Selma, Alabama

Flood Risk Management Study

Integrated Feasibility Report and Environmental Assessment

US Army Corps
of Engineers
Mobile District

May 24, 2021

RESPONSIBLE AGENCIES: The lead agency for the navigation study is the U.S. Army Corps of Engineers (USACE), Mobile District. The City of Selma, Alabama is the non-Federal sponsor (NFS).

ABSTRACT: The study area is located along the Alabama River in the City of Selma, Alabama. It is located approximately 50 miles (mi) west of Montgomery, Alabama. The city itself is divided into wards with each having a representative in the city government. The wards receiving frequent flooding are identified and are the focused project area for this study. Alabama River Mile(s) (RM) 256 through 261 have been assessed for this study.

Though the entire study area encompasses the City of Selma, problematic floodplain inundation from the Alabama River is predominantly located within a subsection named Ward 8. Additionally, riverbank erosion has historically and recently led to the condemnation of structures along Water Avenue. This erosional process is associated with, but not limited to, the slow and lengthy flooding from the Alabama River which saturates the underlying Mooreville Chalk geologic layer. The chalk is somewhat impervious, causing concentrated groundwater to exit the bank slopes within the overburden material as this layer becomes saturated. This continual process could potentially result in material loss beneath the building foundations which, over time, would destabilize the buildings. As such, the final array of alternatives was narrowed to three key features in varying combinations: buyouts, levee, and bank stabilization. Specifically, the final array of alternatives is identified as Alternative 1.A (Buyout), Alternative 3 (Optimized Levee), Alternative 4 (Bank Stabilization), Alternative 5 (Bank Stabilization and Buyout), and Alternative 6 (Combination of Alternative 1.A and 5, but with a modified buyout footprint to capture parcels within Ward 8 and outside the levee alignment). Using a risk-informed decision-making process and specific screening criteria, the Recommended Plan (RP) was identified as Alternative 4 (Bank Stabilization) plus a nonstructural measure to implement a Floodplain Management Emergency Evacuation Plan (FMEEP). The draft Integrated Feasibility Report and Environmental Assessment then underwent concurrent Public, Policy, and Agency review. Following the Agency Decision Milestone (ADM), field investigations were conducted to update the site plan and design of the bank stabilization to include Soldier-Pile Wall and other erosion control features as required. Additionally, comments received during the concurrent review process led to refinement of the FMEEP into a Flood Response Plan (FRP).

The Assistant Secretary of the Army (Civil Works) approved a policy exception to complete the report based upon criteria under the Other Social Effects Account. The approach to formulating the project under Section 14 of the Flood Control Act of 1946, as amended, was used for the formulation and evaluation of alternatives. Using this approach, the least cost plan is justified if the total costs of the proposed alternative are less than the costs to relocate the threatened facility. The recommended plan of including a Soldier-Pile Wall is the least cost plan and the estimated total project first cost is $23,897,000.

EXECUTIVE SUMMARY

The results of engineering, economic, environmental, and real estate investigations performed for this Flood Risk Management (FRM) Study are being used to determine if the Federal Government should participate in design and construction of potential bankline stabilization and a flood response plan at Selma, Alabama. The City of Selma requested the USACE, Mobile District initiate a study to evaluate damages caused by flooding in the City of Selma as authorized by House Resolution No. 66, June 7, 1961 and in accordance with the Bipartisan Budget Act of 2018 (Public Law (P.L.) 115-123), Division B, Subdivision 1, Title IV, which appropriates funding for the study at full Federal expense.

DESCRIPTION OF THE REPORT

Included with this report is an Environmental Assessment (EA). The FRM Study is integrated with the EA (IFR/EA) and documents the study process. The report also presents the results of investigations and analyses conducted to evaluate damages caused by flooding in the City of Selma. It presents: (1) a survey of existing and future conditions; (2) an evaluation of related problems and opportunities; (3) development of potential alternatives; (4) a comparison of costs, benefits, potential adverse impacts, and feasibility of those alternatives; and (5) identification of the Recommended Plan (RP).

PURPOSE AND NEED

The purpose of this feasibility study is to identify and evaluate alternative plans that would address damages caused by flooding in the City of Selma. This study assesses solutions that are structurally sustainable, economically justified, and environmentally acceptable. There is a need for this feasibility study as the City of Selma has experienced historic flooding since its incorporation and many of the historic riverfront structures are at risk of condemnation and demolition due to flood-induced erosion and subsurface instability. There is a further social and regional economic need to maintain the historic, cultural, and community integrity of Selma as it played a pivotal role in the Civil Rights Movement, leading to landmark legislation that changed the nation. Without action, the historic context, viewshed of the Edmund Pettus Bridge, a National Historic Landmark, and crucial heritage tourism within the city could be significantly lessened or completely lost.

AUTHORIZATION

This feasibility study is authorized by House Resolution No. 66, June 7, 1961:

> *"Resolved by the Committee on Public Works of the House of Representatives, United States, that the Board of Engineers for Rivers and Harbors be, and is hereby, requested to review the report on Alabama-Coosa Branch of Mobile River, Georgia and Alabama, published as House Document No. 66, Seventy-fourth Congress, first, session, with a view to determining the advisability of providing improvements for flood control on Alabama River in Dallas County, Alabama."*

The Bipartisan Budget Act of 2018 (Public Law (P.L.) 115-123), Division B, Subdivision 1, Title IV, appropriates funding for the study at full Federal expense. As identified under this "Supplemental Appropriation" bill, the study is subject to additional reporting

requirements and is expected to be completed within three years and for $3 million dollars.

In accordance with the memorandum for the Commander dated July 16, 2020 from Headquarters (HQ) United States Army Corps of Engineers (USACE) to the South Atlantic Division (SAD), the investigation of streambank (bankline) erosion measures is being performed in accordance with Section 1203 of Water Resources Development Act of 2018:

> *"(a) Feasibility Reports.--The Secretary shall expedite the completion of a feasibility study for each of the following projects, and if the Secretary determines that the project is justified in a completed report, may proceed directly to preconstruction planning, engineering, and design of the project: (1) Project for riverbank stabilization, Selma, Alabama."*

FEDERAL INTEREST

The USACE FRM Program works across the agency to focus its policies, programs and expertise toward reducing overall flood risk. This includes the appropriate use and resiliency of structural measures (e.g., levees and floodwalls), as well as the use of non-structural measures (e.g., land acquisition, flood proofing, etc.) to develop alternatives which reduce the risk of loss of life, reduce long-term economic damages to the public and private sector, and improve the natural environment.

The flooding, and subsequent structural integrity issues in Selma have been well documented over the decades, evidenced by the 1967 USACE, Mobile District FRM Study; the USACE, Mobile District Selma, Alabama Continuing Authorities Program (CAP) Section 14 Study discussed further in Section 1.6; and the 2016 Federal Emergency Management Agency (FEMA) armament of a historic masonry stormwater outfall. The 1967 study highlights the overbank flooding towards the east of the City, particularly in Ward 8. The FEMA armoring and the current Section 14 study both highlight the continued flooding-induced erosion that significantly threatens the structural integrity of the historic Selma riverfront.

Addressing bank stabilization as part of FRM helps to preserve many shoreline characteristics that include unique ecosystems, historic structures, and critical infrastructure along navigable waterways. The City of Selma lies on the Alabama River, a Federal navigation project operated by the USACE, which includes three locks and dams (Claiborne Lock and Dam, Millers Ferry Lock and Dam, and Robert F. Henry Lock and Dam), and associated reservoirs. Finally, the City of Selma is nationally historically significant based on the 1965 Selma to Montgomery marches. The heritage tourism spurred from these events attracts hundreds of thousands of visits annually from around the world, contributing significantly to the economy of the City and surrounding region. Based on these factors, there is clear local, State, and Federal interest in preserving and maintaining the cultural, historic, and structural integrity of Selma, Alabama.

ALTERNATIVES AND RP

Though the entire study area encompasses the City of Selma, problematic floodplain inundation from the Alabama River is predominantly located within a subsection named

Ward 8. Additionally, riverbank erosion has historically and recently led to the condemnation of structures along Water Avenue. This erosional process is associated with, but not limited to, the slow and lengthy flooding from the Alabama River which saturates the underlying Mooreville Chalk geologic layer. The chalk is somewhat impervious, causing concentrated groundwater to exit the bank slopes within the overburden material as this layer becomes saturated. This continual process could potentially result in material loss beneath the building foundations which, over time, would destabilize the buildings. As such, the final array of alternatives was narrowed to three key features in varying combinations: buyouts, levee, and bank stabilization. Specifically, the final array of alternatives is identified as Alternative 1.A (Buyout), Alternative 3 (Optimized Levee), Alternative 4 (Bank Stabilization), Alternative 5 (Bank Stabilization and Buyout), and Alternative 6 (Combination of Alternative 1.A and 5, but with a modified buyout footprint to capture parcels within Ward 8 and outside the levee alignment). Using a risk-informed decision-making process and specific screening criteria, the Recommended Plan (RP) was identified as Alternative 4 (Bank Stabilization) plus a nonstructural measure to implement a Floodplain Management Emergency Evacuation Plan (FMEEP). The draft Integrated Feasibility Report and Environmental Assessment then underwent concurrent Public, Policy, and Agency review. Following the Agency Decision Milestone (ADM), field investigations were conducted to update the site plan and design of the bank stabilization to include Soldier-Pile Wall and other erosion control features as required. Additionally, comments received during the concurrent review process led to refinement of the FMEEP into a Flood Response Plan (FRP).

COSTS AND BENEFITS

This study evaluated bank stabilization in accordance with Section 1203 of Water Resources Development Act of 2018 as authorized. Additionally, HQ USACE allowed for an erosion control measure using CAP Section 14 methodology of the Flood Control Act of 1946 (Public Law 79-526), as amended, for emergency streambank and shoreline protection for public facilities and services. This methodology calls for formulation and evaluation of an alternative using the least cost approach. The plan is justified if the total cost of the alternative is less than the costs to relocate the threatened structures.

In the case of the Selma FRM study, the control measure that reduces flood induced erosion is an approximately 1,000 linear ft Soldier-Pile Wall with other erosion control features which seeks to stabilize a portion of the northern bank of the Alabama River in Selma, Alabama. The viewshed of the Edmund Pettus Bridge consists, in part, of 10 properties adjacent to the bridge along the riverfront which are also included within the Water Avenue Historic District. Although the market value of these 10 structures is approximately $5.4 million, the historic and regional economic value of these structures and what they represent for not only the City of Selma but for the nation and the local economy cannot be overstated. The structures are the viewshed of the Edmund Pettus Bridge, one of the most recognizable Civil Rights sites in the U.S. and comprise the tourism hub of Selma, Alabama. Loss of these structures would be detrimental to Selma's economy and the negative economic impacts would reverberate significantly in Civil Rights tourism throughout the region of central Alabama.

Table ES-1 outlines the least cost alternative method using the Section 14 methodology in which the cost analysis utilized the relocation cost as a base comparison. **Table ES-2** outlines the project first cost apportionment for the City of Selma FRM study.

Table ES-1. Bank Stabilization Least Cost Analysis

Alternative	Construction Costs	O&M Costs	Average Annual Cost
Relocation (base cost)	$81,000,000	$0	Not evaluated
Soldier-Pile Wall	$23,897,000	$31,000	$889,000

Table ES-2. Project First Cost Apportionment Summary

Cost Item	Federal (USACE)	Non-Federal Sponsor	Project First Costs
Initial Construction**	$15,533,000	$8,142,000	$23,675,000
Lands, Easements, Right of Way, Relocations, and Disposal sites (LERRDs)***	$0	$222,000	$222,000
First Costs by Entity	$15,533,000	$8,364,000	$23,897,000
Cost Share Percentages	65%	35%	--
OMRR&R		$31,000	

**based on October 2021 price levels*
***Includes PED, FRP, and Construction Management Fee*
****LERRDs Disclaimer: Subject to change based on appraisal, actual costs, and Real Estate review of credit package*

The benefits of implementing the Soldier-Pile Wall were not based on traditional FRM benefits (i.e., inundation reduction compared to the future without project condition) but instead benefits derived using the methodology found in a Section 14 study (i.e., as costs avoidance of relocation). Benefits were calculated based on cost of constructing the Soldier-Pile Wall compared to the relocation costs of the viewshed. **Table ES-3** provides a summary of the annual costs and benefits of the plan discounted at 2.5% over a 50-year period in October 2021 price level.

Table ES-3. Benefits and Costs for Recommended Plan

Item	Amount
Average Annualized Benefits	$2,786,000
Average Annual Annualized Costs	$889,000
Net Benefits	$1,897,000

ENVIRONMENTAL IMPACTS

Results of the detailed analyses suggest that, overall, no substantial impacts to aquatic resources within the study area are anticipated due to channel modifications. All water quality conditions outlined in the November 10, 2020 Water Quality Certification will be adhered to during construction activities to ensure minimal adverse effects.

The USACE will not receive a Fish and Wildlife Coordination Act (FWCA) Report. The FWCA summary was included within the December 21, 2020 Biological Opinion (BO) and

was distinctly separate from ESA formal consultation language. Known populations of Federally listed species under the ESA are located within the study area. Risk management actions include adhering to the Reasonable and Prudent Measures set forth within the BO.

Impacts to cultural resources may occur within the study area. Risk management involves early coordination with the State Historic Preservation Officer, Federally Recognized Tribes, and other Interested Consulting Parties, early implementation of surveys, and seeking design options which minimize and/or mitigate impacts to resources. A Memorandum of Agreement has been executed in May 2021 to mitigate any adverse risks to historic properties

AREAS OF CONCERN AND UNRESOLVED ISSUES

Areas of Concern: Areas of concern that have the ability to impact project costs or implementation include the following:

Feasibility level design based on limited geotechnical investigation. The study utilized geotechnical information from soil borings collected near Water Avenue; however, subsurface profiles extending into the Alabama River could not be established during the study phase. Additional geotechnical investigations within the Alabama River and subsequent analysis will be completed during Preconstruction, Engineering, and Design Phase.

Contaminates may be found within the project footprint. During geotechnical investigations along Water Avenue conducted in February 2021, possible petroleum contaminants were observed within the groundwater at a single boring location. Further survey will be conducted by ADEM to confirm the source of the contaminant and determine whether remediation is needed. If required, remediation will be performed by others.

Civil War era unexploded ordinances may be found within the project footprint. A Memorandum of Agreement has been executed to mitigate any adverse risks to historic properties.

Construction easements will be required from property owners. Prior to construction contract initiation, bank protection easements will be required by the property owners upland of the normal pool elevation (84.3 feet North American Vertical Datum 88). In addition, a license or permit will be required from the Alabama Department of Transportation (ALDOT) for the portion of the project entering the right-of-way for U.S. Hwy 80 (Business Route) adjacent to the Edmund Pettus Bridge. Coordination with ALDOT will also include the need for approval of a proposed cantilevered reinforced concrete wall or T-wall section of bank stabilization where the proposed alignment enters ALDOT right-of-way and passes under the Edmund Pettus Bridge. Furthermore, all lands below the normal pool elevation are utilized under the Navigation Servitude doctrine. Reference the Selma FRM Study, Appendix D, for further information.

Issues to be Resolved: Several commitments require additional coordination with resource agencies. They include:

- Adhering to Endangered Species Act Terms and Conditions, Water Quality Conditions, and MOA Stipulations.
- In addition, there are several Design (PED Phase actions that will be accomplished prior to construction. They include:
- Additional geotechnical investigation within the Alabama River; and
- Land Survey including meets and bounds.

