Mississippi River Valley Division,
Regional Planning and Environment Division South

Amite River and Tributaries East of the Mississippi River, Louisiana

Draft Integrated Feasibility Study with Environmental Impact Statement

November 2019

Cover Page

DRAFT INTEGRATED FEASIBILITY STUDY WITH ENVIRONMENTAL IMPACT STATEMENT

of the

Measures of Reducing the Flood Risk to Residents, Businesses, and Critical Infrastructure Within the Amite River Basin.

Counties/Parishes:	Amite, Lincoln, Franklin, and Wilkinson Mississippi Counties East Feliciana, St. Helena, East Baton Rouge, Livingston, Iberville, St. James, St. John the Baptist, and Ascension Louisiana Parishes
Lead Agency:	U.S. Army Corps of Engineers, New Orleans District
Cooperating Agencies:	U.S. Fish and Wildlife Service U.S. Environmental Protection Agency U.S. Geological Survey U.S. Department of Agriculture-National Resource Conservation Agency

For Further Information Contact the POC below before January 13, 2020:

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Abstract: This draft integrated feasibility report and environmental impact statement documents the analysis of proposed actions related to the feasibility of flood risk reduction measures within the Amite River Basin and tributaries. Alternatives, including the proposed tentatively-selected plan and the No Action Alternatives, are discussed.

Executive Summary

The U.S. Army Corps of Engineers (USACE), Mississippi River Valley Division, Regional Planning and Environment Division South (RPEDS), prepared this Draft Integrated Feasibility Report (IFR) and Environmental Impact Statement (DEIS) for the Amite River and Tributaries East of the Mississippi River, Louisiana (ART). The non-Federal sponsor is the Louisiana Department of Transportation and Development. This supplemental feasibility study, funded through the Bipartisan Budget Act of 2018, is 100 percent federally funded up to $3,000,000. A Feasibility Cost Sharing Agreement was executed on October 3, 2018. The report and the Tentatively Selected Plan (TSP) reflect sponsor, agency, stakeholders, and public input. It presents solutions to reduce damages from flood risk in the Amite River Basin (ARB). The NFS is in support of the tentatively selected plan with the inclusion of optimization for additional flood events.

This DEIS documents a Federal interest in implementation of structural and nonstructural measures. This supplemental study was conducted in response to the Bipartisan Budget Act of 2018, H. R. 1892—13, Title IV, Corps of Engineers—Civil, Department of the Army, Investigations, where funds are being made available for the expenses related to the completion, or initiation and completion, of flood and storm damage reduction, including shore protection studies, which are currently authorized or which are authorized after the date of enactment of this the act, to reduce risk from future floods and hurricanes. The study is based on the August 2016 flooding over southeast and south-central Louisiana, and is a continuing investigation under the authorization provided by the Resolution of the Committee on Public Works of the United States Senate, adopted on April 14, 1967.

Study Area - The study area is the ARB and its tributaries. The ARB begins in southwest Mississippi and flows southward, crossing the state line into southeastern Louisiana. The ARB includes 2,200 square miles flowing into the Amite River and its tributaries. It includes portions of Amite, Lincoln, Franklin, and Wilkinson Counties in Mississippi as well as East Feliciana, St. Helena, East Baton Rouge, Livingston, Iberville, St. James, St. John the Baptist, and Ascension Parishes in Louisiana. The study area is similar to the 1984 Amite Rivers and Tributaries Flood Control Initial Evaluation Study by USACE; however, it has been expanded to include areas that are impacted by backwater flooding to the southeast and east because they are hydraulically connected to the ARB and its tributaries.

No significant flood risks associated with the ARB and its tributaries were identified within Mississippi. The Mississippi Soil and Water Conservation Commission preliminary confirmed on November 19, 2018, that there are “no major flood risk problems in Mississippi from the ARB but may be some minor ones associated with bank carving/sloughing from periodic heavy rains.” Therefore, the project area is limited to the study area located within Louisiana and modeling and development of alternatives was focused on Louisiana.

Problem - The primary problem identified in the study area is the risk of flood damages from the Amite River and its tributaries to industrial, commercial, and agricultural facilities and

residential and nonresidential structures. Critical infrastructure throughout the region is also at risk of flood damages, including the I-10 and I-12 transportation corridors, government facilities, and schools. This critical infrastructure is expected to have increased risk of damaging rainfall events.

Planning Objectives/Constraints - The primary goal is to develop alternatives to reduce the severity of flood risk and damages and risk to human life along the ART to residents, businesses, and critical infrastructure. The federal objective of water and related land resources project planning is to contribute to National Economic Development (NED) consistent with protecting the Nation's environment, pursuant to national environmental statutes, applicable executive orders, and other federal planning requirements. Planning objectives represent desired positive changes to future conditions. All of the objectives focus on alternatives within the study area and within the 50-year period of analysis from 2026 to 2076. The planning objectives are:

- Reduce risk to human life from flooding;
- Reduce flood damages in the ARB to industrial, commercial, and agricultural facilities and to residential and nonresidential structures;
- Reduce interruption to the nation's transportation corridors, particularly the I-10/I-12 infrastructure;
- Reduce risk to critical infrastructure (e.g. medical centers, schools, transportation etc.).

A planning constraint is a restriction that limits plan formulation or that formulation must work around. It is a statement of things the alternative plans must avoid. One planning constraint was identified in this study:

- Avoid induced development, to the maximum extent practicable, which contributes to increased life safety risk.

Additionally, several planning considerations were identified for plan formulation that would not require the removal of an alternative plan, but were assessed as part of the plan formulation process:

- Avoid or minimize negative impacts to:
  - threatened and endangered species and protected species;
  - critical habitat, e.g., threatened and endangered species (T&E);
  - water quality;
  - cultural, historic, and Tribal resources;
  - recreation use in the ARB.
- Recognition/awareness that reaches of the Amite and Comite Rivers are Scenic Rivers, which may require legislative changes in order to implement alternatives.
- Consistency with local floodplain management plans by not inducing flooding in other areas.

Alternatives Considered - The planning process went through several iterations and evaluated management measures and subsequently alternatives ranging from a large regional scale (i.e. across the study area) to a smaller localized scale (i.e. at the community level). A nonstructural assessment was also completed that looked at the effectiveness of implementing measures such as structure elevations or floodproofing, as well as management measures such as flood warning systems.

The ARB primarily has flooding from two different sources. The upper basin flooding is caused from headwater flooding from rainfall events. The lower basin flooding is caused by a combination of drainage from headwaters and backwater flooding from tides and wind setup.

Thirty-four nonstructural and structural management measures of a variety of scales were identified for evaluation to reduce the risk of flood damages within the ARB. The range of management measures was refined to 19 based on preliminary analyses of effectiveness, efficiency, acceptability, and completeness. The initial array of alternatives were identified using one or more of the 19 management measures that were carried forward after the screening evaluation. Fifteen alternatives were assembled for the initial array of alternatives through the plan formulation process, which include alternatives for No Action and Nonstructural. Two additional alternatives were identified through public scoping.

Most alternatives assessed had very little reduction in flood risk and limited benefits. Topographic relief features in the geomorphology of the ARB have significant influence over flooding in the upper and lower basins. In the upper basin, water flows to the south and in the central/lower basin, the geomorphology is very flat, which limited the effectiveness of alternatives. Additionally, many of the alternatives were located where there were not many structures, so there were limited benefits. The parishes in the study area have a combined population of about 900,000 with more than half of the population living in East Baton Rouge Parish. The study area has over 260,000 structures and of those, about 80 percent are in the central portion of the ARB, north of Bayou Manchac. Many of the alternatives were located where there were not many structures, so there were limited benefits. The remaining alternatives, that were not screened, were those that provided storage of water to attenuate flooding downstream in heavily developed areas. Those alternatives are the focused array of alternatives.

An economic analysis of the focused array of alternatives was performed (Table ES-1) based on the Hydraulics and Hydrology (H&H) model outputs and the economics functions. Water surface profiles were provided for eight annual exceedance probability (AEP) events: 0.50 (2-year), 0.20 (5-year), 0.10 (10-year), 0.04 (25-year), 0.02 (50-year), 0.01 (100-year), 0.005 (200-year), and 0.002 percent (500-year). Annualized costs and benefits were calculated and the Benefit Cost Ratio (BCR) was estimated for each alternative. Each of the alternatives should have benefits long into the future but guidance limits it to the 50-year period of analysis from 2026 to 2076. The economic analysis yielded several alternatives that are in the Federal interest and from which a TSP can be identified. Three alternatives were screened due to negative net benefits: the nonstructural plan for a 0.02 AEP floodplain, large scale 0.04 AEP wet Darlington Dam, and the three 0.01 AEP dry dams on the Darlington, Lilley, and Bluff

Creeks. The remaining alternatives are presented in Table ES-2 as the final array of alternatives, which were further evaluated to identify the TSP.

Table ES-1. Summary of Costs and Benefits for Focused Array of Alternatives

Alternative	Non-structural 0.04 AEP	Non-structural 0.02 AEP	Darlington 0.04 AEP Wet Dam	Darlington 0.04 AEP Dry Dam	Sandy Creek Dry Dam 0.01 AEP	3 Tributary Dry Dams 0.01 AEP
Total Project Costs						
First Cost	$1,335,282	$2,160,836	$1,788,531	$1,278,523	$270,977	$349,981
Interest During Construction	$4,536	$7,34	$100,590	$71,907	$7,477	$9,658
Total Investment Cost	$1,339,818	$2,168,176	$1,889,121	$1,350,430	$278,455	$359,638
Estimated Annual Costs						
Annualized Project Costs	$49,628	$80,311	$69,975	$50,021	$10,314	$13,321
Annual OMRR&R	$0	$0	$658	$439	$220	$659
Total Annual Costs	$49,628	$80,311	$70,633	$50,461	$10,534	$13,980
Average Annual Benefits						
Total Annual Benefits	$53,547	$63,542	$65,066	$65,066	$13,649	$6,131
Net Annual Benefits	$3,919	-$16,769	-$5,567	$14,605	$3,115	-$7,849
Benefit to Cost Ratio	1.08	0.79	0.92	1.29	1.30	0.44

FY19 Price Level, $ 1,000s

Table ES-2. Final Array of Alternatives
Alternative
No Action
Dry Dam along tributary: Sandy Creek Dry Dam 0.01 AEP
Large scale dam: Darlington Dry Dam 0.04 AEP
Nonstructural: 0.04 AEP Floodplain (NS-1 and NS-2)

Based on the economic analysis of the focused array (Table ES-3), the NED plan is the Darlington Dry Dam. The flood risk that remains in the floodplain after the proposed alternative is implemented is known as the residual flood risk. Nonstructural measures can be used to reduce the residual risk associated with the TSP. The residential and nonresidential structures damaged under the with-project conditions in year 2026 that incurred flood damages by the stage associated with the 0.04 AEP event, were considered eligible for acquisition, elevation, and floodproofing.

A preliminary analysis found a total of 3,252 residential structures and an additional 314 non-residential structures in the 0.04 AEP floodplain. The nonstructural measures will be refined by assessing the Darlington Dam as the new base condition for the hydrology, which will include assessment of residual flood risk. Table ES-3 shows the expected annual net benefits for the TSP of Darlington Dry Dam with elevation and floodproofing in the 0.04 AEP floodplain to address residual risk. As plans are refined, the costs and benefits of acquisitions within the floodplain will be developed and addressed in the Final IFR and EIS.

Table ES-3 Summary of Costs and Benefits of the Tentatively Selected Plan	
Darlington Dry Dam with 0.04 AEP Nonstructural Measures Total Expected Annual Net Benefits (FY19, $1,000's, 2.75% Discount Rate)	
Item	**Expected Annual Benefits and Costs**
Damage Category	
Structure, Contents, Vehicles, and Debris Removal	$109,066
Total Benefits	$109,066

Structural First Costs	$1,278,524
Nonstructural First Costs*	$1,024,198
Total First Costs	$2,302,722
Interest During Construction	$78,887
Annual Operation & Maintenance Costs	$439
Total Annual Costs	$90,817
*Not including acquisitions	
B/C Ratio	1.20
Expected Annual Net Benefits	$18,249

TSP/NED Plan - Per USACE Guidance, the TSP for flood risk management projects should be the plan that maximizes net benefits, which is also called the NED Plan. In order to determine which alternative is the NED Plan, the costs and benefits for the Focused Array of Alternatives are compared. The alternative with the greatest net benefits is the apparent NED Plan, and thus the TSP.

The TSP identified from the final array is the Dry Darlington Dam combined with nonstructural measures.

The Dry Darlington Dam is an earth embankment dam consisting of a clay core with a random fill outer layer. The constructed dam has a footprint of approximately 205 acres and a flood pool of approximately 12,600 acres, located north of the dam between St. Helena and East Feliciana Parishes. The outlet would consist of three 10x10 feet concrete box culverts with sluice gates that would be closed to prevent flow and allow for water to pool behind the dam prior to release. An emergency spillway would be placed at the flood control pool max elevation. Approximately 1,000 acres of suitable borrow material would be required for construction of the dam, consisting of approximately 10,710,000 cubic yards of random fill and 856,000 cubic yards of clay fill. The Dry Darlington Dam scale will be optimized during the feasibility study design. Final determination for abutment requirements, control tower, sedimentation basin, diversion channel dimensions, outlet channel dimensions to existing Amite River, and spillway location and size (currently evaluating different sizes in an effort of optimization) will need to be determined, along with the staging area(s) for construction. Access road paving and/or surfacing including the crest of the dam and shops needed to maintain the dam will also need to be determined. The evaluation of potential borrow sites and staging areas will also consider environmental impacts and will identify compensatory mitigation requirements for unavoidable impacts.

The nonstructural measures include physical and nonphysical elements. The nonphysical nonstructural measures are to reduce incremental risk with the Darlington Dam in place. An Emergency Action Plan and flood warning system, for the dam and downstream flows, will be established for future with project. Also, each parish impacted by the Darlington Dam will need

to revise and/or develop their Floodplain Management Plans to include emergency response, preparedness and recovery actions necessary to manage existing and future risks. The Floodplain Management Plans are a responsibility of local governments.

The physical nonstructural measures of the TSP may include acquisitions with relocation assistance to displaced persons, elevations of residential structures, and floodproofing of non-residential structures. The nonstructural plan will be refined by assessing the Darlington Dam as the new base condition for the hydrology which will likely include structures in geographical regions that are not getting direct benefits from the Darlington Dam such as the Lower Reach of the ARB.

Timeline - This Draft IFR and EIS is available for public review beginning November 29, 2019. The official closing date for the receipt of comments is January 13, 2020 which is 45 days from the date on which the notice of availability of this Draft IFR and EIS appears in the Federal Register during this review period. Comments may be mailed to the address listed below. Comments may also be emailed to the email address listed below.

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CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICIES

Section 1
Introduction

The U.S. Army Corps of Engineers (USACE), Mississippi River Valley Division, Regional Planning and Environment Division South (RPEDS), has prepared this Draft Integrated Feasibility Report (IFR) and Environmental Impact Statement (DEIS) for the Amite River and Tributaries East of the Mississippi River, Louisiana (ART). It includes input from non-Federal sponsors, agencies, and the public.

1.1 STUDY SCOPE

The ART DEIS is an interim response to the study authority to investigate and determine the extent of Federal interest in plans that reduce flood risk along the Amite River Basin (ARB). The effect of flooding from the Amite River and its tributaries was studied, but localized flooding in adjacent communities was not studied. The study investigated alternatives for flood risk management (FRM) and identified and evaluated a full range of reasonable alternatives including the No Action Alternative. The results of the study are presented in this decision document, which is an integrated Feasibility Report and National Environmental Policy Act of 1969 (NEPA) Environmental Impact Statement (EIS) document, in accordance with the USACE's Planning Guidance Notebook, Engineer Regulation (ER) 1105-2-100.

1.2 STUDY AUTHORITY

The proposed action is authorized as part of the Bipartisan Budget Act of 2018, H. R. 1892—13, Title IV, Corps of Engineers—Civil, Department of the Army, Investigations, where funds for are being made available for the expenses related to the completion, or initiation and completion, of flood and storm damage reduction, including shore protection studies, which are currently authorized or which are authorized after the date of enactment of this the act, to reduce risk from future floods and hurricanes. The funds are at full Federal expense and funds made available for high-priority studies of projects in states and insular areas with more than one flood related major disaster declared pursuant to the Robert T. Stafford Disaster Relief and Emergency Assistance Act (42 U.S. Code [U.S.C.] 5121 et seq.) in calendar years 2014, 2015, 2016, or 2017.

The ART study area is included based on the August 2016 flooding over southeast and south-central Louisiana, and is continuing investigation under the authorization provided by the Resolution of the Committee on Public Works of the United States Senate, adopted on April 14, 1967.

> "RESOLVED BY THE COMMITTEE ON PUBLIC WORKS OF THE UNITED STATES SENATE, That the Board of Engineers for Rivers and Harbors,

created under Section 3 of the River and Harbor Act approved June 13, 1902, be, and is hereby requested to review the report of the chief of Engineers on Amite River and Tributaries, Louisiana, published as House Document Numbered 419, Eighty-fourth Congress. And other pertinent reports, with a view to determining whether the existing project should be modified in any way at this time with particular reference to additional improvements for flood control and related purposes on Amite River, Bayou Manchac, and Comite River and their tributaries." Committee on Public Works, 1967."

1.3 NON-FEDERAL SPONSOR

The non-Federal sponsor (NFS) is the Louisiana Department of Transportation and Development (LADOTD). This supplemental feasibility study, funded through the Bipartisan Budget Act of 2018, is 100 percent federally funded up to $3,000,000. A Feasibility Cost Sharing Agreement was executed on October 3, 2018.

1.4 STUDY AREA AND MAP

The study area is the ARB and its tributaries. The ARB begins in southwest Mississippi and flows southward, crossing the state line into southeastern Louisiana. The ARB includes 2,200 square miles flowing into the Amite River and its tributaries (Figure 1-1). It includes portions of Amite, Lincoln, Franklin, and Wilkinson Counties in Mississippi as well as East Feliciana, St. Helena, East Baton Rouge, Livingston, Iberville, St. James, St. John the Baptist, and Ascension Parishes in Louisiana.

The study area is similar to the 1984 Amite Rivers and Tributaries Flood Control Initial Evaluation Study by USACE; however, it has been expanded to include areas that are impacted by backwater flooding to the southeast and east because they are hydraulically connected to the ARB and its tributaries. No significant flood risks associated with the ARB and its tributaries were identified within Mississippi. The Mississippi Soil and Water Conservation Commission preliminary confirmed on November 19, 2018 that there are "no major flood risk problems in Mississippi from the ARB but may be some minor ones associated with bank carving/sloughing from periodic heavy rains." Therefore, the project area is limited to the study area located within Louisiana and modeling and development of alternatives was focused on Louisiana.

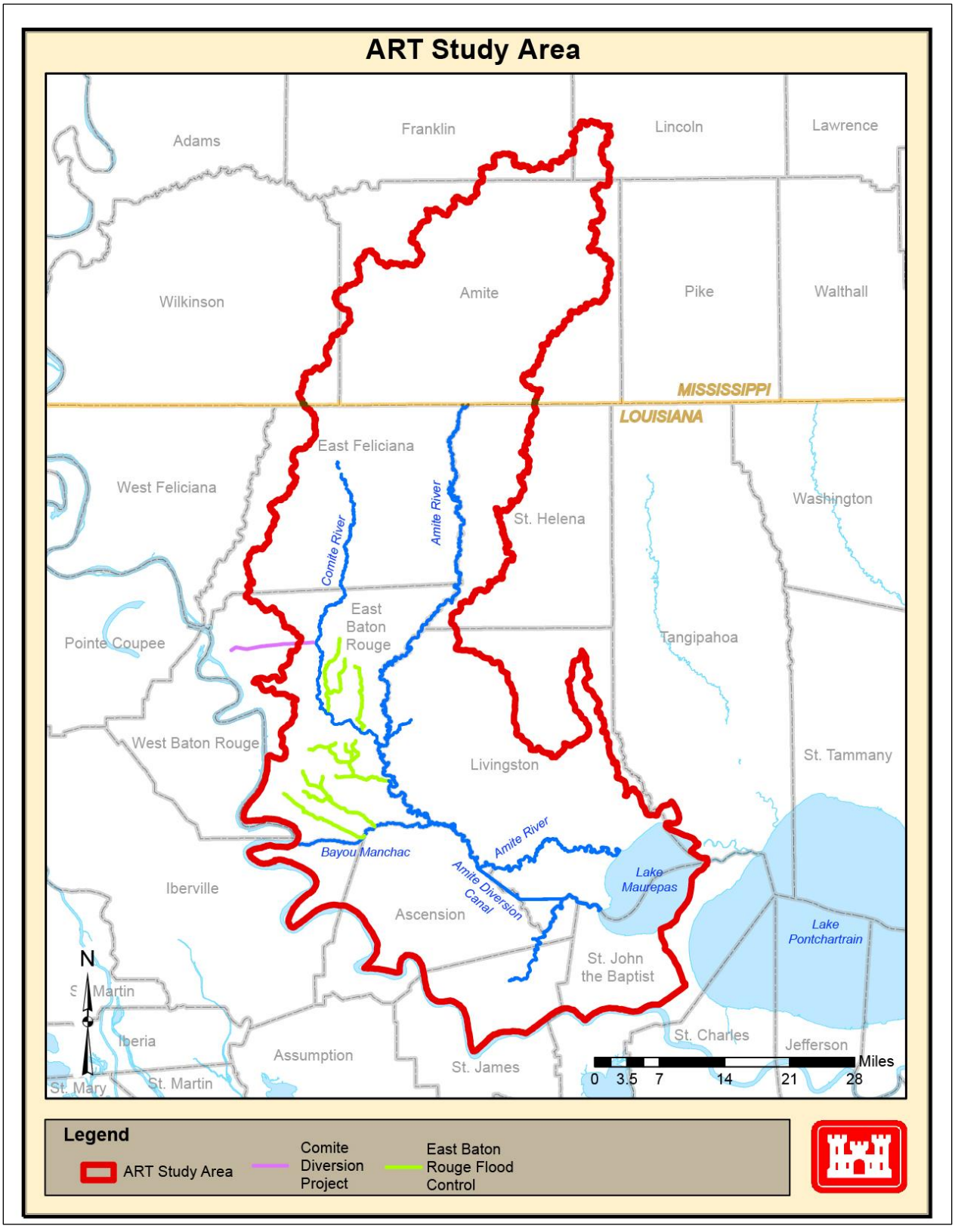

Figure 1-1. ART Study Area

1.5 PRIOR REPORTS, EXISTING WATER PROJECTS, AND ONGOING PROGRAMS

A number of prior reports and studies by USACE as well as other agencies were reviewed and utilized in writing this report. Information from the documents in Table 1-1a was deemed the most significant to problem identification and plan formulation.

There is one existing FRM USACE constructed project in the study area that was authorized on August 9, 1955 (construction was completed in 1964). Pursuant to the 1955 authorization, the NFSs for that project are responsible for its operation and maintenance (O&M). The 1955 authorization states:

> "Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That improvements in the interest of flood control and drainage be undertaken in the Amite River, Bayou Manchac and the Comite River, such work to be prosecuted under the direction of the Secretary of the Army and the supervision of the Chief of Engineers, substantially in accordance with a survey report entitled "Survey Report of Amite River and Tributaries La.," of the district engineer, Corps of Engineers, New Orleans District, dated June 8, 1955, approved by the division engineer, Corps of Engineers, Lower Mississippi Valley Division, and submitted to the Board of Engineers for Rivers and Harbors on July 5, 1955 at an estimated first cost to the United States of $3,008,000: Provided, That local interest comply with the provisions in the district engineer's recommendations, including the contribution of 24.7 per centum of actual cost in cash or equivalent work as approved by the Chief of Engineers, for Comite River, presently estimated at $67,000." House of Representatives, 1956.

The 1955 authorized constructed features include the following:

- Bayou Manchac-Clearing and snagging on bayou from the mouth to below Ward Creek at mile 7.81
- Comite River-Channel enlargement and realignment on Comite River from its mouth to Cypress Bayou at mile 10
- Blind River-Intermittent Clearing/snagging on Blind River below Lake Maurepas
- Amite River-Enlargement/realignment between Bayou Manchac (mile 35.75) to control weir at (mile 25.3); intermittent clearing/snagging from mouth Comite(mile 54) to Bayou Manchac (mile 35.75)
- Amite Diversion Channel-Construct weir and diversion 19 miles long from mile 25.3 on the Amite to mile 4.8 on the Blind River. Weir orginal design 1,500' at sea level divided into 1,000 & 500' sections and then modified to include 5x20' boat way.

Additionally, two authorized USACE construction projects, which will impact the hydrology of the ARB when construction is completed, are located in or adjacent to the study area: Comite River Diversion and the East Baton Rouge Flood Control.

The State of Louisiana is in the process of developing a statewide, comprehensive Watershed-based Floodplain Management Program. Per the 2018 Phase 1 Investigation Report for the Louisiana Statewide Comprehensive Water Based Floodplain Management Program (LWFMP):

> "Currently, Louisiana various different jurisdictions, including city/parish planning, perform Floodplain Management activities in a largely uncoordinated fashion. Additionally, various jurisdictions, including city/parish planning and zoning departments or public works, regulate or undertake activities that affect floodplains independently, even when they affect the same watersheds. Floodplain issues are managed within political jurisdictions, often without mechanism to consider the effects on other jurisdictions or the watershed on a whole." LWFMP, 2018

Several programs provide funding to the study area for floodplain related activities, as provided in Table 1-1b. Louisiana Governor's Office of Homeland Security and Emergency Preparedness (GOSHEP) coordinates funds from grants for Hazard Mitigation Grant Program (HMGP), Flood Mitigation Assistance (FMA), Pre-Disaster Mitigation Program (PDM). Office of Community of Development (OCD) coordinates funds from the Community Development Block Grant (CDBG). Statewide support (CAPP-SSSE) funds are coordinated by the Analysis Team of LA Watershed Initiative, GOSHEP and LADOTD.

Based on communication with the GOSHEP, LADOTD, and OCD, the current programs and projects with funding that may have an impact on the hydrology of the ARB are presented in Table 1-1c. Additionally, the Louisiana Watershed Resiliency Study is currently ongoing by the Federal Emergency Management Agency (FEMA) and the state has applied to FEMA for a Housing and Urban Development grant.

Table 1-1a. Relevant Prior Reports and Studies

Year	Study/Report/Environmental Document Title	Data Source	Consistency	Structural Measures	Non-Structural Measures	FWOP Conditions
Comprehensive Planning Studies						
1980	LA Coastal Resources Program	X	X	X	X	X
1999	Coast 2050: Toward a Sustainable Coastal LA	X	X	X	X	X
2004	LA Coastal Area (LCA), LA Ecosystem Restoration Study	X	X	X	X	X
2017	Louisiana State Master Plan by Coastal Protection and Restoration Authority	X	X	X	X	X
2017	Louisiana Watershed Resiliency Study: Developed Following the March and August 2016 Floods by Federal Emergency Management Agency, Mitigation Branch, Hazard Performance Analysis Group	X	X	X	X	X
2017	Characterization of Peak Streamflows and Flood Inundation of Selected Areas in Louisiana from the August 2016 Flood by United States Geological Survey (USGS) for FEMA	X	X			X
Flood Damage Risk Reduction Projects and Reports						
1888	Preliminary Examination of Bayou Manchac, Louisiana by USACE	X				
1907	Pass Manchac, Louisiana House Doc 882, 60th Congress, 1st Session	X				
1912	Completed Pass Manchac Project by USACE via the River and Harbor Act of 6/24/1910	X				X
1927	Amite River and Bayou Manchac, Louisiana Navigation Project was authorized. (7'X60' navigation canal)	X				X
1928	USACE completes navigation channel improvements in the ARB from Denham Springs to Lake Maurepas.	X				X
1930	Amite River and Bayou Manchac, Louisiana Feasibility Report by USACE	X	X			X
1953-1967	LA DPW and East Baton Rouge improvements to Wards Creek, Clay Cut Bayou, Jacks Bayou, Bayou Duplantier and White Bayou.	X				
1955	ARB and Tributaries Flood Control Study by USACE	X	X	X	X	X
1956	USACE Chief of Engineers Report: Amite River and Tributaries	X	X	X	X	X
1964	USACE completes channel improvements to upstream portions of Amite River, and to lower portions of Comite River, Blind River, and Bayou Manchac; including construction of the Amite Rover	X	X	X	X	X

Table 1-1a. Relevant Prior Reports and Studies

Year	Study/Report/Environmental Document Title	Data Source	Consistency	Structural Measures	Non-Structural Measures	FWOP Conditions
	Diversion Canal and weir					
1971	Bayou Fountain: Floodplain Information Report for East Baton Rouge Parish by USACE	X	X			X
1972	Amite Rivers and Tributaries: Preliminary Evaluation Report by USACE	X	X			X
1972	Ward Creek and Tribes: Floodplain Information Report for East Baton Rouge Parish by USACE	X	X			X
1974	Clay Cut Bayou, Jones Creek and Tributaries: Flood plain Information Report For East Baton Rouge Parish by USACE	X	X			X
1976	Hurricane Creek, Monte Sano Bayou and Tribes: Floodplain Information Report for East Baton Rouge Parish by USACE	X	X			X
1976	Cypress Bayou and Tributaries: Floodplain Information Report for East Baton Rouge Parish by USACE	X	X	X	X	X
1979	Bayou Manchac and Amite River Louisiana Feasibility Report by USACE	X	X	X	X	X
1984	Amite Rivers and Tribes: Flood Control Initial Evaluation Study by USACE	X	X	X	X	X
1989	Amite River Flood Control Study Report for LADOTD	X	X	X		X
1990	Amite River and Tributaries, Louisiana, Comite River Basin Feasibility Study by USACE	X	X	X	X	X
1990	Land Use and Development Plan (Horizon Plan) for the City of Baton Rouge	X	X			X
1991	Comite River Final EIS by USACE	X	X			X
1991	Amite River And Tributaries Study - Feasibility Report On Comite River Basin by USACE	X	X	X	X	X
1992	Amite River and Tributaries Darlington Reservoir Feasibility Study by USACE	X	X	X	X	X
1995	Comite River Design Memorandum No. 1 by USACE	X	X	X	X	X
1995	Final Environmental Assessment (EA #222) Amite River And Tributaries Louisiana, Comite River Basin, Revision Of Diversion Channel Alignment And Other Changes by USACE	X	X			X
1995	Amite Rivers and Tributaries East Baton Rouge Flood Control	X	X	X	X	X

Table 1-1a. Relevant Prior Reports and Studies

Year	Study/Report/Environmental Document Title	Data Source	Consistency	Structural Measures	Non-Structural Measures	FWOP Conditions
	Projects by USACE					
1995	Study to Lower Stages along the Amite River (3 Low Impact Dry Dams) by C.E. Matrailer P.E. & Cecil E. Soileau P.E.	X	X	X		
1995	ARB Flood Control Program for LADOTD	X	X	X		
1996	Post Authorization Change Report for the Comite River Diversion Plan by USACE	X	X	X	X	X
1997	Livingston Parish Feasibility Study for channel improvement for Flood Control by USACE	X	X	X	X	X
1997	Darlington Reservoir Re-evaluation Study by USACE	X		X		
1998	ARBC in conjunction with USGS, LADOTD and LOEP and USACE establish a Flood Warning System for the ARB	X	X		X	X
1999	Comite River Diversion Construction Authority WRDA August 17, 1999	X				X
1999	Amite River Sand & Gravel Mine Reclamation Demonstration Project for LADOTD	X	X			
2000	Amite River and Tributaries Ecosystem Restoration Reconnaissance Study by USACE	X	X			
2002	Environmental Assessment, Lilly Bayou Control Structure, Phase 1 EA# 222-A by USACE	X	X	X	X	X
2005	City of Baton Rouge and East Baton Rouge Parish Bridge Location Index Map by City of Baton Rouge & East Baton Rouge Parish	X	X			X
2005	Frog Bayou and Alligator Bayou Comprehensive Flood Risk Reduction Plan for the Pontchartrain Levee District	X	X			X
2007	Fluvial Instability and Channel Degradation of Amite River and its Tributaries, Southwest Mississippi and Southeast Louisiana by ERDC Geotechnical and Structures Lab	X	X	X	X	X
2007	East Baton Rouge Flood Control Project Authority WRDA 2007	X				X
2011	Amite River Field Investigation and Geomorphic Assessment by ERDC Coastal & Hydraulics Laboratory	X	X		X	X
2014	West Shore Lake Pontchartrain Hurricane and Storm Damage Risk Reduction Study by USACE	X	X	X	X	X

Table 1-1a. Relevant Prior Reports and Studies

Year	Study/Report/Environmental Document Title	Data Source	Consistency	Structural Measures	Non-Structural Measures	FWOP Conditions
2015	ARB Floodplain Management Plan by Gulf Engineers and Consultants for ARB Drainage and Water Conservation District	X	X	X	X	X
2016	August 2016 Flood Preliminary Report ARB	X	X	X	X	X
2017	Hydrologic and Hydraulic Numerical Model of the ARB-Detailed Work Plan, Detailed Cost Estimate and Schedule Proposal	X	X			X
2018	West Shore Lake Pontchartrain Hurricane and Storm Damage Risk Reduction Study by USACE	X	X	X	X	X
2018	St. James/Ascension Storm Surge Flood Protection Project by The Pontchartrain Levee District	X	X	X	X	X
2018	Bayou Conway & Panama Canal Drainage Improvement Project by The Pontchartrain Levee District	X	X	X		X
2018	Laurel Ridge Levee Extension Project Ascension Parish by The Pontchartrain Levee District	X	X	X	X	X
2019	Investigation into the Potential Hydraulic Impacts of Dredging the Lower Amite River for LADOTD	X	X	X		
2019	ARB Numerical Model Project Report for LADOTD	X	X			X
2019	Investigation into the Impacts of the Darlington Reservoir Concept for LADOTD	X	X	X		X

Table 1-1b. Funding Sources for Floodplain Related Activities within the Study Area

Funding Source	Type	Grantor	Funding Range ($ Millions)
Federal Emergency Management Agency (FEMA) Public Assistance (PA)	Post disaster (Non-recurring)	Federal	Varies based on eligible recovery and mitigation scopes of work following a major presidential disaster declaration.
HMGP	Post disaster (Non-recurring)	Federal	Varies based on amount of total federal assistance
FMA	Non-disaster (recurring)	Federal	Varies based on amount appropriated annually by congress, from the NFIP
PDM	Non-disaster (recurring)	Federal	Varies based on amount appropriated annually by congress
CDBG	Post-disaster (Non-recurring)	Federal	$65 to $13,400
Gulf of Mexico Energy Security Act (GOMESA)	Recurring	Federal	$0.1 to $8 (previous) $70 predicted
Statewide Flood Control Program	Recurring	State	$10 to $20

Source: LWFMP, 2018.

