borrow sites needed for future levee lifts, would also need environmental compliance to ensure that no RECs or HTRW issues would be encountered. All potential HTRW contamination within areas where levee lifts or borrow excavation would occur would be identified and evaluated prior to the start of construction activities. All identified RECs would be avoided, or if avoidance is not possible, the non-Federal sponsor would be responsible for remediation. A SPCC Plan would be followed and all fuel, lubricants, and oil would be managed, stored, recycled and disposed in accordance with all Federal, State, and local laws and regulations. If construction reveals the existence of previously unknown HTRW, then work in that area will be stopped until the risk from HTRW is evaluated and the appropriate response is determined. No permanent impacts would occur.

9.3 CUMULATIVE IMPACTS

9.3.1 CUMULATIVE IMPACTS OF HSDRRS CONSTRUCTION AND HSDRRS 2057

The HSDRRS construction and future levee lifts needed to maintain the 100-year level of risk reduction for the life of the project would have cumulative impacts on the natural and human environment in the GNO metropolitan area. Table 9-4 summarizes the intensity of the cumulative impacts from the HSDRRS construction and HSDRRS 2057 construction, and an overview of those impacts is provided below.

Table 9-43: Intensity of the Cumulative Adverse Impacts of HSDRRS Construction and HSDRRS 2057 on Significant Resources

Resource	Negligible Impacts	Minor Impacts	Moderate Impacts	Major Impacts
Soils		X		
Water Quality			X	
Wetlands			X	
Uplands			X	
Fisheries		X		
EFH		X		
Wildlife Resources		X		
Threatened and Endangered Species	X			
Cultural Resources	X			
Recreational Resources	X			
Aesthetics		X		
Air Quality	X			
Noise	X			
Transportation			X	
Socioeconomics and Environmental Justice	X			
HTRW	X			

9.3.1.1 Soils

The cumulative impacts on soils would be from the permanent loss of soils, including prime farmland soils, at borrow sites. As much as 1,076 acres of prime farmland soils was lost from HSDRRS construction and borrow site excavation, which would be a minor cumulative impact when compared to the 110,073 acres available within the HSDRRS project area. Cumulative long-term beneficial impacts on soils would result from the HSDRRS due to a lower risk of inundation from storm events.

There would be significant permanent, cumulative impacts on soils that may include prime farmland soils from the HSDRRS construction and the removal of borrow materials. The magnitude of cumulative impacts on soils would be greater for the borrow sites than for construction of HSDRRS components. Soils removed from borrow sites for HSDRRS construction and for future levee lifts occur primarily in rural areas and could result in thousands of acres of additional prime farmland soils that are no longer suitable for agricultural uses. Adverse cumulative impacts are greatest in Jefferson, Plaquemines, and St. Bernard Parishes, as there are eight borrow areas containing prime farmland soils in Jefferson Parish, 12 in Plaquemines Parish, and 13 in St. Bernard Parish.

Long-term cumulative beneficial impacts on soils would result from the implementation and maintenance of the HSDRRS. All soils within the HSDRRS would have a lower risk of inundation from storm events, including prime farmland soils, which could continue to be used for agricultural production during major storm events. Further, with the reduced risk of storm surge, it would be less likely for crop destruction to occur from flooding or brackish water inundation.

9.3.1.2 Water Quality

Cumulative impacts on water quality would occur from filling of waterways and wetlands for HSDRRS construction and future levee lifts. Sedimentation and nutrient loading of waterways from stormwater runoff during rain events has occurred from the cumulative construction activities, dredging, filling, material stockpiling, water body displacement, and hydrologic modifications. The permanent cumulative impacts on water quality from all HSDRRS construction activities would be moderate.

9.3.1.3 Wetlands

Over 5,000 acres of wetlands and non-jurisdictional BLH would be cumulatively impacted as a result of HSDRRS construction. Although wetlands and non-jurisdictional BLH would be directly impacted through dredging and filling activities, all lost functions of wetlands and non-jurisdictional BLH would be fully mitigated, and direct impacts on wetlands at borrow sites would be avoided entirely. Therefore, the cumulative impacts on wetlands from all HSDRRS construction would be moderate.