AREAS OF RESIDUAL RISK

Risk and uncertainty exist in the acquisition of construction easements, potential fluctuation of the Federal interest rate and unexpected construction costs. The conservative assumptions used during the study make it more likely that impacts will be lower than those presented in the IFR/EA. Additional geotechnical analysis conducted during design will reduce the likelihood of unexpected increases in construction costs, however, discovery of cultural artifacts, unexploded ordinances, underground utilities, or contaminated sediments may not be found until the implementation phase. These discoveries would have the possibility to impact the construction costs.

Selma, Alabama, Flood Risk Management Study Integrated Feasibility Report and Environmental Assessment

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List of Acronyms

ACHP .....Advisory Council on Historic Preservation
ACT .....Alabama Coosa Tallapoosa River Basin
ADCNR ....Alabama Department of Conservation and Natural Resources
ADEM.....Alabama Department of Environmental Management
ADOT .....Alabama Department of Tourism
AEP .....Annual Exceedance Probability
AFB .....Air Force Base
ALDOT .....Alabama Department of Transportation
AMM.....Alternatives Milestone Meeting
AMM-IPR..Alternative Milestone Meeting-In Progress Review
ASA(CW) .Assistant Secretary of the Army for Civil Works
BCR.....Benefit-to-Cost Ratio
BGEPA.....Bald and Golden Eagle Protection Act
BMPs .....Best Management Practices
BO .....Biological Opinion
CAA.....Clean Air Act
CAP.....Continuing Authorities Program
CFR.....Code of Federal Regulations
CWA.....Clean Water Act
DSS.....Decent, Safe, and Sanitary
eDNA.....Environmental DNA
EOP.....Environmental Operating Principles
EQ .....Environmental Quality
ER .....Engineering Regulation
ESA.....Endangered Species Act
FCSA.....Feasibility Cost Share Agreement
FEMA .....Federal Emergency Management Agency
FHWA.....Federal Highway Administration
FMEEP .... Floodplain Management/Emergency Evacuation Plan
FRM ..... Flood Risk Management
FRP..... Flood Response Plan
FWOP..... Future Without-Project Condition
FY ..... Fiscal Year
H&H..... Hydrology and Hydraulics
HEC ..... Hydrologic Engineering Center
HTRW..... Hazardous, Toxic, and Radioactive Waste
HQ ..... Headquarters
ICLUS..... Integrated Climate and Land-Use Scenarios
IDC..... Interest During Construction
IFR/EA..... Integrated Feasibility Report and Environmental Assessment
IPR..... In Progress Review
LERRDs .. Lands, Easements, Rights-of-way, Relocations, and Disposal
LUST ..... Leaking Underground Storage Tank
MBTA ..... Migratory Bird Treaty Act
MFR..... Memorandum for Record
MOA ..... Memorandum of Agreement
NAA..... No Action Alternative
NAAQS.... National Ambient Air Quality Standards
NAVD88 .. North American Vertical Datum of 1988
NED ..... National Economic Development
NEPA..... National Environmental Policy Act
NFIP ..... National Flood Insurance Program
NFS..... Non-Federal Sponsor
NHPA ..... National Historic Preservation Act
NPDES .... National Pollutant Discharge Elimination System
NPS ..... National Park Service

NRCS .....Natural Resources Conservation Service
NRHP .....National Register of Historic Places
O&M.....Operation and Maintenance
OMRR&R .Operations, maintenance, repair, rehabilitation, and replacement
OSE.....Other Social Effects
OSHA.....Occupational Safety and Health Administration
P&G.....Principles and Guidelines

P.L......Public Law
PCE(s).....Primary Constituent Element(s)
PDT .....Project Delivery Team
PED.....Preconstruction Engineering and Design
POA.....Period of Analysis
PPA.....Project Partnership Agreement
REC.....Recognized Environmental Conditions
RED.....Regional Economic Development
RECONS..Regional Economic Systems Model
ROM ..... Rough Order of Magnitude
RM ..... River Mile
RPM(s) .... Reasonable and Prudent Measure(s)
SAD ..... South Atlantic Division
SHU ..... Strategic Habitat Unit
SRRU ..... Strategic River Reach Unit
T&E..... Threatened and Endangered Species
TMDL(s) .. Total Maximum Daily Load(s)
TSP..... Tentatively Selected Plan
U.S...... United States
USACE .... U.S. Army Corps of Engineers
USDA ..... U.S. Department of Agriculture
USEPA .... U.S. Environmental Protection Agency
USFWS.... U.S. Fish and Wildlife Service
USGS ..... U.S. Geological Survey
UXO(s) .... Unexploded Ordnance(s)
WCC ..... White Citizens' Council
WQC..... Water Quality Certification
WRDA ..... Water Resources Development Act
WRRDA... Water Resources Reform and Development Act

Units of Measurement

Cubic feet Per Second.....cfs
Cubic yards.....cy
Degrees ..... °
Fahrenheit..... F
Feet or Foot ..... ft
Inch..... "
Miles .....mi
Percent..... %
River Mile .....RM
Square yards .....sy

1.0 INTRODUCTION*

This Integrated Feasibility Report and Environmental Assessment (IFR/EA) presents the results of the City of Selma Feasibility Study. The IFR/EA integrates plan formulation with documentation of environmental effects, potential alternatives for flood risk reduction, and outlines the process used for identifying the Recommended Plan. It also documents compliance with the National Environmental Policy Act (NEPA) of 1969 and includes input from the non-federal study sponsor and the public. Sections required for NEPA compliance are denoted with an asterisk (*) in the heading.

The Council on Environmental Quality (CEQ) published its Final Rule: Update to the Regulations Implementing the Procedural Provisions of the NEPA in the Federal Register July 16, 2020. The new CEQ NEPA Regulations went into effect September 14, 2020. Preparation of this IFR/EA commenced prior to enactment of the new NEPA regulations. The U.S. Army Corps of Engineers (USACE) may only apply the prior CEQ NEPA regulations from 1978, as well as relevant USACE regulations and guidance, to such pending reviews. As such, this IFR/EA has been prepared in accordance with the 1978 CEQ NEPA regulations.

1.1 Study Authority*

This feasibility study is authorized by House Resolution No. 66, June 7, 1961:

> *"Resolved by the Committee on Public Works of the House of Representatives, United States, that the Board of Engineers for Rivers and Harbors be, and is hereby, requested to review the report on Alabama-Coosa Branch of Mobile River, Georgia and Alabama, published as House Document No. 66, Seventy-fourth Congress, first, session, with a view to determining the advisability of providing improvements for flood control on Alabama River in Dallas County, Alabama."*

The Bipartisan Budget Act of 2018 (Public Law (P.L.) 115-123), Division B, Subdivision 1, Title IV, appropriates funding for the study at full Federal expense. As identified under this "Supplemental Appropriation" bill, the study is subject to additional reporting requirements and is expected to be completed within three years and for $3 million.

In accordance with the memorandum for the Commander dated July 16, 2020 from Headquarters (HQ) USACE to the South Atlantic Division (SAD), the investigation of streambank (bankline) erosion measures is being performed in accordance with Section 1203 of Water Resources Development Act (WRDA) of 2018:

> *"(a) Feasibility Reports.--The Secretary shall expedite the completion of a feasibility study for each of the following projects, and if the Secretary determines that the project is justified in a completed report, may proceed directly to preconstruction planning, engineering, and design of the project: (1) Project for riverbank stabilization, Selma, Alabama."*

1.2 Location and Study Area*

The study area is located along the Alabama River in the City of Selma, Alabama. Selma is home to one of the largest historic districts in Alabama. It is located approximately 50 miles (mi) west of Montgomery, Alabama. The city itself is divided into wards with each

having a representative in the city government. The wards receiving frequent flooding are identified in **Figure 1** and are the focused project area for this study. They include Wards 1, 3, 6 and 8. Alabama River Miles (RM) 256 through 261 have been assessed for this study.

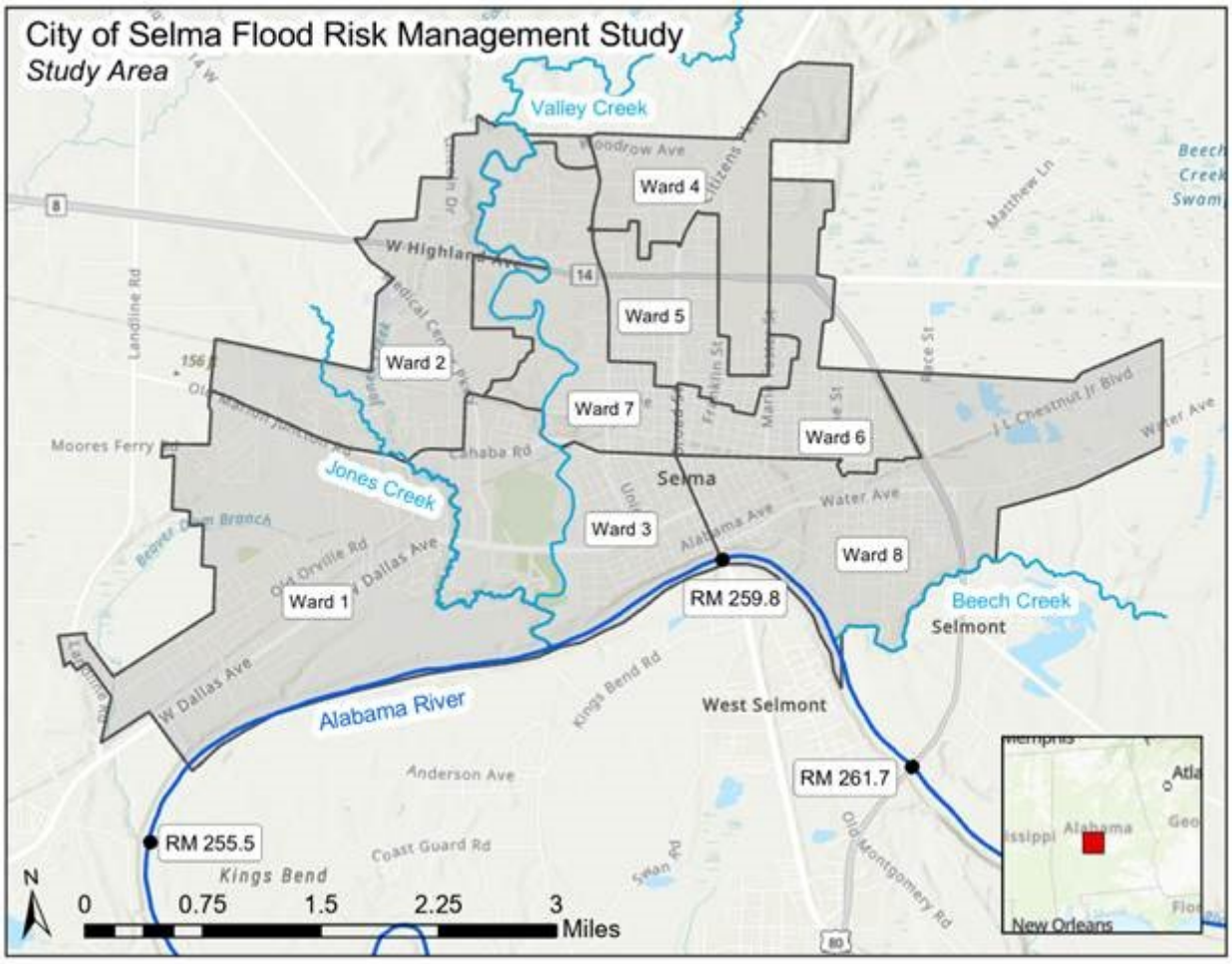

Figure 1: Selma, Alabama, Study Area

1.2.1 Congressional District

United States (U.S.) Senators of Alabama Mr. Richard Shelby and Mr. Tommy Tuberville and U.S. Representative Ms. Terri Sewell (District 7) serve the project area.

1.3 Non-Federal Sponsor

The City of Selma is the Non-Federal Sponsor (NFS) for the Selma, Alabama, Flood Risk Management (FRM) Study. The Feasibility Cost Share Agreement (FCSA) was signed on October 9, 2018 which marked the beginning of the feasibility study process.

1.4 Federal Interest

The USACE FRM Program works across the agency to focus its policies, programs, and expertise toward reducing overall flood risk. For FRM projects, the Federal Interest includes the appropriate use and resiliency of structural measures (e.g., levees and floodwalls), as well as the use of non-structural measures (e.g., land acquisition, flood

proofing, etc.) to develop alternatives which reduce the risk of loss of life, reduce long-term economic damages to the public and private sector, and improve the natural environment.

The flooding, and subsequent structural integrity issues in Selma have been well documented over the decades, evidenced by the 1967 USACE, Mobile District FRM Study; the USACE, Mobile District Selma, Alabama Continuing Authorities Program (CAP) Section 14 design and implementation (D&I) project as shown in **Figure 2** and discussed further in **Section 1.6,** and by the 2016 Federal Emergency Management Agency (FEMA) armament of a historic masonry stormwater outfall. The 1967 study highlights the overbank flooding towards the east of the City, particularly in Ward 8. The FEMA armoring and the current Section 14 D&I project both highlight the continued flooding-induced erosion that significantly threatens the structural integrity of the historic Selma riverfront.

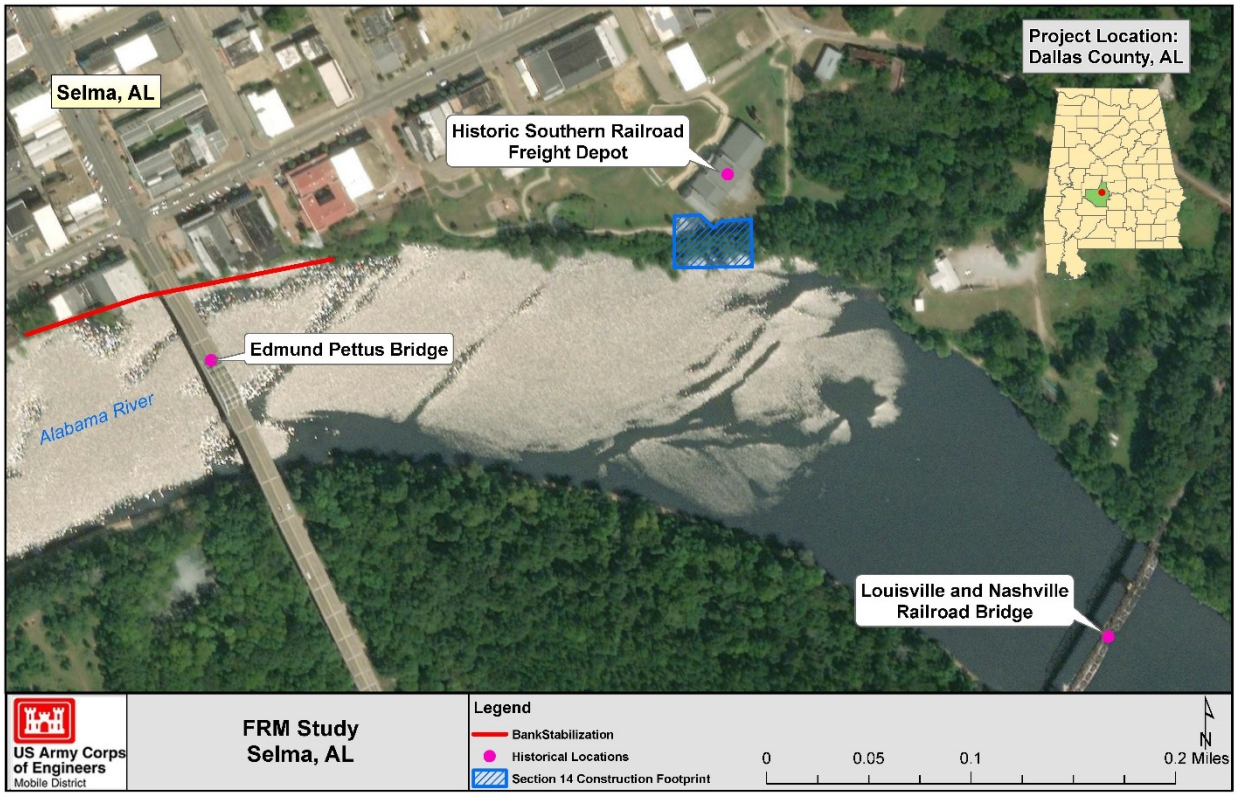

Figure 2: Location of the Selma CAP Project Construction Footprint

Addressing bank stabilization as part of FRM helps to preserve unique ecosystems, properties listed on the National Register of Historic Places (NRHP), and critical infrastructure along navigable waterways. The City of Selma lies on the Alabama River, a Federal navigation project operated by the USACE, which includes three locks and dams (Claiborne Lock and Dam, Millers Ferry Lock and Dam, and Robert F. Henry Lock and Dam) and associated reservoirs. Finally, this study area is historically significant based on the 1965 Selma to Montgomery marches. The heritage tourism spurred from this event attracts hundreds of thousands of visits annually from around the world, contributing significantly to the economy of the City and surrounding region. Based on

these factors, there is clear local, State, and Federal interest in preserving and maintaining the cultural, historic, and structural integrity of study area.