Table 1-1c. Current Funded Programs/Projects within the Study Area

Program	Project Title	Parish
FMA	FMA-PJ-06-LA-2017-024	East Baton Rouge
FMA	EBR Acquisition/Demolition & Elevation	East Baton Rouge
FMA	Livingston FMA 2016 Acquisition & Elevation	Livingston Parish Council
FMA	FY 17 Flood Mitigation Assistance	Livingston Parish Council
HMGP	Livingston Parish 4263 Elevation Project	Livingston Parish Council
HMGP	St. Helena Parish Home Acquisition	St. Helena Parish
FMA	St. John the Baptist Parish Elevation Project	St. John The Baptist
HMGP	Drainage Improvements	St. John The Baptist

Section 2
Problems and Opportunities (Purpose and Need)

2.1 SPECIFIC PROBLEMS AND OPPORTUNITIES

The study area has experienced riverine flooding from excessive rainfall events, in addition to flood damages associated with hurricanes and tropical storms. Since 1851, the paths of 51 tropical events have crossed the study area. The paths and intensities of these storms are shown in Figure 2-1. The FEMA flood claims for the most recent events to impact the area are shown in Table 2-1. Table 2-2 shows the flood claims paid between 1978 and September 2018 for all counties and parishes in the study area. The table includes the number of claims, number of paid losses, and the total amount paid in the dollar value at the time of the payment. The table excludes losses that were not covered by flood insurance.

The most recent event to affect the study area was the 2016 Louisiana flood. This event brought catastrophic flooding damage to Baton Rouge and the surrounding areas with both localized flooding and riverine flooding from the Amite and Comite Rivers and their tributaries. In August 2016, the President issued disaster declarations for parishes in the ARB due to impacts from “The Great Flood of 2016.” The flood was responsible for 13 deaths http://ldh.la.gov/index.cfm/page/2553 and the rescue of at least 19,000 people https://www.army.mil/article/173589/national_guard_rescues_19000_in_flood_affected_areas. The study area experienced historic flooding to thousands of homes and businesses and impacts to the Nation's critical infrastructure because both the I-10 and I-12 transportation system were shut down for days. Major urban centers in the ARB saw significant flooding, well outside of normal flood stages.

The study will provide FRM alternatives to reduce the risks to public, commercial, and residential property, real estate, infrastructure, and human life; increase the reliability of the Nation’s transportation corridor (I-10-I-12); and enhance public education and awareness of flood risks.

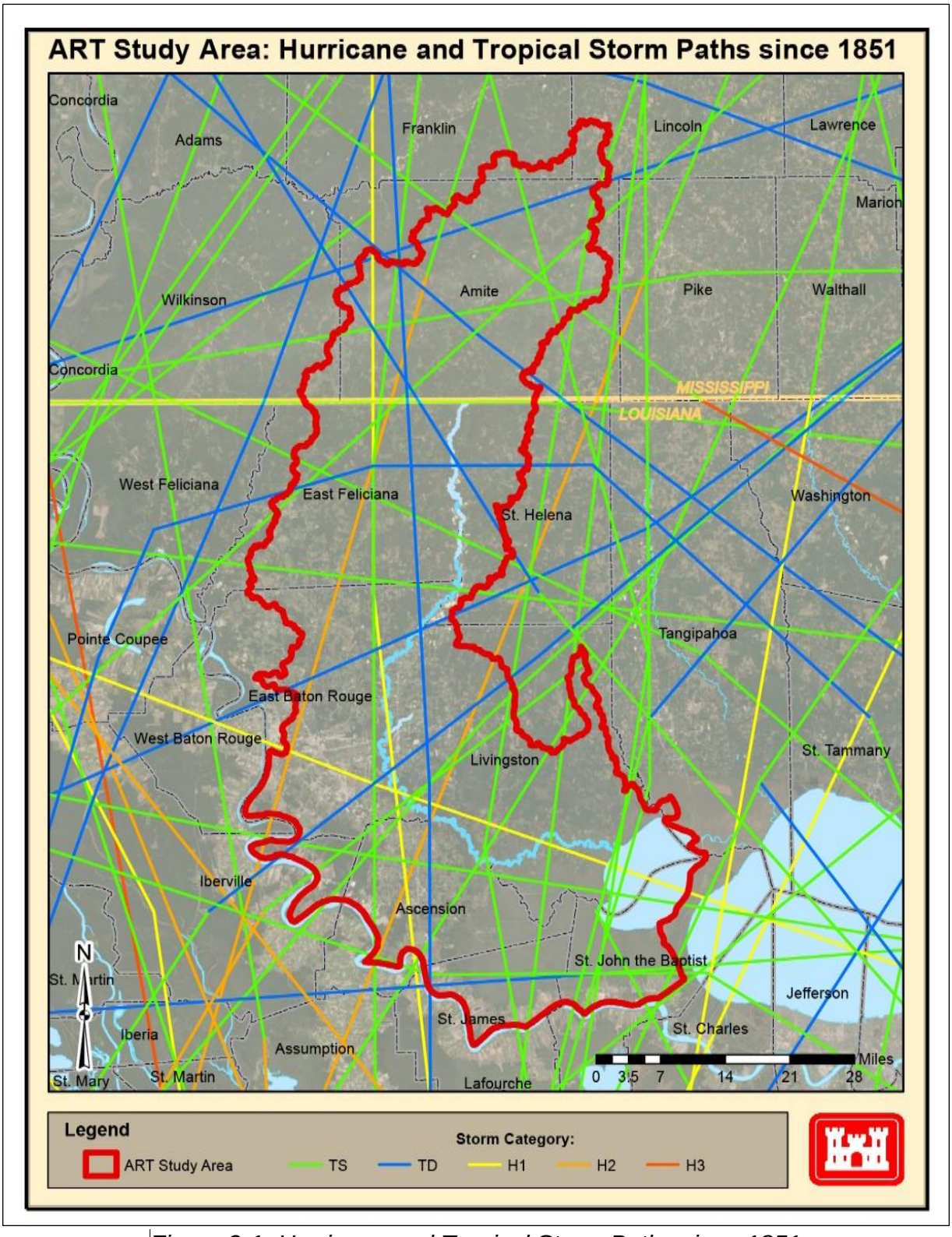

Figure 2-1. Hurricane and Tropical Storm Paths since 1851

Table 2-1.Top Tropical Storms by Amount Paid by FEMA in the Study Area

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

Source: Federal Emergency Management Agency (FEMA)

Note 1: Total amount paid is at price level at time of the event.
Note 2: Claims and amount paid are for entire event, which may include areas outside of the study area.

Table 2-2. FEMA Flood Claims in the Study Area by Parish/County from January 1978 through September 2018

Parish/County	Total Number of Claims	Number of Paid Claims	Total Payments (millions)
Ascension	6,606	5,658	$336.8
East Baton Rouge	19,926	17,139	$1,170.6
East Feliciana	83	72	$2.8
Iberville	540	453	$7.8
Livingston	14,394	12,684	$813.9
St. Helena	51	38	$2.3
St. James	249	204	$6.2
St. John the Baptist	4,942	3,996	$264.2
Amite	4	4	$0.0
Franklin	3	1	$0.0
Lincoln	23	16	$0.1
Wilkinson	1,883	1,603	$21.0
Total	48,704	41,868	$2,625.8

Source: Federal Emergency Management Agency (FEMA)

2.1.1 Problems

The primary problem identified in the study area is the risk of flood damages from the Amite River and its tributaries to industrial, commercial, and agricultural facilities and residential and nonresidential structures. Critical infrastructure throughout the regions includes the I-10 and I-12 transportation corridors, government facilities, and schools. This critical infrastructure is expected to have increased risk of damage from rainfall events.

2.1.2 Opportunities

Opportunities to address the identified problems include:

- Risk Reduction to life, land, property, and infrastructure from flooding.
- Work with local communities to manage flood risk by leveraging the following efforts:
    - Enhance public education and awareness of floodplain management;
    - Improve flood warnings for preparation and evacuation;

    - Recommend future modifications to the roadway systems to maintain emergency response vehicles access during hurricane and tropical storm events.
- Increase the resiliency of the vitally important I-10/I-12 transportation corridor
- Prevent degradation to fish and wildlife habitat by:
    - Improving water quality;
    - Increasing habitat or slowing down the trend of habitat quality reduction;
    - Encouraging best management practices for land use management.
- Afford access to recreation (boating, bike trails, camping, swimming, and sightseeing facilities)

2.1.3 Purpose and Need

Per the authority referenced in Section 1.2, the ART study's purpose is to evaluate FRM. Without the project, the ART study area would continue to experience damages from rainfall and wind/tide induced flooding. These impacts would be exacerbated in the Lower ARB because of increased risk due to flood events.

2.2 PLANNING GOAL AND OBJECTIVES

The primary goal is to develop alternatives to reduce the severity of flood risk and damages and risk to human life along the ART to residents, businesses, and critical infrastructure. The federal objective of water and related land resources project planning is to contribute to National Economic Development (NED) consistent with protecting the Nation's environment, pursuant to national environmental statutes, applicable executive orders, and other federal planning requirements. Planning objectives represent desired positive changes to future conditions. All of the objectives focus on alternatives within the study area and within the 50-year period of analysis from 2026 to 2076. The planning objectives are:

- Reduce risk to human life from flooding;
- Reduce flood damages in the ARB to industrial, commercial, and agricultural facilities and residential and nonresidential structures;
- Reduce interruption to the nation's transportation corridors, particularly the I-10/I-12 infrastructure;
- Reduce risks to critical infrastructure (e.g. medical centers, schools, transportation etc.).

2.3 PLANNING CONSTRAINTS

A planning constraint is a restriction that limits plan formulation or that formulation must work around. It is a statement of things the alternative plans avoid. One planning constraint was identified in this study:

- Avoid induced development, to the maximum extent practicable, which contributes to increased life safety risk.

Additionally, several planning considerations identified for plan formulation that would not require the removal of an alternative plan, but needs to be assessed as part of the plan formulation process:

- Avoid or minimize negative impacts to:
  - threatened and endangered species and protected species;
  - critical habitat, e.g., threatened and endangered species (T&E);
  - water quality;
  - cultural, historic, and Tribal resources;
  - recreation use in the ARB.
- Recognition/awareness that reaches of the Amite and Comite Rivers are Scenic Rivers, which may require legislative changes in order to implement alternatives.
- Consistency with local floodplain management plans by not inducing flooding in other areas.

2.4 PUBLIC SCOPING

Early NEPA coordination with the NFS, stakeholders, Federal and state agencies, and Federally-recognized Tribes (Tribes) was performed prior to the Notice of Intent (NOI) and afterwards through public meetings, social media, and the USACE New Orleans District (CEMVN) website. USACE hosted general scoping meetings within 90 days of the start of the study, per Water Resources Reform and Development Act (WRRDA) 2014. As part of the early coordination, general scoping was initiated prior to the NEPA NOI, in conformity with 40 CFR 1500-1508. A public website page with the study information and request for feedback was established in mid-December 2018.

The collaborative stakeholders associated with this study are USACE, ARB Commission (ARBC), Coastal Protection and Restoration Authority (CPRA), and the following parishes: Livingston, Ascension, St. Helena, East Feliciana, East Baton Rouge, Iberville, St. John the Baptist, and St. James. Resource agencies associated with this study include the US Fish and Wildlife Service (FWS), US Department of Agriculture (USDA) Natural Resource Conservation Service (NRCS), US Geological Survey (USGS), and the Louisiana Department of Wildlife and Fisheries (LDWF). Additionally, in partial fulfillment of USACE's responsibilities under Executive Order (EO) 13175, early NEPA coordination was initiated with the following Tribes: Alabama-Coushatta Tribe of Texas (ACTT), Chickasaw Nation, Chitimacha Tribe of Louisiana (CTL), Choctaw Nation of Oklahoma (CNO), Coushatta Tribe of Louisiana (CT), Jena Band of Choctaw Indians (JBCI), Mississippi Band of Choctaw Indians (MBCI), Muscogee (Creek) Nation (MCN), Seminole Nation of Oklahoma (SNO), Seminole Tribe of Florida (STF), and Tunica-Biloxi Tribe of Louisiana (TBTL) on December 4, 2018.

A NEPA stakeholder meeting was conducted by USACE on December 3, 2018. A subsequent reconnaissance meeting was conducted with the NFS, and resource agencies; Tribes were invited, but were unable to attend the meeting on December 10, 2018. However, a follow up meeting was held on January 7, 2019, during which the MBCI participated. Additionally, a public scoping meeting was conducted on January 10, 2019, at CEMVN with

Facebook Live Streaming, which requested feedback as well. Feedback from the public scoping meeting resulted in the identification of three additional measures.

In accordance with NEPA, a NOI to prepare an EIS was published in the Federal Register (Volume 84, No. 63) on April 2, 2019. The scoping period ends on July 8, 2019. Three public scoping meetings were conducted within the study area on April 24 and 25, with Facebook Live Streaming. Comments were accepted via written correspondence and emails. Approximately 80 non–USACE people attended the meetings in person and the Facebook Live Streaming had over 6,000 views. Scoping identified four areas of concern: flooding, dredging opportunities, levee opportunities, and nature based engineering. People are concerned about inducement of flooding into other area and proposed further investigation in alternative formulation and specific areas of concern. Feedback from the public scoping meeting resulted in the identification of one additional measure, which was proposed by the Healthy Gulf Collaborative, regarding conversion of sand and gravel mines to bottomland hardwoods habitat for flood control.

Additionally, a meeting was conducted on June 18, 2019 with collaborative stakeholders, the NFS, resource agencies, and Tribes to present the preliminary final array of alternatives and the screening rationale of the alternatives that were screened. As a result, three agencies, (FWS, Louisiana Department of Environmental Quality (LDEQ), and LDWF) requested an evaluation of river restoration, which resulted in the addition of another alternative, restoration of river meanders.

The scoping report is included in the Environmental Appendix C-2, which has copies of all written feedback received. Table 2-3 shows the typical NEPA reporting requirements and where they are located in the report.

Table 2-3. NEPA Information in this Report

EIS Sections		Location in this Document
Cover Page		Cover Page
Abstract		Cover Page
Table of Contents		Table of Contents
Purpose of and Need for Action		Section 2
Alternatives Including Proposed Action		Section 4
Affected Environment		Section 3
Environmental Consequences		Section 5
List of Preparers		Section 10
Public Involvement		Section 9
Environmental Laws and Regulations		Section 8
Mitigation		Section 7
List of Report Recipients		Section 9
Index		Listed in References
Appendices		Listed in the Table of Contents

Section 3
Inventory and Forecast Conditions

3.1 ENVIRONMENTAL SETTINGS

3.1.1 Land Use

The Pre-Contact settlement of the ARB extends as far back as the Paleoindian period (11,500-8000 B.C.), although few sites of this age have been identified within the study area. However, archaeological evidence supports that during the period from 8000 B.C. to 800 B.C. the region was well inhabited by Native American peoples who often settled along ridges overlooking streams with gravel outcroppings. It is noteworthy to mention that during the subsequent Pre-Contact period, from approximately 800 B.C. and leading up until the time of Native American-European contact, settlement strategies shift away from the uplands of the ARB towards alluvial valleys, giving rise to some of the earliest agricultural-based settlements in the region. Upon the arrival of Europeans to the ARB there were multiple groups of Native Americans occupying the ARB. The effects of contact between these cultures is understudied at the present time and can be refined as additional investigations are conducted in the future. European Settlements from the 1800s in the ARB primarily consisted of farming, fishing, hunting, and trapping communities near the Prairie Terraces and natural levees, often at or near floodplains. More densely populated communities began to form in response to the need for government administration and trade centers, resulting in the slow degradation of nearly 100 percent of the natural forested landscape. Road and rail networks further contributed to urbanization near high-ground water routes, and the establishment of multiple universities, a large petrochemical industry, and the Second World War prompted continuous population growth into the 1900s (GEC, Inc., 2015).

As of 2015, the study area predominantly consisted of undeveloped acreage. About 28 percent of the land was developed for commercial, residential, agricultural, recreation, and industrial purposes. The remaining 72 percent of the land was comprised of wetlands, new-growth forest, barren land, and other undeveloped land. Refer to Appendix C-1, for the land use classification table and map of the study area.

3.1.2 Climate, Weather Patterns, and Climate Change

The 2014 USACE Climate and Resiliency Policy Statement states the “USACE shall continue to consider potential climate change impacts when undertaking long-term planning, setting priorities, and making decisions affecting its resources, programs, policies, and operations.” The ART Study evaluates the feasibility of structural and nonstructural flood risk measures from 2026 to 2076. The most significant impact on coastal wetlands resulting from climate change is sea level change.

Climate in the region is humid subtropical, being heavily influenced by the movements of warm moist air off of the Gulf of Mexico. Average monthly temperatures vary from approximately 51.2 °F in January to 82.0 °F in July. Winter nighttime lows below freezing are common, as are summer daytime highs in the mid-90s. See Appendix C1, Table C1-2 for the monthly temperature normals recorded from the Baton Rouge Metro Airport, LA monitoring station by the National Oceanic and Atmospheric Administration (NOAA) National Climatic Data Center (NCDC).

Normal annual precipitation for the ARB is 60.5 inches, although for the period 1980 through 1991 rainfall averaged 64 inches a year. The ARB experienced drought conditions (-2 or less on the Palmer Drought Severity Index) during the modern era years of 1952, 1963, 1981, 1999, and 2000. Southerly, maritime winds prevail for much of the year, resulting in the potential for highly variable rainfall over the ARB. Daily variations are frequently measured in inches. Even for a 30-year averaging period annual precipitation at various weather stations throughout the ARB ranged from 56 to 67 inches. The wettest month is December with an average monthly normal rainfall of 6.14 inches. October is the driest month, averaging 3.50 inches of rainfall.

High cumulative rainfall events (e.g., 6 inches or more in less than 72 hours) over large areas of the ARB are caused under two typical scenarios: slow moving cold fronts encountering warm moist coastal air in late-winter or early spring; and slow moving tropical storms in summer or early fall. High short-term localized rainfall intensities (e.g., over one inch in an hour) can occur under these two scenarios, and are also experienced in a third scenario—heavy summer-time thunderstorms. Severe riverine flooding in the lower ARB has occurred under extreme examples of all three scenarios, with minor localized flood events typically occurring at least once per year in small, poorly drained catchments. Record floods often result when significant rainfall events occur in the context of above-average seasonal rainfall patterns, which sustain high soil moisture saturation and floodplain water levels. In addition to rainfall-riverine flood events, the lower ARB is also subject to wind-driven coastal flooding associated with slow-moving tropical storms. Prolonged, heavy, southerly winds cause high water levels along the southeastern Louisiana coast (e.g., Breton and Mississippi Sounds), causing back-step rises in Lakes Borgne, Pontchartrain, and Maurepas. Lake Maurepas levels above 3 feet mean sea level (MSL) typically impact the lower ARB at least once per year. Tropical storms have pushed levels above 6 feet MSL. Increasing levels of relative sea level change are also associated with climate change (See Section 3.1.4).

Current projections of storm frequencies from CPRA Coastal Master Plan Report (2017) anticipates increased frequencies for hurricanes and decreased frequencies for tropical storms. See Table 3-1a for the average annual number of North Atlantic Basin tropical storms and major hurricanes (CPRA 2017).

Table 3-1a. North Atlantic Basin Tropical Storms and Major Hurricanes based on the Plausible Range of Future Tropical Storm Frequency

	1981-2010 Average	Projected Average for 2015-2065	Range of Frequency change (2015-2065)
All tropical storms	12.1	8.8 to 12.6	-28%
Major Hurricanes	2.7	3.1 to 8.6	+13% and +83%

See Appendix C-1, Table C1-2 for the temperature normals from Baton Rouge Metro Airport.

3.1.3 Flood Events

The August 2016 Flood Preliminary Report for ARB (Jacobsen, B.J. 2017) provides findings on prior flooding as well as the 2016 Flood Event. See Appendix C-1, Section 1.1.3 for Table C1-3, which presents the top 10 pre-2016 crests based on USGS gauges for the Amite River at Denham Springs and Comite River at Joor Road (with peak stage data as far back as 1921 and 1943, respectively) and the peak discharge for five of the Amite River floods at Denham Springs. Three significant pre-2016 flood events are:

- The April 1983 Flood. A slow moving system produced 6 to 13 inches of rain over a broad portion of the ARB, with high totals in the Upland Hills. This flood established the pre-2016 record flood for the lower Amite River and backwater in associated tributaries in the Middle and Lower Prairie zones. It was the second highest flood recorded on the Comite River at Joor Road. About 5,300 homes and 200 businesses were flooded and an estimated $172 million of damages incurred (1983 dollars). Flood damages in the Comite River Sub-basin were estimated $48 million.
- Hurricane Juan in October 1985. Hurricane Juan became stalled along the Louisiana coast for several days, producing extremely high wind-driven water levels in Lake Maurepas, reportedly above 6 feet NAVD 88, and 6-day rainfall totals of five to eleven inches throughout the ARB. Record flooding occurred in the Coastal Wetlands and Margins. Upstream portions of the ARB were largely unaffected.
- Tropical Storm Allison in June 2001. Tropical Storm Allison stalled over the region, with 7-day measured rainfall totals of 19.66 inches in Baton Rouge; 14.07 inches in Denham Springs; and, 23.29 inches in Ascension Parish. The seven day rainfall totals in parts of the lower ARB were considered a 0.01 AEP precipitation event. Due to a significant drought and very low soil moisture conditions present prior to the event, flood conditions in the upper and middle ARB were not as extreme.

Additional storms that have had damaging impacts in the study area are included in Table 2-1.

The August 2016 flood over Southeast and Southcentral Louisiana was caused by a slow moving low pressure system that had its origins as an Atlantic tropical wave. Beginning on Monday, August 8, 2016, the low traversed east-to-west across northern Florida and lower

Alabama/Mississippi and approached the ARB late on Thursday, August 11th. The low was not considered an area of interest for development by the National Hurricane Center. The US National Weather Service (NWS) issued a flash flood watch for the region on Tuesday, August 9th. Flash flood and river flood warnings were issued beginning on Wednesday, August 10th and continued through the event. The majority of the ARB received in excess of 10 inches, with a large portion of the northern half of the ARB experiencing over 15 inches. Parts of the Middle Prairie zone in northern East Baton Rouge and northeastern Livingston Parishes had over 20 inches of rainfall.

A report commissioned by Louisiana Economic Development (2016) estimates damages under lost economic activity, property damages to residences, autos and businesses, and damage to government infrastructure. Operations at approximately 19,900 Louisiana businesses were disrupted by the flooding event, impacted approximately 278,500 workers (14 percent of the Louisiana workforce). Table 3-1b provides a summary of damages by category.

Table 3-1b. Summary of Damages by Category

Damages Category	Loss in Millions
Residential Housing Structures	$3,844.2
Residential Housing Contents	$1,279.8
Automobiles	$378.8
Agriculture	$110.2
Business Structures	$595.6
Business Equipment	$262.8
Business Inventories	$1,425.5
Business Interruption Loss	$836.4
Total $8,733.3	

(https://team.usace.army.mil/sites/MVN/PPM/proj/Amite/Plan%20Formulation/Related%20Reports/2016-August-Flood-Economic-Impact-Report_09-01-16.pdf)

3.1.4 Sea Level Change

ER 1100-2-8162 (https://www.publications.usace.army.mil/Portals/76/Users/182/86/2486/ER_1100-2-8162.pdf?ver=2019-07-02-124841-933) provides guidance for incorporating direct and indirect physical effects of projected future sea level change across the project life cycle in managing, planning, engineering, designing, constructing, operating, and maintaining USACE projects and systems of projects. Potential relative sea level change must be considered in every USACE coastal activity as far inland as the extent of estimated tidal influence.

Research by climate science experts predict continued or accelerated climate change for the 21st century and possibly beyond, which would cause a continued or accelerated rise in global mean sea level. The resulting local relative sea level change (SLC) will likely impact USACE coastal project and system performance. As a result, managing, planning, engineering, designing, operating, and maintaining for SLC must consider how sensitive and adaptable natural and managed ecosystems and human and engineered systems are to climate change and other related global changes. Planning studies and engineering designs over the project life cycle, for both existing and proposed projects, will consider alternatives that are formulated and evaluated for the entire range of possible future rates of SLC, represented here by three scenarios of “low,” “intermediate,” and “high” SLC. These alternatives will include structural, nonstructural, nature based, or natural solutions, or combinations of these alternatives. In compliance with USACE policy (Engineering Regulation (ER) 1100-2-8162), the performance of all projects under all three SLR scenarios will be analyzed for the final array of alternatives in the final IFR and EIS.

Using USACE-predicted future water levels under the SLR scenarios, those water levels were converted into relative sea level rise (RSLR) rates, incorporating sea level rise effects measured at the gauges and land loss experienced in the extended project area for each project. No operations and maintenance activities were planned for any of the projects in relation to future elevation changes. Long-term sustainability (percent land left at the end of the period of analysis) was used to analyze the impact that different SLR scenarios had on the project areas. Comparison between the long-term sustainability numbers experienced under the intermediate and high SLR scenarios for all of the mitigation projects in the final array supported the choice of the TSP for all habitat types performed the best under the influence of both the intermediate and high SLR scenarios.

3.2 RELEVANT RESOURCES

This section contains a description of relevant resources in the study area that could be impacted by the proposed project. The significant resources described are those recognized by laws, executive orders, regulations, and other standards of national, state, or regional agencies and organizations; technical or scientific agencies, groups, or individuals; and the general public. Significance based on institutional recognition means that the importance of an environmental resource is acknowledged in the laws, adopted plans, and other policy statements of public agencies, Tribes, or private groups. Significance based on public recognition means that some segment of the general public recognizes the importance of an environmental resource. Significance based on technical recognition means that the importance of an environmental resource is based on scientific or technical knowledge or judgment of critical resource characteristics. Table 3-2 provides summary information of the institutional, technical, and public importance of these resources.

Table 3-2. Relevant Resources in the Study Area

Resource	Institutionally Important	Technically Important	Publicly Important
Cultural and Historic Resources	National Historic Preservation Act (NHPA), as amended, and Section 106 and 110 of the NHPA; the Native American Graves Protection and Repatriation Act of 1990; the Archeological Resources Protection Act of 1979; and USACE's Tribal Consultation Policy (2012).	Federal, State, and Tribal stakeholders document and protect cultural resources including archaeological sites, districts, buildings, structures, and objects that are significant in American history, architecture, archaeology, engineering, and/or sites of religious and cultural significance based on their association or linkage to past events, to historically important persons, to design and construction values, and for their ability to yield important information about prehistory and history.	Preservation groups and private individuals support protection and enhancement of historical resources.
Recreation Resources	Federal Water Project Recreation Act of 1965 as amended and Land and Water Conservation Fund Act of 1965 as amended	Provide high economic value of the local, state, and national economies.	Public makes high demands on recreational areas. There is a high value that the public places on fishing, hunting, and boating, as measured by the large number of fishing and hunting licenses sold in Louisiana; and the large per-capita number of recreational boat registrations in Louisiana.
Aesthetics	USACE ER 1105-2-100, and National Environmental Policy Act of 1969, the Coastal Barrier Resources Act of 1990, Louisiana's National and Scenic Rivers Act of 1988, and the National and Local Scenic Byway Program.	Visual accessibility to unique combinations of geological, botanical, and cultural features that may be an asset to a study area. State and Federal agencies recognize the value of beaches and shore dunes.	Environmental organizations and the public support the preservation of natural pleasing vistas.
Wetlands	Clean Water Act of 1977, as amended; Executive Order 11990 of 1977, Protection of Wetlands; Coastal Zone Management Act of 1972, as amended; and the Estuary Protection Act of 1968., EO 11988, and Fish and Wildlife Coordination Act.	They provide necessary habitat for various species of plants, fish, and wildlife; they serve as ground water recharge areas; they provide storage areas for storm and flood waters; they serve as natural water filtration areas; they provide protection from wave action, erosion, and storm damage; and they provide various consumptive and non-consumptive recreational opportunities.	The high value the public places on the functions and values that wetlands provide. Environmental organizations and the public support the preservation of marshes.

Resource	Institutionally Important	Technically Important	Publicly Important
Uplands	Food Security Act of 1985, as amended; the Farmland Protection Policy Act of 1981; and the Fish and Wildlife Coordination Act of 1958, as amended.	They provide habitat for both open and forest-dwelling wildlife, and the provision or potential for provision of forest products and human and livestock food products.	The high value the public places on their present value or potential for future economic value.
Aquatic Resources/ Fisheries	Fish and Wildlife Coordination Act of 1958, as amended; Clean Water Act of 1977, as amended; Coastal Zone Management Act of 1972, as amended; and the Estuary Protection Act of 1968.	They are a critical element of many valuable freshwater and marine habitats; they are an indicator of the health of the various freshwater and marine habitats; and many species are important commercial resources.	The high priority that the public places on their esthetic, recreational, and commercial value.
Soils and Water Bottoms	Fish and Wildlife Coordination Act, Marine Protection, Research, and Sanctuaries Act of 1990	State and Federal agencies recognize the value of water bottoms for the production of benthic organisms.	Environmental organizations and the public support the preservation of water quality and fishery resources.
Wildlife	Fish and Wildlife Coordination Act of 1958, as amended and the Migratory Bird Treaty Act of 1918	They are a critical element of many valuable aquatic and terrestrial habitats; they are an indicator of the health of various aquatic and terrestrial habitats; and many species are important commercial resources.	The high priority that the public places on their esthetic, recreational, and commercial value.
Threatened and Endangered Species	The Endangered Species Act of 1973, as amended; the Marine Mammal Protection Act of 1972; and the Bald Eagle Protection Act of 1940.	USACE, FWS, NMFS, NRCS, EPA, LDWF, and LDNR cooperate to protect these species. The status of such species provides an indication of the overall health of an ecosystem.	The public supports the preservation of rare or declining species and their habitats.
Prime and Unique Farmland	Farmland Protection Policy Act	State and Federal agencies recognize the value of farmland for the production of food, feed and forage.	Public places a high value on food and feed production.
Air Quality	Clean Air Act of 1963, Louisiana Environmental Quality Act of 1983.	State and Federal agencies recognize the status of ambient air quality in relation to the NAAQS.	Virtually all citizens express a desire for clean air.
Noise and Vibration	USACE ER 1105-2-100, and National Environmental Policy Act of 1969, Noise Control Act of 1972, Quiet Communities Act of 1978	Unwanted noise has an adverse effect on human beings and their environment, including land, structures, and domestic animals and can also disturb natural wildlife and ecological systems.	The EPA must promote an environment for all Americans free from noise that jeopardizes their health and welfare.
Water Quality	Clean Water Act of 1977, Fish and Wildlife Coordination Act, Coastal Zone Mgt Act of 1972, and Louisiana State & Local Coastal Resources Act of 1978.	USACE, FWS, NMFS, NRCS, EPA, and State DNR and wildlife/fishery offices recognize value of fisheries and good water quality and the national and state standards established to assess water quality.	Environmental organizations and the public support the preservation of water quality and fishery resources and the desire for clean drinking water.

Resource	Institutionally Important	Technically Important	Publicly Important
Environmental Justice	Executive Order 12898 of 1994 (E.O. 12898) and the Department of Defense's Strategy on Environmental Justice of 1995	State and Federal agencies recognize social and economic welfare of minority and low-income populations	Public concerns about the fair and equitable treatment (fair treatment and meaningful involvement) of all people with respect to environmental and human health consequences of Federal laws, regulations, policies, and actions.
Socioeconomics	USACE ER 1105-2-100, and National Environmental Policy Act of 1969	When an environmental document is prepared and economic or social and natural or physical environmental effects are interrelated, then the environmental document will discuss all of these effects on the human environment.	Government programs, policies and projects can cause potentially significant changes in many features of the socioeconomic environment.