9.3.1.4 Uplands and BLH-dry

Cumulative impacts on uplands would primarily occur at borrow sites, where borrow site excavation has converted and will continue to convert uplands and BLH dry resources to open water areas. The loss of upland habitat at borrow sites would cumulatively be a moderate impact because this habitat would no longer provide foraging areas and cover for wildlife.

9.3.1.5 Fisheries

Filling of waterways and wetlands for HSDRRS construction and future levee lifts cumulatively impacts fisheries and fish habitat. Temporary closures of waterways during construction activities cumulatively impact fish by reducing movement locally. Minor changes in salinities and flow velocities as a result of gated structures have cumulative long-term minor impacts on estuarine-dependent fish movement and use in Lake Pontchartrain.

9.3.1.6 Wildlife

Less mobile wildlife species within the ROW for construction were likely killed during construction activities, and habitat for wildlife was lost when wetlands, waterways, and uplands were converted to risk reduction structures. This scenario would likely repeat for HSDRRS 2057 construction. However, most of the wildlife and habitat lost are locally and regionally common and are associated with urban or developed areas; therefore, the cumulative impacts on wildlife would be minor. The continued use of borrow sites for future levee lifts would cumulatively contribute to the loss of wildlife habitat.

9.3.1.7 Essential Fish Habitat

The dredge, fill, and material stockpiling activities, filling of waterways and wetlands, hydrologic modification of waterways, and construction activities in waterways would have cumulative minor permanent impacts on EFH. Future levee lifts would contribute to the cumulative loss of EFH through filling of intertidal wetlands.

9.3.1.8 Threatened and Endangered Species

No long-term cumulative impacts would occur on any currently listed threatened or endangered species from HSDRRS construction and future levee lifts. Cumulative impacts on Gulf sturgeon foraging habitat from dredging of access channels would occur from future foreshore protection and wave attenuation features in the New Orleans East sub-basin. These impacts would be minimized by implementing mitigation measures for dredging activities in Gulf sturgeon critical habitat and BMPs, as recommended by USFWS and NMFS, the permanent cumulative impacts on protected species are negligible.

9.3.1.9 Cultural Resources

All historic resources potentially eligible for the NRHP were avoided during HSDRRS construction and would be avoided during future levee lifts. Completion of Section 106 consultation with the Louisiana SHPO prior to all ground-disturbing activities for the HSDRRS would ensure that no adverse cumulative impacts would occur on cultural resources potentially eligible for the NRHP.

9.3.1.10 Recreational Resources

Temporary cumulative impacts on recreational resources occurred during construction activities, and temporary impacts associated with access closures would occur during the life of the HSDRRS due to future levee lifts. The construction of the HSDRRS and future levee lifts provide a cumulative benefit on recreational resources by reducing the risk of hurricane and storm damage to recreation facilities, paths, parks, infrastructure, and green space. Most recreational resources in the HSDRRS project area returned to near pre-construction conditions after HSDRRS construction was completed, and the cumulative impacts of past and future HSDRRS construction would be negligible.

9.3.1.11 Aesthetics

Cumulative impacts on visual resources occurred during construction activities and were temporally and spatially limited to active construction sites. However, impacts on aesthetics would occur for the life of the project, as construction activities would periodically occur through 2057. The cumulative impacts of HSDRRS construction on visual resources are minor.

9.3.1.12 Air Quality

There would be no permanent cumulative impacts on air quality. All air emissions are temporary and are associated with specific construction projects, including future levee lifts, and the air quality would return to background levels after construction. The cumulative impact of SO_2, VOC and NO_x on the ambient air quality was less than 100 tons per year, on average. The impacts, therefore, are still considered to be minimal.

9.3.1.13 Noise

Cumulative temporary noise impacts would occur on sensitive receptors during HSDRRS construction activities and future levee lifts. However, impacts would be short-term at any construction location and would return to ambient conditions following construction.

9.3.1.14 Transportation

Cumulative moderate adverse transportation impacts, such as damage and degradation of infrastructure and wear-and-tear on roadways due to increased truck traffic, occurred throughout the project area. Increased traffic congestion and reduced LOS would likely occur in the vicinity of future construction. Lower flood risk from hurricanes to the roadways in the GNO metropolitan area would be a cumulative beneficial impact on transportation.