Figure 3 shows the recent loss of a structure downstream of the Edmund Pettus Bridge due to erosion along the riverbank.

Figure 3: Structural Demolition Due to Bank Erosion in 2016

1.5 Study Purpose, Need, and Scope

*1.5.1 Study Purpose and Need**

The purpose of this feasibility study is to identify and evaluate alternative plans that would address damages caused by flooding in the City of Selma. This study will assess solutions that are structurally sustainable, economically justified, and environmentally acceptable. There is a need for this feasibility study as the City of Selma has experienced significant flooding since its incorporation and many of the historic riverfront structures are at risk of condemnation and demolition due to flood-induced erosion and subsurface instability. There are also social and regional economic needs to maintain the historic, cultural, and community integrity of Selma as it played a pivotal role in the Civil Rights Movement, leading to landmark Voting Rights Act of 1965 legislation that changed the nation. Without action, the historic context, viewshed of the Edmund Pettus Bridge, a national historic landmark, and crucial heritage tourism within the city could be significantly lessened or completely lost. **Figure 4** shows the historic districts within the study area in reference to the Edmund Pettus Bridge location.

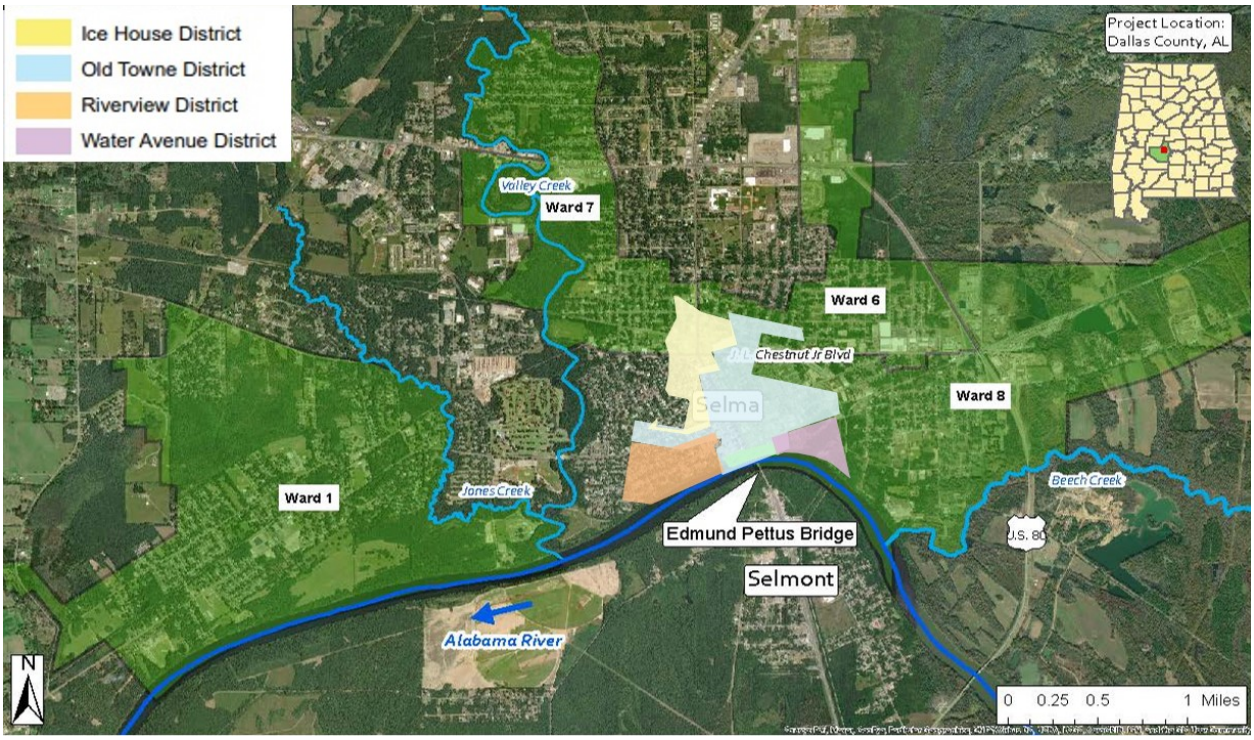

Figure 4: Historic Districts within the Study Area

1.5.2 Study Scope

The scope of the study focused on achieving National Economic Development (NED) benefits in addition to conducting a robust analysis on Regional Economic Development (RED), Environmental Quality (EQ), and Other Social Effects (OSE). The study scope consisted of identifying FRM measures for flooding events and damages within the City of Selma (located along the Alabama River in Dallas County, Alabama) and by evaluating types of improvements as outlined in Engineering Regulation (ER) 1105-2-100, Sec 3, E-17 dated April 22, 2000 and Engineering Pamphlet 1105-2-58.

1.6 Prior Reports and Current Projects

Table 1 lists previous investigations and reports as well as the most recent studies which are pertinent to or supply supplemental information regarding flooding and erosion problems in Selma, Alabama.

Table 1: Prior Studies and Reports

STUDY	DESCRIPTION
Interim Report on Alabama-Coosa River System at and in the Vicinity of Selma, Alabama, dated 2 Feb 1967	The FRM feasibility study was completed in 1967. The report recommended levees be constructed along the Alabama River; however, the project was never implemented.
Continuing Authorities Program – Section 14 Feasibility Study, Emergency Streambank and Shoreline Protection, Selma, Alabama (referred to as the Selma CAP Section 14 Project)	A Section 14 Study recommended construction of approximately 150-ft of articulated concrete mat on the riverbank of the Historic Riverfront Park. Project Design is ongoing. There are no anticipated impacts to the project area outlined in this report.

STUDY	DESCRIPTION
FEMA Armoring Work	FEMA completed armoring work at a historic masonry stormwater outfall adjacent to the Historic Riverfront Park. The project protected the outfall pipe and the surrounding area from erosion.

1.7 Planning Process

This report presents a collaboratively-developed plan prepared in accordance with established policies, principles, and guidance: (1) 1983 Economic and Environmental Principles and Guidelines for Water and Related Land Implementation Studies (P&G); (2) ER 1105-2-100 (2000) also known as Planning Guidance Notebook; and (3) Engineer Pamphlet 1105-2-58, Continuing Authorities Program. This study was conducted under the USACE Planning Process which involves a six-step iterative and structured approach to problem solving: (1) Specify Problems and Opportunities, (2) Inventory and Forecast Conditions, (3) Formulate Alternative Plans, (4) Evaluate Effects of Alternative Plans, (5) Compare Alternative Plans, and (6) Select Recommended Plan. Step 1 is discussed in **Section 2.0**, Step 2 in **Section 3.0**, Steps 3, 5, and 6 in **Section 4.0**, and Step 4 in **Section 5.0**.

2.0 PROBLEMS, OPPORTUNITIES, OBJECTIVES, AND CONSTRAINTS

The City of Selma and surrounding areas have experienced 31 moderate to major floods since 1886. In accordance with the National Weather Service, the major flood events consisted of extensive inundation of structures and roads while moderate floods consisted of inundation of structures and roads near streams. Sixteen of the floods were considered 0.04 annual exceedance probability (AEP) (25-year) or greater flood events with crests greater than a stage of 52 feet (ft) (61.9-ft above datum NAVD 88). These flood events have resulted in flood impacts to structures in a region that is one of the most economically deprived in the country. Although overbank flooding occurs in Wards, 1, 3, 6, and 8, the greatest impacts occur along the Alabama River in Ward 8. As a result of these flood events, flood-induced erosion is threatening one of the few remaining intact historic riverfronts in the U.S. The structures along this riverfront are intimately tied to the Edmund Pettus Bridge, a National Historic Landmark. Currently, there are 10 properties listed on the NRHP included within this viewshed that are at risk under the future without project (FWOP) condition. Threats from riverine flooding and frequent high flow velocities threaten the preservation of cultural and historic values intrinsic to the City of Selma. **Table 2** identifies the total number of structures within each AEP flood event.

Table 2: Number of Structures within each AEP Flood Event

AEP	Number of Structures within Inundation Boundary
0.5	0
0.2	3
0.1	27
0.04	134
0.02	285
0.01	628

AEP	Number of Structures within Inundation Boundary
0.005	908
0.002	1186

2.1 Study Problems and Opportunities

The problems in the study area stem from flooding of the Alabama River. These floods and high-water events have historically and continuously caused problems for Selma and the surrounding area. The problems identified include:

- Infrastructure and structural damages due to flooding in Wards 1, 3, 6, and 8;
- Riverbank erosion along Alabama River from RM 256-261 which impacts the structural foundation of historic buildings adjacent to the Edmund Pettus Bridge; and
- Impacts to community cohesiveness due to flood damages to property.

The opportunities are to:

- Stabilize riverbank to reduce erosion along the Alabama River;
- Reduce flood related damages to properties;
- Improve recreational opportunities and increase public viewing access to the Alabama River; and
- Reduce threats to historic buildings and cultural resources.

2.2 Objectives and Constraints

The Federal objective is to contribute to NED consistent with protecting the Nation's environment. ER 1105-2-100 states:

> *"Protection of the Nation's environment is achieved when damage to the environment is eliminated or avoided and important cultural and natural aspects of our nation's heritage are preserved." (USACE, 2000, 2-1)*

The study objectives describe what the alternative plans should achieve. The following objectives were developed to apply to this area over the 50-year period of analysis (POA) (2025-2074):

- Reduce average annual flood damages to residential and commercial property;
- Increase community resiliency and maintain community cohesion by reducing risk to vulnerable populations (human health and safety);
- Improve the Alabama River's bank stability between RM 256-261, due to erosion and river levels decreasing at a faster rate than soil layers drain following flood events; and
- Stabilize and preserve the historic integrity of structures surrounding the iconic viewshed of the Edmund Pettus Bridge.

The study specific constraints for a 50-year POA from approximately 2025 through 2074 are:

- To the extent practicable, avoid and/or minimize impacts to existing threatened and endangered species (T&E) and their critical habitats (such as Tulotoma Snail

(*Tulotoma magnifica*), Heavy Pigtoe (*Pleurobema taitianum*), Alabama Sturgeon (*Scaphirhynchus suttkusi*), Orangenacre Mucket (*Lampsilis perovalis*), and Southern Clubshell (*Pleurobema decisum*));
- Minimize impacts to cultural resources (such as Edmund Pettus Bridge, historic districts, and Civil War sites);
- Avoid impacts to existing Federally constructed and/or funded projects/studies (e.g., CAP Section 14 project);
- Minimize impacts to available decent, safe, and sanitary (DSS) housing for tenants (socially vulnerable populations) as defined in 25 Code of Federal Regulations (CFR) Section (§) 700.55 (2020);
- Minimize Operations, Maintenance, Repair, Rehabilitation and Replacement (OMRR&R) costs to the NFS; and
- Legal constraints include those associated with expanding the study area beyond the scope of the approved authority.

3.0 AFFECTED ENVIRONMENT AND FUTURE WITHOUT PROJECT CONDITIONS (FWOP)*

The environmental setting without the project describes the resources in the study area that could potentially be affected. The existing condition was established based on a desktop review, as well as site visits made by the USACE, Mobile District, and is a baseline from which the FWOP conditions were assumed and/or developed. The FWOP conditions were developed by applying assumptions related to current trends to the study's baseline to determine a most likely future over a 50-year period. When existing conditions and FWOP for a given resource are similar they will be discussed together. The following resources are expected to have different FWOP conditions than existing: hydrology, geology and soils, climate, threatened and endangered species, bald and golden eagles, cultural and historic resources, aesthetics, industry, and public safety. These resources will be discussed separately.

3.1 Physical Environment*

*3.1.1 Water Resources**

*3.1.1.1 Hydrology**

3.1.1.1.1 Existing Setting

The study area encompasses the Alabama River in Selma, Alabama. The Alabama River begins north of Montgomery, Alabama, where the Coosa and Tallapoosa Rivers join and generally flows westward from Montgomery to Selma, and then follows a more southwesterly path to join the Tombigbee River and form the Mobile River. The river then flows south into the Mobile Bay and eventually into the Gulf of Mexico. This network of rivers is termed the Alabama Coosa Tallapoosa (ACT) River Basin.

There are three tributaries draining into the Alabama River within the study area, including Valley Creek, Jones Creek, and Beech Creek. Flooding along the Alabama River is generally driven by high output rainfall events in the headwater portions of the ACT River Basin, and flooding in Selma is typically observed as a result of backwater from the

Alabama River flowing into the three tributaries mentioned above. While there are some small, local flooding issues, the large-scale issues in the study area are the result of flooding from the Alabama River. The Alabama River basin above Selma is a nearly 17,000 square mile drainage area. An accumulation of significant rainfall causes a slow and steady rise of river stage elevations. Typical flooding events have an advanced notice of roughly two to three days, and continual flooding generally lasts for a few days. As shown in **Figure 5**, much of the flooding within the study area is concentrated within Ward 8 for a 0.002 AEP, or 500-year flood event; depth of flooding varies due to topography. **Figure 6** shows the flood depths within Ward 8 during a 0.01 AEP, or 100-year, flood event.