Resources not impacted in this study include Navigation and Essential Fish Habitat.

3.2.1 Natural Environment

3.2.1.1 Wetland Resources

Bottomland hardwood forests (BLH) in the study area are dominated by water oak, nuttall oak, green ash, red maple, and pignut hickory. Swamps in the Lower ARB are dominated by bald cypress and water tupelo, which have regenerated following extensive logging of virgin forest more than 70 years ago. The Louisiana swamps generally lack a mature canopy, as was present in the forests before logging occurred, and have lower productivity where isolated from riverine influences (Shaffer et al., 2003). Economically important natural resources associated with these swamps include fisheries of crawfish, blue catfish, and channel catfish, as well as logging. The classification of wetlands habitat from the US Fish and Wildlife National Wetlands Inventory (https://www.fws.gov/wetlands/) is located in Appendix C-1, Section 2.1.

3.2.1.2 Upland Resources

Forested Wetlands (From LDWF Natural Communities of Louisiana)

<u>Hardwood Slope Forest</u>

These forests mostly occur on slopes, or sometimes on stream and river terraces that are only rarely subject to flooding. This natural community occurs along slopes rising out of the floodplains in the Upper ARB and is dominated by hardwood trees with a sparse herbaceous layer. The hardwood slope forest community historically occupied approximately 100,000 to 500,000 acres and an estimated 25 to 50 percent of this acreage remains. Habitat conversion to pine plantations or residential uses, invasive and exotic species, construction

of roads, utilities and pipelines, and use of off-road vehicles currently threatens the long-term viability of these forests.

Small Stream Forest

Small stream forests are relatively narrow wetland forests occurring along small rivers and large creeks in central, western, southeastern, and northern Louisiana. They are seasonally flooded for brief periods. The percentage of sand, silt, calcareous clay, acidic clay, and organic material in the soil is highly variable (depending on local geology) and has a significant effect on species composition. Soils are typically classified as silt-loams. At times, the community is quite similar in species composition to hardwood slope forests (beech-magnolia forests). These forested wetlands are critical components of the landscape filtering surface and subsurface flows, improving water quality, and storing sediment and nutrients (Rummer 2004). See Appendix C-1, Table C1-6 for vegetative species list for this natural community.

Nuisance Species (from LDWF Waterbody Management Plan 2017)

Common salvinia and water hyacinth have been the main source of access and habitat issues and complaints over the past several years. Common salvinia is scattered throughout the ARB and is constantly being restocked by draining swamps and bayous. Within the river system, the desire to own/sell waterfront property has led to the construction of numerous man-made canals over the past 4 decades. These canals are typically 50 to 200 feet wide, dead-end offshoots of the main river channel. The canals are lined with houses, camps, boat slips, docks, and an occasional boat ramp. The canal systems are rarely designed so that river water can flow through unimpeded (i.e. horseshoe in shape, etc.). Consequently, these dead-end canals have no inherent “flushing” mechanism to remove floating vegetation. Invariably, some form of aquatic vegetation makes its way into these canals each year and remains stranded due to the stagnant water conditions, and thrives. When the suspect vegetation in these canals reaches unacceptable levels, shoreline property owners call LDWF to complain.

Estimates of vegetation coverage are:

Problematic Species:

- Common Salvinia (*Salvinia minima)* – 25 acres
- Water Hyacinth (*Eichhornia crassipes)* – 15 acres
- Duckweed (*Lemna spp.)* – 15 acres
- Duck Lettuce (*Ottelia alismoides*) – 50 acres
- Crested Floating Heart (*Nymphoides cristata*) – 6 acres

Beneficial Species:

- Yellow Water Lily (*Nymphaea mexicana)* – 100 acres
- Coontail (*Ceratophyllum demersum)* – 100 acres

3.2.1.3 Aquatic Resources and Fisheries

For a list of fish species in the study area, see Appendix C-1, Table C1-8 (LDWF Waterbody Management Plan).

The Alabama Hickorynut (*Obovaria unicolor*) is an at-risk species, 1.2-2 inch-long freshwater mussel, with round or elliptical shape. The outer shell (periostracum) is smooth and brown to yellow-brown, with rays. This species is a long-term brooder that is gravid from June through August of the following year. Like other freshwater mussels, the Alabama Hickorynut releases its larvae (glochidia) into the water column, where they parasitize a fish (glochial host) in order to transform into a juvenile mussel. Once the glochidia are ready, they release from the host to find a suitable substrate. Suitable glochidial host fishes for this species include the naked sand darter (*Ammocrypta beani*), southern sand darter (*Ammocrypta meridiana*), Johnny darter (*Etheostoma nigrum*), Gulf darter (*Etheostoma swaini*), blackbanded darter (*Percina nigrofasciata*), dusky darter (*Percina sciera*), and redspot darter (*Etheostoma artesiae*).

The Alabama Hickorynut inhabits sand and gravel substrates in moderate currents in large streams. However, the presence of moderate gradient pool and riffle habitats in a variety of stream and river sizes may contain this species. In Louisiana, the Alabama Hickorynut is known to occur in the Pearl and Amite River systems. Habitat modification and destruction due to siltation (i.e. from flooding events) and impoundment threaten this species. It is also negatively affected by the pollution of streams and rivers.

The rare Broadstripe topminnow *(Fundulus euryzonus)* is endemic to the Amite and Tangipahoa River Basins. The Broadstripe topminnow is listed as Vulnerable at the global and national level, and Imperiled at the state level. This fish prefers smaller channel widths, with riparian vegetation canopy; features of upstream reaches of rivers. Current and historical mining operations in the ARB have led to channelization, which changes the upstream reaches of the river to behave more like downstream reaches by widening the channel and increasing water flow; thus, diminishing suitable habitat for the topminnow.

3.2.1.4 Wildlife

The study-area wetland and non-wetland forests provide valuable habitat for a variety of migratory game and non-game birds, mammals, amphibians, and reptiles. For a listing of associated species, see Appendix C-1, Table C1-9 through Table C1-12.

The coastal marshes and forested wetlands of the Lake Pontchartrain Basin have been identified by the North American Waterfowl Management Plan (NAWMP), Gulf Coast Joint Venture (GCJV): Mississippi River Coastal Wetlands Initiative as a key waterfowl wintering area. The Gulf Coast is the terminus of the Central and Mississippi Flyways and is therefore one of the most important waterfowl areas in North America, providing both wintering and migration habitat for significant numbers of the continental duck and goose populations that use both flyways.

The Mississippi River Coastal Wetlands Initiative area is dominated by coastal marsh, forested swamps, and seasonally flooded bottomland hardwoods that provide habitat for several species of wintering waterfowl. Wood ducks are the primary waterfowl species in forested wetlands, while other ducks, and use those forested habitats to a lesser degree. Other game birds are present in or adjacent to the study area including rails (Family: Rallidae). Non-game bird species also utilize the study area marshes including various species of gulls and terns. Birds of prey in the study area include resident and transient hawks. Some neo-tropical migrants, currently experiencing population decline, are dependent on large forested areas to successfully reproduce. Also, present are cuckoos, swifts, hummingbirds, woodpeckers, and the belted kingfisher (*Megaceryle alcyon*). See Appendix C-1, Table C1-9 for a list of bird species in the study area.

Alligator Snapping Turtle (From FWS Planning Assistance Letter)

The alligator snapping turtle (*Macrochelys temminckii*) may be found in large rivers, canals, lakes, oxbows, and swamps adjacent to large rivers. It is most common in freshwater lakes and bayous, but also found in coastal marshes and sometimes in brackish waters near river mouths. Typical habitat is mud bottomed waterbodies having some aquatic vegetation. The alligator snapping turtle is slow growing and long lived. Sexual maturity is reached at 11 to 13 year of age (Ernst et al. 1994). Because of this and its low fecundity, loss of breeding females is thought to be the primary threat to the species.

3.2.1.5 Threatened, Endangered, and Protected Species

Factors regarding the existing conditions for threatened and endangered species in the study area principally stem from the alteration, degradation, and loss of habitats; and human disturbance. The continued high rate of commercial development throughout the study area continues to reduce available wetland habitat to threatened and endangered species. This creates increased intra- and interspecific competition for rapidly depleting resources between not only the various threatened and endangered species, but also other more numerous fauna.

On February 26, 2018, CEMVN obtained a planning assistance letter from the FWS that provides lists of threatened and endangered species that may occur in the proposed project location, and/or may be affected by the proposed project (See Appendix C-4 Agency Coordination). Appendix C-1, Table C1-13 provides a summary of these findings including the presence of critical habitat. Descriptions for species with the “May Affect” Impact follow below.

West Indian Manatee

Federally listed as a threatened. species, *Trichechus manatus* (West Indian manatees) occasionally enter Lakes Pontchartrain and Maurepas, and associated coastal waters and streams during the summer months (i.e., June through September). Manatee occurrences appear to be increasing, and they have been regularly reported in the Amite, Blind, Tchefuncte, and Tickfaw Rivers, and in canals within the adjacent coastal marshes of Louisiana. The manatee has declined in numbers due to collisions with boats and barges,

entrapment in flood control structures, poaching, habitat loss, and pollution. Cold weather and outbreaks of red tide may also adversely affect these animals. All contract personnel associated with the project should be informed of the potential presence of manatees and the need to avoid collisions with manatees, which are protected under the Marine Mammal Protection Act of 1972 and the Endangered Species Act of 1973. All construction personnel are responsible for observing water-related activities for the presence of manatee(s). Temporary signs should be posted prior to and during all construction/dredging activities to remind personnel to be observant for manatees during active construction/dredging operations or within vessel movement zones (i.e., work area), and at least one sign should be placed where it is visible to the vessel operator. Siltation barriers, if used, should be made of material in which manatees could not become entangled, and should be properly secured and monitored. If a manatee is sighted within 100 yards of the active work zone, special operating conditions should be implemented, including: no operation of moving equipment within 50 feet of a manatee; all vessels should operate at no wake/idle speeds within 100 yards of the work area; and siltation barriers, if used, should be re-secured and monitored. Once the manatee has left the 100-yard buffer zone around the work area on its own accord, special operating conditions are no longer necessary, but careful observations would be resumed. Any manatee sighting should be immediately reported to the Service's Lafayette, Louisiana Field Office (337/291-3100) and the Louisiana Department of Wildlife and Fisheries, Natural Heritage Program (225/765-2821).

Public data on manatee sightings have provided benefits for conservation efforts, according to Hieb et al. (2017). Ongoing manatee population growth, future climate change, or other large-scale environmental perturbations are likely to continue altering the timing, duration, and location of manatee visits to the northern Gulf of Mexico. Although publicly sourced data and citizen-science efforts have inherent biases, on a decadal time scale these datasets could provide comprehensive information on manatee habitat use than is possible by direct observations.

Atlantic Sturgeon

Acipenser oxyrhynchus desotoi (the Atlantic sturgeon), federally listed as a threatened species, is an anadromous fish that occurs in many rivers, streams, and estuarine waters along the northern Gulf coast between the Mississippi River and the Suwannee River, Florida. In Louisiana, Gulf sturgeon have been reported at Rigolets Pass, rivers and lakes of the Lake Pontchartrain Basin, and adjacent estuarine areas. Spawning occurs in coastal rivers between late winter and early spring (i.e., March to May).Adults and sub-adults may be found in those rivers and streams until November, and in estuarine or marine waters during the remainder of the year. Sturgeon less than 2 years old appear to remain in riverine habitats and estuarine areas throughout the year, rather than migrate to marine waters. Habitat alterations such as those caused by water control structures that limit and prevent spawning, poor water quality, and over-fishing have negatively affected this species.

On March 19, 2003, the FWS and the National Marine Fisheries Service (NMFS) published a final rule in the Federal Register (Volume 68, No. 53) designating critical habitat for the

Gulf sturgeon in Louisiana, Mississippi, Alabama, and Florida. The proposed project; however, does not occur within nor would it impact designated Gulf sturgeon critical habitat.

USACE is responsible for determining whether the selected alternative is likely (or not likely) to adversely affect any listed species and/or critical habitat, and for requesting the FWS' concurrence with that determination. If USACE determines, and the FWS concurs, that the selected alternative is likely to adversely affect listed species and/or critical habitat, a request for formal consultation in accordance with Section 7 of the Endangered Species Act (ESA) should be submitted to the FWS. That request should also include USACE's rationale supporting their determination.

Inflated Heelsplitter Mussel (From Planning Aid Letter, dated 3/13/19)

Federally listed as a threatened species, the Alabama heelsplitter mussel (*Potamilus inflatus*) was historically found in Louisiana in the Amite, Tangipahoa, and Pearl Rivers. Many life history aspects of the species are poorly understood, but are likely similar to that of other members of the Unionidae family. Although the primary host fish for the species is not certain, investigation by K. Roe et al. (1997) indicates that the freshwater drum (Aplodinotus grunniens) is a suitable glochidial host for the species.

Based on the most recent survey data, the currently known range for the Alabama heelsplitter in Louisiana occurs only in the lower third of the Amite River, along the East Baton Rouge/Livingston Parish line from Spiller's Creek, which is in the vicinity of Denham Springs, downstream to the vicinity of Port Vincent. Because it has not been used widely for past or present gravel mining operations, the lower third of the Amite River (between Louisiana Highway 37 and Louisiana Highway 42) is more typical of a coastal plain river; being characterized by a silt substratum, less channelization, and slower water flow, all of which are characteristic of heelsplitter habitat. This freshwater mussel is typically found in soft, stable substrates such as sand, mud, silt, and sandy gravel, in slow to moderate currents. Heelsplitter mussels are usually found in depositional pools below sand point bars and in shallow pools between sandbars and river banks.

Major threats to this species in Louisiana are the loss of habitat resulting from sand and gravel dredging and channel modifications for flood control, as shown by the apparent removal of the species in the extensively modified upper portions of the Amite River.

Protected Species

<u>Bald Eagle</u>

The project-area forested wetlands provide nesting habitat for *Haliaeetus leucocephalus* (the bald eagle), which was officially removed from the List of Endangered and Threatened Species on August 8, 2007. There is one active bald eagle nest that is known to exist within the proposed project area; however, other nests may be present that are not currently listed in the database maintained by the Louisiana Department of Wildlife and Fisheries.

Bald eagles nest in Louisiana from October through mid-May. They typically nest in mature trees (e.g., bald cypress, sycamore, willow, etc.) near fresh to intermediate marshes or open water in the southeastern parishes. Areas with high numbers of nests include the north shore of Lake Pontchartrain and the Lake Salvador area. Major threats to this species include habitat alteration, human disturbance, and environmental contaminants (i.e., organochlorine pesticides and lead).

Breeding bald eagles occupy “territories” that they will typically defend against intrusion by other eagles and that they likely return to each year. A territory may include one or more alternate nests that are built and maintained by the eagles, but which may not be used for nesting in a given year. Potential nest trees within a nesting territory may, therefore, provide important alternative bald eagle nest sites. Bald eagles are vulnerable to disturbance during courtship, nest building, egg laying, incubation, and brooding. Disturbance during this critical period may lead to nest abandonment, cracked and chilled eggs, and exposure of small young to the elements. Human activity near a nest late in the nesting cycle may also cause flightless birds to jump from the nest tree, thus reducing their chance of survival.

Although the bald eagle has been removed from the List of Endangered and Threatened Species, it continues to be protected under the MBTA and the Bald and Golden Eagle Protection Act (BGEPA). The FWS developed the National Bald Eagle Management (NBEM) Guidelines to provide landowners, land managers, and others with information and recommendations to minimize potential project impacts to bald eagles, particularly where such impacts may constitute “disturbance,” which is prohibited by the BGEPA. A copy of the NBEM Guidelines is available at: http://www.fws.gov/southeast/es/baldeagle/NationalBaldEagleManagementGuidelines.pdf. Those guidelines recommend: (1) maintaining a specified distance between the activity and the nest (buffer area); (2) maintaining natural areas (preferably forested) between the activity and nest trees (landscape buffers); and (3) avoiding certain activities during the breeding season. On-site personnel should be informed of the possible presence of nesting bald eagles within the project boundary, and should identify, avoid, and immediately report any such nests to this office. If a bald eagle nest is discovered within or adjacent to the proposed project area, then an evaluation must be performed to determine whether the project is likely to disturb nesting bald eagles. That evaluation may be conducted on-line at: http://www.fws.gov/southeast/es/baldeagle. Following completion of the evaluation, that website will provide a determination of whether additional consultation is necessary. A copy of that determination should be provided to this office.

Colonial Nesting Birds

In accordance with the Migratory Bird Treaty Act and Planning Aid Letter from FWS (dated March 13, 2019) the study area includes habitats that are commonly inhabited by colonial nesting waterbirds. Recommendations to address compliance with the Migratory Bird Treaty Act is included in Section 6.2.12.

3.2.1.6 Geology, Soils and Water Bottoms, and Prime Farmland

The study area can be roughly divided into three regions with distinctive landforms, topographies, and associated floodplain characteristics. For a map of the geographic and physiographic setting, see Appendix C-1, Figure C1-3.

1. The High Terraces includes the Mississippi counties, East Feliciana Parish and St. Helena Parishes, and northern East Baton Rouge Parish. The area, with sediment dated to the Pleistocene era, consists of narrow floodplains with rolling hills at elevations typically ranging from approximately 80 to 500 feet above mean sea level (MSL).

2. The Intermediate and Prairie Terraces includes most of East Baton Rouge and Livingston Parishes and upland portions of Iberville and Ascension Parishes. This landscape transitions from rural hilly older Plio-Pleistocene Terraces to flatter, mid-elevation (approximately 20 to 80 feet MSL) recent Intermediate and Prairie Pleistocene Terraces.

3. The Recent Alluvial Floodplain includes lower Livingston Parish, the remainder of Iberville and Ascension Parishes, as well as St. James Parish. This area is dominated by expansive, low-lying (approximately 1 to 5 feet MSL), alluvial floodplains filled during the recent Holocene.

Soils and Water Bottoms

Soil textures present in the study area are found in Appendix C-1, Section 2.11.

Prime and Unique Farmland

The Farmland Protection Policy Act of 1981 (FPPA) was enacted to minimize the extent that Federal programs contribute to the unnecessary and irreversible conversion of farmland to non-agricultural uses, and to assure that Federal programs are administered in a manner that, to the extent practicable, would be compatible with state, unit of local government, and private programs and policies to protect farmland.

Under this policy, soil associations are used to classify areas according to their ability to support different types of land uses, including urban development, agriculture, and silviculture. The USDA Natural Resource Conservation Service (NRCS) designates areas with particular soil characteristics as either “Farmland of Unique Importance,” “Prime Farmland,” “Prime Farmland if Irrigated,” or variations on these designations. Prime farmland, as defined by the FPPA, is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is available for these uses. Farmland of unique importance is land other than prime farmland that is used for the production of specific high-value food and fiber crops, such as citrus, tree nuts, olives, cranberries, and other fruits and vegetables. A recent trend in land use in some areas has been the loss of some prime farmland to industrial and urban uses. The loss of prime farmland to other uses puts pressure on marginal lands, which generally are more

erodible, drought-prone, and less productive, and cannot be easily cultivated as compared to prime farmland (NRCS 2016).

No unique farmlands are located within the study area, but approximately 503,703 acres of prime farmlands are located in the Louisiana Parishes within the study area. For land classification and acreage of prime and unique farmlands in the study area, see Appendix C-1, Figure C1-5 and Table C1-14.

3.2.1.7 Water Quality

The dominant bodies of water in the ARB are the Amite River, Blind River, and Comite River. Numerous rivers and streams cross through the ARB and its hydrology is greatly affected in the lower basin because the elevation is around sea level, plus or minus a foot.

Water quality in the main channels of the ARB is influenced by non-point source agricultural runoff and by residential and commercial point sources. Water quality in the Upper ARB; however, is often quite different because of hydrological modifications from the sand and gravel mines and berms. Louisiana Department of Environmental Quality has a general permit for the Louisiana Pollutant Discharge Elimination System, which requires that "impoundments of process or mine dewatering wastewater must be surrounded by a levee of sufficient size and construction to prevent a discharge of pollutants into waters of the state." The berms must have a height of 2 feet freeboard.

Nineteen water bodies in the Amite watershed are listed as impaired for one or more designated uses in the 2016 Integrated Report of Water Quality in Louisiana. (See Appendix C-1, Table C1-15 for the 305(b) impaired waterbodies in the study area from the LDEQ Final 2016 Integrated Report of Water Quality in Louisiana).

Most of the segments are impaired for fish and wildlife propagation and swimming. In the Amite watershed, the top five suspected causes of impairment are 1) dissolved oxygen, 2) nitrate/nitrite (nitrite plus nitrate as N), 3) fecal coliform, 4) Phosphorus (Total), and 5) Turbidity.

3.2.1.8 Air Quality

The U.S. Environmental Protection Agency (EPA), Office of Air Quality Planning and Standards has set National Ambient Air Quality Standards for six principal pollutants, called “criteria” pollutants. They are carbon monoxide, nitrogen dioxide, ozone, lead, particulates of 10 microns or less in size (PM-10 and PM-2.5), and sulfur dioxide. Ozone is the only parameter not directly emitted into the air but forms in the atmosphere when three atoms of oxygen (03) are combined by a chemical reaction between oxides of nitrogen and volatile organic compounds in the presence of sunlight. Motor vehicle exhaust and industrial emissions, gasoline vapors, and chemical solvents are some of the major sources of nitrogen and volatile organic compounds, also known as ozone precursors. Strong sunlight and hot weather can cause ground-level ozone to form in harmful concentrations in the air. The Clean Air Act General Conformity Rule (58 FR 63214, November 30, 1993, Final Rule, Determining Conformity of General Federal Actions to State or Federal Implementation

Plans) dictates that a conformity review be performed when a Federal action generates air pollutants in a region that has been designated a non-attainment or maintenance area for one or more National Ambient Air Quality Standards. A conformity assessment would require quantifying the direct and indirect emissions of criteria pollutants caused by the Federal action to determine whether the proposed action conforms to Clean Air Act requirements and any State Implementation Plan.

The general conformity rule was designed to ensure that Federal actions do not impede local efforts to control air pollution. It is called a conformity rule because Federal agencies are required to demonstrate that their actions "conform with" (i.e., do not undermine) the approved State Implementation Plan for their geographic area. The purpose of conformity is to (1) ensure Federal activities do not interfere with the air quality budgets in the State Implementation Plans; (2) ensure actions do not cause or contribute to new violations, and (3) ensure attainment and maintenance of the National Ambient Air Quality Standards.

The ART Study Area includes several parishes in Louisiana and several counties in southwest Mississippi. Four of the Louisiana parishes are located in the Baton Rouge metropolitan area, which has been designated by the EPA as a maintenance area for ozone under the 8-hour standard effective December 27, 2016. This classification is the result of area-wide air quality modeling studies, and the information is readily available from the LDEQ, Office of Environmental Assessment and Environmental Services.

Federal activities proposed in the ozone-maintenance area may be subject to the state's general conformity regulations as stated under LAC 33:III.14.A, Determining Conformity of General Federal Actions to State or Federal Implementation Plans. A general conformity applicability determination is made by estimating the total of direct and indirect volatile organic compound (VOC) and nitrogen oxide (NOX) emissions caused by the construction of the project. Prescribed de minimis levels of 100 tons per year per pollutant are applicable in Ascension Parish. Projects that would result in discharges below the de minimis level are exempt from further consultation and development of mitigation plans for reducing emissions.

3.2.1.9 Noise and Vibration

The Noise and Vibration section characterizes the affected environment for this resource. There have been no studies or new data generated to date that are relevant to the discussion of the affected environment.

3.2.2 Human Environment

3.2.2.1 Cultural, Historic, and Tribal Trust Resources

The cultural prehistory and history of Southeast Louisiana and Southwest Mississippi is a rich one that is shared with much of the southeast. The generalized Pre-Contact cultural chronology for the region according to Rees (2010:12) is divided into five primary archaeological components, or "periods," as follows: Paleoindian (11,500-8000 B.C.), Archaic (8000-800 B.C.), Woodland (800 B.C.-1200 A.D.), Mississippian (1200-1700 A.D.),

and Historic (1700 A.D.-present). Regionally, these periods have been further divided into sub-periods based on material culture, settlement patterns, subsistence practices, and sociopolitical organization. Specific sub-periods identified within the study area include: Poverty Point, Tchefuncte, Marksville, Baytown, Troyville, Coles Creek, Plaquemine, and Mississippian. Post-Contact Period (ca. 1650 A.D.-present) cultural affiliations within the study area, follow the thematic approach set forth in the Louisiana Division of Archaeology's (LDOA) State of Louisiana Site Record Form (amended August 29, 2018) and are divided into the following temporal groups: *Historic Exploration* (1541-1803 A.D.), *Antebellum Louisiana* (1803-1860 A.D.), *War and Aftermath* (1860-1890 A.D.), *Industrial and Modern* (1890-1945 A.D.), and *Post-WWII* (1945 A.D.-present).

Archaeological Sites

Table 3-3 lists the historic properties within the study area.

Table 3-3. Historic Properties within the Study Area

County/Parish	Building	Site	Structure	District	NHL	Archaeological Sites
Mississippi:						
Amite	18	1	—	—	—	29
Franklin	3	—	2	—	—	—
Lincoln	14	—	—	1	—	—
Wilkinson	11	3	—	2	—	1
Louisiana:						
Ascension	17	1	—	1	—	78
East Baton Rouge	67	7	2	13	2	20
East Feliciana	28	1	—	2	1	104
Iberville	21	—	1	1	—	22
Livingston	13	—	—	1	—	87
St. Helena	3	—	—	—	—	72
St. James	19	—	1	2	1	41
St. John the Baptist	14	1	—	2	1	14

Based on a review of the LDOA, *Louisiana Cultural Resources Map* (web-resource), the Mississippi Department of Archives and History (MDAH) Historic Resources Inventory Map (web-resource), and pertinent site and survey reports regarding previous investigations, CEMVN determined that approximately 468 archaeological sites (Table C1-14) are recorded within the current study area that collectively span the entire spectrum of Pre-Contact and Post-Contact archaeological components referenced above; encompassing some 10,000 years or more. It is also important to stress that many known of the known sites in the study

area have occupation spans encompassing more than one of these cultural/temporal periods attesting to the long-ranging cultural importance of the region. Presently, no comprehensive systematic archaeological survey has been conducted throughout the entire study area and the distribution of recorded archaeological sites is largely indicative of project-specific federal and state compliance activities (e.g., linear surveys of roads, pipelines, and power line right-of-ways). Therefore, in addition to considering the known sites within the region, project areas must also be further assessed for archaeological site potential.

Archaeological Site Potential

It is estimated that several hundred archaeological sites exist within the proposed study area that cover the range of human occupation from the Paleo-Indian through to historic occupation. It is anticipated that project measures and/or alternative measures will impact these sites. In lieu of additional survey data, Louisiana's Comprehensive Archaeological Plan (Girard, et al. 2018) and research conducted by Earth Search, Inc. (Lee et al. 2009) for the *Proposed Amite River and Tributaries, Bayou Manchac Water Shed Feasibility Study, Ascension, East Baton Rouge & Iberville Parishes, Louisiana*, can be used for baseline planning purposes. To a great extent, the unique geomorphology and ecology of the study area has influenced site type and location. To examine how the physical landscape impacts the archaeological record, the LDOA divides the study area into a series of regions that follow the ecoregions classification of the Western Ecology Division of the U.S. Environmental Protection Agency (https://www.epa.gov/eco-research/ecoregion-download-files-state-region-6#pane-16). There are six Regions at Level III, three of which fall within the present study area (Southern Coastal Plain, Mississippi Valley Loess Plain and Mississippi Alluvial Plain). All three Level III Regions are then further divided into sub-regions (Level IV: Southern Rolling Plains, Baton Rouge Terrace, Gulf Coast Flatwoods, Inland Swamps, and Southern Holocene Meander Belts). Girard, et al. (2018: 24-31) define how the unique environmental, biological, and physiological characteristics of each region influenced cultural development in order to provide context to the distribution of where sites are likely or unlikely to occur. Complimentary to Girard, et al.'s (2018) ecosystem-based model (above), Lee et al. recommend:

> It is essential that investigations be conducted in the fullest consideration and effective integration of available knowledge of landscape dynamics. In doing so, surveys can be designed to provide adequate assessment of all areas, but with greater attention and effort focused on areas that would have been relatively more favorable for prehistoric occupation. Of greater importance, it avoids the expenditure of resources in areas where existing knowledge of geomorphic processes and landscape evolution indicates with confidence that prehistoric activities were precluded or where subsequent natural processes have destroyed the evidence…Geomorphologic data, previous archaeological investigations, and previously recorded sites will constitute the primary data sets utilized in the predictive model. Landform type, elevation, and soils will also be utilized to construct the predictive model. These data will be integrated

> to determine high probability areas within the riverine and upland portions of the project area. Lee et al. (2009:132)

Geospatial modeling of cultural landscapes for predictive scientific research is an important emerging approach in contemporary archaeology. Depending on the scale of the final array of project alternatives, it may be advantageous to develop a geospatial predictive model based upon the work of Girard, et al. (2018) and Lee et al. (2009) that incorporates the accumulated environmental and archaeological information specified above as a means to forecast the probability of significant archaeological sites occurring in any particular location that can be used to guide efficient identification and evaluation strategies.

U.S. Civil War

The study area is also the setting of at least 11 terrestrial and naval Civil War battles ranging from small skirmishes to major decisive battles. The NPS's American Battlefield Protection Program (ABPP; 54 U.S.C. 380101-380103), Civil War Sites Advisory Commission (Public Law 101-628), has assigned Preservation Priorities (https://www.nps.gov/abpp/battles/bystate.htm) to five individual battlefields located within the study area: Magnolia Cemetery (East Baton Rouge: Priority IV.1), Donaldsonville 1862 (Ascension Parish; Priority IV.2), Donaldsonville 1863 (Ascension Parish; Priority IV.2), Cox's Plantation (Ascension Parish; Priority IV.1), and Port Hudson (East Baton Rouge Parish and East Feliciana Parish: Priority I.1).

Louisiana Scenic Rivers Act

The Louisiana Department of Wildlife and Fisheries is the lead state agency in the State Scenic River Program. Archaeological resources within scenic river corridors are protected by law under the Louisiana Scenic Rivers Act of 1988 (LSRA). The current study area includes the following Louisiana Natural and Scenic Rivers: the Amite River, Comite River, Blind River, and Bayou Manchac. In addition to the extra protections afforded to cultural resources under the LSRA, Bayou Manchac from the Amite River to the Mississippi River is designated as a "Historic and Scenic River," which requires that "full consideration shall be given to the detrimental effect of any proposed action upon the historic and scenic character thereof, as well as the benefits of the prosed use."

3.2.2.2 Aesthetics

The majority of the study area is within the ARB, which constitutes a mosaic of forest, pine plantations, pasture, and cropland. The primary land-use in the area is agriculture. The Amite River flows South from the Mississippi Valley Loess Plains Ecoregion and into the Mississippi Alluvial Ecoregion. The dominant natural vegetation in the northeast consists of upland forests dominated by oak, hickory, and both loblolly and shortleaf pine. The dominant natural vegetation in the northwest consists of forests characterized by beech, southern magnolia, and American holly. The dominant natural vegetation in the south consists of inland swamps and ridges (according to the State of Louisiana Eco-Region Map, ref. "Louisiana Speaks" and "USGS Eco-Region Map," Daigle, J.J., Griffith, G.E. Omernik, J.M., Faulker, P.L., McCulloh, R.P., Handley, L.R., Smith, L.M., and Chapman, S.S., 2006,

Ecoregions of Louisiana color poster with map, descriptive text, summary tables, and photographs): Reston, Virginia, U.S. Geological Survey (map scale 1:1,000,00)."

From an aesthetic perspective, the inland swamps in the south have a fairly dense canopy constituted by bald cypress and water tupelo trees. The majority of the bald cypress are rarely the mature and majestic specimens as they once were due to logging operations in the early 1900s. The heavily shaded swamp understory is composed primarily of red maple and green ash. The ground is hard bottom. The tranquil swamps are perennially wet and the water is clear. These swamp areas are often difficult to access and are generally viewed into from roadway edges, waterways, and natural ridges. The ridges are small rises in the inland swamp and are typically occupied by Water Oak, Diamond Oak, Sweetgum, Ash, Wax Myrtle, Black Willow, Chinese Tallow, and Privet. The ridges provide a dryer and slightly more accessible setting in contrast to the surrounding darkness and wetness of the inland swamps for hunters, nature observers, bird watchers, and ecologists.

Numerous efforts have been made to protect and promote visual resources within the ARB that are known for their unique culture and natural identity. One of these efforts, made by the Louisiana Department of Culture, Recreation & Tourism, is for marketing scenic byways thru rural landscape and culturally significant communities. There is a Scenic Byway bordering the study area on the south and east which includes the Great River Road. This is but one segment to an overall scenic byway that stretches on multiple thoroughfares from Canada to the Gulf of Mexico. It is state and federally designated and has an "All American Road" status, making it significant in culture, history, recreation, archeology, aesthetics, and tourism.