9.3.1.15 Socioeconomic Resources and Environmental Justice

All citizens within the project area, regardless of race, income level, or age, experience short-term impacts associated with heightened noise levels, increased traffic, damaged roads, and air emissions from HSDRRS construction. Additionally, all citizens in the HSDRRS project area benefit equally from a lower risk of flooding from hurricanes. No permanent cumulative adverse impacts occurred on socioeconomic resources. Cumulatively, expenditures in the region for construction, maintenance, and future levee lifts have provided billions of dollars to the economy of the region, which is a beneficial impact. No cumulative permanent disproportionate impacts on minority or low-income communities are anticipated.

9.3.1.16 Hazardous, Toxic, and Radioactive Waste

All potential HTRW contamination was identified prior to construction activities, and avoided or remediated, as necessary; therefore, no cumulative impacts from HTRW contamination occurred.

Similar procedures would be followed for future construction. Accordingly, no adverse HTRW impacts would be anticipated. Beneficial impacts in the form of reduced risk of HTRW contamination during flooding events are also likely.

9.3.2 CUMULATIVE IMPACTS OF REGIONAL ACTIONS

Cumulative impacts were described in detail in Section 4, and as anticipated, the HSDRRS has contributed and will continue to contribute to cumulative impacts in the GNO metropolitan area and in southeast Louisiana. Table 9-5 provides a summary of the intensity of cumulative impacts of HSDRRS and other present and future regional actions.

Table 9-54: Intensity of the Cumulative Adverse Impacts of HSDRRS and Other Regional Actions on Relevant Resources

Resource	Negligible Impacts	Minor Impacts	Moderate Impacts	Major Impacts
Soils				X
Water Quality			X	
Wetlands				X
Uplands			X	
Fisheries		X		
Wildlife Resources			X	
EFH			X	
Threatened and Endangered Species	X			
Cultural Resources		X		
Recreational Resources	X			
Aesthetics	X			
Air Quality	X			
Noise	X			
Transportation			X	
Socioeconomics and Environmental Justice	X			
HTRW	X			

Other ongoing and proposed projects in southeast Louisiana may provide cumulative benefits. For example, projects such as freshwater reintroduction from the Bonnet Carré Spillway, CFDC, other CWPPRA diversion projects, and other coastal and wetland restoration projects, including HSDRRS wetlands mitigation activities, would provide long-term benefits to wildlife, fisheries, and sustainability of wetlands regionally. The following provides an overview of the cumulative impacts of HSDRRS and other present and future regional actions.

9.3.2.1 Soils

Cumulatively, past, ongoing, and future projects in the region would result in the permanent loss of biological productivity of soils as undeveloped areas are developed. All construction projects have the potential for cumulative indirect impacts on soils through erosion and stormwater runoff during construction, and in the long term as the area of impermeable surfaces increases. Major permanent cumulative impacts on prime farmland soils in the region are anticipated as borrow sites are used for flood risk reduction projects in the region, and induced development converts agricultural lands to residential and commercial development. These adverse impacts have been determined to be greater than the cumulative beneficial effects on soils that would result from the reduced risk of flooding in areas behind new flood and storm risk reduction features.

9.3.2.2 Water Quality

In general, construction impacts from all regional projects were determined to temporarily increase turbidity, BOD, water temperature, and sedimentation, and lead to potential increases in contaminants from petroleum, oil, and lubricant spills, and decreases in DO within waterways. Regional construction and redevelopment projects would have cumulative short-term adverse impacts on water quality in the region due to stormwater runoff from construction sites, dredging, and hydro-modification. In general, there would be cumulative moderate impacts on water quality in the region.

The construction of both flood damage risk reduction and environmentally beneficial projects, such as coastal restoration projects, would permanently impact the local hydrology in those specific project areas. For example, the closure of the MRGO has altered water flows and salinities regionally and caused episodic low DO events that are expected to be permanent. Water quality in the region currently is impaired because of existing commercial and industrial uses, as well as point source discharges of stormwater and wastewater from industrial sources and pump stations.

River diversion projects (through reduced salinities), in combination with reduced discharges from flooded urban areas, would likely improve water quality in the region. An increase in organic material from hydrological improvements associated with levee drainage and crossings would enhance primary productivity (e.g., microbial, plankton, and emergent vegetation) while supporting the trophic structure and stamina needed for fisheries recovery and sustainability.