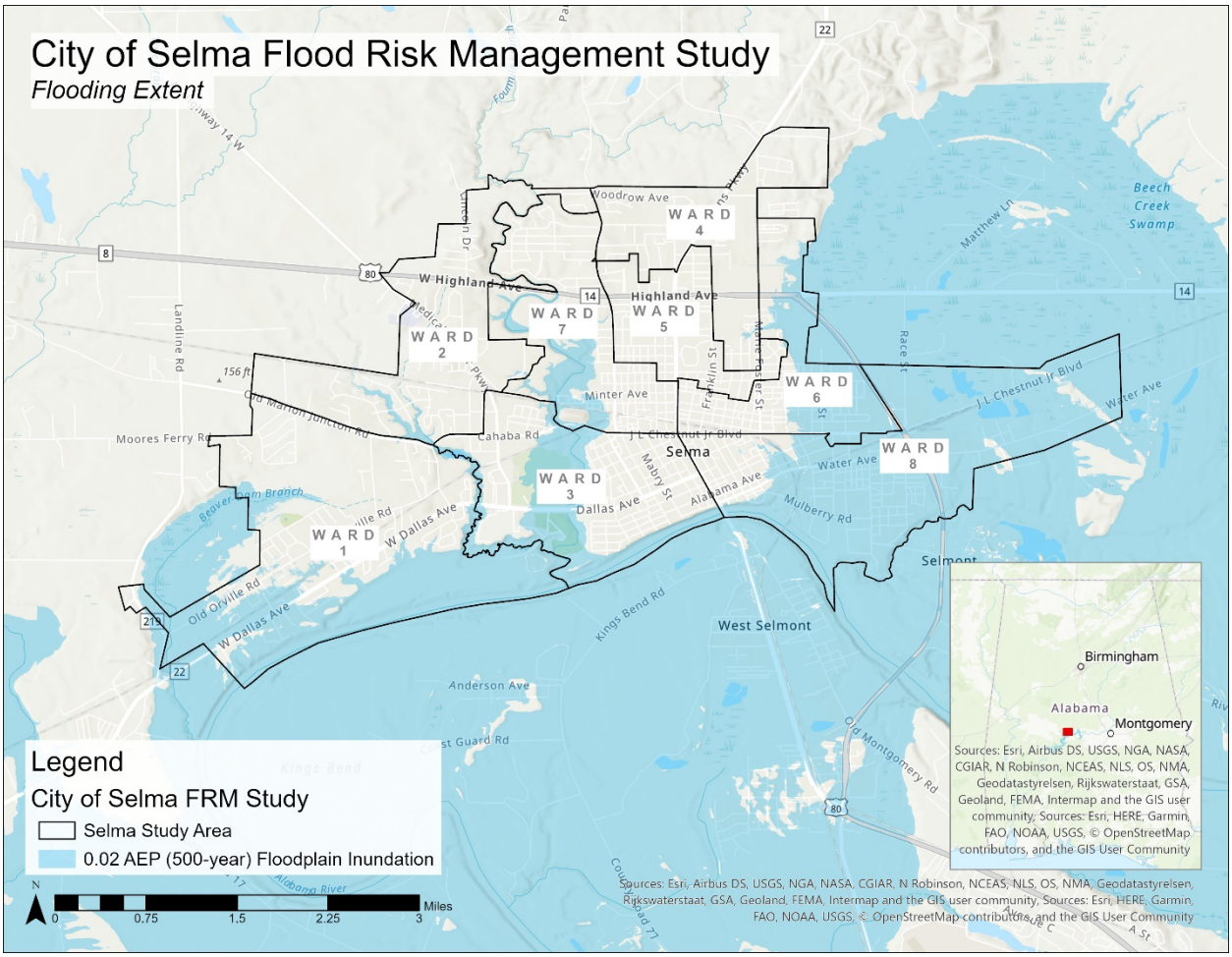

Figure 5: Floodplain inundation during the 0.002 AEP, or 500-year, flood event

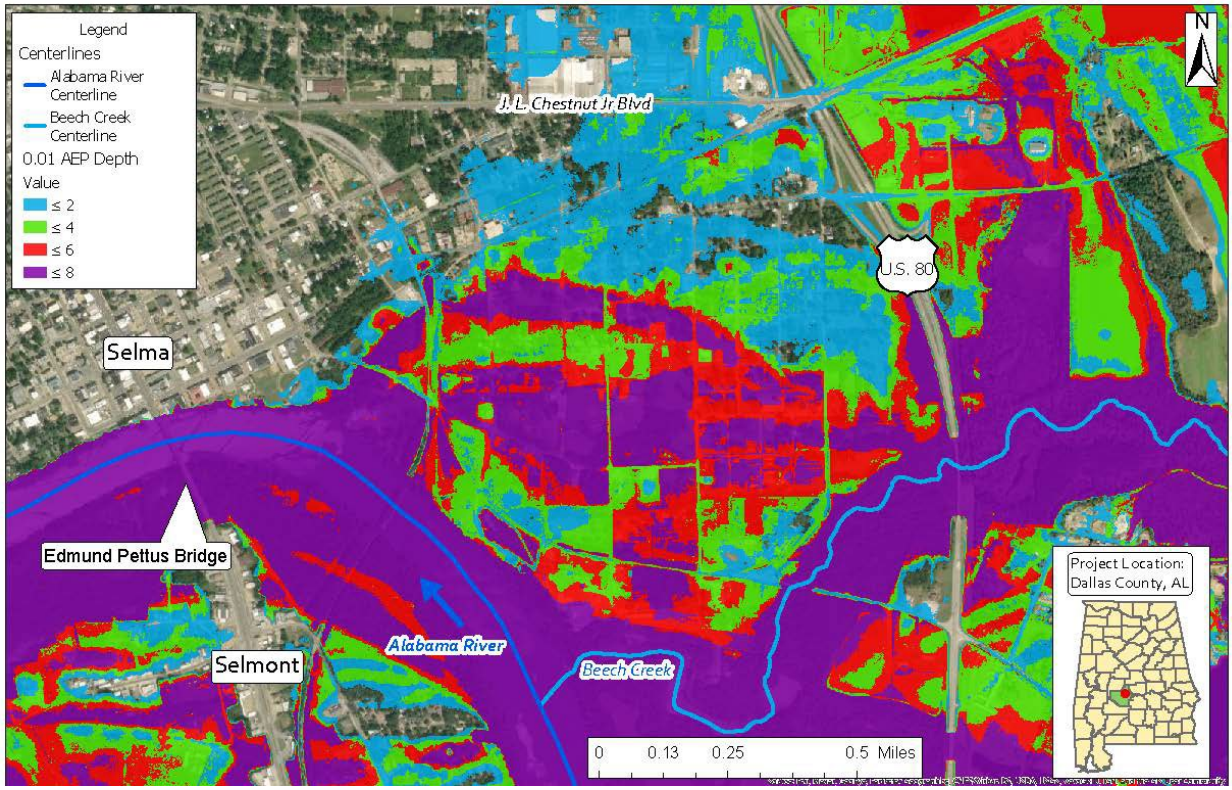

Figure 6: Flood depths (in feet) of the 0.01 AEP, or 100-year, flood event within Ward 8

Figure 7 demonstrates the relationship of stages and flows at the U.S. Geological Survey (USGS) gage located on the Alabama River near Selma. This relationship was developed based on peak flows measured by the USGS from 1886 through 1990 when flow measurements were stopped. Note, the downstream operation of Miller's Ferry Lock and Dam can affect the stage/flow relationship at this gage. Miller's Ferry Lock and Dam fluctuates about 1-ft between normal to slightly above normal flows as the site reregulates flows for the use of navigation and hydropower. This approximate 1-ft variation at the dam can have a small effect on the stage flow relationship at the Selma gage due to backwater effects; however, during high flows minimal variability is observed. Though the study area includes all Wards within Selma, floodplain inundation shows that the study area receives flood waters predominantly in Ward 8.

Figure 8 demonstrates the frequency of major and moderate flood events declined after lock and dam structures were constructed in the 1970s; however, climatological changes such as a decrease in the number of significant precipitation events as well as increasing temperatures in the region are likely the main contributors to this decline in peak stages resulting from flood events. While direct flooding of properties along the riverbank declined, damage to the riverbank and overburden soils were never addressed. The damaged overburden soils and unrestrained riverbank continued to actively erode along the bankline and may contribute to potential failure and further damages to historic structures.

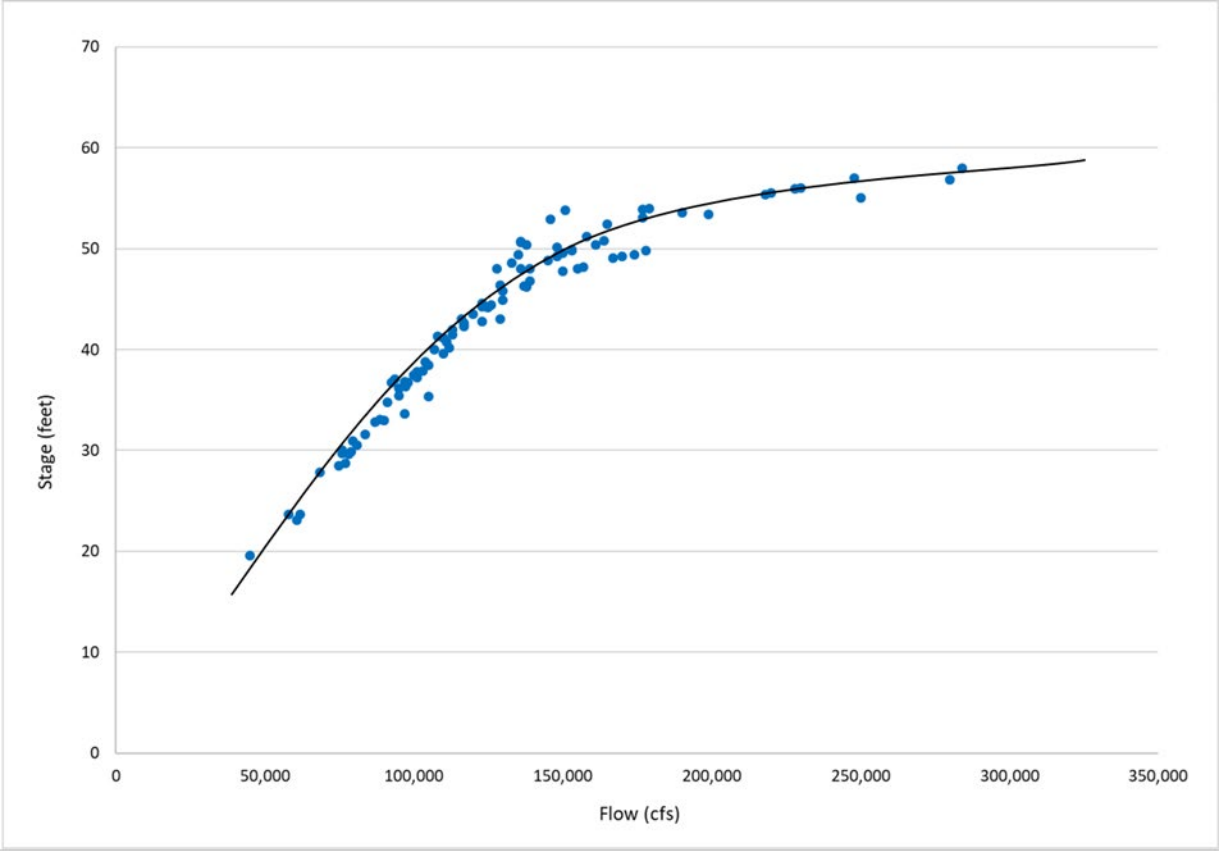

Figure 7: Stage vs Flow Chart – Alabama River

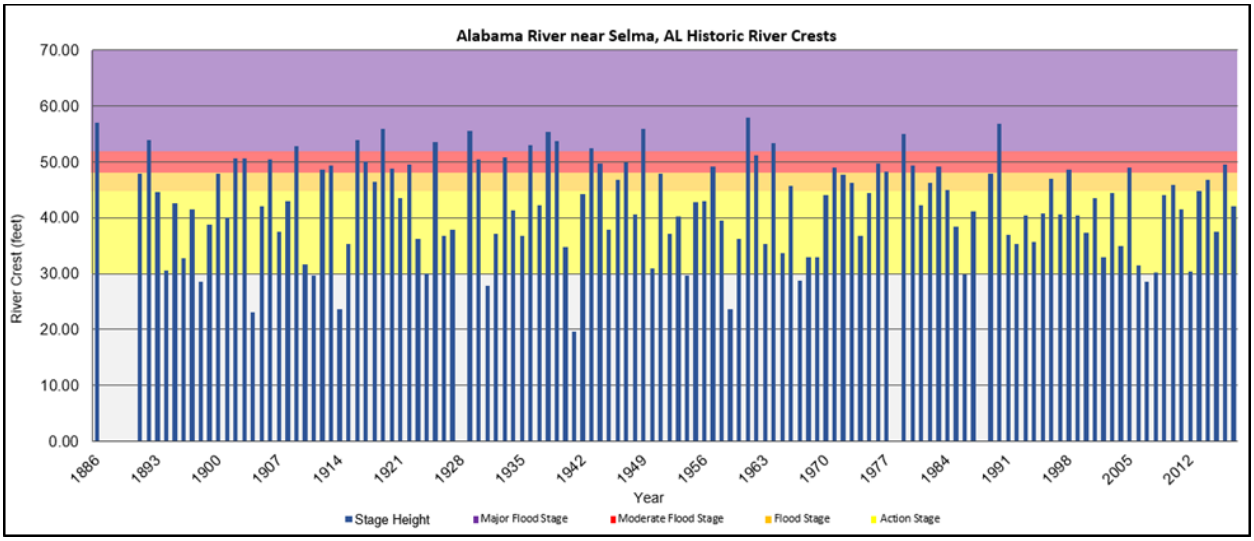

Figure 8: Alabama River Crest Stages

*3.1.1.1.2 Future Without Project Conditions**

The FWOP condition hydrology is driven primarily by changes in land use along the headwaters upstream of Selma, rather than land use within and immediately surrounding the study area. It can be reasonably assumed that in the future, population growth in the headwater portions will continue current trends and lead to an increase in peak flood flows from the Alabama River in the area of Selma as impervious areas surrounding the

headwater rivers increase in places such as Rome, Georgia, and Montgomery, Alabama. However, no additional or significant development in the immediate vicinity of the study area is currently expected. To estimate the increase in peak flow, the Hydrologic Engineering Center (HEC) Hydrologic Modeling System for the ACT River Basin was used. This is a rainfall-runoff model that estimates flow into and along the mainstem rivers of the ACT River Basin, including the Alabama River near Selma. This model is typically used for forecasting flows in the basin and is considered calibrated to existing conditions. Adjustments were made to the estimated impervious areas in the model to account for the changes in land use due to population growth in the headwater areas.

To estimate future land use conditions of the basin, the U.S. Environmental Protection Agency (USEPA) Integrated Climate and Land-Use Scenarios (ICLUS) percent impervious surface projections dataset (Ver 1.3.2) was used. This dataset utilizes population projections through the end of the century, reflecting different assumptions about fertility, mortality, and immigration to determine the demand for new homes, and estimates the amount of impervious surface that can be expected. Average future impervious percentages for each sub-basin were calculated for the basins above Selma using this ICLUS dataset, and areas of anticipated increased development were verified using aerial imagery to assess if these areas could in fact become more developed.

Then, a series of rainfall events, ranging from the 0.5 AEP (2-year) to the 0.002 (500-year) AEP, were run through the hydrology model for both the existing and future land use scenarios. Comparison of each of these runs showed that peak flows increased about 2 percent (%) for the entire range of rainfall events; therefore, a uniform 2% increase in flow (measured in cubic feet per second (cfs)) for all AEP events was used for the FWOP hydrology. These flows and associated peak elevations (using the North American Vertical Datum of 1988 (NAVD88) and stages at the Selma, Alabama, USGS gage are shown in **Table 3**.

Table 3: Annual Exceedance Probability Events for FWOP Conditions (Selma, Alabama USGS Gage #02423000)

AEP	Flow (cfs)	Elevation (ft - NAVD88)	Stage (ft)
0.5 (2-year)	125,000	105.21	43.41
0.2 (5-year)	168,000	110.83	49.03
0.1 (10-year)	195,000	113.63	51.83
0.04 (25-year)	221,000	115.91	54.11
0.02 (50-year)	253,000	118.01	56.21
0.01 (100-year)	277,000	119.33	57.53
0.005 (200-year)	302,000	120.89	59.09
0.002 (500-year)	334,000	122.85	61.05

As **Table 3** shows, the river reaches 105.21-ft NAVD88 under FWOP conditions at an AEP of just under 0.5 AEP, or 2-year, flood event. This is approximately the same elevation that the overburden soil layer is present in the study area indicating the high frequency of flood waters reaching the interface of the overburden soils and underlying chalk layer as discussed later in the report. The elevation where building foundations intersect the ground surface along the bankline ranges from approximately 109-ft to 135-ft and the centerline elevation of Water Avenue is approximately 135-ft.