In 1970, the Louisiana Legislature created the Louisiana Natural and Scenic Rivers System. The System was developed for the purpose of preserving, protecting, developing, reclaiming, and enhancing the wilderness qualities, scenic beauties, and ecological regimes of certain free-flowing Louisiana streams. These rivers, streams and bayous, and segments thereof, are located throughout the state and offer a unique opportunity for individuals and communities to become involved in the protection, conservation and preservation of two of Louisiana's greatest natural resources; its wilderness and its water. Within the study area, there are four designated Louisiana Natural and Scenic Rivers (RS 56:1857). The Amite River from the Louisiana-Mississippi state line to La. Hwy. 37 in East Feliciana Parish; the Blind River from its origin in St. James Parish to its entrance into Lake Maurepas; the Comite River from the Wilson-Clinton Hwy. in East Feliciana Parish to the entrance of White Bayou in East Baton Rouge Parish; and Bayou Manchac from the Amite River to the Mississippi River is designated as a Louisiana Historic and Scenic River (RS 56:1856).

"The general purpose of the Louisiana Scenic Rivers Act as it applies to the Amite River is to protect this section of river from channel modifications, protect water quality and habitats, and preserve recreational and scenic aspects of this river. Many of the Amite River reaches upstream and downstream of Grangeville have experienced significant mining activity and are neither natural nor scenic." (Hood, Patrick, Corcoran, Fluvial Instability and Channel Degradation of Amite River and its Tributaries, Southwest Mississippi and Southeast Louisiana, ERDC/GSL TR-07-26, Page 12, September 2007)

3.2.2.3 Recreation

Both consumptive and non-consumptive recreation activities in the study area are centered on natural resources. Consumptive recreation includes hunting, fishing for freshwater and saltwater species, and trapping alligators and nutria. Non-consumptive recreation includes wildlife viewing, sightseeing, boating, camping, and environmental education/interpretation. Opportunities for the activities listed are widespread via the waterways within and comprising the boundaries of the study area.

The following public areas, both within and in close proximity to the study area, have been set aside and provide high quality recreation opportunities: Homochito National Forest, Caston Creek Wildlife Management Area (WMA), Maurepas Swamp WMA, Waddill Outdoor Education Center, and multiple county-wide park and recreation systems. Table 3-4 highlights the extensive network of recreation resources within the study area currently established at the public level.

Table 3.4. Recreational Resources within the Study Area

Public Area	Size (acres)	Parish / County	Managing Agency	Recreation		Boat Launch	Recreational Highlights
				Consumptive	Non-consumptive		
National Forest							
Homochito National Forest	191,839	Amite, Franklin, Lincoln, Wilkinson	United States Department of Agriculture Forest Service	fishing, hunting	Horseback riding, hiking, picnicking, mountain biking, birding, photography, camping, shooting range	Yes	This National Forest is just outside the project area border to the northwest and includes 5.5 mile Bushy Creek Horse Trail, Clear Springs Recreation Area, Okhissa Lake Recreation Area with boat ramps, Woodman Springs Shooting Range
State Wildlife Refuge							
Caston Creek WMA	28,286	Amite, Franklin	Mississippi Department of Wildlife, Fisheries& Parks	Fishing, hunting	Horseback riding, hiking, picnicking, mountain biking, birding, photography, camping	No	This WMA is just outside the project area border to the northwest and within Homochito National Forest. It offers scenic horseback trails as well as various hiking and biking trails for the avid outdoorsmen or the novice adventurer.
Maurepas Swamp WMA	124,567	Ascension, Livingston, St. James, St. John the Baptist	Louisiana Department of Wildlife and Fisheries	fishing, hunting, trapping	Boating, camping, birding, wildlife viewing	No	Bald eagles and osprey nest in and around the WMA. Numerous species of neotropical migrant birds use this coastal forest habitat during fall and spring migrations. Resident birds, including wood ducks, black-bellied whistling ducks, egrets, and herons can be found on the WMA year-round.
Waddill Outdoor Education Center	237	East Baton Rouge	Louisiana Department of Wildlife and Fisheries	fishing,	Nature trails, birding, shooting range, archery range, picnic facilities	No	Accessible via North Flannery Road or by boat from the Comite River. LDWF initiated a Summer Day Camp for children ages 12 to 16 in the summer of 2011. The camp is free and open for 5 days allowing participants to receive official boater and hunter education certifications. The camp also offers a fish identification class, fishing and canoeing, skeet shooting, and other outdoor related activities.
Parish/County Park System							
Ascension Parish Parks	N/A	Ascension	Ascension	N/A	Ballfields, courts, playgrounds, leisure paths, swimming pools, picnic areas	Yes	The parish has 13 parks within the study area in communities including St. Amant, Gonzales, Prairieville, and Geismer

Recreation and Park Commission for the Parish of East Baton Rouge (BREC)	N/A	East Baton Rouge	BREC	N/A	Horseback riding, hiking, picnicking, mountain biking, birding, photography, camping, shooting range	Yes	BREC has more than 180 parks including a unique mix of facilities, which mirror the history and rich natural resources in the region; including a state-of-the-art observatory, a swamp nature center and conservation areas, a performing arts theatre, an equestrian park, an art gallery, an arboretum, an accredited zoo, seven golf courses and an extreme sports park with a 30,000-foot concrete skate park, rock-climbing wall, BMX track, and velodrome.
Livingston Parish Parks	N/A	Livingston	Livingston	N/A	Ball field, courts, pools, leisure paths, picnic areas	No	The parish has parks within the study area in communities including Greenwell Springs, Walker, Parks and Recreation of Denham Springs (PARDS), and Livingston Parks and Recreation (LPR).
St. James Parish Parks	N/A	St. James	St. James Parish Parks and Recreation	N/A	Ball fields, courts, playgrounds, leisure paths, swimming pools	No	The parish has 4 parks within the study area including Gramercy Park, Lutcher Park, Paulina Park, and Romeville Park,
St. John Parish Parks	N/A	St. John the Baptist	St. John the Baptist	N/A	Ball fields, courts, playgrounds, leisure paths, swimming pools, picnic areas	No	The parish has 8 parks within the study area: Ezekiel Jackson, Regala, Belle Pointe, Emily C. Watkins, Greenwood, Cambridge, Stephanie Wilking, and Hwy. 51 Park

According to the United States Department of the Interior National Park Service Land & Water Conservation Fund (LWCF), nearly 100 recreation projects within the study area have been supported between 1965 and 2011. Section 6(f)(3) of the L&WCF Act assures that once an area has been funded with L&WCF assistance, it is continually maintained in public recreation use unless National Park Service (NPS) approves substitution property of reasonably equivalent usefulness and location and of at least equal fair market value. Table 3-5 illustrates funding from the LWCF within the study area.

Table 3-5. LWCF Grant Funding within the Project Area

Grants	Parish/County	Amount
19	Ascension	$1,249,286.86
58	East Baton Rouge	$3,729,989.60
16	Livingston	$1,538,956.14
5	St. James	$539,740.17
1	St. John the Baptist	$128,026.56
99	**Total**	**$7,185,999.33**

3.2.2.4 Environmental Justice

An Environmental Justice (EJ) analysis focuses on the potential for disproportionately high and adverse impacts to minority and low-income populations during the construction and normal operation of the Federal action, in this case, the proposed flood risk-reduction system alternatives: Darlington Dry Dam, the Sandy Creek Dry Dam, and the Non-Structural plan. The EJ assessment identifies environmental and demographic indicators for the project alternatives, using the EPA tool, EJSCREEN. If the alternative impact is appreciably more severe or greater in magnitude on minority or low-income populations than the adverse effect suffered by the non-minority or non-low-income populations after taking offsetting benefits into account, then there may be a disproportionate finding. Avoidance or mitigation are then required. The following subsections provide information on the low-income and minority population in Ascension, East Baton Rouge, East Feliciana, Iberville, Livingston, St. Helena, St. James, and St. John the Baptist Parishes in Louisiana and the Mississippi Counties of Amite, Franklin, Lincoln, and Wilkinson. .

Methodology

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

The methodology to accomplish an EJ analysis, consistent with E.O. 12898, includes identifying low-income and minority populations within the study area using up-to-date economic statistics, aerial photographs, U.S. Census Bureau decennial data, and the 2013-2017 American Community Survey (ACS) estimates, as well as EPA's EJSCREEN tool. At this time, although public scoping meetings have taken place, specific EJ outreach has not been conducted and may have to be performed during the Pre-Construction, Engineering and Design (PED) phase of the study. The ACS estimates provide the latest socioeconomic community characteristics, including minority and poverty level data, released by the U.S. Census Bureau and are based on data collected between January 2013 and December 2017.

Existing Conditions

Five of the 12 parishes or counties in the study area including East Baton Rouge, Iberville, St. James, and St. John the Baptist Parishes as well as Wilkinson County, Mississippi, have

a majority minority population identifying as Black/African American, American Indian and Alaska Native, Asian, Native Hawaiian and Other Pacific Islander, Some Other Race, or Two or More Races. Most of the minority population identifies as Black/African American. The 2017 ACS total population of the 12 parish area is approximately 895,000. Hispanic population represents the largest ethnicity of the parishes and counties and is between 0.2 percent and 5.8 percent of total population. For more information on minority populations, refer to Appendix C-1, Section 3.8.

Four of the 12 parishes/counties in the study area, including St. Helena Parish in Louisiana and Amite, Lincoln, and Wilkinson Counties in Mississippi have 20 percent or more of individuals living below poverty, which in 2017 is $25,094 for a family of four. Less than 20 percent of the population lives below poverty level in the other eight areas. For more information on low-income populations, refer to Appendix C-1, Section 3.8.

The EJSCREEN uses environmental and demographic indicators to help identify EJ communities. The EJ Environmental Indexes, presented in Table C1-22 of the Environmental Appendix C-1, Section 3.8 are all below the 80th percentile in the state or USA, which is according to the EPA, the percentile where one would expect EJ concerns.The Environmental Indicators do not highlight EJ concerns. However, the demographic indicator, Minority Population, shows the area well over 50 percent minority, both for communities within the Darlington Dam footprint and communities in the 0.04 AEP floodplain.

Mitigation measures should be developed specifically to address potential disproportionately high and adverse effects to minority and/or low-income communities. When identifying and developing potential mitigation measures to address environmental justice concerns, members of the affected communities would be consulted. Enhanced public participation efforts would also be conducted to ensure that effective mitigation measures are identified and that the effects of any potential mitigation measures are fully analyzed and compared. Mitigation measures may include a variety of approaches for addressing potential effects and balancing the needs and concerns of the affected community with the requirements of the action or activity. If necessary, additional EJ details would be provided in future NEPA documents including:

- Outreach and public involvement details
- Details of acquisition alternatives
- Relocation assistance

3.2.2.5 Socioeconomics

Table 3-6, 3-7, and 3-8 display the population, number of households, and the employment (number of jobs) for each of the parishes and counties for the years 2000, 2010, and 2017 as well as projections for the years 2025 and 2045. The 2000 and 2010 population, number of households, and employment is based on estimates from the 2010 U.S. Census and the projections were developed by Moody’s Analytics (ECCA) Forecast, which has projections to the year 2045.

Table 3-6 Historical and Projected Population by Parish/County

Parish/County	2000	2010	2017	2025	2045
Ascension	76,627	107,215	122,948	136,988	161,973
East Baton Rouge	412,852	440,171	446,268	441,495	415,720
East Feliciana	21,360	20,267	19,412	18,140	15,910
Iberville	33,320	33,387	33,027	31,166	27,428
Livingston	91,814	128,026	138,228	150,306	166,260
St. Helena	10,525	11,203	10,363	9,681	8,592
St. James	21,201	22,006	21,790	22,599	23,727
St. John the Baptist	43,248	45,621	44,078	45,713	47,995
Amite	13,599	13,131	12,447	11,992	11,680
Franklin	8,448	8,118	7,765	7,517	7,476
Lincoln	33,166	34,869	34,347	35,400	36,479
Wilkinson	10,312	9,878	8,804	8,335	7,823
Total	776,472	873,893	899,477	919,332	931,063

Sources: 2000, 2010, 2017 from U.S. Census Bureau; 2025, 2045 from Moody's Analytics (ECCA) Forecast

Table 3-7. Projected Households by Parish/County

Parish/County	2000	2010	2017	2025	2045
Ascension	26,995	38,050	44,890	51,815	66,244
East Baton Rouge	156,740	172,440	179,910	184,008	186,082
East Feliciana	6,694	6,996	6,922	6,752	6,411
Iberville	10,697	11,075	11,229	11,137	10,643
Livingston	32,997	46,297	52,184	57,891	69,149
St. Helena	3,890	4,323	4,116	3,995	3,810
St. James	7,002	7,691	7,945	8,561	9,727
St. John the Baptist	14,381	15,875	16,005	17,249	19,602
Amite	5,261	5,349	5,213	5,149	5,252
Franklin	3,205	3,214	3,118	3,138	3,272
Lincoln	12,563	13,313	13,682	14,272	15,446
Wilkinson	3,584	3,452	3,236	3,097	3,065
Total	284,008	328,074	348,450	367,063	398,703

Sources: 2000, 2010 from U.S. Census Bureau; 2017, 2025, 2045 from Moody's Analytics (ECCA) Forecast

Table 3-8.Projected Employment by Parish/County

Parish/County	2000	2010	2017	2025	2045
Ascension	36,431	49,414	59,670	65,803	82,614
East Baton Rouge	197,789	205,112	227,301	222,833	222,810
East Feliciana	7,811	7,427	7,866	7,321	6,820
Iberville	11,745	12,622	13,661	12,892	12,054
Livingston	42,326	56,675	66,010	70,000	82,219
St. Helena	3,830	4,097	4,171	3,868	3,649
St. James	8,102	8,949	8,940	9,257	10,448
St. John the Baptist	18,702	19,252	18,794	19,479	21,968
Amite	5,274	4,385	4,206	4,023	4,082
Franklin	3,234	2,866	2,721	2,650	2,747
Lincoln	13,981	12,940	13,614	13,749	14,784
Wilkinson	3,239	2,968	2,610	2,404	2,343
Total	352,463	386,704	429,564	434,280	466,538

Sources: 2000, 2010 from U.S. Bureau of Labor Statistics; 2017, 2025, 2045 from Moody's Analytics (ECCA) Forecast

Table 3-9 shows the per capita personal income levels for the 12 parishes and counties for the years 2000, 2010, 2017, and 2025, with projections provided by Moody's Analytics Forecast.

Table 3-9. Per Capita Income ($) by Parish/County

Parish/County	2000	2010	2017	2025
Ascension	24,052	39,416	47,628	60,180
East Baton Rouge	27,228	39,651	48,120	60,048
East Feliciana	20,049	33,122	39,908	53,331
Iberville	18,681	32,342	38,960	50,288
Livingston	21,521	32,621	39,883	51,341
St. Helena	16,821	34,136	41,273	55,046
St. James	18,722	38,421	45,219	60,576
St. John the Baptist	20,002	33,894	41,505	57,423
Amite	17,923	25,620	32,225	41,711
Franklin	15,844	27,175	33,133	42,441
Lincoln	20,257	30,468	36,895	44,607
Wilkinson	14,667	24,322	28,745	37,916

Sources: 2000, 2010 from U.S. Census Bureau; 2017, 2025 from Moody's Analytics (ECCA) Forecast

3.3 FUTURE WITHOUT PROJECT CONDITIONS

NEPA requires that in analyzing alternatives to a proposed action, a federal agency must consider an alternative of "No Action." The Future without Project (FWOP) conditions apply to when the proposed action would not be implemented and the predicted additional environmental gains (e.g. flood risk reduction) would not be achieved. The FWOP conditions would include lower tax revenues as property values decline due to higher risk of damage from flooding events over time. Higher risk of damage from flooding could manifest itself in higher premiums for flood insurance under FEMA's National Flood Insurance Program: higher premiums are expected to increase the cost of property ownership and result in correspondingly lower market values.

Without implementation of the proposed action, other federal, state, local, and private restoration efforts may still occur within or near the proposed project area. Section 1.5 of this report discusses ongoing programs and potential projects in the study area for floodplain related activities. None of the proposed projects are currently in construction and if they were implemented would have only localized flood risk reduction within the study area. The projects/programs would have the potential to reduce the number of eligible structures for the nonstructural portion of the TSP.

Two authorized USACE construction projects, Comite River Diversion and the East Baton Rouge Flood Control, were included in the baseline conditions of the study; therefore, they are not anticipated to impact the benefits from the economic analysis of this study.

The Comite River Diversion, which is currently under construction, will be located approximately 20 river miles upstream of the confluence of the Comite and Amite Rivers (Figure 4-1). The project will divert water from the Comite River west to the Mississippi River, between the cities of Zachary and Baker, providing urban flood damage reduction. The East Baton Rouge Flood Risk Reduction Project reduces flooding along five sub-basins throughout the parish, including Jones Creek, Ward Creek, Bayou Fountain, Blackwater Bayou, and Beaver Bayou. This project consists of improvements to 66 miles of channels, including clearing and snagging, widening, concrete lining, and improvements to existing culverts and bridges to reduce headwater flooding/backwater overflow in the ARB.

Section 4
Formulate Alternative Plans

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

The initial plan formulation strategy was to focus on regional solutions (e.g., dams, detention basin, and diversion) followed by formulation based on economics damage centers (e.g., where the greatest consequences are) minimizing life loss, and/or more local protection. These measures/alternatives were developed based on previous reports and studies, NFS information, stakeholder/public input, new hydrology and hydraulics, geotechnical assessments, and professional judgment. This section also describes the plan formulation process to identify the TSP, which includes development of cost estimates and economic analysis.

The plan formulation process utilized the best available information at this phase of the study to identify a TSP. However, during the final phase of this feasibility study, additional analyses will be completed to refine the design and cost estimates of the features included in the TSP. The revised design and costs will be incorporated into the numerical modeling (Hydraulics and Economics) in order to develop an accurate assessment of the performance and cost-effectiveness of the plan which will be included in the Final IFR & EIS.

4.1 MANAGEMENT MEASURES AND SCREENING

The ARB primarily has flooding from two different sources. The upper basin flooding is caused from headwater flooding from rainfall events. The lower basin flooding is caused by a combination of drainage from headwaters and backwater flooding from tides and wind setup. Thirty-four nonstructural and structural management measures of a variety of scales were identified for evaluation to reduce the risk of flood damages within the ARB (Table 4-1). The measures were evaluated by the screening process based on the planning objectives, constraints, as well as the opportunities and problems of the study/project area.

Nineteen measures were carried forward to develop the alternative plans. Section 2 of Appendix E provides a description of the evaluation.

Table 4-1. Management Measures

Measure ID	Description
RW-1	Dredging of Outfall @ Amite River
RW-2	Dredging of Lower Amite River
RW-3	Dredging of Upper Amite River
RW-4	Dredging of Bayou Manchac
RW-5	Bridge Restrictions/ Improvements for I-12
RW-6	Amite River Channel Bank Gapping
RW-7	Storage Area at Spanish Lake, Ascension/Iberville Parish
RW-8	Hwy 22 and Port Vincent Bridge Drainage Improvements
RW-9	Upper Amite Bridge Restrictions/ Improvements
RW-10	Bayou Conway Pump to Mississippi River
RW-11	Diversion Gravity Fed (Manchac)
RW-12	Diversion Pump Station (Manchac)
RW-13	Diversion Gravity Fed (Union)
RW-14	Diversion Pump Station (Union) with conveyance channel
RW-15	Diversion Gravity Fed (Romeville)
RW-16	Diversion Pump Station (Romeville) with conveyance channel
RW-17	Modifications to Comite Diversion
RW-18	Dredging of Outfall @ Blind River
RW-19	Dredging of Lower Blind River
RW-20	Dredging of Colyell Creek
RW-21	Amite River Diversion Channel Bank Gapping
RW-22	Dredging of Lake Maurepas
HW-1	0.01 AEP Dry Dams-Upper Amite Tributaries
HW-2	Small Dry Dams on Amite River -Upper Amite
HW-3	Reservoirs along Bayou Manchac
HW-4	Flood Gate at Blind River Hwy 61
HW-5	Dry Retention Ponds- Lower Amite
HW-6	Closures at Tidal Passes
HW-7	University Lakes as Reservoir
UL-1	Large Scale Dam -Upper Amite (i.e. Darlington 0.04 AEP)
NS-1	Flood warning/Monitoring systems
UL-2	Dredging of Amite River Tributaries
NS-2	Nonstructural Improvements for high frequency events
FS-1	Ring Levees around Critical Facilities

Note: Shaded cells are measures that were not carried forward during the screening process.

4.2 DEVELOPMENT OF INITIAL ARRAY OF ALTERNATIVE AND SCREENING

Fifteen alternatives were assembled through the plan formulation process, which include alternatives for No Action and Nonstructural (Table 4-2). The alternative plans were initially identified using one or more of the nineteen management measures that were carried forward after the screening evaluation. Two additional alternatives were identified through public scoping, as discussed in Section 2.4.

The alternatives comprised of the FRM concepts are:

- Remove Water (RW) = Removing water more quickly out of the ARB
- Hold Water (HW) = During heavy rainfall events water would be held back from flowing down the ARB until water levels drop to reduce the flood risk.
- Nonstructural (NS)= does not modify or restrict the natural flood
- Upper and Lower Basin (UL) = Alternative that likely results in reduced flood risk for the entire ARB.
- FS = Focused Structural measures to protect critical Facilities.

Most alternatives assessed had very little reduction in flood risk and limited benefits. Topographic relief features in the geomorphology of the ARB have significant influence over flooding in the upper and lower basins. In the upper basin water flows to the south and in the central/lower basin the geomorphology is very flat, which limited the effectiveness of alternatives. Additionally, many of the alternatives were located where there were not many structures, so there were limited benefits. The parishes in the study area have a combined population of about 900,000 with more than half of the population living in East Baton Rouge Parish. The study area has over 260,000 structures and of those, about 80 percent are in the central portion of the ARB north of Bayou Manchac. Many of the alternatives were located where there were not many structures, so there were limited benefits. The remaining alternatives that were not screened, were those that provided storage of water to attenuate flooding downstream in heavily developed areas. Those alternatives are the focused array of alternatives. Appendix E provides a description of the evaluation as well as list of each of the alternatives evaluated. Appendix G provides details of the Hydraulics and Hydrology (H&H) analysis completed.

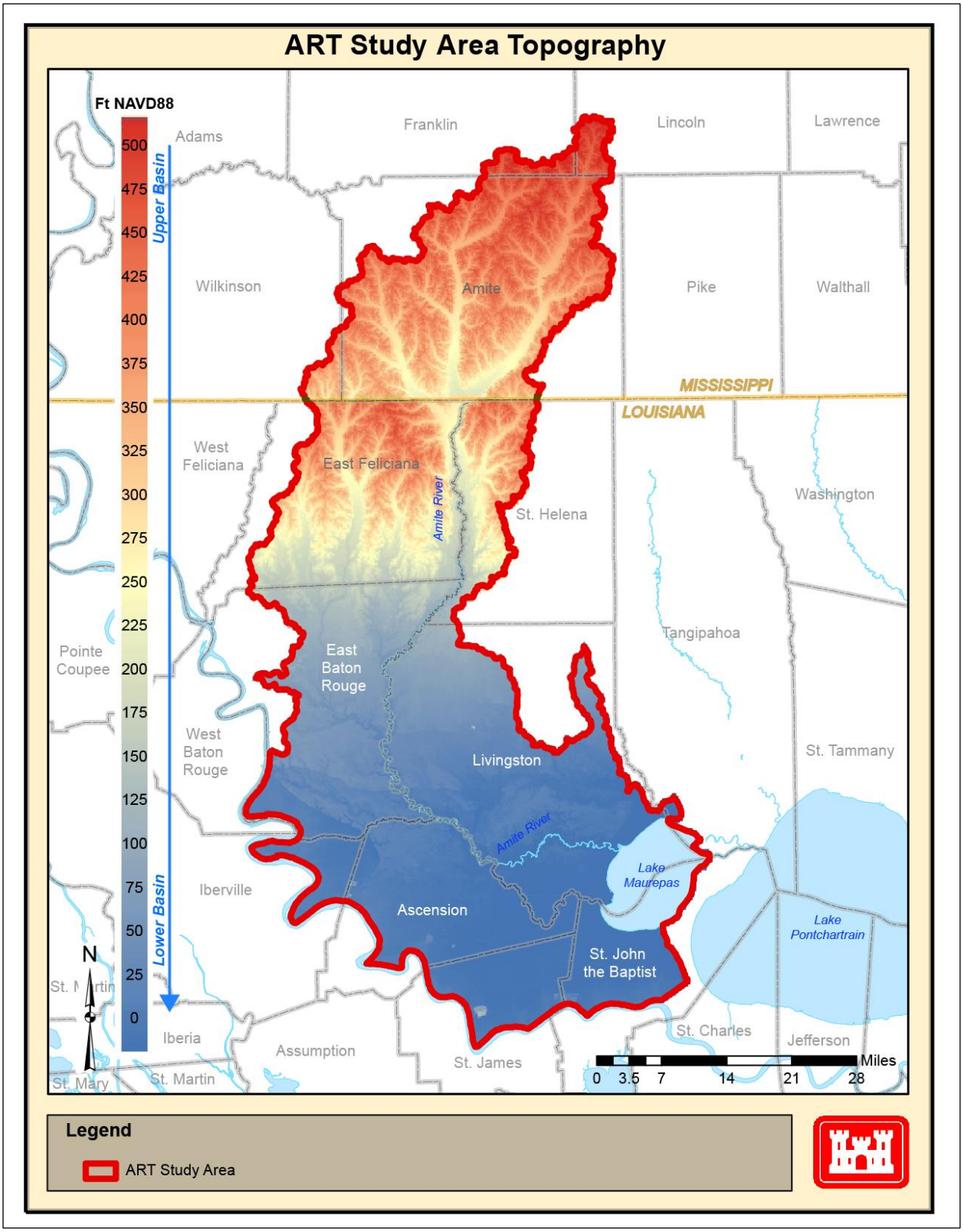

Figure 4-1. ARB Topographic Digital Elevation Model (Source: Louisiana Oil Spill Coordinators Office 2001)

Table 4-2. Alternatives

Alt ID	Measures Included	Alternative Description
Alt 1	No Action	No action would be taken under this plan. Damages would continue into the future.
Alt 2	RW-1+RW-2	Dredging of the Amite River outfall (RW-1) and in the lower reaches of the Amite River (RW-2)
Alt 3	RW-6	Lower Amite River Channel Bank Gapping (RW-6)
Alt 4	RW-8	Hwy 22 and Port Vincent Bridge drainage improvements (RW-8)
Alt 5	HW-3+ RW-4	Dredging (RW-4) and storage along Bayou Manchac in multiple small reservoirs (HW-3)
Alt 6	RW-7+NS-2+FS-1	Flood gate at Airline Hwy, Pump to MS River, open flood gates at Turtle and Alligator Bayous (RW-7) with the addition of nonstructural measures (NS-2) and ring levees for residential communities and critical infrastructure (FS-1)
Alt 7	RW-5+RW-9	Reduction of flow restrictions from bridges at I-12 (RW-5) and above I-12 (RW-9)
Alt 8	RW-3	Dredging of the Upper and Central Amite Basin, above I-12 (RW-3)
Alt 9	HW-7	University Lakes as reservoirs (HW-7)
Alt 10	HW-1	0.01 AEP Dry Dams along tributaries (HW-1)
Alt 11	HW-2	Small dry dams on the Amite River (HW-2)
Alt 12	UL-1	Large scale 0.04 AEP dam (UL-1)
Alt 13	NS-1+ NS-2	Nonstructural (NS-1 and NS-2)
Alt 14	None	Conversion of sand and gravel mines in the Amite Riverine to bottomland hardwood forest and swamp forest
Alt 15	None	Restoration of River Meanders

Note: Shaded cells are alternatives that were not carried forward during the screening process.

4.3 FOCUSED ARRAY OF ALTERNATIVES

The focused array of alternatives carried forward for consideration are presented in Table 4-3 and the locations of the structural alternatives are presented on Figure 4-2. Engineering Appendix A provides design and details of the structural alternatives.

Table 4-3. Focused Array of Alternatives

Alt ID	Management Measures	Alternative Description
Alt 1	No Action	No action would be taken under this plan. Damages would continue into the future.
Alt 10	HW-1	0.01 AEP Dry Dams along tributaries (HW-1)
Alt 12	UL-1	Large scale 0.04 AEP dam (UL-1)
Alt 13	NS-1+ NS-2	Nonstructural (NS-1 and NS-2)

4.3.1 No Action

Under the No Action Alternative, no risk reduction would occur. The area would continue experience damages from rainfall and wind/tide induced flooding. This would be exacerbated in the Lower ARB due to relative sea level rise.

4.3.2 Dry Dams along Tributaries

A 0.01 AEP dam design was chosen.to try to capture the most benefits by lowering the peak stage height along the Amite River by holding water back along larger tributaries in the upper basin. The alternative for dry dams along tributaries was divided further into two different alternatives after the initial assessment in order to ensure incremental justification of the dry dams. The alternative was broken into H&H analysis runs for one dam along Sandy Creek and the other run which combined there smaller dams along Darlington, Lilley, and Bluff Creeks. Limited data was available; therefore, many assumptions were made such as the geology of the area, the dam theoretical section, the outlet and spillway structure design, borrow material, and quantities, as discussed in Appendix A.

4.3.2.1 Dry Dam on Sandy Creek

The Dry Dam on Sandy Creek alternative consists of an earthen dam on Sandy Creek, a tributary of the Amite River and a summary of the design is presented in Table 4-4.

Table 4-4. Dry Dam on Sandy Creek Design Summary

Dry Dam Site	Storage Required for 0.01 AEP (acre-ft)	Maximum Elevation (ft) (NGVD29)	Max Elevation Acreage	Max Elevation Pool Volume (acre-ft)	Dry Dam Height (ft)	Length (ft)
Little Sandy Creek	26,000	160	3,550	56,250	30	7,720

4.3.2.2 Dry Dams on Darlington, Lilley, and Bluff Creeks

The dry dam for the Darlington, Lilley, and Bluff Creek alternative consists of three earthen dams on Darlington Creek, Lilley Creek, and Bluff Creek, all tributaries of the Amite River. A summary of the design is presented in Table 4-5.

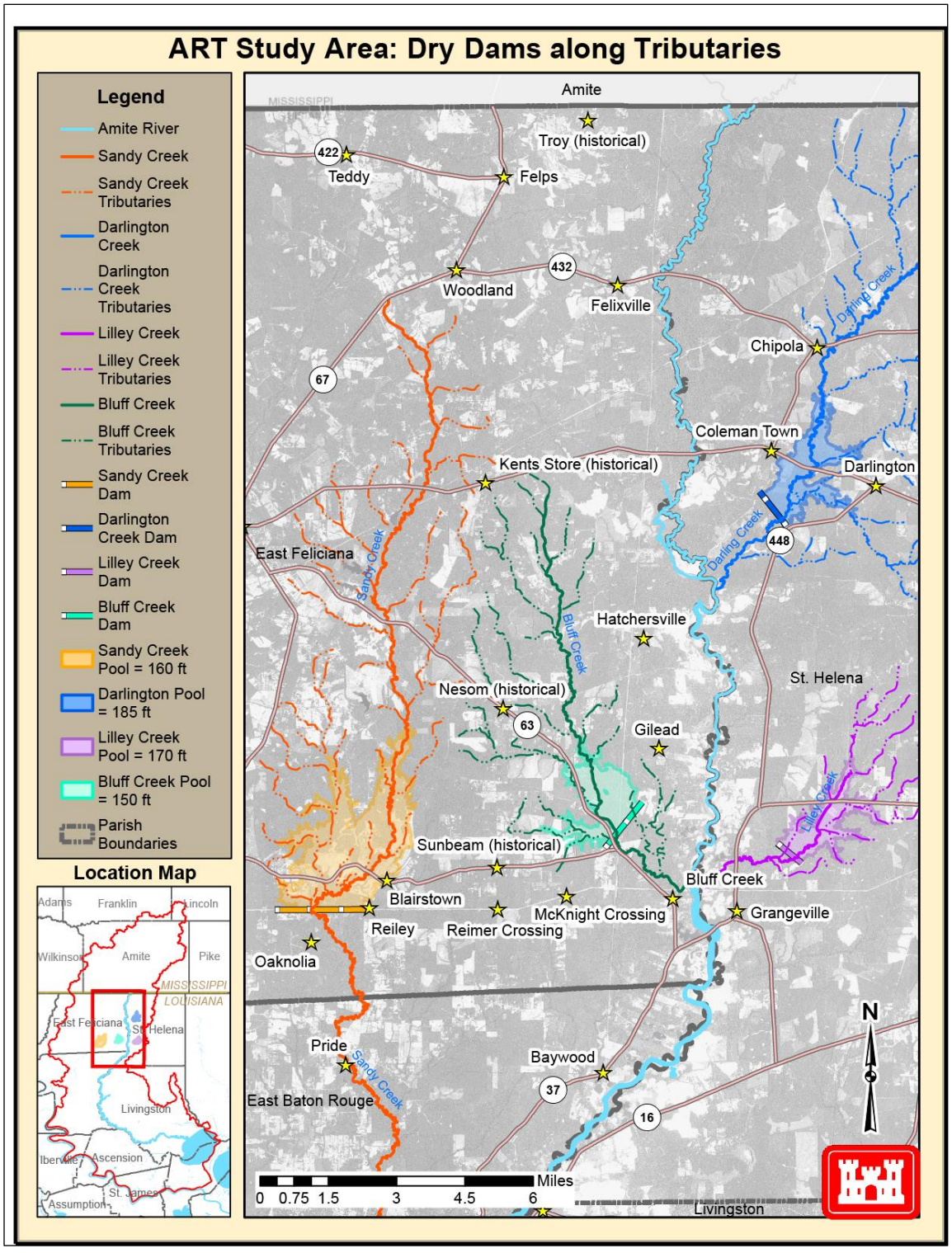

Figure 4-2. Location of Dry Dams along Tributaries and Large Scale Darlington Dam

Table 4-5. Dry Dams on Darlington, Lilley, and Bluff Creeks Design Summary

Dry Dam Site	Storage Required for 0.01 AEP (acre-ft)	Maximum Elevation (ft) (NGVD29)	Max Elevation Acreage	Max Elevation Pool Volume (acre-ft)	Dry Dam Height (ft)	Length (ft)
Darlington Creek	6,700	185	1,400	13,300	20	3,980
Bluff Creek	3,300	150	1,220	9,772	20	4,980
Lilley Creek	7,300	170	1,040	14,240	35	2,780

4.3.3 Large Scale 0.04 AEP Dam (Darlington Dam)

The large scale 0.04 AEP Darlington Dam alternative consists of an earthen dam on the Amite River with the option of being a wet or dry dam. Because this alternative was previously studied, data for analyzing it was available in the “Amite River and Tributaries, Darlington Reservoir Re-evaluation Study (Reconnaissance Scope),” dated September 1997. The 1997 report recommended Dry and Reduced-wet Darlington Dam alternatives were analyzed using the same design section (Figure 4-3 and Appendix A). A wet dam would consist of a permanently flooded reservoir/conservation pool, while the reservoir for a dry dam would be used only during flood events to accommodate outflow and thus minimize inundation to the surrounding area. The dry dam would have a crown elevation 1 foot lower than the reduced-wet (Table 4-6).