9.3.2.3 Wetlands

The cumulative impact on wetlands from past, ongoing, and future projects in the region, in combination with the high rates of wetland loss in coastal Louisiana, is major, and only through mitigation measures can these impacts be reduced. Coastal and wetlands restoration and creation projects have provided some measures for combating the regional loss of wetlands, but the size of these projects has been small relative to the scale of projects that have contributed to wetland loss. Future large-scale restoration projects proposed by the State and Federal governments would cumulatively provide a major benefit to wetlands in the region but are not likely to fully offset the cumulative adverse impacts of historic flood risk reduction projects on wetland loss.

Indirect cumulative impacts include alterations to habitats and hydrology, which could result in changes to salinity and nutrient loads in local wetlands, leading to additional wetlands loss. Flood risk reduction projects and other regional projects occurring near wetlands would cause damage to adjacent wetlands vegetation (including SAV) and increase turbidity and sedimentation in the adjacent wetlands habitat and drainage canals.

Wetlands and non-jurisdictional BLH would continue to recover in the area due to various coastal and wetland restoration project techniques being employed in southeast Louisiana. Introduction of fresh, nutrient-rich, and sediment-laden water from the Mississippi River, proper operation of the gates on the IHNC and GIWW, and closure of the MRGO would be potentially beneficial to area wetlands by offsetting existing salinity stress and damage. Likewise, diversion projects, such as Violet Freshwater Diversion, would be beneficial to area wetlands. The HSDRRS and other regional flood risk reduction projects would fully compensate for their impacts on wetlands functions.

9.3.2.4 Uplands and BLH-dry

Storm damage reconstruction and redevelopment projects had negligible impacts on uplands or BLH-dry species because these area habitats have already been disturbed and altered. Even though minimal in size when compared to the regional extent of forested and grassland habitats directly and indirectly affected by previous development activities, the excavation and use of borrow material in the project area, in combination with other past, present, and future large-scale flood risk reduction and transportation construction projects, would cumulatively lead to the loss of upland habitats within southeast Louisiana. Based on historical human activities and land use trends in the area, it is reasonable to anticipate that future activities would further contribute to cumulative degradation of the land resources and, ultimately, upland habitats. In southeast Louisiana, most development occurs in the upland areas, which comprise a relatively small portion of the surface area of the region. Most of southeast Louisiana is composed of wetlands, open water, and estuarine habitats, and undeveloped and undisturbed upland areas are relatively rare. Therefore, the cumulative loss of upland area that functions as habitat for wildlife and provides forested resources is a long-term, moderate cumulative impact.

9.3.2.5 Fisheries

Direct cumulative adverse impacts on fisheries and fish habitat are associated with the actual construction activities, the associated dredge, fill, and material stockpiling activities, water body displacement, and hydrologic modifications of waterways and ecosystems. Indirect cumulative adverse impacts on fisheries and their habitats occur from alterations to fish migratory movements, active/passive transport of fish eggs and larvae, nursery habitat, recruitment of fish larvae and juveniles, water characteristics and organism access to abiotic water quality habitats (e.g., temperature, salinity, turbidity, and DO), organism access to biotic water quality habitats (e.g., protection from predators and food availability), and hydrology and water velocity.

Storm damage reconstruction and transportation projects within the HSDRRS project area are anticipated to result in insignificant cumulative impacts on fisheries or fish habitat, since most of the projects proposed are either limited to upland construction or occur in previously disturbed areas. Flood risk reduction projects often alter existing nearshore habitats and impact interior marshes by impacting the natural processes of hydrology, erosion, subsidence, and saltwater intrusion. Water flow and important fish habitats between the protected side and the flood side of levees often become further fragmented.

Flood risk reduction projects, combined with other regional coastal and marsh restoration projects, would result in fish habitat with greater heterogeneity and interspersion, and lower salinity levels. Flood risk reduction projects would also provide beneficial impacts on fish habitat through the reduction of storm surge inundation via increased hurricane protection. Future regional projects also provide opportunities for dredged material from the access channels to be used for marsh rebuilding and, thus, fish habitat creation or nourishment.

The cumulative direct and indirect impacts from regional projects that result in the temporary degradation of water quality, or the permanent loss of wetlands that serve as quality fish habitat, combined with the current trend of water quality and habitat degradation in southeastern Louisiana, would result in cumulative minor impacts on fisheries and fish habitat regionally.