*3.1.1.2 Water Quality**

Section 401 of the Clean Water Act (CWA) requires that the State issue water quality certification for any activity which requires a Federal permit and may result in a discharge to State waters. This certification must state that applicable effluent limits and water quality standards will not be violated. The USEPA delegates authority pursuant to the CWA to the states for monitoring and maintaining clean water standards.

Section 303(d) of the CWA authorizes USEPA to assist states, territories, and authorized tribes in listing impaired waters and developing Total Maximum Daily Loads (TMDLs) for these water bodies. A TMDL establishes the maximum amount of a pollutant allowed in a water body and serves as the starting point or planning tool for restoring water quality. States are required to submit their list for USEPA approval every two years. For each waterbody on the list, the state identifies the pollutant causing the impairment, when known. In addition, the state assigns a priority for development of TMDL based on the severity of the pollution and the sensitivity of the uses to be made of the waters, among other factors (40 CFR § 130.7.b.4, 2020). According to the Final 2020 Alabama Department of Environmental Management (ADEM) 303(d) list, there are no 303(d) listed bodies of water within the study area. The nearest impaired waterbody is Childers Creek which is a tributary of the Alabama River downstream of Selma, Alabama as shown on **Figure 9**.

Additionally, Section 402 of the CWA addresses stormwater pollution by requiring a National Pollutant Discharge Elimination System (NPDES) permit for activities that discharge into Waters of the U.S. through point (i.e., a pipe, ditch, or channel) and nonpoint source (i.e., runoff) pollution. All construction sites greater than one acre are required to obtain a NPDES permit.

Impaired water quality is predominantly related to urbanized settings. No significant urbanization growth is anticipated within the surrounding areas near Selma due to a depressed economy. The city of Selma has seen a continued population decline since 1960 and has lost 17% of its population since 2010; therefore, FWOP conditions would not be significantly changed from the existing setting.

*3.1.2 Geology and Soils**

3.1.2.1 Existing Setting

The Selma area is situated near the center of the Black Prairie subdivision of the Gulf Coastal Plain physiographic province. The Black Prairie subdivision is a belt of low relief which crosses the state in and east-west direction. In the Selma area, it is about 20 mi wide and consists of flat to gently undulating prairie land. The major drainage of the area

is by the entrenched and meandering Alabama River which crosses the prairie belt in a southwesterly direction. The Black Prairies correspond in length and width to the weathered outcrop of the Selma Group of late Cretaceous age which is a chalky to argillaceous limestone formation with a maximum known thickness of about 900 ft. The general dip of the strata in the Selma area is about 30-ft per mile to the south.

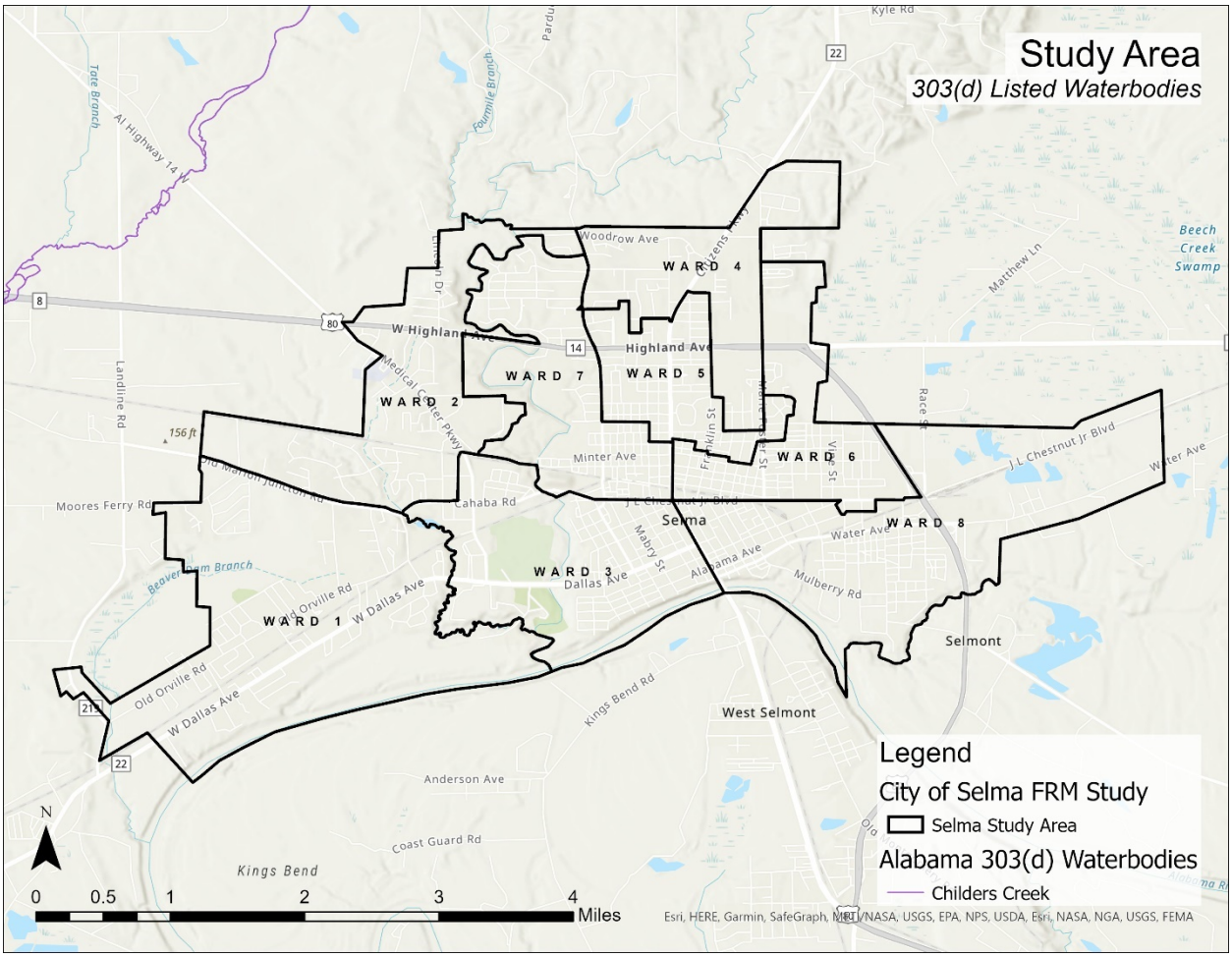

Figure 9: Location of 303(d) Listed Impaired Waterbodies Near Selma, Alabama

The geology in and around the City of Selma consists of alluvial deposits, underlain by various formations within the Selma Group, the most prevalent of these being the Mooreville Chalk. Alluvium deposits consist of a mixture of varicolored, fine to coarse sand with clay lenses and gravel. The Mooreville Chalk is generally characterized as a yellowish-gray to olive-gray clayey chalk or chalky marl. A visual survey of the banks indicate that the banks are steep (1V:1.5H and steeper), and they are comprised of sands, silts, and clays that sit atop a layer of chalk. Historical borings from past geotechnical explorations confirm this assessment, noting that the chalk layer is dense and strong. Recent soil explorations and laboratory testing have determined the Mooreville “Chalk” layer in this area is a hard, fat clay with low permeability. North shore riverbanks in the downtown area range in height between 30 to 50-ft above the water’s surface (average water surface elevation at the Edmond Pettus Bridge is 84.30 ft). The interface of the

overburden and the chalk is easily spotted from the river, and this interface appears anywhere from 5 to 20-ft above the water's surface.

Many historic buildings are situated along the riverbank between Franklin and Church Streets. Their foundations appear to be set in the overburden alluvial deposits, with little to no soil coverage on the riverside of the foundation. The chalk is somewhat impervious, causing concentrated groundwater to exit the bank slopes within the overburden material as this layer becomes saturated. This continual process could potentially result in material loss beneath the building foundations which, over time, would destabilize the buildings. **Figure 10** shows a generalized cross-section of the geology of the riverbank.

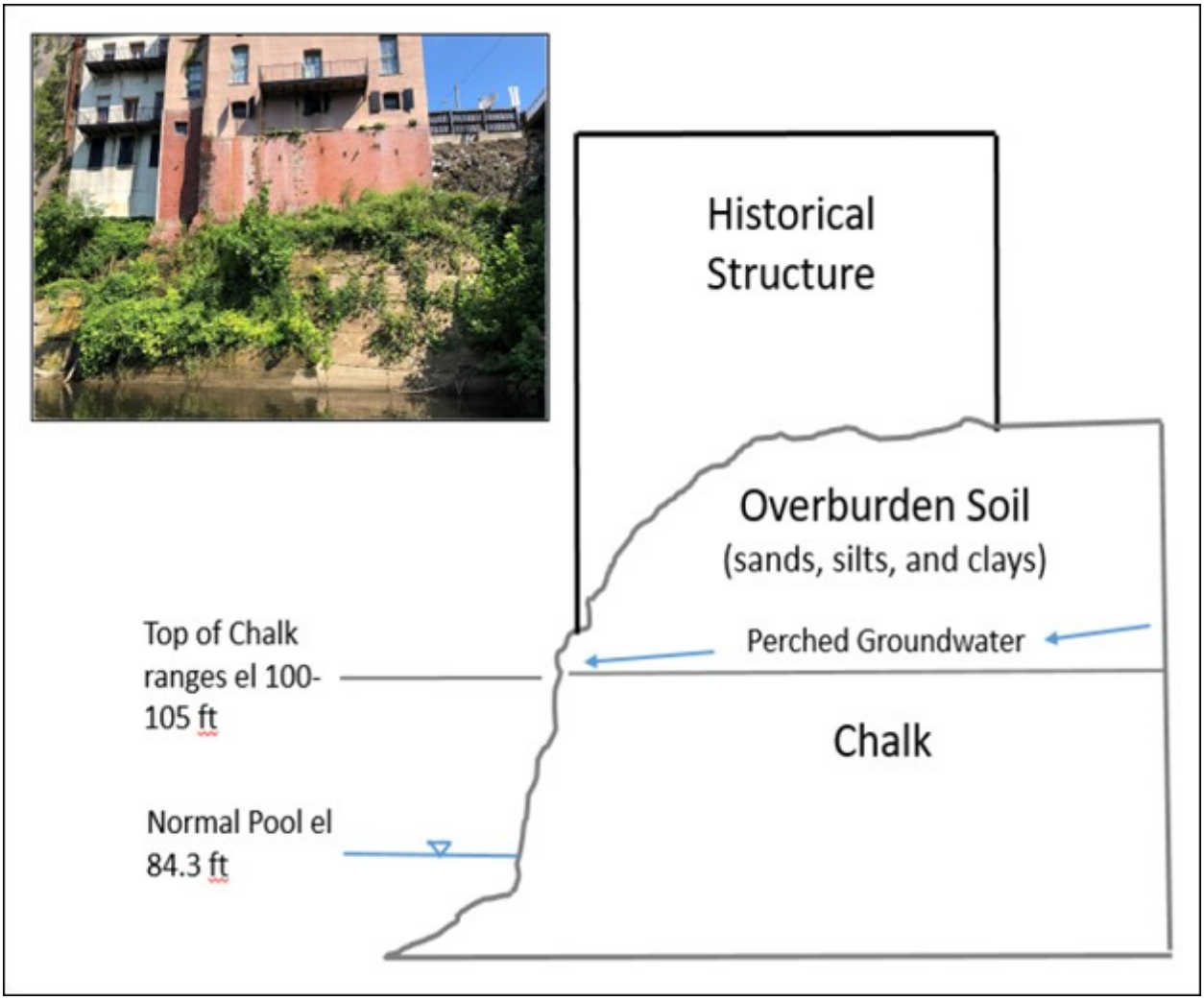

Figure 10: Cross section of the downtown Selma bluffs

The interface of the overburden soils and underlying chalk fluctuates from approximate elevation 100 to 105-ft in the study area. When comparing this to river elevation, it puts the boundary of the two layers approximately 15 to 20-ft above the normal pool level of 84.3-ft. According to historical hydrologic data, this layer would see loading due to the river cresting at around the 0.5 AEP (2-year) flood event. This is a fairly frequent loading and shows that minor flooding of the river could contribute to building instability. In

addition, the river turns west at Selma which is likely a result of the relatively high river bank composed of this dense, clay strata with low permeability.

Historical and current photos show that there is a history of erosion along the Alabama River in downtown Selma. **Image 1**, **Image 2**, and **Image 3** show photos of the losses over time.

Image 1: Downtown Selma (c. 1940s-1950s)

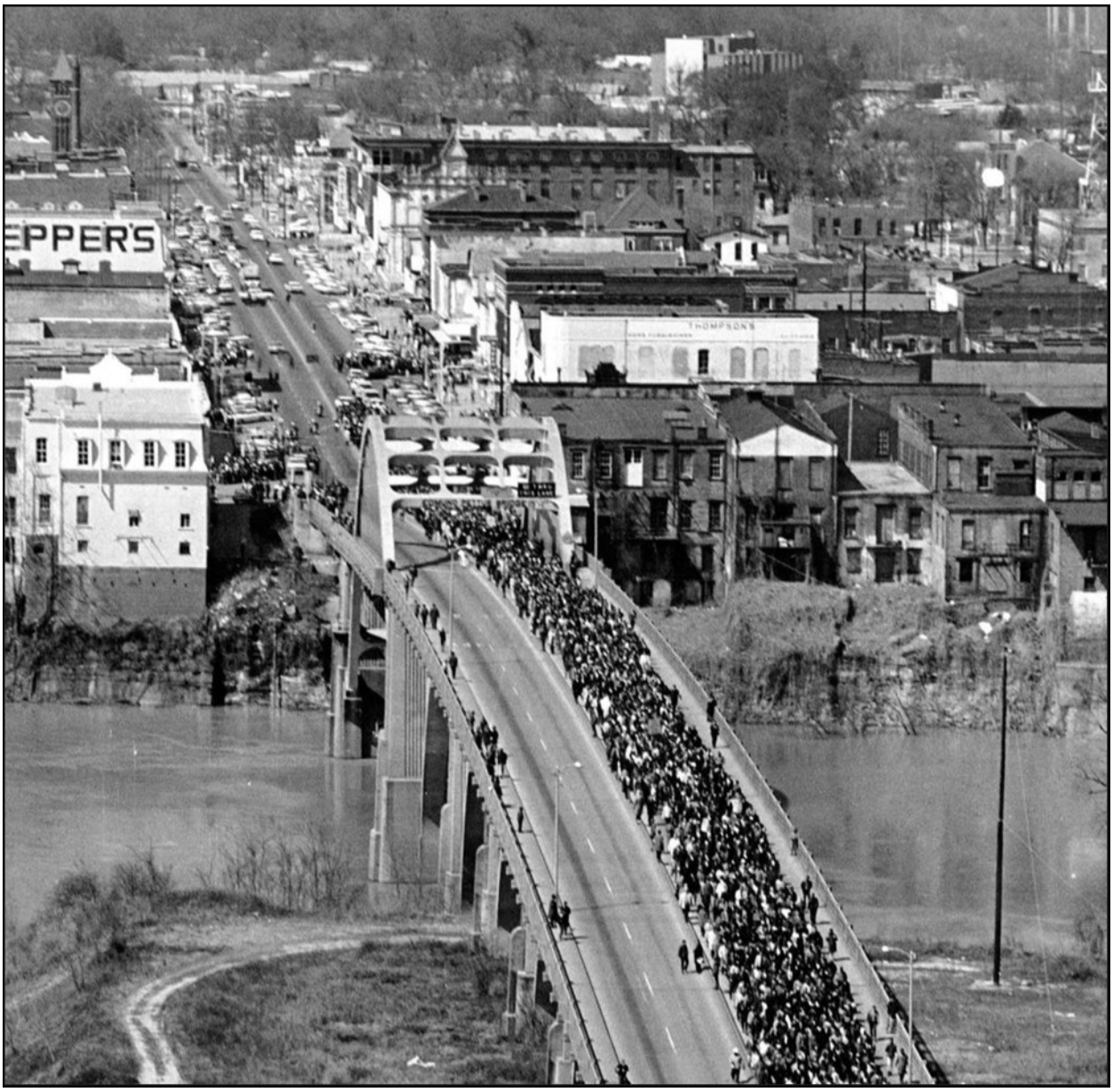

Image 2: Edmund Pettus Bridge (1965)

Image 3: Upstream viewpoint from Edmund Pettus Bridge (2019)

The State of Alabama typically experiences mild to moderate tectonic activity resulting in earthquakes that are rarely felt. Even so, most of these earthquakes have occurred to the north and west of the study area. No earthquakes have occurred within or near the

study area in the period of historical record since 1886. No active volcanoes are located in the Southeastern U.S.