The dam consists of a clay core with a random fill outer layer and a 70 foot deep slurry trench. The dry dam design section consists of a reservoir with a 24 foot wide crown at elevation 201.0 (NGVD 29), side slopes of 1 vertical on 3 horizontal from the crown to elevation 171.0 (NGVD) (Figure 4-4). Below elevation 171.0 (NGVD 29) on the flood side, the slope is 1 vertical on 6 horizontal to elevation 150.0 (NGVD 29). The flatter slope is to reduce the chances of sudden drawdown failures that tend to occur in this zone. Below elevation 150.0 (NGVD 29), the slope is 1 vertical on 4 horizontal down to the existing ground. On the protected side, from elevation 171.0 to elevation 150.0 (NGVD 29), the slope is 1 vertical on 5 horizontal. The flatter slope in this area will increase stability and will resist seepage forces that may concentrate in the lower portion of the dam. Below elevation 150.0 (NGVD 29), the slope is 1 vertical on 3 horizontal. The low-level outlet structure consists of 3 - 10’ x 10’ concrete box culverts and will be located approximately 1000 feet to the east of

the Amite River. A 1000 foot long emergency spillway will be placed at elevation 171.0 (NGVD 29).

The design section developed using slope stability analyses in the 1997 study was designed with a top width of 24 feet. The top width of the dam does not meet EM 1110-2-2300 (General Design and Construction Considerations for Earth and Rock-Fill Dams), Article 4-3, which requires a minimum top width between 25 and 40 feet based on the dam height. However, EM 1110-2-2300 also states that the top width has little effect on stability and is governed by the functional purpose the top of the dam must serve. The design will be refined for the final IFR and EIS.

Table 4-6. Darlington Dam Design Summary

	0.04 AEP Dry Dam	0.04 AEP Wet Dam
Dam Elevation NGVD	201	202.8
Flood Control Pool	NA	39,000
Flood Control Pool Elevation	171	172.8
Flood Control Pool Storage acre-ft	213,000	198,000
Surcharge Pool Storage acre-ft	399,000	421,000
Total Peak Storage acre-ft	612,000	658,000
Max Outflow cfs	437,000	432,000

4.3.4 Nonstructural

A nonstructural assessment (Appendix F) was completed that looked at the effectiveness of implementing physical nonstructural measures (NS-2) such as structure elevations, acquisitions, and floodproofing. For evaluation purposes, the nonphysical measures (NS-1) which consists of flood warning system/evacuation plans were not included in the evaluation since there are no economic benefits that can be derived, but these measures are intended to reduce incremental risk at low cost, and will be included in the tentatively selected plan.

An inventory of residential and non-residential structures was developed using the National Structure Inventory (NSI) version 2.0 for the portions of the study area impacted by flooding from rainfall and sea-level rise associated with the future without project condition. An assessment of all structures located in the 0.04 and 0.02 AEP floodplains was performed and the results are presented below.

The nonstructural alternatives will be further refined based on analyses of effectiveness and cost. Further refinement will include a new analysis to combine nonstructural measures with structural alternatives, revisiting of groupings to address areas of potential life safety concerns and/or geographic groupings, as well as additional surveys conducted to be applied to the structure inventory.

The second nonstructural alternative that was evaluated included acquisition and relocation for all structures located in the 0.04 aggregated floodplain and can also be found in Appendix F. In this alternative, the costs of acquisitions, with relocation assistance to displaced persons, were compared with the expected annual damages reduced by the demolition of structures from the floodplain. For the analysis of the Nonstructural Alternative as a standalone alternative, acquisitions were not carried forward because the cost of the alternative exceeded the damages reduced (benefits).

4.3.4.1 0.04 AEP Floodplain

Measured every structure receiving a flood stage at or above the first floor elevation during the base year 0.04 AEP event.

- 4,291 residential structures could be raised to the future 0.01 AEP stage up to 13 feet.
- 387 nonresidential structures could be floodproofed up to 3 feet.

4.3.4.2 0.02 AEP Floodplain

Measure to every structure receiving a flood stage at or above the first floor elevation during the base year 0.02 AEP event.

- 6,774 residential structures could be raised to the future 0.01 AEP stage up to 13 feet.
- 670 nonresidential structures could be floodproofed up to 3 feet.

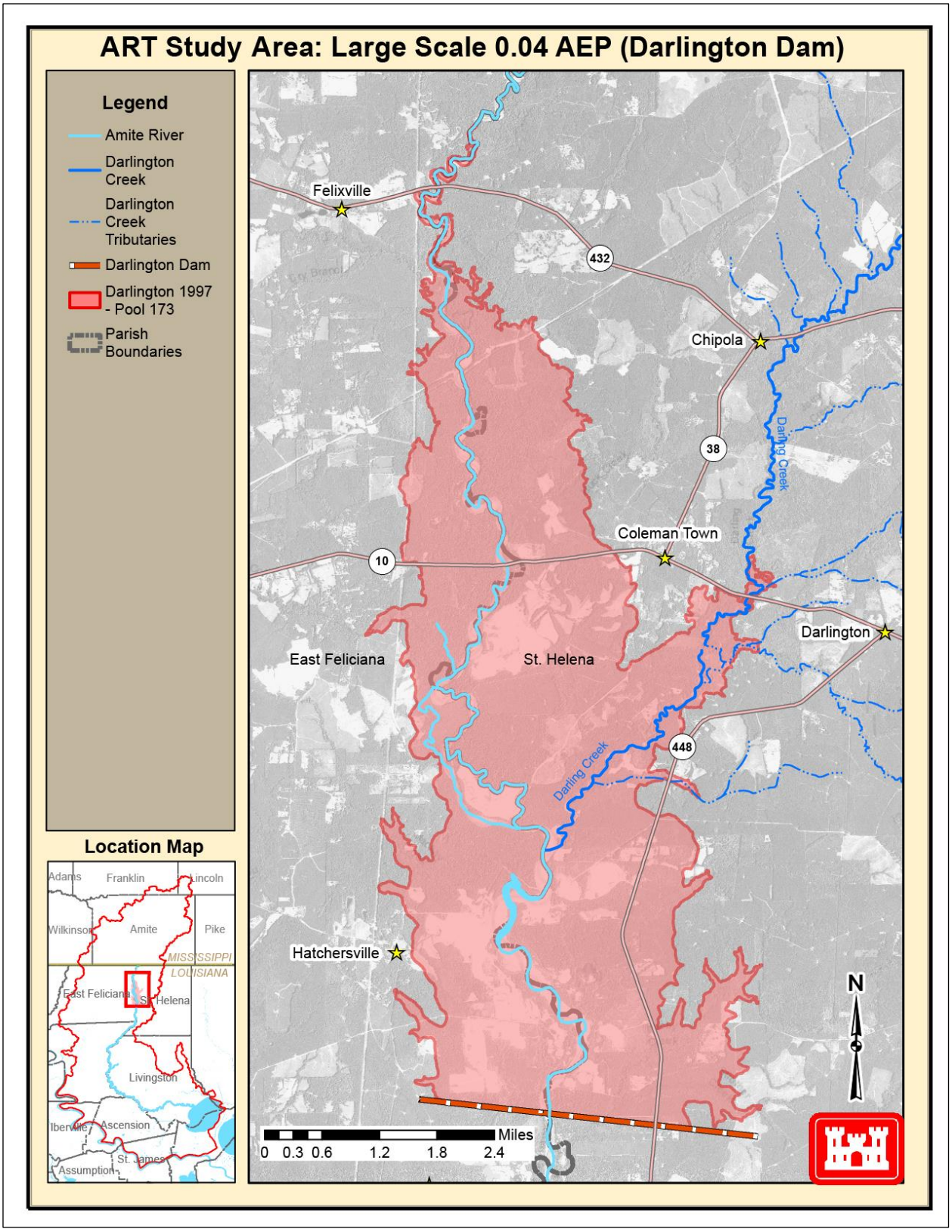

Figure 4-3. Close up of Large Scale 0.04 AEP Dam (Darlington Dam)

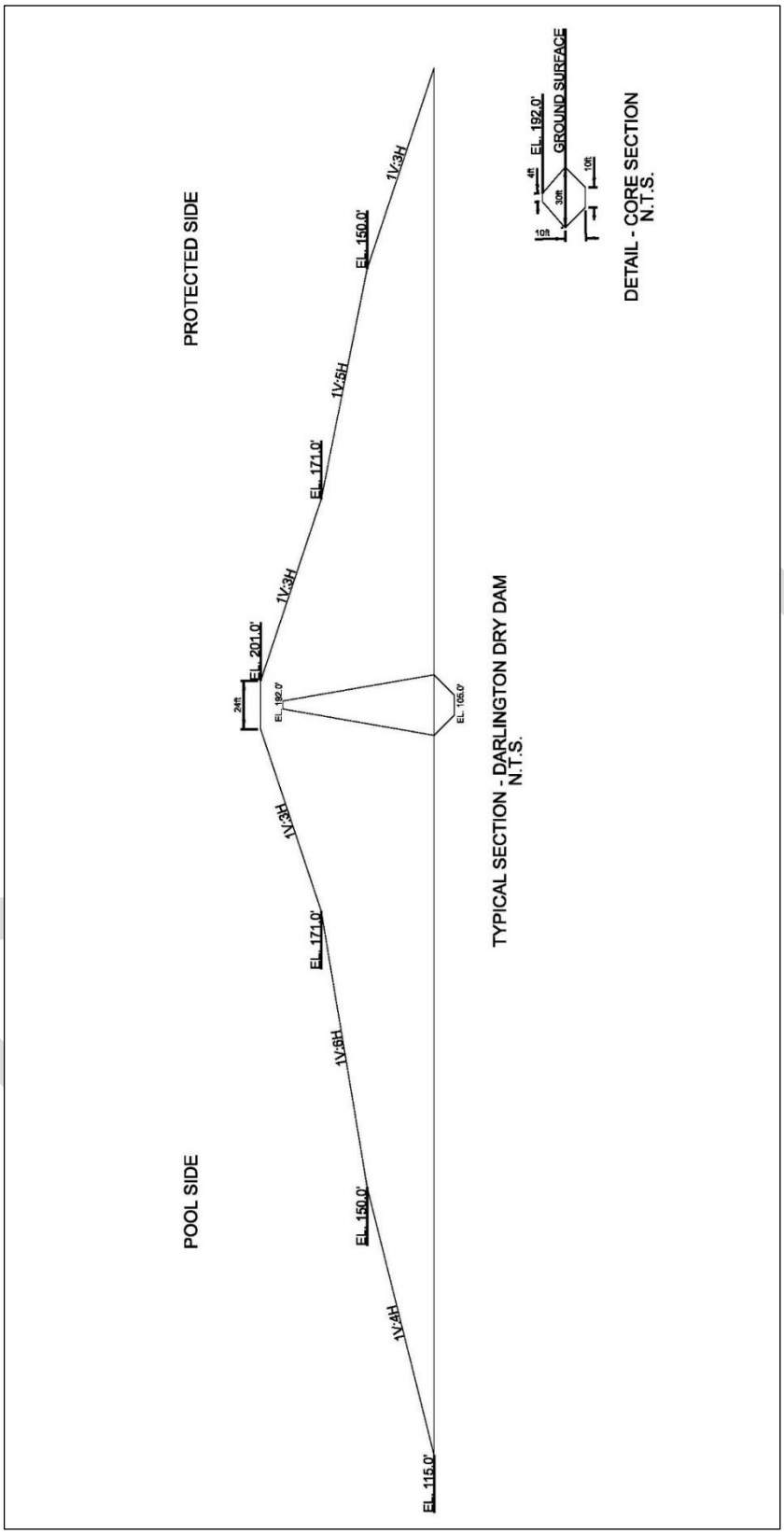

Figure4-4. Typical Section-Darlington Dry Dam

The plan formulation process utilized the best available information at this phase of the study to identify a TSP. However, during the final phase of this feasibility study, additional analyses will be completed to refine the design and cost estimates of the features included in the TSP. The revised design and costs will be incorporated into the numerical modeling (Hydraulics and Economics) in order to develop an accurate assessment of the performance and cost-effectiveness of the plan which will be included in the Final IFR & EIS.

4.4 FOCUSED ARRAY OF ALTERNATIVES COST ESTIMATES

Cost estimates of the focused array were developed and compared to help identify the TSP based on efficiency.

4.4.1 Structural Alternatives

The costs estimates for structural alternatives were developed utilizing Parametric costs, historical costs or the Micro-Computer Aided Cost Estimating System, 2nd Generation (MCACES MII) cost estimating software and is presented in Appendix B. These cost estimates developed First Costs or Construction Costs and include Real Estate costs, Relocation costs, Environmental and Cultural Resources costs, Planning, Engineering and Design costs and Construction Supervision and Administration costs. To cover unknowns, uncertainties, and unanticipated conditions that could not be evaluated at this time an appropriate amount of contingencies were included in each first cost depending on the level of investigative data and design detail available. Separate from first costs, Operations, maintenance, repair, rehabilitation, and replacement (OMRR&R) costs were developed and later included as part of Total Project Costs.

The first costs for the 0.04 AEP Darlington Dam alternative for the wet reservoir ($1.8 Billion) and dry reservoir ($1.3 Billion) costs were very similar with the exception for the Fish & Wildlife feature that covers BLH habitat and inflated heelsplitter mussel mitigation. Due to the permanently wet flood control pool, the habitat mitigation costs for a wet dam would be approximately $400 million more than for a dry dam. The first cost for the earthen dry dams along tributaries was $270 million for the dry dam on Sandy Creek and $350 million for three dams on Darlington Creek, Lilley Creek, and Bluff Creek.

4.4.2 Nonstructural Alternative

The physical nonstructural alternative was evaluated through two measures. The first looked at the cost of elevating residential structures and floodproofing non-residential structures located in the 0.04 and 0.02 AEP floodplains. The second measure looked at the cost of acquiring structures located in the same aggregated floodplains, including relocation assistance to displaced persons. The measure with the higher net benefits was used to determine the nonstructural feature cost, which happened to be the elevation and floodproofing measure. Relative Sea Level Rise (RSLR) impacts the number of structures to be raised in the lower basin near Lake Maurepas, resulting in uncertainty as to how many structures would have to be raised by any given date. A

cost estimate of the 0.04 ($1.3 Billion) and 0.02 AEP ($2.2 Billion) nonstructural features was developed based on the cost of reducing risk to structures in the year 2026 respective flood plains and is presented in Appendix F.

4.5 FOCUSED ARRAY ECONOMIC ANALYSIS

H&H model outputs and the economics functions were fed into the HEC-FDA, the USACE hydrologic modeling software for flood damage reduction analysis (https://www.hec.usace.army.mil/software/hec-fda/) and those results were tabulated and compared. More detailed costs were estimated based on construction, preconstruction engineering and design, construction management, real estate, and environmental and cultural mitigation, including all contingencies. Annualized costs and benefits were calculated and the Benefit Cost Ratio (BCR) for each alternative was estimated. Each of the alternatives should have benefits long into the future but guidance limits it to the 50-year period of analysis from 2026 to 2076. The economic results for each alternative are summarized in Table 4-7. The economic analysis yielded several alternatives that are in the Federal interest and from which a TSP can be identified. Three alternatives were screened due to negative net benefits, which included the nonstructural plan for a 0.02 AEP floodplain, large scale 0.04 AEP wet Darlington Dam, and the three 0.01 AEP dry dams on the Darlington, Lilley, and Bluff Creeks.

Table 4-7. Summary of Costs and Benefits for Focused Array of Alternatives

Alternative	Non-structural 0.04 AEP	Non-structural 0.02 AEP	Darlington Wet Dam 0.04 AEP	Darlington Dry Dam 0.04 AEP	Sandy Creek Dry Dam 0.01 AEP	3 Tributary Dry Dams 0.01 AEP
Total Project Costs						
First Cost	$1,335,282	$2,160,836	$1,788,531	$1,278,523	$270,977	$349,981
Interest During Construction	$4,536	$7,34	$100,590	$71,907	$7,477	$9,658
Total Investment Cost	$1,339,818	$2,168,176	$1,889,121	$1,350,430	$278,455	$359,638
Estimated Annual Costs						
Annualized Project Costs	$49,628	$80,311	$69,975	$50,021	$10,314	$13,321
Annual OMRR&R	$0	$0	$658	$439	$220	$659
Total Annual Costs	$49,628	$80,311	$70,633	$50,461	$10,534	$13,980
Average Annual Benefits						
Total Annual Benefits	$53,547	$63,542	$65,066	$65,066	$13,649	$6,131
Net Annual Benefits	$3,919	-$16,769	-$5,567	$14,605	$3,115	-$7,849
Benefit to Cost Ratio	1.08	0.79	0.92	1.29	1.30	0.44

FY19 Price Level, $ 1,000s

4.6 FINAL ARRAY OF ALTERNATIVES

The remaining alternatives are presented in Table 4-8 as the final array of alternatives, which were further evaluated to identify the TSP. The final array of alternatives were compared based on a variety of factors including economics, H&H impacts, NFS coordination, and tribal coordination. As was done with the initial screening, the four evaluation criteria were also used to evaluate and compare alternative plans:

- Completeness – Does the alternative plan account for all necessary investments/actions to realize the planning objectives?
- Effectiveness – Does the alternative plan contribute to achieving the planning objectives?
- Efficiency – Is the alternative plan cost effective and efficient (benefits exceed costs)?
- Acceptability – Is the alternative plan feasible from technical, environmental, economic, financial, political, legal, institutional, and social perspectives? Does the alternative plan satisfy government entities and the public?

Table 4-8. Final Array of Alternatives

Alternative
No Action (FWOP)
0.01 AEP Dry Dam along tributary: Sandy Creek Dry Dam
Large scale dam: Darlington Dry Dam
Nonstructural: 0.04 AEP Floodplain (NS-1 and NS-2)

4.6.1 System of Accounts

To facilitate alternatives evaluation and comparison of the alternatives, the 1983 Principles and Guidelines lay out four Federal Accounts that are used to assess the effects of the final array of alternatives. The accounts are NED, Environmental Quality (EQ), Other Social Effects (OSE), and Regional Economic Development (RED).

- The intent of comparing alternative flood risk reduction plans in terms of NED account was to identify the beneficial and adverse effects that the plans may have on the national economy. Beneficial effects were considered to be increases in the economic value of the national output of goods and services attributable to a plan. Increases in NED were expressed as the plans' economic benefits, and the adverse NED effects were the investment opportunities lost by committing funds to the implementation of a plan.
- The EQ account was another means of evaluating the plans to assist in making recommendations. The EQ account was intended to display the long-term effects that the alternative plans may have on significant environmental resources. The Water Resources Council defined significant environmental resources as those components of the ecological, cultural and aesthetic environments that, if affected by the alternative plans, could have a material bearing on the decision-making process.
- The RED account was intended to illustrate the effects that the proposed plans would have on regional economic activity, specifically, regional income and regional employment.
- The OSE account typically includes long-term community impacts in the areas of public facilities and services, recreational opportunities, transportation and traffic and man-made and natural resources. Table 4-9 describes the compared by completeness and effectiveness by alternative of the four accounts NED, EQ, RED, and OSE.

Table 4-9. Evaluation of the Four Accounts

Four Accounts	Nonstructural 0.04 AEP Floodplain	Darlington Dry Dam 0.04 AEP	Darlington Dry Dam with Nonstructural	Sandy Creek Dry Dam 0.01 AEP

			0.04 AEP	
National Economic Development (NED)	Avg. Annual Benefits- $53.5M Avg. Annual Costs- $49.6M $3.9M in net benefits. 1.07 BCR Ranked 4th	Avg. Annual Benefits- $65M Avg. Annual Costs- $50.5M $14.6M in net benefits. 1.29 BCR Ranked 2nd	Avg. Annual Benefits- $109M Avg. Annual Costs- $88.1M $20.5M in net benefits. 1.23 BCR Ranked 1st	Avg. Annual Benefits- $13.6M Avg. Annual Costs- $10.5M $3.1M in net benefits. 1.30 BCR Ranked 3rd
Environmental Quality (EQ)	Negligible footprint for this plan. Ranked 1st	Construction footprint is the largest and therefore a large environmental impact. Ranked 3rd (tie)	Construction footprint is the largest and therefore a large environmental impact. Ranked 3rd (tie)	Construction footprint is the smallest of the three structural plans and therefore little environmental impact. Ranked 2nd
Regional Economic Development (RED)	The project cost supports a large amount of regional employment from construction of the project. Ranked 3rd	The project cost supports a large amount of regional employment from construction of the project. Ranked 2nd	The project cost supports the largest amount of regional employment from construction of the project. Ranked 1st	The project cost supports a moderate amount of regional employment from construction of the project. Ranked 4th
Other Social Effects (OSE)	Effects to OSE would be minimized as the 0.04 AEP aggregation treats all structures in the floodplain as equals and does not rank individual structures on BCRs. Structure elevation or acquisitions are possible. A human impact to EJ resources is expected. Ranked 2nd	Effects to OSE would increase, as the dam footprint would require acquisition and relocation assistance to low income residents. Ranked 3rd	Effects to OSE would increase, as the dam footprint would require acquisition and relocation assistance to low income residents. Human impacts to EJ resources is expected. Ranked 4th	Effects to OSE would increase, as the dam footprint would require acquisition and relocation assistance to low income residents. Ranked 1st

4.6.2 Other Evaluation

Based on analysis of H&H, the 0.01 AEP dry dam on Sandy Creek was screened because the Darlington Dam has a much larger benefit region; therefore, larger net annual benefits. The large scale 0.04 AEP dry Darlington Dam and the Sandy Creek Dam both have benefit areas that are primarily on the main stem of the Amite River. The Darlington Dam and the Sandy Creek Dam both have benefit areas that are primarily on the main stem of the Amite River. The Darlington Dam provides benefits to structures that could have potentially seen benefits from Sandy Creek Dam. Once the benefits are captured by the Darlington Dam, there are no longer enough potential benefits available for Sandy Creek Dam to be justified. The same would be true in

reverse: Sandy Creek Dam provides benefits to some of the structures that could have seen benefits from Darlington Dam. Once those benefits are captured by Sandy Creek, there are less benefits available for Darlington Dam to capture. Due to this overlapping of benefit regions, the alternative of combining Darlington Dam and Sandy Creek cannot simply add the individual benefits of the two dams.

Based on the economic analysis of the focused array (Table 4-7) the NED plan is the Darlington Dry Dam. The flood risk that remains in the floodplain after the proposed alternative is implemented is known as the residual flood risk. Nonstructural measures can be used to reduce the residual risk associated with the TSP. The residential and nonresidential structures, damaged under the with project conditions in year 2026 that incurred flood damages by the stage associated with the 0.04 AEP event, were considered eligible for acquisition, elevation, and floodproofing based upon these criteria.

- Elevating residential structures up to 13 feet and floodproofing non-residential structures up to 3 feet located in the 0.04 AEP floodplain and outside the FEMA regulatory floodway. Residential structures will be elevated to the 0.01 AEP base flood elevation (BFE) predicted to occur in the year 2076.
- If a structure would require elevating greater than 13 feet to meet the future year 0.01 AEP BFE, the structure may instead be acquired and removed from the floodplain. The 13 feet height is based on guidance provided in the FEMA publication P-550.
- Following detailed design, it may become necessary to acquire structures for permanent evacuation of the FEMA regulatory floodway. Such determination would be based on risk and performance.

During further refinement, should the Life Safety Risk Analysis indicate the need for acquisitions for permanent evacuation of the FEMA regulatory floodway or any other areas of critical concern, then eminent domain would be retained as a method of accomplishing acquisitions required of the NFS, consistent with USACE Planning Bulletins 2016-01 and 2019-03. A preliminary analysis found a total of 3,252 residential structures and an additional 314 non-residential structures in the 0.04 AEP floodplain. The nonstructural measures will be refined by assessing the Darlington Dam as the new base condition for the hydrology which will include assessment of residual flood risk. Table 4-10 shows the expected annual net benefits for the TSP of Darlington Dry Dam with elevation and floodproofing in the 0.04 AEP floodplain to address residual risk. As plans are refined, the costs and benefits of acquisitions within the floodplain will be developed and addressed in the Final IFR and EIS.

Table 4-10. Summary of Costs and Benefits of the TSP

Darlington Dry Dam with 0.04 AEP Nonstructural Measures Total Expected Annual Net Benefits (FY19, $1,000's, 2.75% Discount Rate)	
Item	**Expected Annual Benefits and Costs**
Damage Category	
Structure, Contents, Vehicles, and Debris Removal	$109,066
Total Benefits	$109,066
Structural First Costs	$1,278,524
Nonstructural First Costs*	$1,024,198
Total First Costs	$2,302,722
Interest During Construction	$78,887
Annual Operation & Maintenance Costs	$439
Total Annual Costs	$90,817
*Not including acquisitions and related costs	
B/C Ratio	1.20
Expected Annual Net Benefits	$18,249

4.7 IDENTIFYING THE TSP

Per USACE Guidance, the tentatively selected plan for flood risk management projects should be the plan that maximizes net benefits which is also called the NED Plan. In order to determine which alternative is the NED Plan, the costs and benefits for the Focused Array of Alternatives were compared. The alternative with the greatest net benefits is the apparent NED Plan, and thus the TSP.

The TSP identified from the final array is the Dry Darlington Dam combined with nonstructural measures.

The Dry Darlington Dam is an earth embankment dam consisting of a clay core with a random fill outer layer. The constructed dam has a footprint of approximately 205 acres and a flood pool of approximately 12,600 acres, located north of the dam between St. Helena and East Feliciana Parishes. The outlet would consist of three 10x10 feet concrete box culverts with sluice gates that would be closed to prevent flow and allow for water to pool behind the dam prior to release. An emergency spillway would be placed at the flood control pool max elevation. Approximately 1,000 acres of suitable borrow material would be required for construction of the dam, consisting of approximately 10,710,000 cubic yards of random fill and 856,000 cubic yards of clay fill. The Dry Darlington Dam scale will be optimized during the feasibility study design. Final determination for abutment requirements, control tower, sedimentation basin, diversion channel dimensions, outlet channel dimensions to existing Amite River, and spillway location and size (currently evaluating different sizes in an effort of optimization) will need to be determined, along with the staging area(s) for construction. Access road paving and/or surfacing including the crest of the dam and shops needed to maintain the dam will also need to be determined. The evaluation of potential borrow sites and staging areas will also consider environmental impacts and will identify compensatory mitigation requirements for unavoidable impacts.

The nonstructural measures include physical and nonphysical elements. The nonphysical nonstructural measures are to reduce incremental risk with the Darlington Dam in place. An Emergency Action Plan and flood warning system, for the dam and downstream flows, will be established for future with project. Also, each parish impacted by the Darlington Dam will need to revise and/or develop their Floodplain Management Plans to include emergency response, preparedness and recovery actions necessary to manage existing and future risks. The Floodplain Management Plans are a responsibility of local governments.

As noted in Section 4.6.2, the physical nonstructural measures of the TSP may include acquisitions with relocation assistance to displaced persons, elevations of residential structures, and floodproofing of non-residential structures. The nonstructural plan will be refined by assessing the Darlington Dam as the new base condition for the hydrology, which will likely include structures in geographical regions that are not getting direct benefits from the Darlington Dam such as the Lower Reach of the ARB.

Section 5
Evaluate Alternative Plans

5.1 ENVIRONMENTAL CONSEQUENCES

In accordance with NEPA, this chapter includes the scientific and analytic basis for comparison of the considered alternatives identified in Section 4 – Formulate Alternative Plans. The discussion includes the environmental impacts of the considered alternatives, any adverse environmental effects which cannot be avoided, direct, indirect and cumulative effects of proposed actions, the relationship between short-term uses and long-term productivity, and any irreversible or irretrievable commitments of resources involved in the proposed actions should one be implemented.

This chapter assesses the project's potential environmental impact on those resources identified in Section 3, Inventory and Forecast Conditions.

5.2 CUMULATIVE EFFECTS ANALYSIS

The Council on Environmental Quality (CEQ) Regulations define cumulative impacts as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time." (40 CFR §1508.7).

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

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

For a description of the geographic boundaries and timeframe of the cumulative impact analysis, refer to Appendix C-1, Section 5.2

5.3 SUMMARY OF ENVIRONMENTAL CONSEQUENCES BY EACH ALTERNATIVE

This chapter describes the environmental consequences associated with implementing the final array of alternatives, including the TSP of the Darlington Dam and Nonstructural

measures. Impacts for borrow sources and staging areas for Alternatives 2, 3, and 5 are currently unknown,but will be considered in the final EIS.

This chapter compares the effects of the proposed alternatives:

- Alternative 1: No Action Alternative
- Alternative 2: 0.01 AEP Dry Dam along tributary: Sandy Creek Dry Dam
- Alternative 3: Large-Scale 0.04 AEP .04 (Darlington Dam)
- Alternative 4: Nonstructural: 0.04 AEP Floodplain (Nonstructural)
- TSP: Combined Darlington Dam and Nonstructural

5.3.1 Relevant Resources Affected

This section describes the direct, indirect, and cumulative effects of the No Action Alternative and the Proposed Action (TSP).

A wide selection of resources were initially considered and several were determined not to be affected by the project—mainly due to the remote and uninhabited nature of the project area and general lack of significant populated areas in the vicinity. Navigation, aquatic resources/fisheries, and essential fish habitat would not be affected by the proposed project. Table 5-1 provides a list of resources in the project area and anticipated impact(s) from implementation of the proposed action.

Table 5-1. Relevant Resources Impacts in and near the Project Area

Relevant Resource	Negative Impact	Positive Impact	Not Impacted
Wetland Resources	Temporary and permanent for structural measure and No Action (structural)		Nonstructural measure (nonstructural)
Upland Resources	Temporary and permanent for structural and No Action		Nonstructural
Aquatic Resources/Fisheries	Temporary and permanent for structural		No Action Alternative and nonstructural
Wildlife	Temporary for structural	Potential for structural	No Action Alternative and nonstructural
Threatened, Endangered, and Protected Species	Potential adverse for structural if present		*With contractor guidance; not likely to adversely affect. None for No Action Alternative
Geology, Soils, and Prime and Unique Farmland	Potential for Prime and Unique Farmland for structural (*soil borrow and placement)		No Action Alternative and Nonstructural
Water Quality		Potential for permanent	No Action Alternative and Nonstructural
Air Quality	Temporary for Structural		None for No Action Alternative and Nonstructural
Cultural	Potential adverse for structural		No Action Alternative and Nonstructural
Recreation	Temporary for structural	potential	No Action Alternative and Nonstructural
Aesthetics	Temporary for structural	potential for Nonstructural	No Action Alternative and Nonstructural
Socioeconomic Resources		Potential for Nonstructural with Acquisitions	
Environmental Justice	Adverse Impact for No Action; Potential adverse disproportionate for structural and nonstructural measure (acquisition)	Permanent for reduced flood risk for structural and nonstructural measures	
HTRW			No Action Alternative; structural and nonstructural measures

While there may be marginal effects to land-use from each of the alternatives, no major changes to land-use are expected from any of the projects being considered. For the

structural alternatives, impacts will be further analyzed for the dam footprint, staging area, and borrow sites.