As water quality and structural habitat improve as a result of habitat restoration, and a reduction in discharge of urban flood waters from better operational procedures, fisheries production would increase. Restoration of wetlands would also lead to improved nursery habitat for important finfish. In addition, the rock used for shoreline protection and stabilization along the HSDRRS would, over time, cumulatively benefit fisheries by providing protection for juvenile and larval species and enhancing foraging potential of aquatic prey species. Providing rocky shoreline habitat to otherwise sand and mud benthic communities would expand the surface area for motile and sessile aquatic organisms to inhabit and thrive.

9.3.2.6 Wildlife

Overall, construction activities associated with the HSDRRS and other proposed regional projects would contribute to the cumulative loss of wildlife habitat and resources within the project area. BLH forests, cypress swamps, marshes, and tidal channels impacted by regional projects provide habitat for an abundance of birds, amphibians, reptiles, and shellfish. Coastal wetlands, marshes, and forests provide permanent habitat or indirectly serve as breeding and rearing refugia for wildlife. Cumulative impacts from construction activity and conversion of natural habitats to developed areas would be moderate and cause habitat fragmentation, altered hydrology, and degraded habitat quality.

9.3.2.7 Essential Fish Habitat

Regional projects would contribute to cumulative loss of EFH in the project area. Regional projects would adversely impact EFH by causing direct habitat loss through the filling of waterways and marshes and the dredging of water bottoms.
Indirect cumulative impacts include alterations of habitats and hydrology, which could result in changes in salinity and nutrient loads, leading to further degradation of EFH. Past, present, and future flood risk reduction projects and other regional projects occurring near EFH would cause damage to EFH (including SAV) and adjacent wetlands vegetation, disturb fisheries and sediments, and increase turbidity and sedimentation in the adjacent aquatic habitat and drainage canals.

Risk reduction projects directly alter existing shoreline habitat and hydrologically impact marshes by affecting the natural processes of erosion, subsidence, and saltwater intrusion. The historic construction of flood risk reduction projects in southeast Louisiana is responsible for limiting water flow between the protected side of the levee and the flood side of the levee, altering fresh water and sediment input into estuaries, and contributing to wetland fragmentation and loss. Future flood and storm risk reduction projects cumulatively add to these impacts on EFH. Large-scale coastal and wetlands restoration projects are anticipated to restore these habitats in the future, and will offset some of these historic losses of EFH. However, the cumulative impacts of regional construction activities on EFH are moderate.

Modification of local drainage systems through fresh water reintroduction from the Bonnet Carré Spillway would likely improve water quality in the region, and thereby increase productivity of fisheries as wetlands recover. An increase in organic material from hydrological improvements associated with levee drainage and crossings would enhance primary productivity (e.g., microbial, plankton, and emergent vegetation) and support the trophic structure and stamina needed for fisheries recovery and sustainability.

9.3.2.8 Threatened & Endangered Species

Regional construction activities would contribute to adverse modification of Gulf sturgeon critical habitat that occurs in the Lake Pontchartrain and Lake Borgne area. These modifications would create permanent adverse impacts on Gulf Sturgeon habitat regionally; however, through ESA protection of the Gulf Sturgeon and designated critical habitat, and subsequent consultations with NMFS for adverse effects, these impacts would be minimized. The cumulative impacts of regional construction activities on other threatened and endangered species would be negligible since most construction activities in southeast Louisiana occur in habitats not used by listed species.

Other projects proposed in southeastern Louisiana would potentially lessen impacts from implementation of the HSDRRS, including projects such as fresh water reintroduction from the Bonnet Carré Spillway, CFDC, and other CWPPRA diversion projects, as well as other coastal and wetlands restoration projects. Projects such as these would provide cumulative long-term beneficial impacts on threatened and endangered species. Some of these projects in southeastern Louisiana would include restoration projects, such as the Bayou Bienvenue Restoration, which would create numerous acres of marsh and swamp through the placement of dredged sediments from the Mississippi River. Other proposed projects, such as shoreline protection projects, would positively impact Lake Pontchartrain and Breton Sound, resulting in lower salinity marshes with greater heterogeneity and interspersion. Enhancement of habitat through wetlands and coastal restoration projects would provide long-term benefits to the area and would be beneficial to threatened and endangered species.