*3.1.2.2 Future Without Project Conditions**

Historical observations suggest erosion is occurring beneath the building foundations along the riverbank between Church Street and Franklin Street. A building located at the downstream extent of the proposed project area near Church Street and Water Avenue along the riverbank was demolished in 2015 according to City officials due to erosion of the bankline and a concern for failure of the building foundation. If erosion is left unaddressed in the proposed project area, soil will continue to migrate from beneath other building foundations along the riverbank. If this were to continue in a FWOP scenario, it would result in a loss of the historically significant buildings and viewshed to the Edmund Pettus Bridge and the Selma riverfront.

*3.1.3 Prime and Unique Farmlands**

Due to the urbanized setting, much of the prime farmland soils within the study area have been degraded. The surrounding terrain, however, contains a large portion of prime and unique farmland soils as shown in **Figure 11**.

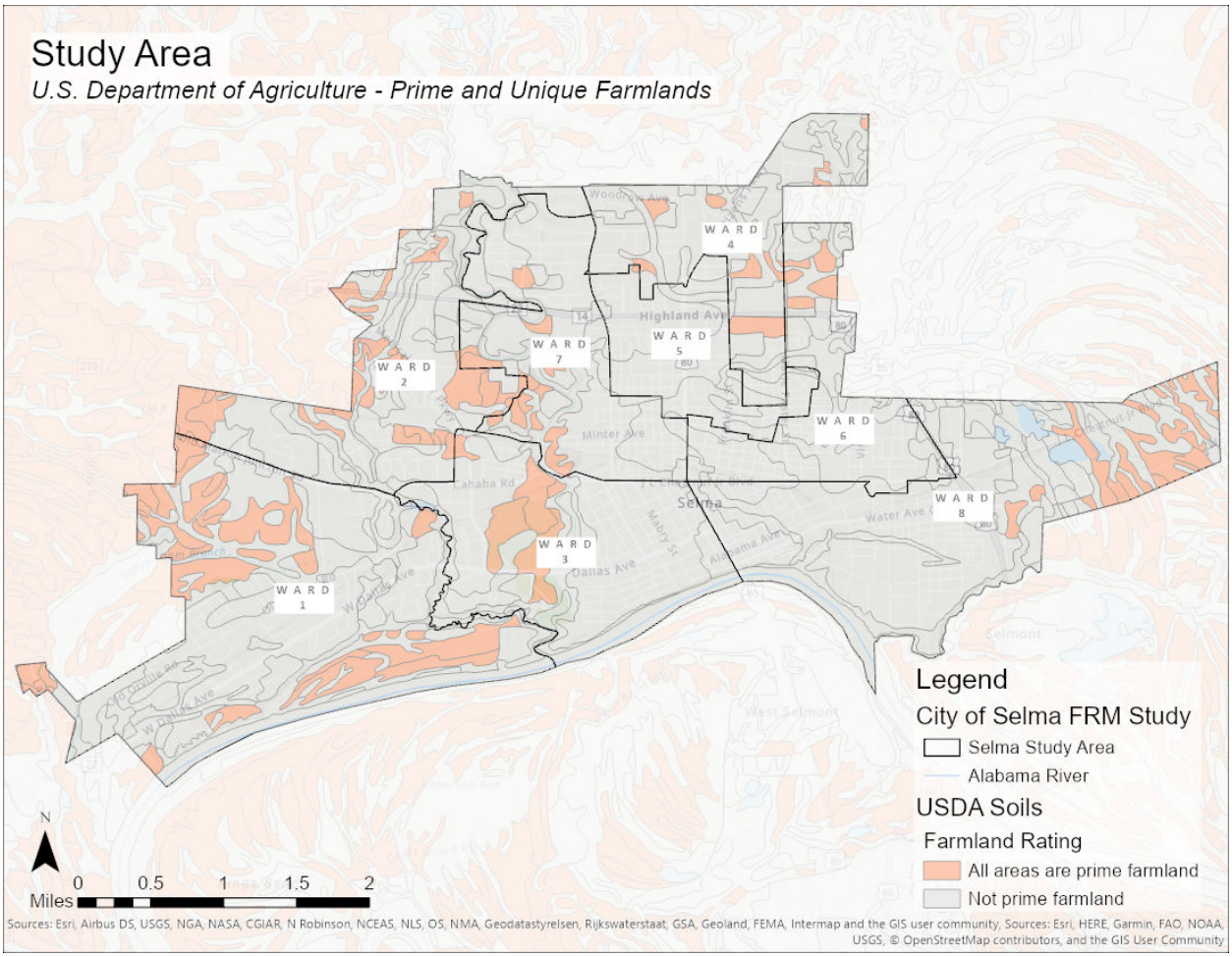

Figure 11: Prime and Unique Farmland Soils within the Study Area

FWOP conditions would be similar to existing conditions. No large-scale urbanization is anticipated due to the depressed economy; therefore, conversion of farmlands would be minimal.

*3.1.4 Climate**

3.1.4.1 Existing Setting

The climate in Selma is generally warm with some seasonal variations. According to U.S. Climate Data, represented in **Figure 12**, the hottest month of the year tends to be August with an average high temperature of 92°Fahrenheit (F) and average low of 71°F.

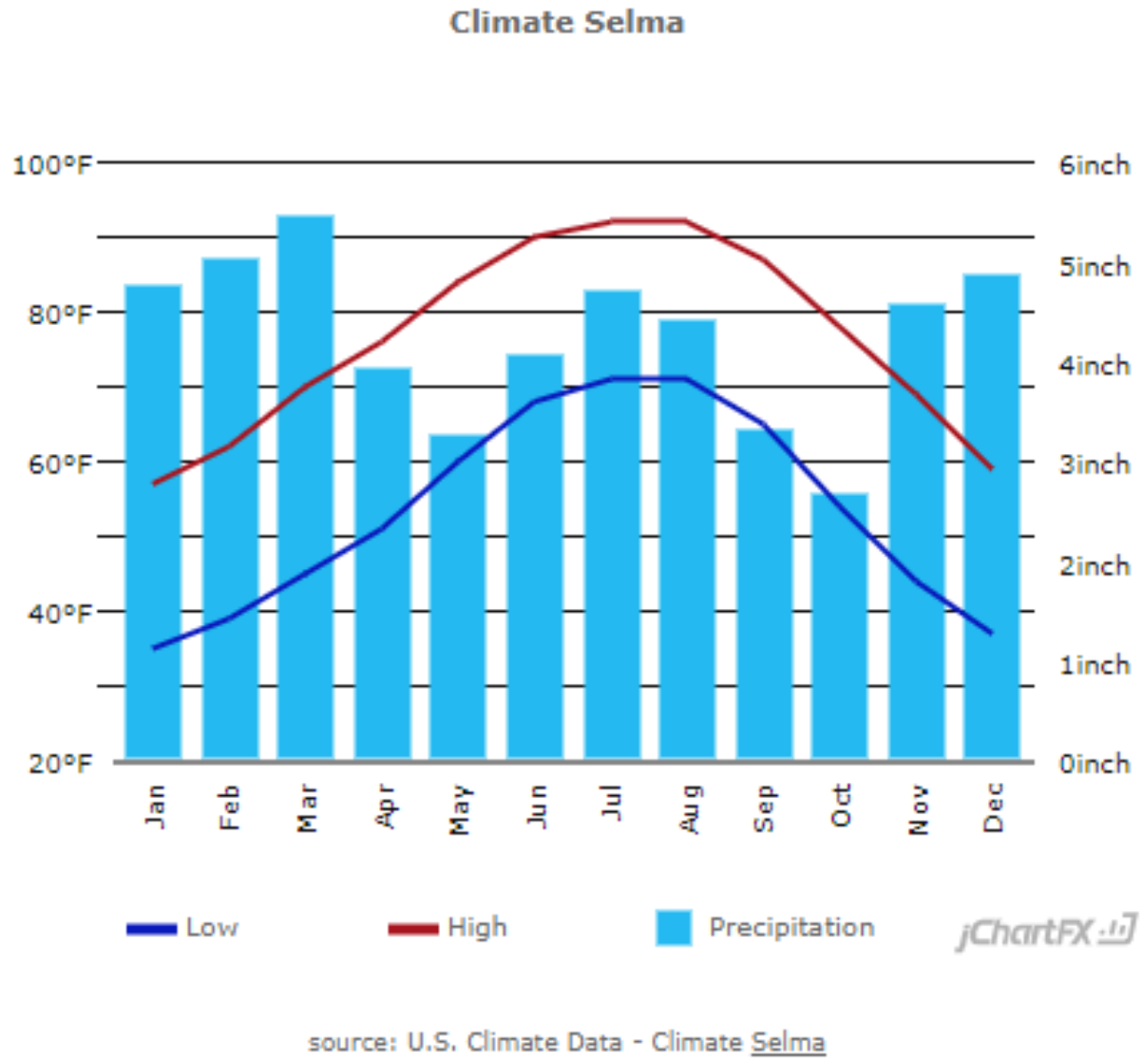

Figure 12: U.S. Climate Data average monthly temperatures and precipitation

The coolest month of the year is January with an average high of 57°F and low of 35°F. Precipitation is heaviest in the project area during the month of March with an average rainfall rate of 5.47 inches (“). Conversely, October is the driest month of the year with an average of 2.68” of rainfall. The average annual precipitation is 51.11”.

*3.1.4.2 Future Without Project Conditions**

The FWOP conditions for the climate were analyzed in a climate change assessment for the study area. Based on literature review of relevant climate data for the southeast region, there is some consensus that there will be mild increases in the severity and frequency of storms in the region. However, there is no consensus on future changes in hydrology. Observed data from near the study area shows temperatures have been gradually rising since the 1970s, after a cooling period in the middle part of the century. Based on a few of the gages in the watershed, it is difficult to conclude whether temperature is increasing or if this is a reoccurring pattern. Annual precipitation seems to be variable for the region. It appears there may be more extremes occurring in recent years, such as extreme low annual precipitation values; however, the overall trend appears to be constant or increasing slightly. There is some consensus that peak streamflow for the region has been decreasing since the middle of the century; however, the literature lacks a clear, strong consensus across multiple studies.

A climate change analysis was performed using the non-stationarity detection tool and the USACE Climate Hydrology Assessment Tool. A detailed description of the climate change analysis can be found in **Appendix A**. Based on the results of this assessment, including considerations of observed precipitation, temperature, and streamflow in the basin, there is not strong evidence suggesting increasing peak annual streamflow will occur in the future within the region as a result of climate change. Furthermore, there is only some consensus the region might see a mild increase in the frequency and severity of precipitation events. This evidence, by itself does not indicate high confidence in an increase in peak flows in the Alabama basin resulting from climate change. There is also substantial uncertainty tied to the models used to forecast future streamflow in the basin; therefore, the effects of climate change can be considered within the standard uncertainty bounds associated with the hydrologic/hydraulic analysis being conducted as part of this study. The climate change analysis also includes a vulnerability assessment for the HUC-4 Basin in which the study area lies. The analysis shows the basin is not in the top 20% of vulnerable basins with respect to the Flood Risk Reduction Business Line. This, however, does not mean that the basin itself is invulnerable to impacts of climate change on the Flood Risk Reduction business line. There are locally significant impacts relative to climate change driven by many different factors. The changes to hydrology were primarily driven through forecasted changes in land use in the Alabama River Basin above the City of Selma as discussed in **Section 3.1.1.1.2**. The peak flows are predicted to increase by 2% under FWOP conditions.

*3.1.5 Air Quality and Greenhouse Gasses**

The USEPA sets National Ambient Air Quality Standards (NAAQS) in accordance with the Clean Air Act (CAA) “for pollutants considered harmful to public health and the environment.” The CAA identifies two types of NAAQS: primary and secondary. Primary standards provide public health protection and secondary standards provide public welfare protection. The USEPA has set NAAQS for six principal pollutants, which are called criteria air pollutants: carbon monoxide, nitrogen dioxide, ozone, sulfur dioxide, lead, and particulate matter (PM_{10} and $PM_{2.5}$).

The General Conformity Rule published by the USEPA on November 30, 1993 designates and implements Section 176(c) of the CAA for geographic areas in CAA non-attainment areas for criteria pollutants and in those attainment areas subject to maintenance plans required by CAA Section 175(a). The CAA General conformity Rule applies to Federal actions.

The study area is not located within or near any designated non-attainment areas for any criteria air pollutants as shown in **Figure 13**.