5.3.1.1 Wetland Resources

A preliminary assessment of existing vegetation was completed on the entire final array of alternatives using existing USGS land classifications. Right of entry (ROE) was not available for all portions of the project sites at the time the impacts to the forested communities were estimated based on flood tolerances of tree species present. An assumption was made that all forested habitat was bottomland hardwoods, however a follow-up windshield survey was conducted that identified additional forested habitat types (See Section 5.3.1.2). Final site visits would refine the types of forested habitats impacted. Once ROE is obtained, site-specific WVAs would be run for the Dry Dams and Darlington Dam structural alternatives. As design proceeds, final WVAs would be completed on these alternatives to determine the most probable impacts to the habitat value.

During preliminary WVA's, impacts to forested habitat were estimated to be approximately 1,300 average annual habitat units (AAHUs) for the Darlington Dry Dam using data from projects with similar existing conditions. Figure 5-1 shows the National Wetlands Inventory dataset within the Darlington conservation pool.

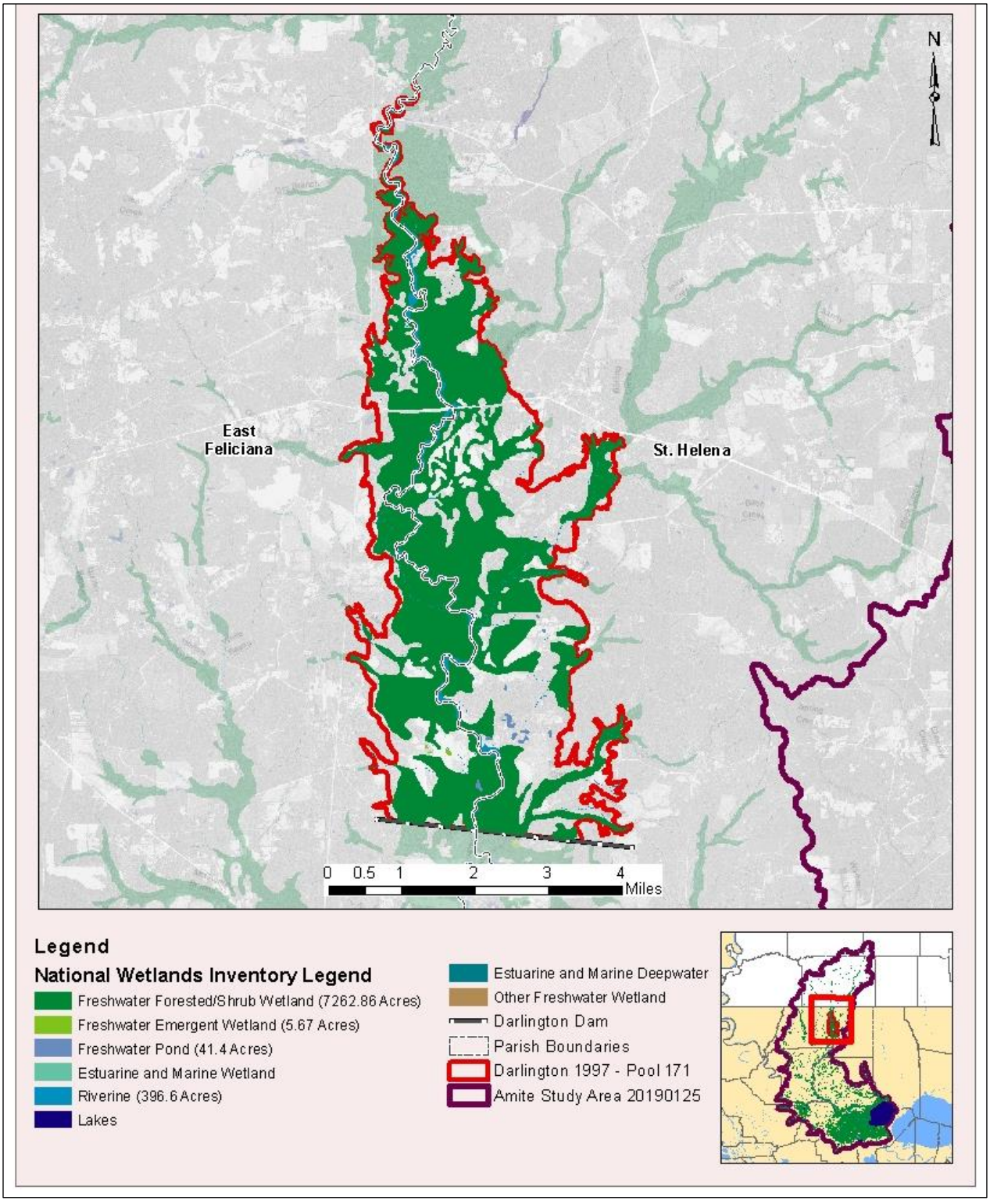

Figure 5-1. Wetland Impacts in the Darlington Dry Dam Conservation Pool
Source: FWS National Wetlands Inventory, https://www.fws.gov/wetlands/

Impacts of Considered Alternatives

Alternative 1: No Action Alternative

Direct, Indirect, and Cumulative Impacts: Without implementation of the proposed action, wetland resources would not be impacted from construction of a dry dam and associated features. Forested wetlands in the project area would continue to be directly and indirectly impacted by the present natural and anthropogenic factors (e.g. commercial development, sand and gravel mining). Erosional forces from major flood events would continue to permanently adversely impact these communities in the Lower ARB, while the Upper ARB would continue to experience less of an impact. Loss of small stream forest and to the Upper ARB from sand and gravel operations would continue.

Alternative 2: Sandy Creek Dry Dam

Direct, Indirect, and Cumulative Impacts: The Sandy Creek Dry Dam would be constructed in a manner that allows for drainage following flood events. Complete mortality of flood-sensitive species within those forests is not anticipated as the dry reservoirs would be constructed and operated in a manner that allows them to thoroughly drain following flood events. Some mortality could result with a transition to the more flood-tolerant species over time. Based on the 1997 mitigation estimate for dry reservoirs, approximately half to one-third of the species would experience mortality. USACE would mitigate for impacts to forested habitat and avoid impacts to natural forested habitat within borrow areas, to the extent practicable.

Alternative 3: 0.04 AEP Large-Scale Dam (Darlington Dam)

Direct, Indirect, and Cumulative Impacts: The Darlington Dam would be constructed in a manner that allows for drainage following flood events. Complete mortality of flood-sensitive species within those forests is not anticipated as the dry reservoirs would be constructed and operated in a manner that allows them to thoroughly drain following flood events. Some mortality could result with a transition to the more flood-tolerant species over time. Based on the 1997 mitigation estimate for dry reservoirs, approximately half to one-third of the species would experience mortality. USACE would mitigate for impacts to forested habitat and avoid impacts to natural forested habitat within borrow areas, to the extent practicable.

Cumulative impacts to this resource would be the additive combination of impacts by this and other Federal, state, local, and private flood risk reduction efforts, including, but not limited to the Comite River Diversion and the East Baton Rouge Flood Control Project.

Alternative 4: Nonstructural

Direct, Indirect, and Cumulative Impacts: Implementation of Alternative 4 would have no impact to aquatic species within the ARB.

TSP: Combined Darlington Dam and Nonstructural

When combining the Darlington Dam and nonstructural measures, there would be no additional impacts to this resource.

5.3.1.2 Upland Resources

Impacts of Considered Alternatives

Alternative 1: No Action Alternative

Direct, Indirect, and Cumulative Impacts: Without implementation of the proposed action, vegetative resources would not be impacted from construction of a dry dam and associated features. Forested wetlands in the project area would continue to be directly and indirectly impacted by the present natural and anthropogenic factors (e.g. commercial development, sand and gravel mining). Erosional forces from major flood events would continue to permanently adversely impact these communities in the Lower ARB, while the Upper ARB would continue to experience less an impact. Loss of small stream forest and to the Upper ARB from sand and gravel operations would continue.

Alternative 2: Sandy Creek Dry Dam

Direct, Indirect, and Cumulative Impacts: The Sandy Creek Dry Dam would be constructed in a manner that allows for drainage following flood events. Complete mortality of flood-sensitive species within those forests is not anticipated as the dry reservoirs would be constructed and operated in a manner that allows them to thoroughly drain following flood events. Some mortality could result with a transition to the more flood-tolerant species over time. Based on the 1997 mitigation estimate for dry reservoirs, approximately half to one-third of the species would experience mortality. USACE would mitigate for impacts to forested habitat and avoid impacts to natural forested habitat within borrow areas, to the extent practicable.

Alternative 3: Large-Scale 0.04 AEP Dam (Darlington Dam)

Direct, Indirect, and Cumulative Impacts: The Darlington Dam would be constructed in a manner that allows for drainage following flood events. Complete mortality of flood-sensitive species within those forests is not anticipated as the dry reservoirs would be constructed and operated in a manner that allows them to thoroughly drain following flood events. Some mortality could result with a transition to the more flood-tolerant species over time. Based on the 1997 mitigation estimate for dry reservoirs, approximately half to one-third of the species would experience mortality. USACE would mitigate for impacts to forested habitat and avoid impacts to natural forested habitat within borrow areas

Alternative 4: Nonstructural

Direct, Indirect, and Cumulative Impacts: Elevating homes would not directly impact vegetationin any surrounding areas, although the shading could potentially result in shifting plant communities. In cases where a home or land acquisition may take place, this could indirectly impact visual resources by removing a viewer from a given area. In areas where there is public access from a street or roadway, these nonstructural elements would not

change the view shed. Houses being raised are currently present, their elevation would change, but the site is still occupied either way. In the case of a home acquisition, if a home is removed and open land is created, this could be considered as a benefit to drivers looking for natural scenery or a loss to an established neighborhood.

TSP: Combined Darlington Dam and Nonstructural

When combining the Darlington Dam and nonstructural measures, there would be no additional impacts to this resource.

5.3.1.3 Aquatic Resources and Fisheries

Impacts of Considered Alternatives

Alternative 1: No Action Alternative

Direct, Indirect, and Cumulative Impacts: Without implementation of the proposed action, aquatic resources and fisheries in the project area would continue to be directly and indirectly impacted by the present natural and anthropogenic factors (e.g. commercial development, sand and gravel mining).

Alternative 2: Sandy Creek Dry Dam

Direct, Indirect, and Cumulative Impacts: Implementation of Alternative 2 would be similar to Alternative 3 although lesser in impact.

Alternative 3: Large-Scale 0.04 AEP Dam (Darlington Dam)

Direct, Indirect, and Cumulative Impacts: Implementation of Alternative 3 would have potentially adverse direct impacts to migration and spawning aquatic species from dam structure. Any aquatic species downstream of the dry dam could potentially by indirectly affected by having limited access to the upstream portion of Sandy Creek.

Alternative 4: Nonstructural

Direct, Indirect, and Cumulative Impacts: Implementation of Alternative 4 would have no impact to aquatic species within the ARB.

TSP: Combined Darlington Dam and Nonstructural

When combining the Darlington Dam and nonstructural measures, there would be no additional impacts to this resource.

5.3.1.4 Wildlife

Impacts of Considered Alternatives

Alternative 1: No Action Alternative

Direct, Indirect, and Cumulative Impacts: Without implementation of the Proposed Action (TSP), habitat loss would likely continue at the present rate resulting in a reduction of habitat diversity and availability for resident terrestrial wildlife (See Appendix C-1).

Alternative 2: Sandy Creek Dry Dam

Direct, Indirect, and Cumulative Impacts: Habitat loss impacts breeding habitat, nesting, and forage for wildlife species (See Appendix C-1). Impacts from this alternative would be similar to the TSP, except there would be a lesser loss of wildlife habitat.

Alternative 3: Large-Scale 0.04 AEP Dam (Darlington Dam)

Direct, Indirect, and Cumulative Impacts: Implementation of the TSP would directly result in the loss of forested habitat for wildlife species, with the potential for species mortality and displacement of non-mobile species present during construction. The common inhabitants of this area are bird species that are fully equipped to relocate to nearby freshwater emergent marsh. It is anticipated that displaced wildlife would return to similar habitat in the study area once construction is complete. Migration of terrestrial wildlife would also be restricted by the dry dam and the spillways would also impede movement of partially aquatic wildlife species that navigate in the Upper Amite River (e.g. otters, nutria, amphibians, and alligators.) Traffic from proposed access roads would also directly impact wildlife species that are present during construction activities, resulting in further mortality and displacement.

Any disturbance-tolerant wildlife species outside the project may indirectly benefit from having the converted upland habitat of the dam as additional territory for foraging and mating opportunities.

Cumulatively, this project would prevent an overall loss in the ARBBarataria of habitat necessary for many wildlife species. This project, when added to other past, present, and reasonably foreseeable future ecosystem restoration and mitigation projects in the basin, would help reduce the loss of wetlands and overall decline of wildlife species within the basin and would be beneficial to preserving species biodiversity.

Alternative 4: Nonstructural

Direct, Indirect, and Cumulative Impacts: Elevating structures in the floodplain could potentially provide shelter to wildlife species from predators; however, given the limited number of structures elevated, this impact would be low to neglible in extent.

TSP: Combined Darlington Dam and Nonstructural

When combining the Darlington Dam and nonstructural measures, there would be no additional impacts to this resource.

5.3.1.5 Threatened, Endangered, and Protected Species

Impacts of Considered Alternatives

Alternative 1: No Action Alternative

Direct, Indirect, and Cumulative Impacts: With the No Action alternative, no direct impacts to endangered species or their critical habitat would occur. Existing conditions would persist and listed threatened, endangered, or protected species would likely continue to be subject to institutional recognition and further regulations and federal management. Other listed species could also be adversely impacted by the continued habitat loss and degradation including the inflated heelsplitter mussel.

Alternative 2: Sandy Creek Dry Dam

Direct, Indirect, and Cumulative Impacts: This alternative would have impacts similar in impacts to Alternative 3, but lesser in extent.

Alternative 3: Large-Scale 0.04 AEP Dam (Darlington Dam)

Direct, Indirect, and Cumulative Impacts: Although threatened or endangered species may occur within the study area, most of their presence within the project area is highly unlikely. The project area does not contain critical habitat for federally-listed species, and the forested areas surrounding the project area would allow them to easily avoid the project activities. Therefore, the proposed action is unlikely to cause adverse direct or indirect impacts to (i.e., not likely to adversely affect) most federally-listed threatened or endangered species, or their critical habitat, under the jurisdiction of FWS, except for the Alabama Heelsplitter Mussel. Additionally, CEMVN has concluded that no critical habitat for any threatened, endangered, or candidate species under the purview of FWS has been designated within the project area, and that there would be no adverse impacts (i.e., not likely to adversely affect, NLAA) to any of the state-listed species that could potentially occur within the project area.

With coordination from FWS and NMFS, it was found that both the Atlantic sturgeon is not in the project area. The NLAA determination for the West Indian manatee includes Standard Manatee Conditions for In-Water Activities (see Section 8).

Table 5-1. Threatened (T), Endangered (E), & Protected (P) Species in Study Area

Scientific name	Common name and status (T, E, or P)	Listing	Found in Study Area	Found in Project Area	Determination of Effects
Potamilus inflatus	Alabama Heelsplitter Mussel (T)	Federal	Yes	Yes	May effect
Acipenser oxyrhynchus desotoi	Atlantic Sturgeon (T)	Federal	Yes	No	NLAA
Trichechus manatus	West Indian Manatee (TT)	Federal	Yes	No	NLAA
Haliaeetus leucocephalus	Bald Eagle (P)	State	Yes	Yes	NLAA

West Indian manatees and Atlantic Sturgeon are not present in the project area and would not be impacted by the dry dam. Bald eagles could potentially be adversely impacted by loss of nesting habitat. During nesting season, construction must take place outside of FWS/LDWF buffer zones. A USACE Biologist and a FWS Biologist would survey for nesting birds. This would be done prior to the start of construction.

Alternative 4: Nonstructural

Direct, Indirect, and Cumulative Impacts: This alternative would not result in impacts to threatened, endangered, and protected species.

TSP: Combined Darlington Dam and Nonstructural

When combining the Darlington Dam and nonstructural measures, there would be no additional impacts to this resource.

5.3.1.6 Geology, Soils and Water Bottoms, and Prime Farmland

Impacts of Considered Alternatives

Alternative 1: No Action Alternative

Direct, Indirect, and Cumulative Impacts: This alternative would not have an effect on prime farmland. Soil and water bottoms could continue to experience both anthropogenic and natural impacts within the ARB, including the sand and gravel operations and erosional forces that alter the river channel.

Cumulatively, the soils and water bottoms would continue to experience periodic shifts during rainfall events.

Alternative 2: Sandy Creek Dry Dam

Direct, Indirect, and Cumulative Impacts: This alternative would have the same impacts as Alternative 3, but to a lesser extent. There are potential impacts to prime farmland in Louisiana from obtaining borrow material.

Alternative 3: Large-Scale 0.04 AEP Dam (Darlington Dam)

Direct, Indirect, and Cumulative Impacts: This alternative would affect prime farmland. Soils and prime farmland would be directly adversely impacted by this alternative in areas for obtaining borrow fill material for the dam as well as the constructed dam and reservoir. Soils within the reservoir footprint and other associated features would also be lost.

The borrow source lands will be acquired by the NFS.

Alternative 4: Nonstructural

Direct, Indirect, and Cumulative Impacts: Structures elevated or purchased in the floodplain could contain but not affect prime farmland, soils, or water bottoms.

TSP: Combined Darlington Dam and Nonstructural

When combining the Darlington Dam and nonstructural measures, there would be no additional impacts to this resource.

5.3.1.7 Water Quality

Impacts of Considered Alternatives

Alternative 1: No Action Alternative

Direct, Indirect, and Cumulative Impacts: Without implementation of the Proposed Action, no direct impacts to water quality would occur. Indirect impacts as a result of not implementing the proposed action would be the continued degradation of water quality as the area continues to erode as a result of flood events and human development in the ARB.

Alternative 2: Sandy Creek Dry Dam

Direct, Indirect, and Cumulative Impacts: This alternative would be similar in impacts to Alternative 3, but would influence a smaller extent of the ARB.

Alternative 3: Large-Scale 0.04 AEP Dam (Darlington Dam)

Direct, Indirect, and Cumulative Impacts:

The Darlington Dry Dam extends between St. Helena and East Feliciana Parishes. It would be built to a 201 feet (NVGD) design elevation. The USACE would apply for a Water Quality Certification (WQC) from LDEQ to determine whether the construction of these proposed features will impact established site specific water quality standards. The construction

contractor would be required to comply with any applicable conditions and requirements included as part of the issued WQC. The construction contractor would be required to comply with any special conditions pertaining to protection of water quality contained in LDNR's final determination for the proposed project. Additionally, to help avoid and minimize the proposed project's impacts to water quality, the construction contractor would be required to prepare a Stormwater Pollution Prevention Plan (SWPPP) for review and approval by the USACE. The construction contractor would then be required to apply for and obtain a Stormwater General Permit (i.e., Louisiana Pollutant Discharge Elimination System General Permit) from the LDEQ. The construction contractor would further be required to comply with all applicable conditions and requirements set forth in the issued permit. The required permits and actions above are designed to lessen construction impacts on receiving waterbodies.

Because LDEQ has currently classified the receiving waterbodies (i.e., LDEQ subsegments) as "not supporting designated use" for some of its use categories (see Water Quality Section 1.2.7), which indicates that water quality is currently not meeting applicable water quality standards, the temporary direct effects to water quality from the proposed construction activity would be expected to adversely affect the existing conditions.

There are no permanent cumulative effects to water quality anticipated by implementing the TSP when added to other past, present, and reasonably foreseeable future ecosystem restoration and mitigation projects in the basin. As discussed previously, there would be construction-related water quality degradation that would have a temporary cumulative effect.

Alternative 4: Nonstructural

Direct, Indirect, and Cumulative Impacts: This alternative would not directly impact water quality. When combined with other past, present, and reasonably foreseeable future projects in the ARB, this alternative would not impact water quality.

TSP: Combined Darlington Dam and Nonstructural

Direct, Indirect, and Cumulative impacts: When combining the Darlington Dam and nonstructural measures, there would be no additional impacts to this resource.

5.3.1.8 Air Quality

Impacts of Considered Alternatives

Alternative 1: No Action Alternative

Direct, Indirect, and Cumulative Impacts: East Feliciana and St. Helena are currently in attainment for all Federal NAAQS pollutants. In the future, without the implementation of the Proposed Action, it is likely that the quality of ambient air would not be adversely affected.

Alternative 2: Sandy Creek Dry Dam

Direct, Indirect, and Cumulative Impacts: Construction of this alternative would have impacts similar to Alternative 3, but lesser in extent.

Alternative 3: Large-Scale 0.04 AEP Dam (Darlington Dam)

Direct, Indirect, and Cumulative Impacts: During construction of this project, an increase in air emissions could be expected. These emissions could include exhaust emissions from operations of various types of ground-moving construction equipment such as bulldozers. Fugitive dust emissions are not anticipated during construction.

Any site-specific construction effects to air quality would be temporary, and air quality would return to pre-construction conditions shortly after the completion of construction activities. Because the project area is in a parish in attainment of NAAQS, a conformity analysis is not required.

Alternative 4: Nonstructural

Direct, Indirect, and Cumulative impacts: Construction of this alternative would have no impact on air quality.

TSP: Combined Darlington Dam and Nonstructural

Direct, Indirect, and Cumulative impacts: When combining the Darlington Dam and nonstructural measures, there would be no additional impacts to this resource.

5.3.1.9 Noise and Vibration

Impacts of Considered Alternatives

Alternative 1: No Action Alternative

Direct, Indirect, and Cumulative Impacts: The No Action Alternative would not have any impact on Noise and Vibration.

Alternative 2: Sandy Creek Dry Dam

Direct, Indirect, and Cumulative Impacts: This alternative would have impacts similar to Alternative 3, but lesser in extent.

Alternative 3: Large-Scale 0.04 AEP Dam (Darlington Dam)

Direct, Indirect, and Cumulative Impacts: No rock outcrops are anticipated with construction of the Darlington Dam. Construction activities would consist of heavy compaction equipment associated with compaction activities during dam construction and would include pile drivers and vibratory steel-wheel rollers (EM 1110-2-1911 on compaction equipment). Overall noise and vibration impacts are anticipated to remain low to moderate during construction and within the staging area, as it may temporarily disturb wildlife and residences, but be less than significant. Some noise and vibration impacts may be potentially reduced by the use of electricity for the construction equipment and the diversion structure.

Alternative 4: Nonstructural

Direct, Indirect, and Cumulative Impacts: This alternative would not have an impact on noise and vibration.

TSP: Combined Darlington Dam and Nonstructural

Direct, Indirect, and Cumulative impacts: When combining the Darlington Dam and nonstructural measures, there would be no additional impacts to this resource.

5.3.1.9 Cultural, Historic, and Tribal Trust Resources

Alternative 1: No Action Alternative

Direct, Indirect, and Cumulative impacts: Impacts to cultural and historic resources within the study area have resulted from both natural processes (e.g., erosion) and human activities (e.g., land development, timber harvesting, gravel mining, agriculture, and vandalism). Riverine environments are dynamic, and impacts to cultural and historic resources in the area would continue at the current trend because of natural processes including anthropogenic modifications of the landscape as well as human alterations.

Alternative 2: Dry Dam on Sandy Creek

Direct, Indirect, and Cumulative impacts: The impacts to cultural resources for the considered action would be proportionally similar to the impacts described for Alternative 3.

Alternative 3: Large-Scale 0.04 AEP Dam (Darlington Dam)

Background: In 1984, a preliminary engineering study was completed on the behalf of LA DOTD for proposed flood-control measures within the ARB (Brown and Butler 1984). The selected plan utilized, as its principal flood-control measure, a single dam and reservoir in approximately the same location as the presently considered action (Alternative 3). As part of the 1984 study, Espey, Huston & Associates, Inc. (EH&A 1989) conducted a Cultural Resource Assessment and sample Cultural Resources Survey of lands within the proposed Darlington damD site and reservoir. The former study area encompassed approximately 21,500 acres of land, of which about 1,400 acres of the proposed reservoir area were subjected to pedestrian survey focused towards re-locating previously recorded resources. A sample area of approximately 70-percent (350 acres) of the 500-acre area that the proposed dam site encompassed was also subjected to an Intensive Cultural Resources Survey (i.e., comparable to LA Division of Archaeology Phase I standards: https://www.crt.state.la.us/cultural-development/archaeology/CRM/section-106/field-standards/phase-i-surveys/indexhttps://www.crt.state.la.us/cultural-development/archaeology/CRM/section-106/field-standards/phase-i-surveys/index). As a result of the aforementioned investigations, a total of 30 archaeological sites were identified within the proposed footprint of the dam. The resources identified within the 350-acre sample area are primarily attributed to the Pre-contact period (e.g., mounds and artifact concentrations). The reservoir footprint (flood pool) also included other types of Pre-contact and historic sites (e.g., extraction locales, cemeteries, farmsteads, residences, other standing structures). Based upon the available

information, EH&A (1989) concluded that “at least 365 cultural resource sites are projected to occur within the flood pool and dam site.”

Direct Impacts: This alternative includes ground disturbing activities involving access, staging, demolition, construction of structural features (i.e., dam, spillways, and an on-site batch plant); borrow fill, habitat mitigation, and other required ancillary areas; and, relocation and hardening of infrastructure and/or other direct effects to above-ground historic properties (i.e., demolition). These activities may directly impact both known and undocumented cultural resources listed or eligible for the National Register of Historic Places (NRHP) not limited to: archeological sites; historic structures; cemeteries or other sites that may contain human remains, funerary objects, sacred objects, or objects of cultural patrimony; and Traditional Cultural Properties that exist both within the project footprint and associated areas in a way that will diminish the integrity of these property’s location, design, setting, materials, workmanship, feeling, or association.

Initial dam and reservoir construction will require the removal of above-ground or built-environment cultural resources (e.g., historic architecture). Thereafter, continued direct impacts to archaeological deposits within the reservoir footprint are anticipated as a result of storm water fluctuations. Because inundation removes vegetation, archaeological sites will become more susceptible to deflation resulting from the removal of the archeological soils; leaving heavier items and artifacts behind and altering their contextual relationship within the site. Water running over un-vegetated slopes also causes erosion. The movement of artifacts and site features within or away from an archaeological site decreases its scientific integrity and value because it becomes difficult to reconstruct the site's original features and artifact contexts. Archaeological deposits within the reservoir footprint would also be subjected to repeated cycles of wetting and drying, which causes deterioration of organic deposits (e.g., bone or wood) and other artifact types (e.g., ceramics and metal). Drawdown of flood waters can also cause slumping or landslides of slopes in or above the reservoir as water rapidly vacates the pores between soil particles, causing the soil to lose cohesion. Furthermore, the regular operation of spillways and release of floodwaters also has the potential to induce additional direct effects to cultural resources beyond the dam and reservoir footprint that may require avoidance and minimization measures.

Indirect Impacts

A review of Alternative 3 indicates that the considered action includes the introduction of new visual elements (i.e., flood control structures and infrastructure) to the project area’s viewshed that have the potential to indirectly impact known and previously undocumented cultural resources that may be listed or eligible for the NRHP by introducing an element that is inconsistent with its historic or cultural character in a way that may diminish the visual integrity of the property’s setting, feeling, or association and/or cause changes to the integrity of feeling or character associated with a historic or Traditional Cultural Property (TCP). For example, an increase in nearby recreational uses might adversely affect a TCP (e.g., Native American ritual site) by increasing sights and sounds incompatible with ritual use.

Furthermore, changes in land use within the project area as a result of the creation of the dry reservoir area (e.g., conversion of private to public land) may have additional indirect adverse impacts to archaeological resources. For instance, the recreational attractiveness of the reservoir is likely to lead to an increased number of visitors. The loss of protective vegetation and deflation of archeological sites in the flood pool make them more visible to the public. When more people are present and archeological sites are more visible there is a greater likelihood of vandalism and artifact theft. Archeological sites in the de-vegetated zone are also more susceptible to disturbance, artifact displacement, and erosion from increased pedestrian, vehicle, or livestock traffic. Because of the large size of the reservoir area, it is not possible to patrol all known sites to prevent vandalism and theft. Cumulative impact analysis of operational effects must therefore also consider land management actions. Conversely, positive impacts may include increased public accessibility and interpretation value of archaeological sites.

Cumulative Impacts

A review of Alternative 3 indicates that the Cumulative impacts to cultural resources would be the additive combination of impacts by this and other federal, state, local, and private flood risk reduction efforts including authorized USACE construction projects adjacent to the study area (i.e., Comite River Diversion (CRD) and the East Baton Rouge (EBR) flood control projects) and other projects that will alter the hydrology of the ARB (see: Section 1.5).

A reduction in the frequency of downstream flooding from Alternative 3 in conjunction with the CRD, EBR, and other flood control projects may have a long-term positive net impact to cultural resources within the ARB and surrounding communities; potentially including resources and districts at all levels of significance (Table C1-17, Historic Properties within the Study Area). Conversely, potential negative cumulative impacts may include incremental damage to, or destruction of, archaeological resources significant at the state, local, and national level that may be listed or eligible for the NRHP and/or of significance to Tribes. Incremental effects would result from repeated water table fluctuations within the reservoir as well as from releases during major flood events in conjunction with discharge from other flood control projects adjacent to the study area (CRD and EBR). Rapid fluctuations in water levels can cause river bank slumping in downstream river reaches that destroys cultural resources in an accelerated manner. When combined with the erosion of cultural resources at the reservoir itself, the cumulative effect is significantly adverse, placing a relatively high percentage of the ARB's cultural resources in jeopardy. The overall effect would be the destruction of a large percentage of the cultural sites and scientific resources from the river basin.

Alternative 4: Nonstructural

Direct Impacts

A review of Alternative 4 indicates that the proposed action includes the introduction of new visual elements and/or modifications to built-environment resources (i.e., elevation, flood proofing, or acquisition (demolition)) that may directly affect known and undocumented

above-ground historic properties (e.g., standing structures and historic districts; see: Table C1-2), in a manner that may diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association and ground disturbing activities (e.g., access, staging, foundation work, utility relocations and hardening, demolition) within the project footprint that may directly affect known and undocumented archeological resources in a manner that may diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association.

Indirect Impacts

A review of Alternative 4 indicates that the considered action includes elevation, flood proofing, and acquisition (demolition) measures that may indirectly result in the potential successive introduction of new visual elements and/or modifications to the viewshed and overall visual landscape of known and previously undocumented cultural resources that may be listed or eligible for the NRHP, potentially including historic structures, National Register Historic Districts (NRHD), National Historic Landmarks (NHL), other built-environment resources (Table C1-2), and/or TCPs by introducing elements that are inconsistent with the historic or cultural character of these resources in a way that may diminish the visual integrity of the property's setting, feeling, or association and/or cause changes to the integrity of feeling or character associated with a historic or TCP.

Cumulative Impacts

A review of Alternative 4 indicates that that the cumulative impacts to cultural resources would be the additive combination of impacts by this and other federal, state, local, and private flood risk nonstructural efforts including authorized USACE construction projects adjacent to the study area (see: Section 1.5). In addition to those direct and indirect impacts described above, successive additions and/or modifications to the visual landscape may result in cumulative adverse effects to cultural resources (Table C1-17) by introducing elements that are inconsistent with their historic or cultural character. In conjunction with similar repetitive impacts from other large-scale nonstructural projects in the region (e.g., Table 1-1c), this could lead to the loss of connection to place; causing a net loss of cultural diversity within the ARB and its surrounding communities.

TSP: Combined Darlington Dam and Nonstructural

Direct Impacts

Direct impacts for Alternative 5 would be the combination of those direct impacts described in Alternatives 3 and 4.

Indirect Impacts

Indirect impacts for Alternative 5 would be the combination of those indirect impacts described in Alternatives 3 and 4.

Cumulative Impacts

A review of Alternative 5 indicates that the cumulative impacts to cultural resources for the proposed alternative would be the additive combination of impacts of Alternatives 3 and 4 and other federal, state, local, and private flood risk reduction efforts including authorized USACE construction projects adjacent to the study area (i.e., CRD and EBR flood control projects) and other projects that will alter the hydrology of the ARB (see: Section 1.5). Activities associated with these projects have the potential to cumulatively impact existing and previously undocumented cultural resources within the project footprints, surrounding viewsheds, and communities they occur in. However, no determination of effect under the NHPA has been made at this time.

Potential negative cumulative impacts may include direct damage to, or destruction of, archaeological and built-environment resources, as well as the potential successive introduction of new visual elements and/or modifications to the viewshed and overall visual landscape of known and previously undocumented cultural resources significant at the state, local, and national level and/or of significance to Tribes that may be listed or eligible for the NRHP; including archaeological sites, historic structures, NRHDs, NHLs, other built-environment resources (Table C1-2) and/or TCPs. Conversely, in conjunction with the CRD and EBR flood control projects, a reduction in the frequency of downstream flooding may have long-term positive net impacts to cultural resources within the ARB and surrounding communities; potentially including resources at all levels of significance (Table C1-2). Furthermore, CEMVN acknowledges that non-structural elevation and/or flood-proofing measures may result in modifications to historic buildings or other built-environment resources potentially not meeting the Secretary of the Interior's Standards (48 FR 44716-42, September 29, 1983). However, the overarching goal of this effort is to reduce risk from future flood events while still preserving the physical integrity and historic character of built-environment resources in relation to other resources within a historic district, thus; protecting the architectural qualities of historic districts as a whole. Therefore, the proposed action may also have positive cumulative impacts towards preserving at-risk unique architectural and design characteristics that many of Louisiana communities and historic districts strive to maintain and enhance. Otherwise, damage to, or widespread loss of, cultural resources within the present study area in conjunction with similar repetitive impacts from other large-scale flood risk and coastal storm surge risk reduction projects in the region could lead to the loss of connection to place; causing a net loss of cultural diversity within the ARB and its surrounding communities. This is important because the cultural resources along many portions of the basin are understudied and/or not duplicated or replaced at other locations. Because most cultural resources are nonrenewable this would constitute a significant cumulative impact.