9.3.2.9 Cultural Resources

While many cultural resource surveys have been conducted within the project APE, future and concurrent regional projects still have the potential to adversely affect cultural resources by the destruction of all or part of eligible archaeological sites, modification of historic structures, or alteration of the viewshed of historic districts. However, for Federal and State projects, if any unrecorded cultural resources that are potentially eligible for listing on the NRHP are located within a project's boundaries, then no work would proceed in the area containing these cultural resources until the SHPO has been notified. Other current and future regional projects completed by private entities could potentially have direct and indirect cumulative adverse impacts on cultural resources. Therefore, the cumulative regional construction impacts would be minor.

9.3.2.10 Recreational Resources

Recreational resources would experience temporary cumulative adverse impacts due to the HSDRRS and other ongoing and future regional projects during construction activities. Where construction projects cross recreational areas, temporary closures of access can occur. Some green space and other recreational areas may be permanently lost or impacted, but cumulatively, improvements offered through these regional projects would provide beneficial effects on recreational resources in the HSDRRS area. Cumulative adverse impacts on recreational resources in southeast Louisiana would be negligible.

9.3.2.11 Aesthetics

Cumulative long-term impacts on visual resources are still evident from Hurricanes Katrina and Rita in the area, and include degraded, damaged, or destroyed homes, facilities, and recreational parks in the area. In general, all regional projects would have short-term moderate construction impacts on visual resources. Most storm damage and redevelopment projects in the region would have beneficial cumulative impacts on visual quality after the construction phase. Flood risk reduction and coastal restoration projects would beneficially impact aesthetic resources and the overall visual viewsheds within the project area, as the risk for storm damage and flooding would be reduced and marshes are created or restored. New and restored infrastructure redevelopment projects would also benefit the aesthetic resources in the project area by upgrading aging or failing infrastructure, which often contributes to a blighted visual quality within an area.

HSDRRS construction and the use of borrow sites have contributed to the permanent cumulative impacts on visual resources. Aesthetically enhanced floodwalls have been used in some locations, which minimize the adverse degradation of the visual quality of HSDRRS structures, reducing the cumulative impacts on aesthetics.

9.3.2.12 Air Quality

Air emissions were determined to have negligible or no cumulative permanent adverse impacts within the region. For all regional projects, including rebuilding and new construction, air emissions would be temporary and would only last during the time period required for completion of construction activities, and return to pre-construction conditions once complete. No long-term adverse impacts on air quality would occur from regional construction projects.

9.3.2.13 Noise

Noise emissions were determined to have negligible cumulative permanent adverse impacts within the region. For all project types, noise impacts would only occur during construction activities and would cause localized and, in some cases, major temporary impacts. While flood risk reduction, infrastructure, and transportation projects would likely expose local residents to elevated noise levels during relatively short construction periods, the variety and distribution of projects across the region make it unlikely that these projects would contribute to adverse cumulative noise emissions.

9.3.2.14 Transportation

Regional construction projects would contribute directly and indirectly to cumulative impacts on transportation in the project area through increased traffic, damage and degradation of infrastructure, and roadway wear and tear due to increased truck traffic. The lower flood risk to the GNO metropolitan area upon completion of the HSDRRS could cause additional economic and population growth in the region, and thus, could increase the demand for transportation resources, which could lead to cumulative indirect long-term moderate impacts. However, there would also be long-term beneficial impacts on transportation resources from the HSDRRS construction due to the potential to save millions of dollars in repair costs for transportation infrastructure that could otherwise be damaged by flooding.

9.3.2.15 Socioeconomics and Environmental Justice

Most adverse impacts on businesses and industries and related employment, housing, and any disproportionate impacts on minority and low-income communities within the HSDRRS project area were temporary during construction activities. These construction-related impacts occurred due to general traffic congestion, road and highway closures, noise, and closures of navigation channels. Temporary direct adverse impacts on low-income and minority populations were minor within the HSDRRS; however, indirect impacts from temporary construction-related activities contributed to an increase in noise and air emissions and nearby traffic congestion during project construction. Additional value would accrue for various purposes, ranging from industrial, commercial, residential, institutional, and public, immediately adjacent to the developments throughout the HSDRRS region. The HSDRRS projects would also contribute to and benefit community and regional growth and recovery (e.g., reduced risk of property flooding).