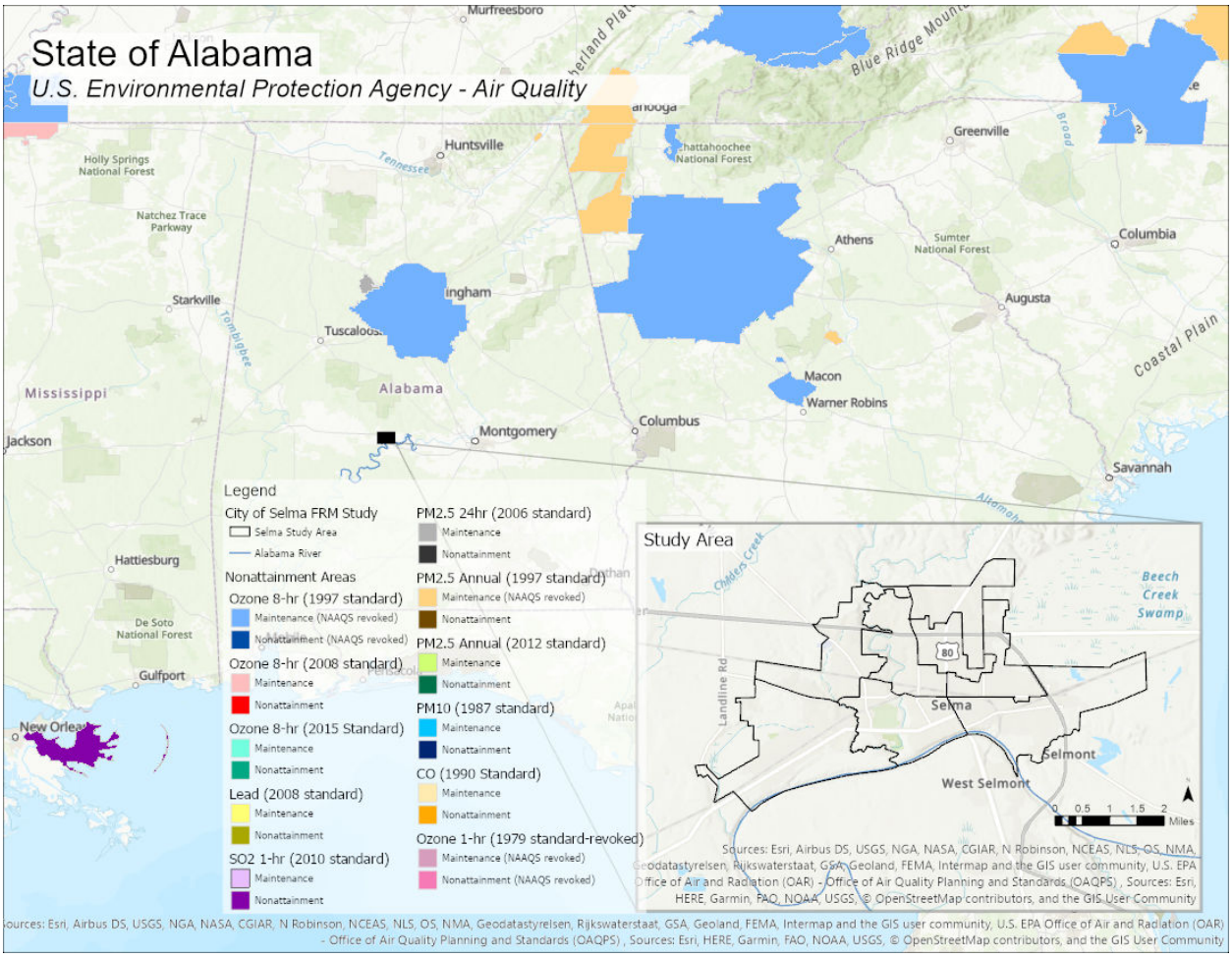

Figure 13: Nonattainment Zones

Greenhouse gases trap heat and make the planet warmer. According to the USEPA, human activities are responsible for almost all of the increase in greenhouse gases in the atmosphere over the last 150 years. The largest source of greenhouse gas emissions from human activities in the U.S. is from burning fossil fuels for electricity, heat, and transportation. Since 1990, gross U.S. greenhouse gas emissions have increased by 3.7 percent. From year to year, emissions can rise and fall due to changes in the economy, the price of fuel, and other factors. In 2018, U.S. greenhouse gas emissions increased compared to 2017 levels. The increase in CO_2 emissions from fossil fuel combustion was a result of multiple factors, including increased energy use due to greater heating and cooling needs due to a colder winter and hotter summer in 2018 compared to 2017.

Air quality and greenhouse gasses are predominantly driven by urbanized settings. No large-scale urbanization growth is anticipated within the surrounding area due to a depressed economy; therefore, FWOP conditions would be unchanged from the existing setting.

*3.1.6 Hazardous, Toxic, and Radioactive Waste (HTRW)**

The City of Selma has conducted several Environmental Site Assessments as part of an EPA Brownfields Grant awarded in 2017 to identify properties at which development may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant. Phase I and Phase II surveys were performed to identify Recognized Environmental Conditions (RECs) within the study area which may present HTRW concerns. RECs such as petroleum, gasoline, fertilizer, chemical cleaners and degreasers, paint products, solvents, and herbicides/pesticides were identified throughout seven properties. Those locations are shown in **Figure 14**.

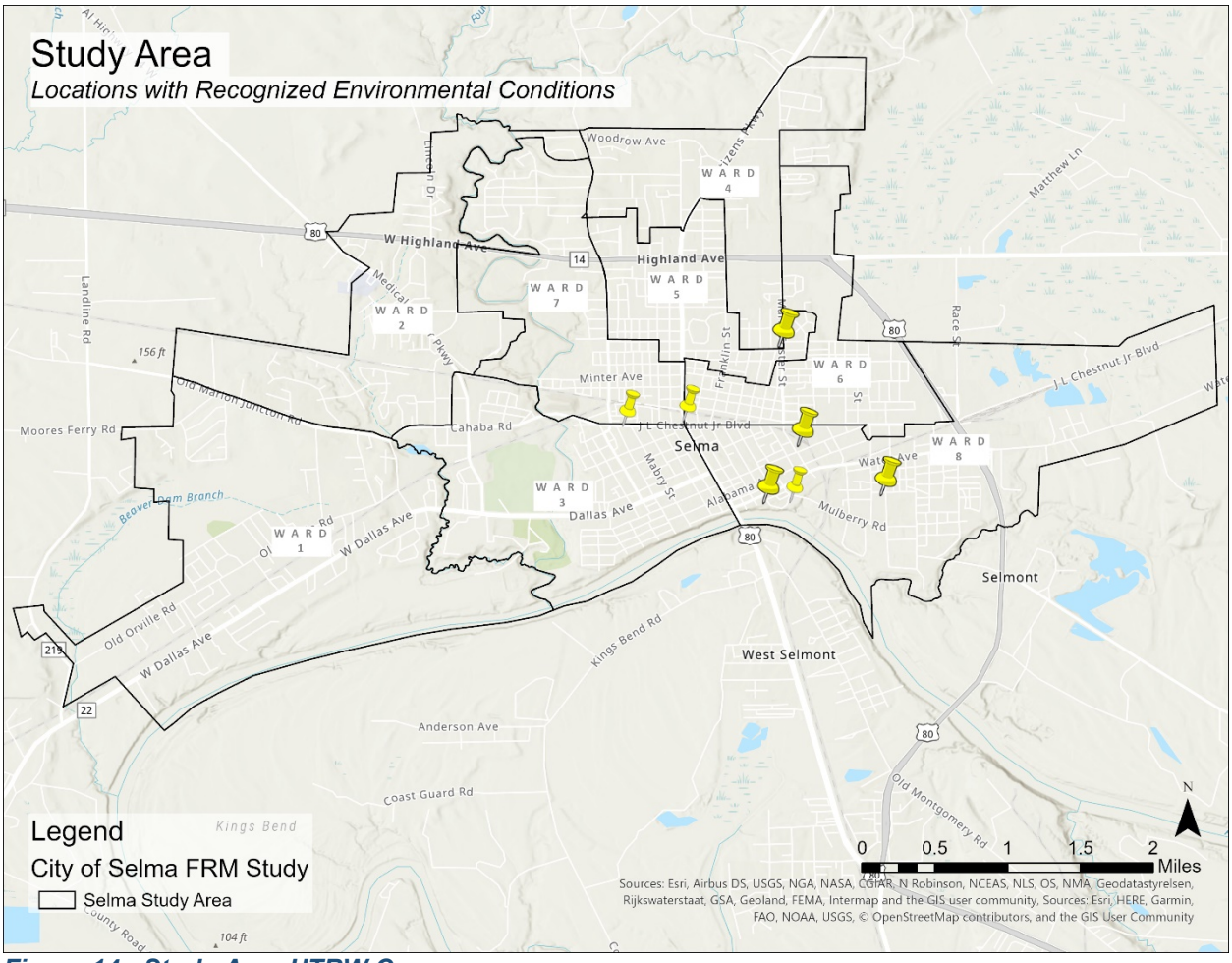

Figure 14: Study Area HTRW Concerns

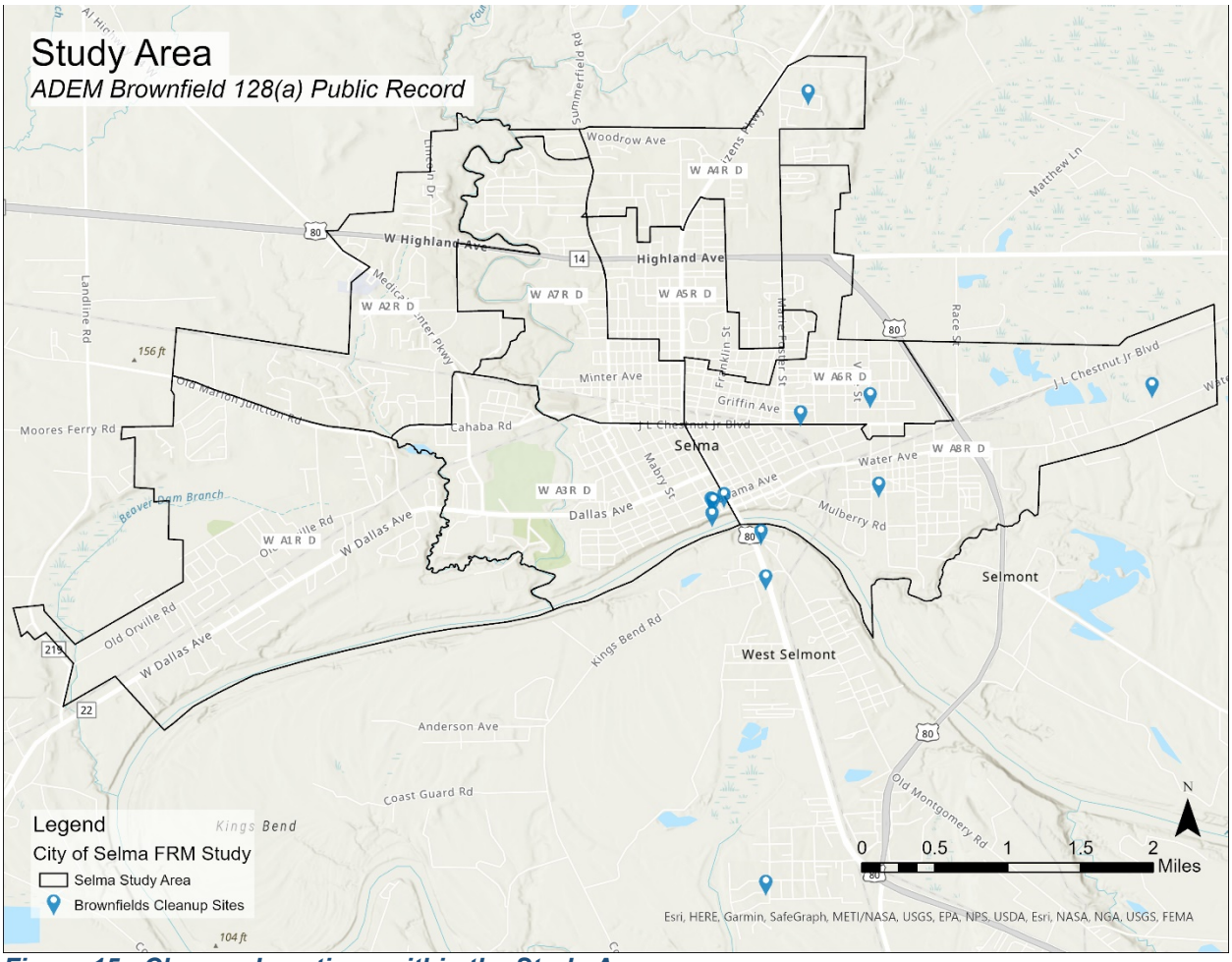

Figure 15: Cleanup Locations within the Study Area

During geotechnical investigations along Water Avenue conducted in February 2021, possible petroleum contaminants were observed within the groundwater at a single boring location. This contaminant is likely due to the former LUST site at Don's Foreign Car located approximately 265-ft uphill. Following coordination regarding the contamination, ADEM issued a letter acknowledging the location of the boring and outlined the path forward. Further survey will be conducted to confirm the source of the contaminant and determine whether remediation is needed. If required, remediation will be performed by others. A copy of this letter is included in **Appendix B**.

Additionally, placement of Unexploded Ordnances (UXOs) from the Selma Arsenal within the Alabama River during the Civil War is cause for concern regarding the possibility of toxic chemical leeching into the riverbed (Selma Times Journal, 2017). In addition, based upon past cultural surveys, UXOs have been identified within the immediate area. Several excavations have occurred; however, no sediment testing has been conducted to show the level of contamination, if any.

The FWOP conditions would be similar to existing conditions with respect to UXO placement or RECs. Because the likelihood that UXO material was made using lead is high, the possibility of chemical leeching into the riverbed sediment is a concern; therefore, chemical leeching would continue under FWOP conditions. RECs identified as

petroleum, gasoline, fertilizer, chemical cleaners and degreasers, paint products, solvents, and herbicides/pesticides would continue to be present in the FWOP conditions and may be subject to additional cleanup.

3.2 Biological Resources*

*3.2.1 Vegetation**

The U.S. Department of Agriculture (USDA) has defined ecological regions of the U.S. through a hierarchal assessment of domains, divisions, and provinces. Based on the USDA Ecoregion Map provided in **Figure 16**, the study area lies within the southeastern mixed forest province of the Continental U.S. (Bailey 1995).

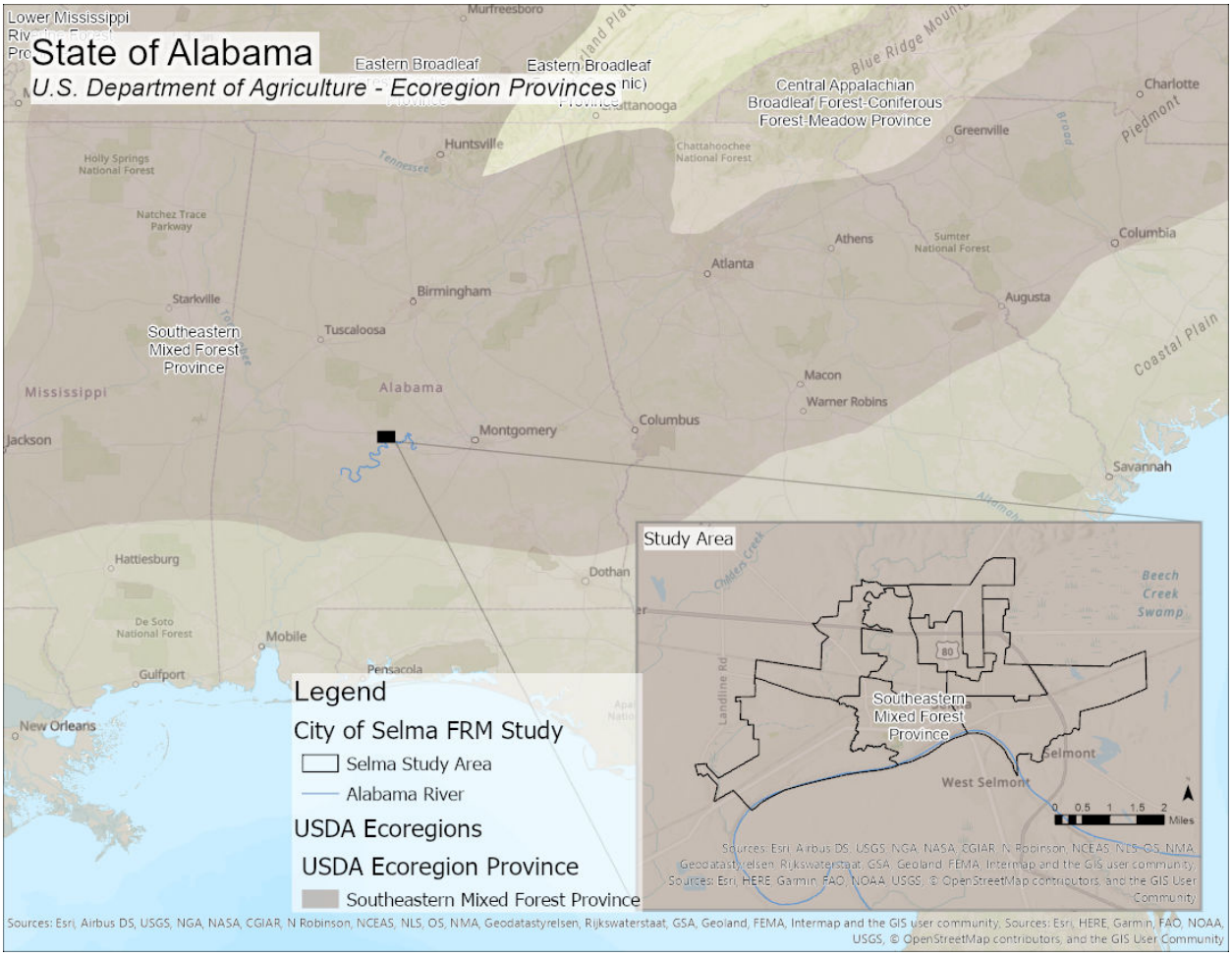

Figure 16: Study Area Ecoregion Province

Since extensive cultivation practices during the 19th century, much of the Piedmont Ecoregion has reverted to pine and hardwood woodlands. Vegetation within the Southern Mixed Forest Province ranges from medium to tall forests of broadleaf deciduous trees and evergreen pine trees (Bailey 1995). Existing habitat within the study area ranges from heavily to moderately disturbed areas. The surrounding habitat includes forested riparian settings. Dominant native plant species throughout the study area include Tulip Poplar (*Liriodendron tulipifera*), White Oak (*Quercus alba*), Northern Red Oak (*Q. rubra*), Black Oak (*Q. velutina*), Post Oak (*Q. stellata*), Hickories (*Carya glabra*, *C. tomentosa*,

and *C. cordiformis*), American Beech (*Fagus grandifolia*), Loblolly Pine (*Pinus taeda*), Virginia Pine (*Pinus virginiana*), Sweetgum (*Liquidambar styraciflua*), Black Cherry (*Prunus serotina*), Flowering Dogwood (*Cornus florida*), Box Elder (*Acer negundo*), and Eastern Red Cedar (*Juniperus virginiana*).