CEMVN would follow its Section 106 procedures, described in Appendix C-1 (Section 3 NHPA and Tribal Coordination) if the proposed action is carried forward to develop a Programmatic Agreement (PA), in consultation with the NFS, LA SHPO, Advisory Council on Historic Preservation (ACHP), federally-recognized Tribes, and other interested parties, that outlines the steps required to identify and evaluate cultural resources and make determinations of effects. If direct, indirect, and/or cumulative adverse effects to cultural resources are identified and cannot be avoided or minimized, such effects would be mitigated through the procedures outlined in the PA. The PA would then govern the

CEMVN's subsequent NHPA compliance efforts and any additional conditions or requirements will be documented at that time.

5.3.1.10 Aesthetics

Alternative 1: No Action Alternative

Direct and Indirect Impacts: The harmonious natural landscape combination of rivers and creeks slowly meandering southward is contrasted by unnaturally straight roadways and spoil banks, cutting through the mosaic of forest, pine plantations, pasture, and cropland. Visual resources would continue to evolve from existing conditions as a result of both land use trends and natural processes over the course of time. Waterways would continue to swell to capacity and overflow into nearby areas seasonally. Communities near these waterways would continue to experience high water events seasonally due to stormwater inputs from development adding to, and at times exceeding, the pre-development capacity.

Cumulative Impacts: Cumulative impacts to visual resources would be the additive combination of impacts by this and other Federal, state, local, and private flood risk reduction efforts, including but not limited to the Comite River Diversion and the East Baton Rouge Flood Control Project.

Alternative 2: Sandy Creek Dry Dam

Direct Impacts: The Dry Dam on Sandy Creek Alternative consists of an earthen dam on Sandy Creek. Impacts to aesthetics would be minimal as the site is remote and public access is limited. The earthen dam would not directly impact any visual resources such as unique geological, botanical, and cultural features, such as parks, museums, refuges, etc. The earthen dam will be in proximity to and parallel with the existing clear cut utility corridor which may be visible from nearby Louisiana Highway 409 and Parish Road 5-104 / Percy Dreher. The earthen dam could create an elevated vantage point of the surrounding landscape offering a new and unique view shed.

Indirect Impacts: Indirect impacts to visual resources would be similar to those listed for the dry dam on Darlington, but to a lesser degree.

Cumulative Impacts: Cumulative impacts to visual resources would be the additive combination of impacts by this and other Federal, state, local, and private flood risk reduction efforts, including, but not limited to the Comite River Diversion and the East Baton Rouge Flood Control Project.

Alternative 3: Large Scale 0.04 AEP Dam (Darlington Dam)

Direct Impacts: The large scale 0.04 AEP Darlington Dam Alternative consists of an earthen dam on the Amite River. This earthen dam would directly impact visual resources with regard to the Louisiana Scenic Rivers Act and the Amite River from the Mississippi River/Louisiana state line to the Louisiana Highway 37 crossing. "The general purpose of the Louisiana Scenic Rivers Act as it applies to the Amite River is to protect this section of river

from channel modifications, protect water quality and habitats, and preserve recreational and scenic aspects of this river. Many of the Amite River reaches upstream and downstream of Grangeville have experienced significant mining activity and are neither natural nor scenic." (Hood, Patrick, Corcoran, Fluvial Instability and Channel Degradation of Amite River and its Tributaries, Southwest Mississippi and Southeast Louisiana, ERDC/GSL TR-07-26, Page 12, September 2007) The Amite River would have an earthen dam crossing perpendicular to the river's southward-flow.

The earthen dam would be visible from the Amite River channel at the site itself and the man-made structure may be obtrusive. The earthen dam may be visible from nearby Louisiana Highway 448 and Parish Highway 960. The earthen dam could create an elevated vantage point of the surrounding landscape offering a new and unique view shed.

Indirect Impacts: During construction, visual resources could be temporarily impacted by construction activities related to implementing the earthen dam and by transport activities needed to move equipment and materials to and from the site. However, this temporary impact would most likely affect visual resources only from the immediate roadways.

Cumulative Impacts: Cumulative impacts to visual resources would be similar to those listed for the dry dam on Sandy Creek.

Alternative 4: Nonstructural

Direct, Indirect, and Cumulative Impacts: Elevating and floodproofing homes would not impact view sheds into any surrounding areas. In cases where a home or land acquisition may take place, this could indirectly impact visual resources by removing a viewer from a given area. In areas where there is public access from a street or roadway, these nonstructural elements would not change the view shed. Houses being raised are currently present, their elevation would change, but the site is still occupied either way. In the case of a home acquisition, if a home is removed and open land is created, this could be considered a benefit to drivers looking for natural scenery or a loss to an established neighborhood**.**

TSP: Combined Darlington Dam and Nonstructural

Direct Impacts: The impacts to this resource would be the same as Alternative 3's impacts.

The nonstructural component of the TSP may include acquisition and relocation assistance to displaced persons, elevation and floodproofing. Such actions would not directly impact view sheds into any surrounding areas. In areas where there is public access from a street or roadway, these nonstructural elements would not change the view shed. Houses being raised are currently present, their elevation would change, but the site is still occupied either way.

Indirect Impacts: Indirect impacts to visual resources for the 0.04 AEP Darlington Dam component of the TSP would be similar to those listed for the dry dam on Sandy Creek. These temporary impacts would most likely affect visual resources from the Amite River channel and the immediate roadways.

The nonstructural component of the TSP, where a home or land acquisition may take place, could indirectly impact visual resources by removing a viewer from a given area. In the case of a home acquisition, if a home is removed and open land is created, this could be considered a benefit to drivers looking for natural scenery or a loss to an established neighborhood**.**

Cumulative Impacts: Cumulative impacts to visual resources of the TSP would be similar to those listed for the dry dam on Sandy Creek.

5.3.1.11 Recreation

Alternative 1: No Action (Future without project)

Direct, Indirect, and Cumulative Impacts: Without intervention, communities within the study area would continue to be at risk from high water events induced by stormwater inputs. Recreational resources would continue to be influenced by existing conditions as a result of both land use trends and natural processes over the course of time.

Alternative 2: Dry Dam on Sandy Creek

Direct Impacts: The Dry Dam on Sandy Creek alternative consists of an earthen dam on Sandy Creek which could have a direct impact to recreational resources. The earthen dam may be built in wildlife habitats and displace animals using the area. Consumptive recreational resources associated with hunting and fishing in these habitats may be directly impacted. Productivity to habitat upstream and downstream of the earthen dam could temporarily impact recreational resources. Sandy Creek, north of the earthen dam, may swell on a more frequent basis and in a controlled setting for temporary periods of time. Sandy Creek south of the earthen dam may be cut off from its northern water supply and swell on a less frequent basis for temporary periods of time, all of which could decrease activities such as trapping and wildlife seeing.

Indirect Impacts: During construction, there could be short-term, indirect impacts to recreational resources along the immediate earthen dam. Mobile species associated with hunting and fishing may attempt to move from the area of influence. Non-consumptive recreation resources relating to sports and leisure could be impacted by noise and/or dust associated with construction activity. Traffic associated with construction may indirectly impact recreation near access roads.

Cumulative Impacts: Cumulative impacts to recreational resources would be the additive combination of impacts by this and other Federal, state, local, and private flood risk reduction efforts.

Alternative 3: Large Scale .04 AEP Dam (Darlington Dam)

Direct, Indirect, and Cumulative Impacts: The large scale 0.04 AEP Darlington Dam alternative consists of an earthen dam on the Amite River. This earthen dam would directly impact recreational resources with regard to the Louisiana Scenic Rivers Act and the Amite

River from the Mississippi River/Louisiana state line to the Louisiana Highway 37 crossing. Impacts to recreational resources will be similar to those for the Dry Dam on Sandy Creek, but on a larger scale.

Alternative 4: Nonstructural

Direct, Indirect, and Cumulative Impacts: The nonstructural features could have no impact to recreational resources, depending on the methods used.

TSP: Combined Darlington Dam and Nonstructural

Direct, Indirect, and Cumulative Impacts: When combining the Darlington Dam and nonstructural measures, there would be no additional impacts to this resource.

5.3.1.12 Environmental Justice

Impacts of Considered Alternatives

Alternative 1: No Action Alternative

Direct, Indirect, and Cumulative Impacts: The No Action Alternative would not provide flood risk reduction to the residents living within the study area. There would be no direct impact on minority and/or low-income population groups under this alternative. However, because this alternative fails to provide flood risk reduction, the actual and perceived risks to minority and/or low-income population groups under this alternative would be higher than under the alternatives.

Indirect impacts under the No Action Alternative include a higher potential for permanent displacement of minority and/or low-income population groups as compared to the with-project alternatives as residents relocate to areas with higher levels of flood protection.

Cumulative impacts under the No Action Alternative include the potential for a steady decline in minority and/or low-income population groups and other groups as residents move to areas with lower flood risks as well as continued financial and emotional strain placed on these groups as they prepare for and recover from flood events. Other Federal, state, local, and private flood risk reduction efforts, including but not limited to the Comite River Diversion and the East Baton Rouge Flood Control Project, would also influence these populations.

Alternative 2: Sandy Creek Dry Dam

Direct, Indirect, and Cumulative Impacts: The direct, indirect and cumulative impacts to EJ resources in the Sandy Creek Dam area would be similar to the impacts described for the Darlington Dam project, but to a much lesser extent because fewer homeowners would be displaced. Additionally, an EJ community is identified by the low-income criteria, with 21 percent of households having incomes below poverty.

Alternative 3: Large-Scale 0.04 AEP Dam (Darlington Dam)

Direct Impacts: There is the potential for high, adverse, disproportionate, direct impacts to EJ communities from construction of the Darlington Dam. All structures within the footprint of the proposed dam would be acquired, with relocation assistance provided to displaced persons per the Uniform Relocation Assistance Act (URA). According to the U.S. Census Bureau data, housing considered for the acquisition plan is located in census block groups that have a majority (73 percent) of population identifying as minority. For more information on the Demographic Indicators, refer to Appendix C, Table C1-20. Additionally, 23 percent of the households in the census block groups that comprise the dam have incomes below the poverty level (Table C1-21). Both the minority and low-income criteria used to identify EJ communities are met. Housing located within the proposed footprint and within the FEMA floodway would be purchased and thus removed from the floodplain and homeowners would receive market value for the acquired property and relocation assistance as per the Uniform Relocation Assistance Act (URA). For more information on URA, see the Real Estate Section 6.2.1.

The high, adverse impact of relocation is potentially disproportionate to minority or low-income homeowners if they comprise a vast majority of homes being purchased. According to Census data, it is likely that the vast majority of housing within the dam footprint is minority-owned. The community would likely relocate to housing in an area outside of a floodplain. A disproportionately high and adverse effect means the impact is appreciably more severe or greater in magnitude on minority or low-income populations than the adverse effect suffered by the non-minority or non-low-income populations after considering offsetting benefits.

Mitigation of the high, adverse and potentially disproportionate EJ impact of relocation includes the provision of market value for the acquired property and relocation assistance, as per URA. Market value is the price paid for a house if sold today, often based upon comparable sales and appraisals. If necessary, additional EJ details would be provided in future NEPA documents including:

- Outreach and public involvement details
- Details of acquisition alternatives
- Relocation assistance

Indirect impacts: Indirect impacts include a decrease in risk of damage from 0.04, 0.02 and 0.01 AEP storm events for minority and/or low-income populations in the study area. Population groups residing or working near the construction site itself may experience minor, adverse indirect impacts due to the added traffic congestion and construction noise and dust. The environmental indicator, “Traffic Proximity and Volume”, Appendix C, shows the area to be at the 13th percentile in the state, which indicates 87 percent of the state has higher traffic volume and is not, compared to the state, an existing environmental risk (Table C1-22). Truck traffic and noise along roads, highways and streets during project construction would cease following completion of construction activities. There may also be a degradation of the transportation infrastructure, primarily local roads and highways, as a result of the wear and tear from transporting construction materials. Indirect impacts related to

construction activities are expected to be short-term and minor. Best management practices will be utilized to avoid, reduce, and contain temporary impacts to human health and safety.

Cumulative Impacts: Positive cumulative impacts to minority and/or low-income populations, including lower flood risk, are expected to occur as a result of the Amite, East Baton Rouge and Comite River projects. If these projects and other federal, state and local projects encourage regional economic growth, any additional jobs created may benefit minority and/or low-income groups living within the study/proposed project area.

Adverse cumulative impacts to EJ communities occur when impacted communities are relocated, having to find comparable housing, which may or may not be available in a desired location outside of the floodplain.

Short-term cumulative impacts associated with construction of various flood risk reduction measures will cause inconveniences to those residents in the vicinity of construction activities.

Alternative 4: Nonstructural

Direct Impacts: The voluntary nonstructural plan involving structure elevation may directly impact EJ communities and these impacts are not disproportionate. All residents regardless of race and income will have the choice of elevation. Direct impacts include temporary disruption of use of homes during elevation. At this time, there are 4,291 structures within the 0.04 AEP floodplain and it is uncertain who may participate in the non-structural plan. All structures within the 0.04 AEP flood zone are located in economically justified reaches and would be flood-proofed, elevated, or acquired; therefore, all residents within the reaches, irrespective of race, ethnicity, or income, would be able to choose to participate in the plan.

The nonstructural measures may provide those choosing home elevation in this low density area of minority and low-income populations with hurricane and storm damage, risk reduction equivalent to structural measures, which are not economically justifiable due to the sparse populations scattered over a large area. Acquisition of property may potentially affect the economic base found within these communities by removing portions of the population that contribute to the local economy. This may contribute to changes in community cohesion and to potential collapse of the entire local community if there are large numbers of acquisitions. Despite existing base floor elevations differing among individual structures, elevations would provide the same level of risk reduction benefits per structure at year 2076 (end of the period of analysis). Homeowners would be responsible for costs associated with repairs to ensure a structurally-sound home prior to elevation and would be responsible for temporary relocation costs during elevation. All other costs of elevating structures, including the cost to elevate the structure, would not be borne by any single individual or the community; rather, these costs would be part of the proposed project costs.

Indirect Impacts: Indirect impacts to EJ resources will be similar to those described for the Darlington Dam alternative.

Cumulative Impacts: Positive cumulative impacts to minority and/or low-income populations associated with providing risk reduction are expected to occur as a result of the lower flood risk in the area under this alternative. Additionally, other federal, state and local flood risk reduction projects will provide positive cumulative impacts by reducing flood risk to low-income and minority communities. Housing within floodplains that are elevated will no longer be susceptible to 0.04 AEP and greater storm events. For those living in structures in the 0.04 AEP floodplain that choose not to elevate, flood risk from future storm events, 0.04 AEP and greater, will continue (unless new H&H modeling, which is still being determined, shows flooding is greatly reduced once a dam is built).

TSP: Combined Darlington Dam and Nonstructural

Direct Impacts: Direct impacts to EJ communities are expected to be similar to those described for the Darlington Dam Alternative and similar to but less than for the Nonstructural Alternative. EJ direct impacts include the potential acquisition of structures within the proposed dam footprint and the FEMA floodway and the potential for high, adverse disproportionate impacts and temporary inconveniences during elevation of residential structures in the 0.04 AEP floodplain. However, the number of structures affected by the TSP nonstructural measure could be less than the number of structures impacted under the Nonstructural Alternative since the dam would be in place and residual flood risk may be lower resulting in fewer structures having to be relocated.

Indirect Impacts: Indirect impacts would be similar to those described for Darlington Dam Alternative and similar but less than indirect impacts described for Nonstructural plan.

Cumulative Impacts: Cumulative impacts of the TSP to EJ resources would be similar to those described for the Darlington Dam and Nonstructural Alternatives.

5.3.1.13 Socioeconomics

Alternative 1: No Action

Direct, Indirect, and Cumulative Impacts: The No Action alternative would maintain the current without-project condition of the study area. There are no expected cumulative impacts due to the Comite River Diversion and East Baton Rouge Flood Control projects or other Federal, state, local, or private flood risk reduction efforts. Cumulative impacts to socioeconomic resources would be the additive combination of impacts by this study and other studies, including, but not limited to the two aforementioned projects.

Alternative 2: Sandy Creek Dry Dam

Direct, Indirect, and Cumulative Impacts: In the short-term, the Sandy Creek Dry Dam may have some minor negative socioeconomic consequences such as displacement of low-income residents (21 percent of households have incomes below the poverty level in the region, according to U.S. Census Bureau data) from acquisitions necessary to complete construction of the dam. In the long-term, remaining residents would enjoy a decreased risk of flooding which would benefit the residents of the area. There are no expected cumulative

socioeconomic impacts due to this alternative; anticipated socioeconomic impacts due to this alternative are independent of the socioeconomic impacts of the Comite River Diversion and East Baton Rouge Flood Control projects or other Federal, state, local, or private flood risk reduction efforts.

Alternative 3: Large-Scale 0.04 AEP Dam (Darlington Dry Dam)

Direct, Indirect, and Cumulative Impacts: Socioeconomic consequences of the Darlington Dry Dam are similar to those of the Sandy Creek Dry Dam, but on a larger scale. 73 percent of the population with homes considered for acquisitions under this plan identify as minority, according to U.S. Census Bureau data. Additionally, households with incomes below the poverty level comprise 23 percent of the census block. While these individuals may be subjected to displacement under this alternative, the remaining residents would enjoy a decreased risk of flooding. There are no expected cumulative socioeconomic impacts due to this alternative; anticipated socioeconomic impacts due to this alternative are independent of the socioeconomic impacts of the Comite River Diversion and East Baton Rouge Flood Control projects or other Federal, state, local, or private flood risk reduction efforts.

Alternative 4: Nonstructural

Direct, Indirect, and Cumulative Impacts: The non-structural alternative would rely upon the voluntary participation of residents of the 4,291 structures within the 0.04 AEP floodplain to have their structures flood-proofed, elevated, or acquired where applicable. The voluntary nature of this alternative makes it impossible to determine which residents would participate without surveys. Because all residents of the floodplain would be given this opportunity, there is no expected socioeconomic impact from this alternative. There are no expected cumulative socioeconomic impacts due to this alternative; socioeconomic impacts due to this alternative are independent of the socioeconomic impacts of the Comite River Diversion and East Baton Rouge Flood Control projects or other Federal, state, local, or private flood risk reduction efforts.

Alternative 5: Combined Darlington Dam and Nonstructural (TSP)

Direct, Indirect, and Cumulative Impacts: Socioeconomic impacts are expected to be similar to those described for the Darlington Dam alternative and the Non-Structural alternative. Regardless of their decision, residents given the option to participate in non-structural measures will enjoy a decreased risk of flooding from the Darlington Dam. This may result in fewer residents electing to participate in the Non-Structural alternative, but again, because all residents will be given this opportunity, there is no expected socioeconomic impact. There are no expected cumulative socioeconomic impacts due to this alternative; anticipated socioeconomic impacts due to this alternative are independent of the socioeconomic impacts of the Comite River Diversion and East Baton Rouge Flood Control projects or other Federal, state, local, or private flood risk reduction efforts.

Section 6
Tentatively Selected Plan

Based on the cost and benefit analysis of the final array of alternatives, the TSP is the NED Plan of the Dry Darlington Dam combined with nonstructural measures. The Dry Darlington Dam scale will be optimized during the feasibility study design. Additionally, the nonstructural plan will be refined by assessing the Darlington Dam as the new base condition for the hydrology, which will likely include structures in geographical regions that are not getting direct benefits from the Darlington Dam, such as the Lower Reach of the ARB.

This plan is estimated to produce $109 million in average annual benefits at an average annual cost of $90.8 million (total project cost of 2. Billion), for a BCR of 1.2 at the current Federal Discount Rate (FDR) of 2.75 percent.

6.1 NATIONAL SIGNIFICANCE OF THE PROJECT

The intent of comparing alternative flood risk reduction plans in terms of NED is to identify the beneficial and adverse effects that the plans may have on the national economy. Beneficial effects were considered to be increases in the economic value of the national output of goods and services attributable to a plan. Increases in NED were expressed as the plans' economic benefits, and the adverse NED effects were the investment opportunities lost by committing funds to the implementation of a plan. The NED costs and benefits for the final array are described in Table 4-7. The Dry Darlington Dam combined with nonstructural measures has the greatest net benefits (Table 4-10).

6.2 IMPLEMENTING THE PLAN

Subject to project authorization, appropriation and availability of funding, full environmental compliance, and execution of a binding agreement with the NFS, construction is currently scheduled to begin in 2022. The schedule assumes a complete risk reduction system in place by year 2026. The project requires construction authorization and the appropriation of construction funds. A continuous funding stream is needed to complete this project within the anticipated timeline, which requires continuing appropriations from Congress and the State of Louisiana in order to fund the detailed design phase and fully fund construction contracts.

Once construction funds are appropriated for this project, the LADOTD, as the NFS, and the Department of the Army will enter into a Project Partnership Agreement (PPA). After the signing of a PPA, the NFS will acquire the necessary land, easements and rights of way to construct the project. Because project features cannot be advertised for construction until the appropriate real estate interests have been acquired, obtaining the necessary real estate in a timely fashion is critical to meeting the project schedule. At the completion of construction, or functional portions thereof, the NFS would be fully responsible for OMRR&R, as the functional portions of the project are completed.

6.2.1 Real Estate

The TSP for the project includes a structural component (the Darlington Dam) and a nonstructural component that may include acquisitions, residential elevations and nonresidential flood proofing. The Darlington Dam component will require 15,860 acres to be acquired in Fee, Excluding Minerals and 10,309 acres in Flowage Easements. The Darlington Dam footprint is estimated to impact approximately 700 landowners. Using preliminary information, there appear to be approximately 365 structures within the footprint that would need to be acquired. Relocation assistance to displaced persons would need to be provided for these acquisitions and an estimated cost has been included in the cost estimate. These costs do not include acquisitions downstream, if applicable, due to potential life safety concerns associated implementation of the Darlington Dam. Additionally, there are administrative costs associated with relocating a cemetery, which is within the footprint. Mitigation will be required for unavoidable impacts and it is not determined at this time if compensatory mitigation will involve the purchase of credits from approved mitigation banks or USACE constructed mitigation sites. If USACE constructed sites are needed, these sites will be acquired in Fee, Excluding Minerals. Costs for acquiring mitigation sites are not included for the estimate, but if Corps constructed mitigation sites are necessary, then the Total Real Estate Costs for the Structural portion of the TSP are $223,167,000. This cost is not only land costs, but also improvements cost, relocations assistance to displaced persons, acquisition costs, cemetery relocation administrative costs, mitigation costs, and contingencies.

The Nonstructural portion of the TSP consists of implementing nonstructural measures to reduce the risk of damages from flooding to residential and non-residential structures that have first floor elevations at or below the 0.04 AEP flood plain. This may involve acquisitions, elevations of residential structures and flood proofing of nonresidential structures. An economics assessment of at-risk properties has currently identified a total of 3,566 structures (3,252 residential and 314 non-residential) that appear to meet the preliminary eligibility criteria for participation in the project. Total Real Estate Costs for this portion of the TSP are $74,567,000. This cost includes relocation assistance for tenants, administrative costs (Flood Proofing Agreement, Title verification, etc.), and contingencies. As the plans are refined, the cost of acquisitions and relocation assistance to such displaced persons will be developed and addressed in the Final IFR & EIS.

6.2.2 Darlington Dam 0.04 AEP Dry Design

Based on the review of ART, Darlington Reservoir Re-evaluation Study (Reconnaissance Scope),” dated September 1997, it was determined that the limited analyses performed are considered adequate for cost estimating purposes of the Darlington Reservoir alternative.

6.2.3 Construction Method for the Structural Component of the TSP

A comprehensive construction sequence has not been completed, but a general construction method would begin with foundation preparation. This includes clearing, grubbing, stripping (approximately 5 feet), and scarifying the footprint of the dam. A diversion channel would need to be created to divert the river away from the current course to allow

seepage cutoff and outlet construction. Once diverted, the slurry trench would be constructed from one abutment through the existing river alignment. The construction of the outlet conduits and control tower would commence. Outlets would include trash racks and debris booms. The embankment construction would commence from the same abutment the slurry trench began. Once the conduit has adequate cover, the river would be returned to its original path and route through the new conduit construction. A sedimentation basin would be designed and possibly placed near the diversion channel. Final placement and size is to be determined. Slurry trench would continue from the end point beyond the original termination and extend through the other abutment. Embankment construction would follow the slurry trench construction. Embankment construction would also include filter blanket as determined by future design. The construction of embankment to full section would be completed except the spillway. Spillway construction would include walls, anchors, and exit control. A new channel would be placed between the spillway and the downstream segment of the river. Final dressing would require armoring at the dam features as needed. Embankment would be fertilized and seeded. Final determination for access road paving and or surfacing including the crest of the dam will need to be determined. Final determination will also be made for storage facilities and shops needed to maintain the dam. Final construction duration cannot be made until specific details and acquisition strategy is determined. First cut of construction duration is 4 years. It is recommended to enhance construction sequencing in accordance with EM 1110-2-2300 and EM 1110-2-1911.

6.2.4 Operations, Maintenance, Repair, Rehabilitation, and Replacement

OMRR&R is currently under development.

6.2.5 Cost Sharing Requirements

A NFS must support all phases of the project. Feasibility study costs are typically shared 50 percent Federal and 50 percent non-Federal, but this one is 100 percent federally funded for up to $3,000,000. Design and implementation phases are cost-shared, with the NFS providing a minimum 25 percent and maximum 50 percent of the total project costs. Additionally, the NFS must provide all the LERRDs. While the sponsor may receive credit toward this cost-share for work-in-kind and LERRDs, a minimum cash contribution of 5 percent is required. Once a project has been implemented, OMRR&R of the project is a 100 percent non-Federal responsibility.

6.2.6 Federal Responsibilities for the Selected Plan

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

6.2.7 Non-Federal Responsibilities for the Selected Plan

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

a. Provide minimum 25 percent and maximum 50 percent of total project costs as further specified below:
    1. Provide the required non-Federal share of design costs in accordance with the terms of a design agreement entered into prior to commencement of design work for the project;
    2. Provide, during the first year of construction, any additional funds necessary to pay the full non-Federal share of design costs;
    3. Provide all lands, easements, and rights-of-way, including those required for relocations, the borrowing of material, and the disposal of dredged or excavated material; perform or ensure the performance of all relocations; and construct all improvements required on lands, easements, and rights-of-way to enable the disposal of dredged or excavated material, all as determined by the Government to be required or to be necessary for the construction, operation, maintenance, repair, rehabilitation and replacement of the project;
    4. Provide, during construction, any additional funds necessary to make its total contribution equal to the NFS share of total project costs;
b. Shall not use funds from other Federal programs, including any non-Federal contribution required as a matching share therefore, to meet any of the non-Federal obligations for the project unless the Federal agency providing the funds verifies in writing that such funds are authorized to be used to carry out the project;
c. Not less than once each year, inform affected interests of the extent of protection afforded by the project;
d. Agree to participate in and comply with applicable Federal floodplain management and flood insurance programs;
e. Comply with Section 402 of the Water Resources Development Act of 1986, as amended (33 U.S.C. 701b-12), which requires a non-Federal interest to prepare a floodplain management plan within one year after the date of signing a project partnership agreement, and to implement such plan not later than one year after completion of construction of the project;
f. Publicize floodplain information in the area concerned and provide this information to zoning and other regulatory agencies for their use in adopting regulations, or taking other actions, to prevent unwise future development and to ensure compatibility with protection levels provided by the project;
g. Prevent obstructions or encroachments on the project (including prescribing and enforcing regulations to prevent such obstructions or encroachments) such as any new developments on project lands, easements, and rights-of-way or the addition of facilities which might reduce the level of protection the project affords, hinder operation and maintenance of the project, or interfere with the project's proper function;
h. Comply with all applicable provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, Public Law 91-646, as amended (42 U.S.C.

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

i. For so long as the project remains authorized, OMRR&R the project or functional portions of the project, including any mitigation features, at no cost to the Federal government, in a manner compatible with the project's authorized purposes and in accordance with applicable Federal and State laws and regulations and any specific directions prescribed by the Federal government; provided, however, that the NFS shall have no obligation to address loss of risk reduction due to relative sea level rise through the repair, rehabilitation or replacement of localized storm surge risk reduction components associated with the construction of large ring berms around groups of residential structures, nor shall the NFS be obligated to OMRR&R those flood proofing measures that constitute elevation of individual residential structures or construction of small ring berms around individual non-residential or light industry/warehouse structures.
j. Give the Federal government a right to enter, at reasonable times and in a reasonable manner, upon property that the NFS owns or controls for access to the project for the purpose of completing, inspecting, operating, maintaining, repairing, rehabilitating, or replacing the project;
k. Hold and save the United States free from all damages arising from the construction, operation, maintenance, repair, rehabilitation, and replacement of the project and any betterments, except for damages due to the fault or negligence of the United States or its contractors;
l. Keep and maintain books, records, documents, or other evidence pertaining to costs and expenses incurred pursuant to the project, for a minimum of 3 years after completion of the accounting for which such books, records, documents, or other evidence are required, to the extent and in such detail as will properly reflect total project costs, and in accordance with the standards for financial management systems set forth in the Uniform Administrative Requirements for Grants and Cooperative Agreements to State and Local Governments at 32 CFR Section 33.20;
m. Comply with all applicable Federal and State laws and regulations, including, but not limited to: Section 601 of the Civil Rights Act of 1964, Public Law 88-352 (42 U.S.C. 2000d) and Department of Defense Directive 5500.11 issued pursuant thereto; Army Regulation 600-7, entitled "Nondiscrimination on the Basis of Handicap in Programs and Activities Assisted or Conducted by the Department of the Army"; and all applicable Federal labor standards requirements including, but not limited to, 40 U.S.C. 3141-3148 and 40 U.S.C. 3701 – 3708 (revising, codifying and enacting without substantial change the provisions of the Davis-Bacon Act (formerly 40 U.S.C. 276a et seq.), the Contract Work Hours and Safety Standards Act (formerly 40 U.S.C. 327 et seq.), and the Copeland Anti-Kickback Act (formerly 40 U.S.C. 276c et seq.);
n. Perform, or ensure performance of, any investigations for hazardous substances that are determined necessary to identify the existence and extent of any hazardous substances regulated under the CERCLA, Public Law 96-510, as amended (42 U.S.C.

9601-9675), that may exist in, on, or under lands, easements, or rights-of-way that the Federal government determines to be required for construction operation, and maintenance of the project, including those lands, structures and interests necessary for the implementation of all of the localized storm surge risk reduction components of the Project as described in this Report. However, for lands that the Federal government determines to be subject to the navigation servitude, only the Federal government shall perform such investigations unless the Federal government provides the NFS with prior specific written direction, in which case the NFS shall perform such investigations in accordance with such written direction;

o. Assume, as between the Federal government and the NFS, complete financial responsibility for all necessary cleanup and response costs of any hazardous substances regulated under CERCLA that are located in, on, or under lands, easements, or rights-of-way that the Federal government determines to be required for construction, operation, and maintenance of the project, including those lands, structures and interests necessary for the implementation of all of the localized storm surge risk reduction components of the Project as described in this Report;
p. Agree, as between the Federal government and the NFS, that the NFS shall be considered the operator of the project for the purpose of CERCLA liability, and to the maximum extent practicable, operate, maintain, repair, rehabilitate, and replace the project in a manner that will not cause liability to arise under CERCLA; and
q. Comply with Section 221 of Public Law 91-611, Flood Control Act of 1970, as amended (42 U.S.C. 1962d-5b), and Section 103(j) of the Water Resources Development Act of 1986, Public Law 99-662, as amended (33 U.S.C. 2213(j)), which provides that the Secretary of the Army shall not commence the construction of any water resources project or separable element thereof, until each non-Federal interest has entered into a written agreement to furnish its required cooperation for the project or separable element.
r. Shall not use any project features or lands, easements, and rights-of-way required for such features as a wetlands bank or mitigation credit for any other project;
s. Pay all costs due to any project betterments or any additional work requested by the sponsor, subject to the sponsor's identification and request that the Government accomplish such betterments or additional work, and acknowledgement that if the Government in its sole discretion elects to accomplish the requested betterments or additional work, or any portion thereof, the Government shall so notify the NFS in writing that sets forth any applicable terms and conditions.