9.3.2.16 Hazardous, Toxic, and Radioactive Waste

Cumulatively, all construction projects, including ecosystem restoration, infrastructure improvements, rebuilding and reconstruction, have the risk of exposing unknown contaminated materials or spilling of potential contaminants during activities such as refueling. All Federal and State projects evaluate the potential for HTRW risks at construction sites prior to the start of construction, minimizing the likelihood for encountering contaminated areas. Construction BMPs are employed to minimize the risk of spills, and to be proactive in the event of an accidental spill. Further, the construction of the HSDRRS and other flood damage risk reduction projects would reduce the risk of additional catastrophic flood events regionally and the related risk of release of HTRW. HTRW was determined to have negligible cumulative permanent adverse impacts within the region.

9.4 CONCLUSION

The devastation to the GNO metropolitan area and the gulf coast from Hurricanes Katrina and Rita created one of the most expensive natural disasters in U.S. history. The HSDRRS is the USACE's largest civil works project to date and it provides the level of risk reduction necessary for public confidence of residents of southeast Louisiana and has encouraged rebuilding and reconstruction in storm and flood damaged areas. The CED incorporates information from NEPA Alternative Arrangement documents, and from construction activities in the New Orleans metropolitan area.

The public was engaged throughout the planning process, including 200 public meetings, scoping meetings, and workshops, and over 6,500 field trips to view various features of the HSDRRS during planning and construction. The CEMVN created a website, www.nolaenvironmental.com, to make all information generated during the planning and construction phase readily available to the public. This included providing the opportunity to review and comment on every IER, Supplements and EAs prepared in support of the HSDRRS.

The construction of the HSDRRS had short-term impacts on both the human and natural environment in the project area. On a local scale or for individuals near construction sites, many of the temporary short-term and localized impacts, such as noise emissions, impacts on recreation resources and aesthetics, and air emissions (e.g., fugitive dust), were major. However, on a sub-basin, parish and regional basis, these impacts were temporary and short term, only occurring during the length of the construction period, and negligible or minor in intensity.

For some resources, where the construction activities altered the physical condition of relatively undisturbed areas, the impacts were of greater intensity and were permanent. To reduce these impacts, mitigation measures were implemented to the greatest extent possible. Since the HSDRRS was predominantly constructed within a highly urbanized environment, it did not directly impact resources beyond the physical boundaries of the constructed features and the excavated borrow sites. Compared to other regional and historic flood control projects and navigation projects that preceded HSDRRS, and modified and confined the Mississippi River and its tributaries, affecting its ability to flood coastal marshes and estuaries with sediment-rich fresh water, the HSDRRS impacts on wetlands, water quality, and fisheries are relatively minor.

Adverse impacts on southeast Louisiana from the 2005 hurricane season were great, and discussion of economic losses and social disruption cannot fully explain the change in the community. It is clear that southeast Louisiana suffered terrible losses but is recovering from the devastation experienced in 2005. Since the start of the HSDRRS, the CEMVN engaged the public through hundreds of meetings for input regarding the design the 100-year level of risk reduction project components. To the extent practicable, CEMVN minimized impacts on residents, businesses, transportation, and sensitive biological resources during design and implementation. CEMVN regularly provided the public with updates on construction progress. The CEMVN described the project actions in various IERs and in the CED and evaluated impacts on the natural and human environment. Through the planning, design, and construction phases, the CEMVN developed mitigation processes to compensate for short-term and permanent impacts on the human and natural environment, such as systematic avoidance of wetlands at borrow sites, requiring mitigation bank credit purchase for non-jurisdictional BLH impacts at contractor-furnished borrow sites, and implementing a Mitigation Program to address wetland and BLH-dry compensatory mitigation needs. Further, because more borrow sites were evaluated in the IERs than were used for the excavation of borrow material, impacts on soils (including prime farmland soils), BLH-dry, and transportation were less than originally described. For other resources, such as air quality and noise, the longer construction period beyond the anticipated 2011 date increased the duration of these impacts; however, given their temporary nature, those impacts were determined to be negligible or minor. Throughout this process, the CEMVN has sought to provide the level of risk reduction desired by the community and minimized permanent losses of relevant resources that are valued in the region and throughout the U.S.

SECTION 10

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SECTION 11

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