6.2.8 Risk and Uncertainty

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

6.2.9 Residual Damages and Residual Risks

Incorporating nonstructural measures in addition to the Darlington Dam structural component of the TSP is a plan formulation strategy being used to further reduce residual

damages in areas where the Darlington Dam is not effective at reducing flood stages. By incorporating the nonstructural plan in conjunction with the dam, USACE is limiting the potential for high residual damages.

6.2.10 Potential Induced Flooding

No potential induced flooding is anticipated except for the in-pool area. The potential induced flooding will be further investigated during feasibility-level design. If the induced flooding is confirmed, measures would be formulated to appropriately address the issue.

Section 7
Mitigation Assessment

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

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

The appropriate application of mitigation is to formulate an alternative that first avoids, then minimizes, and lastly, compensates for unavoidable adverse impacts. Potential alternatives for the compensatory mitigation plan for the Amite Study are evaluated in this DEIS.

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

> To mitigate losses to flood damage reduction capabilities and fish and wildlife resulting from a water resources project, the Secretary shall ensure that the mitigation plan for each water resources project complies with the mitigation standards and policies established pursuant to the regulatory programs administered by the Secretary. (Section 2036(a)(3)(A) of WRDA 2007)

These components are summarized in the mitigation plan in Appendix C-5.

7.1 HABITAT MITIGATION

A general mitigation plan has been developed based on a site visit and preliminary habitat analysis. A detailed mitigation plan would be developed in coordination with the Interagency Team and set forth in the final IFR and EIS and prior to signing of the ROD.

During a preliminary aerial survey of Darlington Dam, CEMVN identified approximately 1,332 AAHUs of bottomland hardwood within the Darlington Dam footprint of the occasionally inundated reservoir. In addition, there will likely be impacts within the staging area(s) and borrow excavation sites. However, because those locations have not yet been determined, their impacts will be discussed in the Final EIS. WVA assumptions will be addressed in the final IFR and EIS. See the general mitigation plan in Appendix C-5.

The following mitigation options may be considered respectively:

1. Purchasing BLH Mitigation Bank Credits

   At the time of screening, mitigation banks in Lake Pontchartrain Basin existed that had BLH credits available for purchase. Many of these banks also had in-kind credits that could be released in the future. It is not known which banks would be available when the decision whether to purchase bank credits or not is made: some banks may not have enough credits remaining, some may be closed, and additional mitigation banks may be approved. As such, a general mitigation bank for BLH habitat, including in and out of coastal zone options, was assumed for the next step of the mitigation project analysis using information obtained from existing banks in the basin and no specific banks were identified. The Regulatory In lieu fee and Bank Information Tracking System (RIBITS) (https://ribits.usace.army.mil/) has information on all currently approved banks in the basin including their credit availability.

2. Potential BLH Corps-constructed Mitigation Sites

   Mitigation for the TSP could include creation and restoration and enhancement of bottomland hardwoods (BLH) habitat as compensatory mitigation for some of the BLH impacts resulting from construction of the Darlington Dam. The BLH restoration and enhancement areas (mitigation areas) would be located in abandoned agriculture, scrub/shrub, pasture, and other non-forested areas of lower habitat value. Required earthwork for each mitigation site would primarily consist of removal of remnant spoil material (sand, sediments, gravel) in various portions of each of the mitigation sites in an effort to establish an appropriate hydroperiod for BLH plant species. Grading and gapping to ensure appropriate drainage, establishing access roads, and tillage are also required in preparing the site. Following initial earthwork, native canopy and midstory plants typical of BLH-dry habitats would be installed in the mitigation areas following completion of the initial earthwork. See Table 7-1 for a summary of potential BLH mitigation sites.

Table 7-1. Darlington Dam Summary Data for Potential BLH Mitigation Sites

Mitigation Site ID	Basin	Public Land	Total Acres	AAHUs	AAHUs/acre
Bottomland Hardwoods-Dry					
1	Lake Pontchartrain		31.8	17.5	0.55
2	Lake Pontchartrain		80.9	40.5	0.5
3	Lake Pontchartrain		124	74.4	0.6
4	Lake Pontchartrain		38.3	17.2	0.45
5	Lake Pontchartrain		99.0	59.4	0.6
6	Lake Pontchartrain		38.0	19.0	0.5
7	Lake Pontchartrain		48.9	26.9	0.55
8	Lake Pontchartrain		80.5	40.3	0.5
9	Lake Pontchartrain	X	94.7	42.1	0.44
10	Lake Pontchartrain	X	75.2	39.5	0.52
11	Lake Pontchartrain	X	55.8	28.5	0.51
12	Lake Pontchartrain	X	267	155.6	0.58
13	Lake Pontchartrain	X	134.9	54.1	0.40
14	Lake Pontchartrain	X	1,246.0	296.5	0.54
15	Barataria		324.0	168.0	0.52
16	Terrebonne	X	89.3	42.4	0.47
17	Terrebonne	X	483.8	248.3	0.51
18	Terrebonne	X	224.8	112.6	0.50
19	Atchafalaya	X	147.2	72.7	0.49
Totals			**3684.1**	**1555.5**	

Notes:

* = All mitigation sites in these categories are elements of the Tentatively Selected Plan

Acres indicated are the total acres of mitigation areas within each site. Values do not include the acreage encompassed by the overall property boundaries.

BLH = Bottomland Hardwood Forest

AAHUs = Average Annual Habitat Units (as determined by using Wetland Value Assessment model for BLH)

Mitigation Site ID	Basin	Public Land	Total Acres	AAHUs	AAHUs/acre
Bottomland Hardwoods-Dry					

1	Lake Pontchartrain		31.8	17.5	0.55
2	Lake Pontchartrain		80.9	40.5	0.5
3	Lake Pontchartrain		124	74.4	0.6
4	Lake Pontchartrain		38.3	17.2	0.45
5	Lake Pontchartrain		99.0	59.4	0.6
6	Lake Pontchartrain		38.0	19.0	0.5
7	Lake Pontchartrain		48.9	26.9	0.55
8	Lake Pontchartrain		80.5	40.3	0.5
9	Lake Pontchartrain	X	94.7	42.1	0.44
10	Lake Pontchartrain	X	75.2	39.5	0.52
11	Lake Pontchartrain	X	55.8	28.5	0.51
12	Lake Pontchartrain	X	267	155.6	0.58
13	Lake Pontchartrain	X	134.9	54.1	0.40
14	Lake Pontchartrain	X	1,246.0	296.5	0.54
15	Barataria		324.0	168.0	0.52
16	Terrebonne	X	89.3	42.4	0.47
17	Terrebonne	X	483.8	248.3	0.51
18	Terrebonne	X	224.8	112.6	0.50
19	Atchafalaya	X	147.2	72.7	0.49
Totals			**3684.1**	**1555.5**	

Notes:

* = All mitigation sites in these categories are elements of the Tentatively Selected Plan

Acres indicated are the total acres of mitigation areas within each site. Values do not include the acreage encompassed by the overall property boundaries.

BLH = Bottomland Hardwood Forest

AAHUs = Average Annual Habitat Units (as determined by using Wetland Value Assessment model for BLH)

7.2 MONITORING

Monitoring requirements for mitigation covers habitat restoration and enhancement success criteria over the 50-year project life. See Appendix C-5, Section 1.9 for the requirements for the Corps-constructed mitigation in the draft mitigation plan.

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Monitoring requirements for mitigation covers habitat restoration and enhancement success criteria over the 50-year project life. See Appendix C-5, Section 1.9 for the requirements for the Corps-constructed mitigation in the draft mitigation plan.

7.3 ADAPTIVE MANAGEMENT

Adaptive management is considered to mitigate for bottomland hardwood impacts from the tentatively selected plan (TSP). The Water Resources Development Act (WRDA) of 2007, Section 2036(a) and U.S Army Corps of Engineers (USACE) implementation guidance for Section 2036(a) (CECW-PC Memorandum dated August 31, 2009: "Implementation Guidance for Section *2036 (a) of the Water Resources Development* Act of 2007 (WRDA 2007) – Mitigation for Fish and Wildlife and Wetland Losses") require adaptive management be included in all mitigation plans for fish and wildlife habitat and wetland losses. Full descriptions of the mitigation projects will be included in the final IFR and EIS, due to the current lack of information.

See Appendix C-5, Section 1.11 for the requirements for the Corps-constructed mitigation in the draft mitigation plan.

7.4 ENVIRONMENTAL CONSEQUENCES MATRIX

Table 7-2 below provides a summary of impacts to relevant resources from the two mitigation options.

Table 7-2 Summary of impacts for proposed mitigation options

Relevant Resource	**Corps-constructed BLH Mitigation Site**	**Mitigation Bank**
Wetland Resources	Positive impact; ag land and degraded BLH habitat converted to higher habitat value BLH	No impact
Upland Resources	Positive impact; ag land and degraded upland habitat converted to higher habitat value upland habitat	No impact
Aquatic Resources/Fisheries	No impact	No impact
Wildlife	Positive impact; improved habitat for various species	No impact
Threatened, Endangered, and Protected Species	Positive impact; improved habitat for various T&E	No impact

	species	
Prime and Unique Farmland	Impact depends on acreage and location	No impact
Water Quality	Positive impact; temporary disturbance, long-term improvement.	No impact
Air Quality	No impact	No impact
Cultural	Potential negative impact Archaeological	No impact
Recreation	Potential positive impact from improved habitat for rec activities	No impact
Aesthetics	Temporary negative; long-term positive improvement	No impact
Socioeconomic Resources	Potential negative to commercial, residential, and industrial properties	No impact
Environmental Justice	Potential negative to minority populations disproportionately impacted	No impact
HTRW	Low probability of encountering HTRW	No impact

7.5 INFLATED HEELSPLITTER MITIGATION

If the inflated heelsplitter mussel is found in the project footprint during field survey, then a biological assessment would be conducted. The mitigation for the inflated heelsplitter mussel may include relocating individuals upstream and downstream to maintain gene flow.

Section 8
Environmental Laws and Regulations

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

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

8.2 CLEAN AIR ACT OF 1970

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

8.3 CLEAN WATER ACT OF 1972 – SECTIONS 401 AND 404

The Clean Water Act (CWA) sets and maintains goals and standards for water quality and purity. Section 401 requires a Water Quality Certification from the Louisiana Department of Environmental Quality (LDEQ) that a proposed project does not violate established effluent limitations and water quality standards. Coordination with LDEQ for a State Water Quality Certification will be completed at a later date to determine that the requirements for a WQC have been met.

Section 305(b) of the Clean Water Act requires each state to monitor and report on surface and groundwater quality, which the Environmental Protection Agency (EPA) synthesizes into a report to Congress. The Louisiana Department of Environmental Quality (LDEQ) produces a Section 305(b) Water Quality Report that provides monitoring data and water quality summaries for hydrologic units (subsegments) throughout the state. See Appendix C-1 for the listing of impaired water bodies in the study area.

As required by Section 404(b)(1) of the CWA, an evaluation to assess the short- and long-term impacts associated with the placement of fill materials into waters of the United States resulting from the TSP is currently ongoing. The Section 404(b)(1) public notice would be later mailed for concurrent public and agency review with final integrated report.

8.4 ENDANGERED SPECIES ACT OF 1973

The Endangered Species Act (ESA) is designed to protect and recover threatened and endangered (T&E) species of fish, wildlife and plants. A NLAA letter may be issued at a later date for listed T&E species, including Atlantic sturgeon and inflated heelsplitter mussel, migratory shorebirds, and species of management concern (i.e. rare and very rare species) that are known to occur or believed to occur within the vicinity of the project area. No plants were identified as being threatened or endangered in the project area (Appendix C-4).

The proposed action would include Standard Manatee Conditions for In-Water Activities with the contractor instructing all personnel regarding the potential presence of manatees in the project area, and the need to avoid collisions with these animals. If a manatee(s) is sighted within 100 yards of the project area, moving equipment must be kept at least 50 feet away from the manatee or shut down. There would be restrictions on vessel operation, restrictions on the use of siltation barriers, and mandatory signage designed to avoid any harm to manatees in the project area. More specific information would be contained in the dredging

contracts. This DEIS has been made available to agencies and coordination with FWS is ongoing to determine if the project could have an adverse impact to the threatened inflated heelsplitter mussel (Appendix C-4).

8.5 FISH AND WILDLIFE COORDINATION ACT OF 1934

The Fish and Wildlife Coordination Act (FWCA) provides authority for the FWS involvement in evaluating impacts to fish and wildlife from proposed water resource development projects. It requires that fish and wildlife resources receive equal consideration to other project features. It requires federal agencies that construct, license or permit water resource development projects to first consult with the FWS, NMFS and state resource agencies regarding the impacts on fish and wildlife resources and measures to mitigate these impacts. Section 2(b) requires the FWS to produce a Coordination Act Report (FWCAR) that details existing fish and wildlife resources in a project area, potential impacts due to a proposed project and recommendations for a project. The FWS reviewed the proposed action project described in this DEIS and provided a FWCAR with project specific recommendations on 30 October, 2019. The ROD will be signed prior to completion of all coordination.

The final IFR and EIS will include responses to the final FWCAR. The draft FWCAR, dated 30 October, 2019, can be found in Appendix C-4 and recommendations are as follows:

1. The Darlington Dam should be designed to allow continuous upstream and downstream fish passage. The 10’ x 10’ box culverts should be installed slightly below grade to prevent “perching” and provide benthic macroinvertebrates and bottom dwelling fish (including the host fish for at-risk and listed mussels) free passage. Ideally, culverts should be installed to a depth that allows sediment to accumulate in the bottom, typically 20 percent of the height. If this reduces the required volume of flow to an unacceptable level then larger or more culverts should be installed.

2. Depending on the design and configuration of culverts at the Darlington Dam, [FWS] may require a fish passage study. The USACE should coordinate culvert design and configuration with the [Fish and Wildlife] Service.

3. If ring levees are proposed as part of the “non-structural” component of the TSP, the levee alignments should be located to avoid and minimize impacts to both herbaceous wetlands and forested communities (wet and non-wet) as much as possible. The acreage of wetlands and forested habitat enclosed within ring levees also should be minimized to the maximum extent practicable.

4. Any clearing of riparian vegetation should be limited to a single bank and when possible that bank should be either the eastern or northern bank.

5. Important fish and wildlife habitat (emergent wetlands, forested wetlands, and non-wetland forest) should be conserved by avoiding and minimizing the acreage of those habitats directly impacted by project features.

6. Any forest clearing associated with project features should be conducted during the fall and winter to minimize impacts to nesting migratory songbirds, when practicable.

7. Avoid impacts to threatened and endangered species, at risk species, and species of concern such as the bald eagle, and wading bird nesting colonies.

8. West Indian manatee conservation measures from Appendix A [of the draft FWCAR (See Appendix C-4)] should be included in all contracts, plans, and specifications for in-water work in areas where the manatee may occur.

9. Consultation should continue for the Alabama heelsplitter mussel. Any conservation measures that are identified through consultation should be included in all contracts, plans, and specifications for any work that may adversely impact the heelsplitter.

10. Compensation should be provided for any unavoidable losses of stream habitat, wetland habitat, and non-wetland forest caused (directly or indirectly) by project features. All mitigation should be developed/coordinated with the [Fish and Wildlife] Service and other natural resource agencies. Only after forest restoration opportunities along the Amite River (abandoned sand and gravel mines) have been implemented to the maximum extent practicable should other mitigation opportunities be pursued. The Service will not be able to agree to the suitability of other mitigation proposals until after ROE allows onsite evaluation of the resources to be impacted to ensure no net loss of “in-kind” habitat value.

11. Borrow material required for construction should be acquired in accordance with the Borrow Site Prioritization Criteria provided in Appendix B [of the draft FWCAR (See Appendix C-4)].

8.6 HAZARDOUS, TOXIC, AND RADIOACTIVE WASTE

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

A preliminary HTRW Phase 1 Environmental Site Assessment (ESA) was conducted for the current draft draft IFR and DEIS. The ART study area was surveyed via aerial photography and environmental database searches in the study area’s respective zip codes.

The preliminary ESA identified the following potential HTRW issues within or near the study area:

1. Three National Priorities List (Superfund) sites that are currently under remediation and review by the U.S. Environmental Protection Agency (EPA): Petro-Processors of Louisiana, Inc. and Devil's Swamp Lake in East Baton Rouge Parish and Combustion, Inc. in Livingston Parish. Petro Processors and Devil's Swamp Lake are located outside of the ART study area near Scotlandville, Louisiana and Combustion, Inc. is located within the ART study area near Denham Springs, Louisiana.

2. Four former Superfund sites that have undergone remediation and review by the EPA and have been deleted from the National Priorities List: Central Wood Preserving Co. in East Feliciana Parish; Dutchtown Treatment Plant, Old Inger Oil Refinery, and the Cleve Reber site in Ascension Parish. All four of these sites are currently under a 30-year Operation and Maintenance plan that is managed by the EPA and LDEQ.

The preliminary ESA also identified the presence of several active, inactive, and plugged and abandoned oil/gas wells, several injection wells, and several oil and gas pipelines within the study area. Several industrial facilities such as chemical plants and refineries were also noted in the study area. There is a low probability of encountering HTRW from the wells, pipelines, and industrial facilities during construction of the project.

This preliminary ESA was conducted to facilitate early identification and consideration of HTRW issues. Several potential HTRW issues were identified in this ESA; however, a full Phase I ESA will be required upon the selection of the Tentatively Selected Plan and will be included in the final IFR and EIS

8.7 MIGRATORY BIRD TREATY ACT

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

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

Biologist and a FWS Biologist would survey for nesting birds. This would be done prior to the start of construction.

8.8 E.O. 12898 ENVIRONMENTAL JUSTICE

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

A minority population exists where the percentage of minorities in an affected area either exceeds 50 percent or is meaningfully greater than in the general population. Low-income populations are those whose income is the Census Bureau's statistical poverty threshold for a family of four. The Census Bureau defines a "poverty area" as a census tract or block numbering area with 20 percent or more of its residents below the poverty threshold level and an "extreme poverty area" as one with 40 percent or more below the poverty threshold level.

There is the potential for high, adverse, disproportionate, direct impacts to minority and low-income communities from construction of the Darlington Dam. A disproportionately high and adverse effect means the impact is appreciably more severe or greater in magnitude on minority or low-income populations than the adverse effect suffered by the non-minority or non-low-income populations after considering offsetting benefits. The high, adverse impact of relocation is potentially disproportionate to minority or low-income homeowners if they comprise a vast majority of homes being acquired. According to Census data, it is likely that the vast majority of housing within the dam footprint is minority-owned. The community would likely relocate to housing in an area outside of a floodplain. All structures within the footprint of the proposed Darlington Dam and the FEMA regulatory floodway would be acquired, with relocation assistance provided to displaced persons per the Uniform Relocation Assistance Act (URA). According to the U.S. Census Bureau data, housing considered for the acquisition plan is located in census block groups that have a majority (73 percent) of population identifying as minority. For more information on the Demographic Indicators, refer to Appendix C, Table C1-22. Additionally, 23 percent of the households in the census block groups that comprise the dam footprint have incomes below the poverty level (Table C1-21). Both the minority and low-income criteria used to identify EJ communities are met.

The voluntary nonstructural measures may directly impact EJ communities but these impacts are likely not disproportionately high and adverse. Eligible structures within the 0.04 AEP floodplain could be voluntarily floodproofed or elevated; therefore, all residents, irrespective of race, ethnicity, or income, would be able to choose to participate in the plan.

8.9 NATIONAL HISTORIC PRESERVATION ACT OF 1966

A detailed synopsis of the Cultural Resources compliance activities is provided in Appendix C-1, Section 3.

8.10 TRIBAL CONSULTATION

It is the policy of the federal government to consult with Federally recognized Tribal Governments on a Government-to-Government basis as required in EO 13175 ("Consultation and Coordination with Indian Tribal Governments;" U.S. President 2000). The requirement to conduct coordination and consultation with federally recognized Tribes on and off of Tribal land finds its basis in the constitution, Supreme Court cases, and is clarified in later planning laws, such as the National Environmental Policy Act. When conducting a civil works planning activity (http://www.usace.army.mil/Missions/Civil-Works/Tribal-Nations/), USACE is directed to follow six principles when engaging with Tribal Governments: these principles emphasize Tribal Sovereignty, the federal governments trust responsibility, Government-to-Government consultation, early and pre-decisional consultation, recognition of tribal self-reliance, focusing USACE on efforts at tribal capacity building, and requiring USACE to protect natural and cultural resources during project development and implementation. Moreover, the USACE Planning and Guidance Notebook (ER 1105-2-100), including Smart Planning, gives guidance in Appendix B, Public Involvement, Collaboration and Coordination (B-8) and Appendix C, Environmental Evaluation and Compliance (C-4), reinforcing the same authorities and processes. The most explicit and accessible guidance regarding USACE and Tribal interaction can be found in USACE's Tribal Consultation Policy (1 Nov 2012).

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

USACE started the Tribal Consultation process by inviting Tribes to participate in the early scoping process via letter on December 4, 2018 (also see Section 2.4. Public Scoping). The letters were directed to the leadership of each of the Tribal governments whose aboriginal and historic territories or historic removal routes extended to the lands where the proposed activities would occur (i.e., the ACTT, CTL, CNO, CT, MBCI, JBCI, STF, SNO, and TBTL). Two responses were received that did not address the substance of the request. The MBCI participated in a scoping meeting and raised the issue of effects to pre-contact

archaeological sites from any of the then-proposed alternatives. Next, on April 10, 2019, USACE provided an email distribution of the April 2, 2019 Notice of Intent to produce an EIS as well as the advertisement of public meetings for this project. No responses were received regarding this distribution. USACE also invited each of the tribes to participate as a cooperating agency in the development of the EIS at a meeting on June 18, 2019. Only the MCN responded to this correspondence, indicating that the tribe was choosing to consult under the NHPA, rather than participate as a cooperating agency. USACE intends to keep the lines of communication open throughout the study, relying on the "Section 106 Process" to capture significant tribal concerns regarding historic properties, but remains open to the need to undertake Government-to-Government consultation, as necessary.

Section 9
Public Involvement

A Public Notice for the ART draft IFR and DEIS will be published in the Baton Rouge and New Orleans Advocate for the 45-day comment period beginning November 29, 2019 and ending January 13, 2019.

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

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

Section 10
Conclusion

10.1 RECOMMENDATION

CEMVN has assessed the environmental impacts of the recommended TSP for the ART on relevant resources in this draft IFR and DEIS. The TSP would have both temporary and permanent impacts to these resources. Future environmental impact assessments in the project footprint of the Darlington Dry Dam would be completed to more fully address them in the final report. Additionally, impacts to borrow sources and staging area(s), along with mitigation measures, will be evaluated and determined in the final IFR and DEIS. In order to reduce impacts to these resources, refinements in the TSP design may also be addressed in PED.

10.2 PATH FORWARD

This Draft IFR and DEIS is available for public review beginning November 29, 2019. The official closing date for the receipt of comments is January 13, 2020 which is 45 days from the date on which the notice of availability of this Draft IFR and EIS appears in the Federal Register during this review period. Comments may be mailed to the address listed below. Comments may also be emailed to the email address listed below.

U.S. Army Corps of Engineers
Attention: Project Management
CEMVN–PMR, Room 331,
7400 Leake Avenue
New Orleans, LA 70118
Email: AmiteFS@usace.army.mil

Public meeting dates and locations for this draft IFR and DEIS are listed below.

17 Dec 2019
North Park Recreation Center
30372 Eden Church Road
Denham Springs. LA 70726
6:30 pm-830pm

18 Dec 2019
Clinton United Methodist Church
11321 Old S Dr.
Clinton, LA 70722
6pm-8pm

List of Preparers

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References and Resources

Brown and Butler, Inc. 1984. *Conceptual Stage Engineering and Economic Feasibility Report. Preface, Introduction, Summary, Proposed Darlington Reservoir*. Prepared for the Louisiana Department of Transportation and Development, Office of Public Works, Baton Rouge.

Brown & Daniel. 2014. The Population Ecology of the Threatened Inflated Heelsplitter, Potamilus inflatus, in the Amite River, Louisiana. *The American Midland Naturalist* 171(2), 328-339, (1 February 2014) https://bioone.org/journals/The-American-Midland-Naturalist/volume-171/issue-2/0003-0031-171.2.328/The-Population-Ecology-of-the-Threatened-Inflated-Heelsplitter-iPotamilus-inflatus/10.1674/0003-0031-171.2.328.full

Committee on Public Works of the United States Senate. Resolution adopted on April 14, 1967. Flood control and related purposes on Amite River, Bayou Manchac, and Comite River and their tributaries Authorization.

Daigle, J.J., Griffith, G.E. Omernik, J.M., Faulker, P.L., McCulloh, R.P., Handley, L.R., Smith, L.M., and Chapman, S.S., 2006. State of Louisiana Eco-Region Map, ref. "Louisiana Speaks" and “USGS Eco-Region Map”, *Ecoregions of Louisiana* color poster with map, descriptive text, summary tables, and photographs.

EPA EJ Screen: https://ejscreen.epa.gov/mapper; Internet accessed (date)

Espey, Huston & Associates, Inc. 1989. *Cultural Resources Survey Of The Proposed Darlington Reservoir (Amite River Alternative R-La*) East Feliciana And St. Helena Parishes, Louisiana State Project Number 575-99-30. Report prepared for the Louisiana Department of Transportation and Development and the ARB Drainage and Water Conservation District (LA DOA Report No. 22-1382).

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

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

Gulf Coast Joint Venture (GCJV): *Mississippi River Coastal Wetlands*. Electronic resource: http://www.gcjv.org/docs/MSRcoastpub.pdf

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

Hood, Patrick, Corcoran*, Fluvial Instability and Channel Degradation of Amite River and its Tributaries, Southwest Mississippi and Southeast Louisiana*, ERDC/GSL TR-07-26, Page 12, September 2007

House of Representatives Document No. 419. 84th Congress 2nd Session. Chief of Engineers Report: Survey Report of Amite River and Tributaries, Louisiana.

Lee, Aubra, Christa Clements, Dayna B. Lee, Angele Montana, John Rawls & Rhonda L. Smith, 2009. Background Research for the Proposed Amite River and Tributaries, Bayou Manchac Watershed Feasibility Study, Ascension, East Baton Rouge & Iberville Parishes, Louisiana. Report prepared by Earth Search, Inc. on behalf of the Shaw Group for the U.S. Army Corps of Engineers, New Orleans District. New Orleans, Louisiana (LA DOA Report No. 22-3427).

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

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

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

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

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

National Environmental Policy Act of 1969. 1970. Vol. 83, secs. 1-207, 852; available from http://www.gpo.gov/fdsys/pkg/STATUTE-83/pdf/STATUTE-83-Pg852.pdf. Amended 1975. Statutes at large, Vol. 89, sec. 102, 424; http://www.gpo.gov/fdsys/pkg/STATUTE-89/pdf/STATUTE-89-Pg424.pdf; Internet; accessed 11/16/2017.

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

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

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

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

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

USACE. ER 1100-2-8162, 2019. *Global Changes. Incorporating Sea Level Change in Civil Works Programs*. Electronic resource: https://www.publications.usace.army.mil/Portals/76/Users/182/86/2486/ER_1100-2-8162.pdf?ver=2019-07-02-124841-933

USACE. EM 1110-2-1911, 1995. *Construction Control for Earth and Rock-Fill Dams*. Electronic resource: https://www.publications.usace.army.mil/Portals/76/Publications/EngineerManuals/EM_1110-2-1911.pdf?ver=2013-09-04-161128-287

USACE. EM 1110-2-2300, 2004. *General Design and Construction Considerations For Earth and Rock-Fill Dams*. Electronic resource: https://www.publications.usace.army.mil/Portals/76/Publications/EngineerManuals/EM_1110-2-2300.pdf?ver=2014-04-07-145941-947

USACE. Planning Bulletin 2016-01, 2015. *Clarification of Existing Policy for USACE Participation in Nonstructural Flood Risk Management and Coastal Storm Damage Reduction Measures*. Electronic resource: https://planning.erdc.dren.mil/toolbox/library/pb/PB2016_01.pdf

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

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

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

U.S. Fish and Wildlife Service. *National Bald Eagle Management Guidelines*. May 2007. Electronic Resource: http://www.fws.gov/southeast/es/baldeagle/NationalBaldEagleManagementGuidelines.pdf.http://www.fws.gov/southeast/es/baldeagle/NationalBaldEagleManagementGuidelines.pdf

Williams et al. 2017.*A Revised list of the Freshwater Mussels (Mollusca: Bivalvia: Unionida) of the United States and Canada*. Freshwater Mollusk Biology and Conservation. 20:22-58, 2017.Electronic resource: https://molluskconservation.org/PUBLICATIONS/FMBC/FMBC_Vol20/20-2-articles/20-2-33-58-Williams%20et%20al-frmc.pdf

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

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

List of Acronyms and Abbreviations

ACHP	Advisory Council on Historic Preservation
ACS	American Community Survey
ACTT	Alabama-Coushatta Tribe of Texas
AEP	Annual Exceedance Probability
APE	Area of Potential Effects
ARB	Amite River Basin
ARBC	Amite River Basin Commission
ART	Amite River and Tributaries East of the Mississippi River, Louisiana.
BCR	Benefit to Cost Ratio
BGEPA	Bald and Golden Eagle Protection Act
BMP	Best Management Practices
BREC	Recreation and Park Commission for the Parish of East Baton Rouge
CDBG	Community Development Block Grant
CEMVN	USACE New Orleans District
CEQ	Council on Environmental Quality
CNO	Choctaw Nation of Oklahoma
CPRA	Coastal Protection and Restoration Authority
CT	Coushatta Tribe of Louisiana
CTL	Chitimacha Tribe of Louisiana
CWA	Clean Water Act
DEIS	Draft Integrated Feasibility Report and Environmental Impact Statement
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
EJ	Environmental Justice

EO	Executive Order
EPA	Environmental Protection Agency
EQ	Environmental Quality
ER	Engineer Regulation
ESA	Endangered Species Act
FDR	Federal Discount Rate
FEIS	Integrated Feasibility Report and Environmental Impact Statement
FEMA	Federal Emergency Management Agency
FMA	Flood Mitigation Assistance
FPPA	Farmland Protection Policy Act of 1981
FRM	Flood Risk Management
FS	Focused Structural
FWCA	Fish and Wildlife Coordination Act
FWCAR	Coordination Act Report
FWS	Fish and Wildlife Services
FWOP	Future With Out Project
GCJV	Gulf Coast Joint Venture
GOMESA	Gulf of Mexico Energy Security Act
GOSHEP	Louisiana Governor's Office of Homeland Security and Emergency Preparedness
H&H	Hydraulics and Hydrology
HMGP	Hazard Mitigation Grant Program
HTRW	Hazardous, Toxic, and Radioactive Waste
HW	Hold Water
IFR	Integrated Feasibility Report
JBCI	Jena Band of Choctaw Indians

LCA	LA Coastal Area
LDEQ	Louisiana Department of Environmental Quality
LDOA	Louisiana Division of Archaeology
LADOTD	Louisiana Department of Transportation and Development
LDWF	Louisiana Department of Wildlife and Fisheries
LPR	Livingston Parks and Recreation
LWCF	Land and Water Conservation Fund
LWFMP	Louisiana Statewide Comprehensive Water Based Floodplain Management Program
MBCI	Mississippi Band of Choctaw Indians
MBTA	Migratory Bird Treaty Act
MCACES MII	Micro-Computer Aided Cost Estimating System, 2nd Generation
MCN	Muscogee (Creek) Nation
MSL	Mean Sea Level
NAAQS	National Ambient Air Quality Standards
NAWMP	North American Waterfowl Management Plan
NBEM	National Bald Eagle Management
NCDC	National Climatic Data Center
NED	National Economic Development
NEPA	National Environmental Policy Act
NFS	Non- Federal Sponsor
NGVD	National Geographic Vertical Datum
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent

NOX	Nitrogen Oxide
NPS	National Park Service
NRC	National Research Council
NRCS	Natural Resource Conservation Service
NRHP	National Register of Historic Places
NS	Nonstructural
NSI	National Structure Inventory
NWS	US National Weather Service
O&M	Operation and Maintenance
OCD	Office of Community of Development
OMRR&R	Operations, Maintenance, Repair, Rehabilitation, and Replacement
OSE	Other Social Effects
PA	Public Assistance
PA	Programmatic Agreement
PARDS	Parks and Recreation of Denham Springs
PDM	Pre-Disaster Mitigation Program
PED	Planning, Engineering and Design
PPA	Project Partnership Agreement
REC	Recognized Environmental Condition
RED	Regional Economic Development
ROD	Record of Decision
ROE	Right of Entry
RPDES	Regional Planning and Environment Division South
RSLR	Relative Sea Level Rise
RW	Remove Water
SHPO	State Historic Preservation Officer

SLC	Sea Level Change
SNO	Seminole Nation of Oklahoma
STF	Seminole Tribe of Florida
T&E	Threatened and Endangered
TBTL	Tunica-Biloxi Tribe of Louisiana
THPO	Tribal Historic Preservation Officers
TSP	Tentatively Selected Plan
UL	Upper and Lower Basin
URA	Uniform Relocation Assistance Act
USACE	United States Army Corps of Engineers
USDA	US Department of Agriculture
USGS	United States Geological Survey
VOC	Volatile Organic Compound
WMA	Wildlife Management Area
WRRDA	Water Resources Reform and Development Act
WVA	Wetland Value Assessment