Invasive plant species throughout the surrounding area include Japanese Arrowroot (*Pueraria montana* var. *lobata*), Cogongrass (*Imperata cylindrical*), Yellow Iris (*Iris pseudacorus*), Japanese Honeysuckle (*Lonicera japonica*), Star-Of-Bethlehem (*Ornithogalum umbellatum*), Garlic Mustard (*Alliaria petiolate*), and Chinese Wisteria (*Wisteria sinensis*). No formalized invasive species control plans exist within the study area.

FWOP conditions would be similar to existing conditions.

*3.2.2 Fish and Wildlife Resources**

The Alabama Department of Conservation and Natural Resources (ADCNR) updates its State Wildlife Action Plan (SWAP) on a 10-year basis, which identifies outstanding wildlife diversity on a comprehensive statewide scale. According to the 2015 SWAP, “Alabama surpasses all eastern states in plant and animal diversity, ranking fifth in the nation after California, Texas, Arizona, and New Mexico” despite only contributing 1.6% of area compared to the total area within the entire contiguous continental U.S.

*3.2.2.1 Aquatic Species**

Alabama ranks one of the highest among the continental U.S. for aquatic diversity in both total and endemic populations as shown in **Figure 17** and **Figure 18**. Alabama is home to 93 native reptiles (*Reptiles* 2020) and 450 fish species, which is “the most found in any other state or province in North America” (Mettee, 2016). Additionally, Encyclopedia of Alabama states “Alabama is home to the most diverse fauna of freshwater mussels in all of North America, with 180 species” (Garner, 2013). Boshung and Mayden (2004), documented 185 fish species historically occurring within the Alabama River drainage (161 native species, 2 euryhaline species, 4 marine species, and 18 introduced species). Williams et al. (2008), document 51 mussel species historically occurring within the Alabama River drainage area. **Table 4** lists some common species found throughout the study area, but is not a comprehensive list of all species known to occur. **Figure 19** shows the location of known aquatic invasive species within the study area.

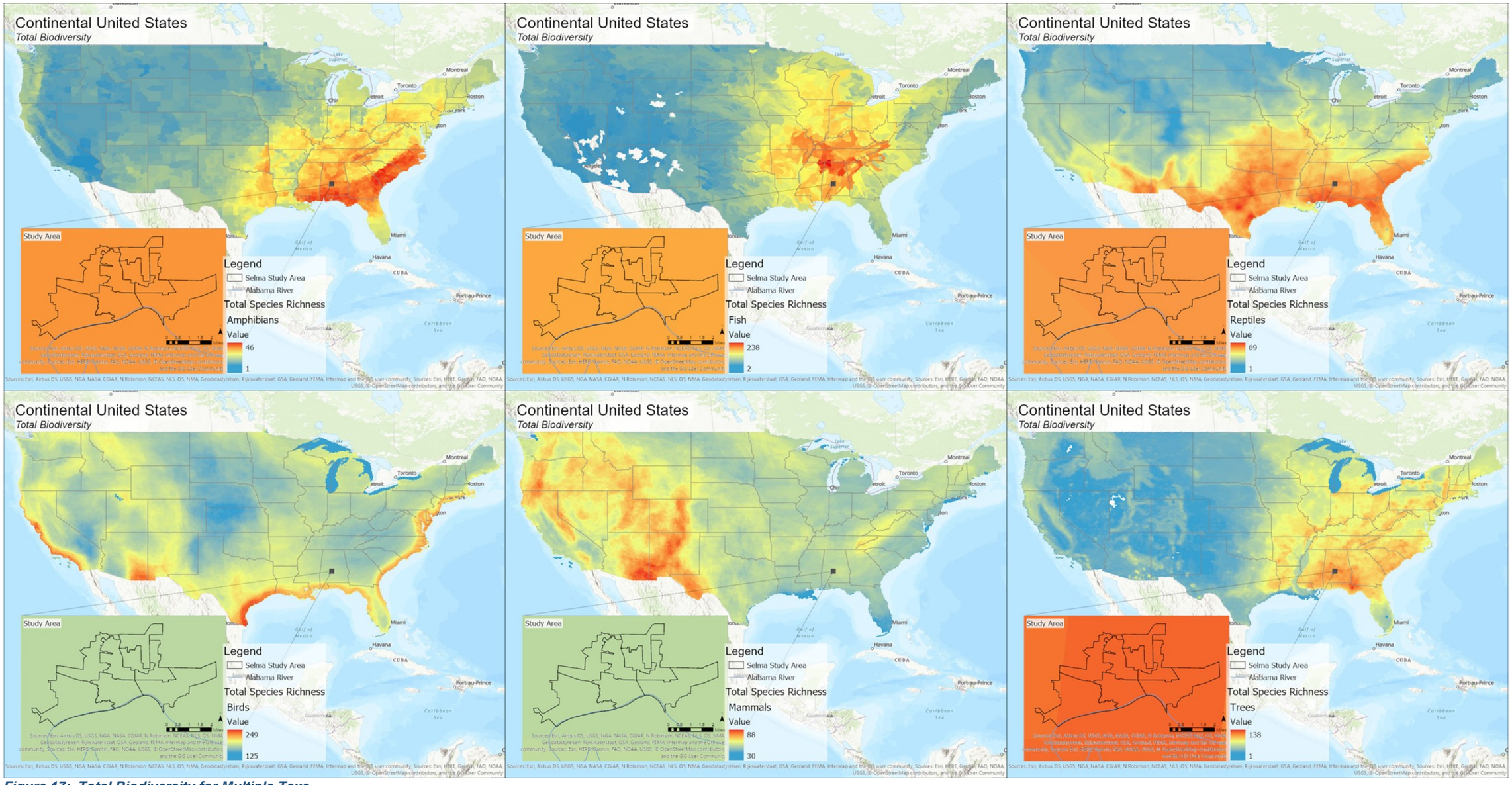

Figure 17: Total Biodiversity for Multiple Taxa

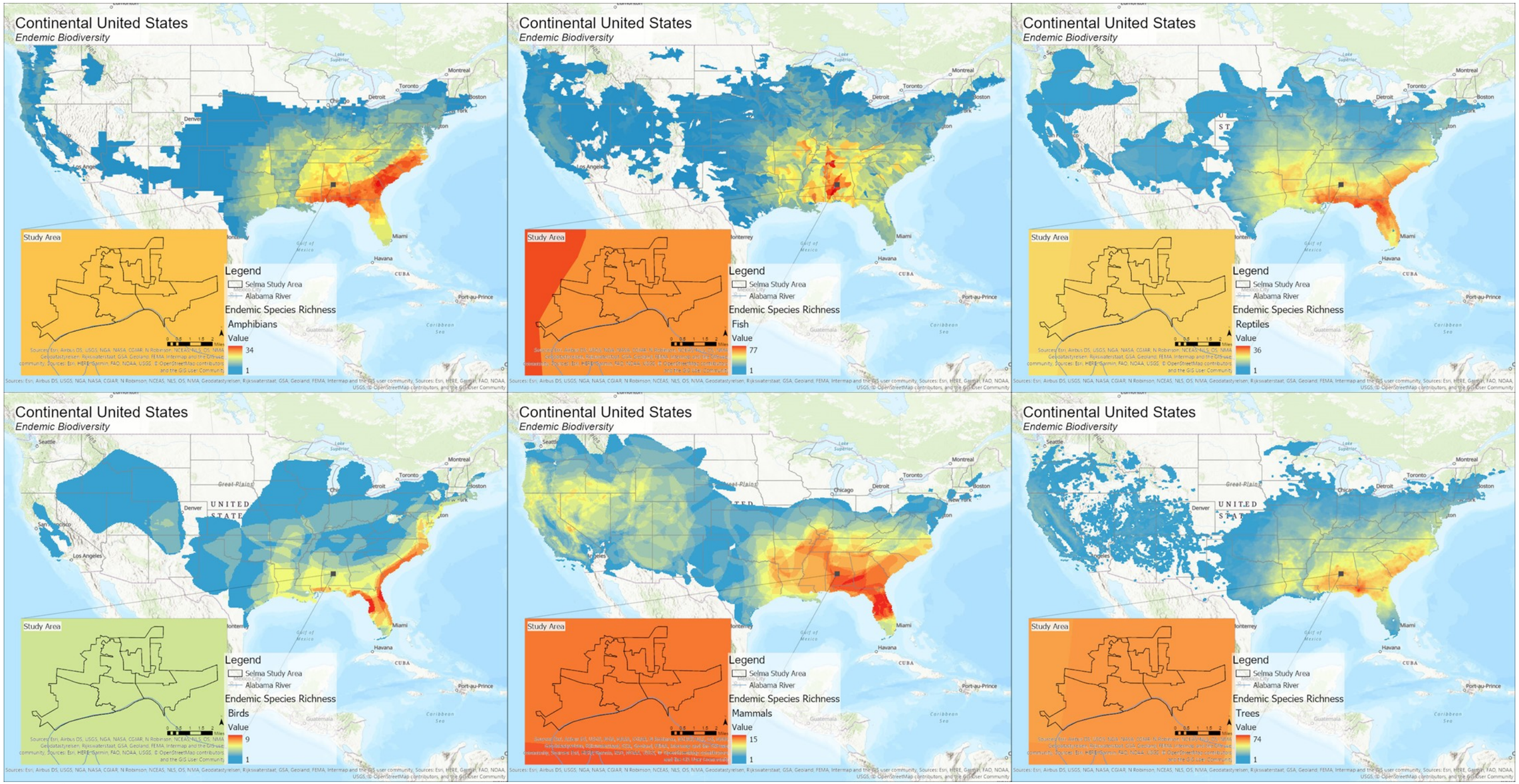

Figure 18: Endemic biodiversity for multiple taxa

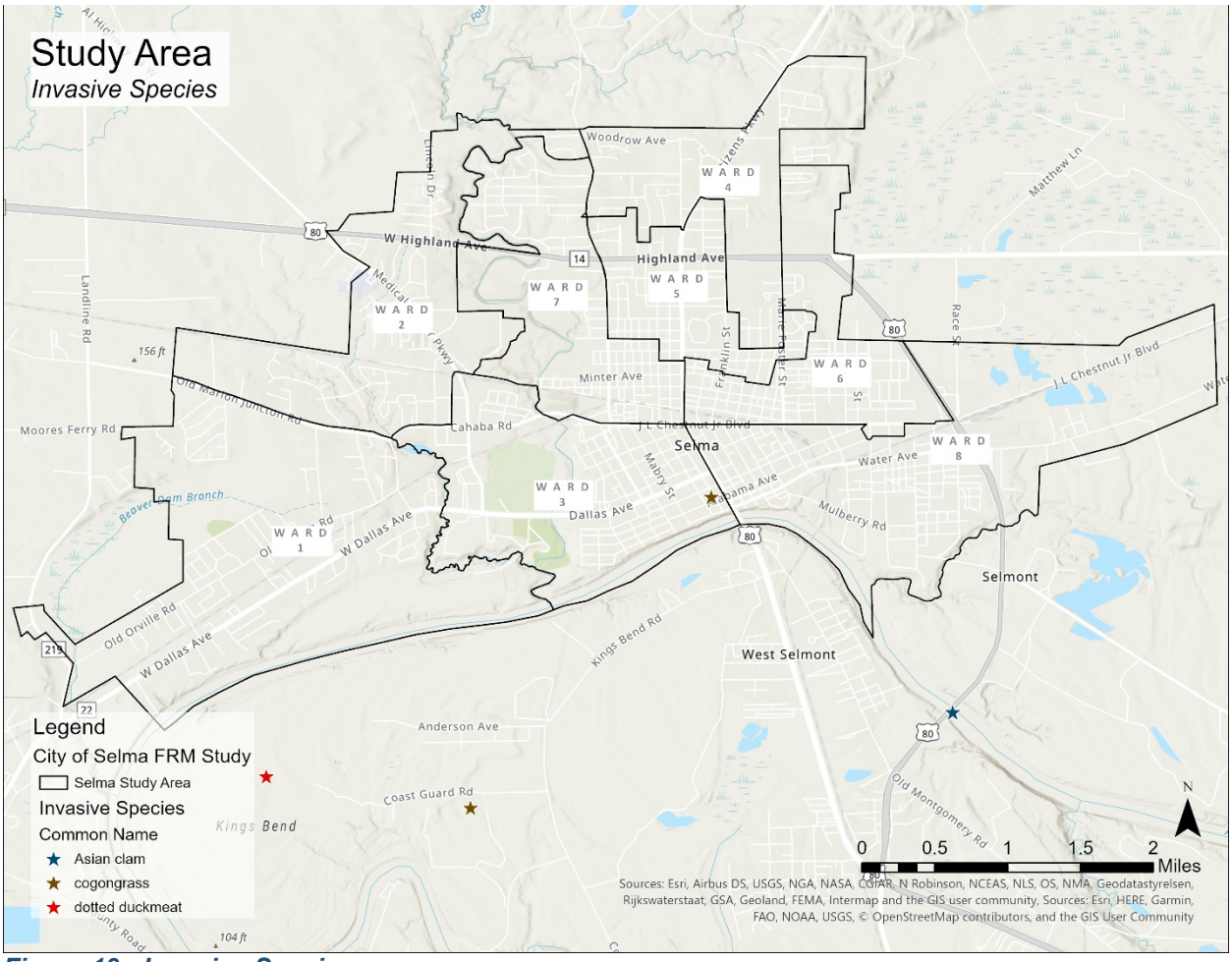

Figure 19: Invasive Species

Table 4: Aquatic Species within the Study Area

Fish	**Mussels**	**Amphibians and Reptiles**
Alabama Darter (*Etheostoma ramseyi*)	Threehorn Wartyback (*Obliquaria reflexa*)	Eastern Cottonmouth (*Agkistrodon piscivorus piscivorus*)
Alligator Gar (*Atractosteus spatula*)	Washboard (*Megalonaias nervosa*)	snapping turtles (*Chelydra serpentina*)
Black Crappie (*Pomoxis nigromaculatus*)	Bankclimber (*Plectomerus dombeyanus*)	Eastern Spiny Softshell (*Apalone spinifera spinifera*)
Blue Catfish (*Ictalurus furcatus*)	Southern Mapleleaf (*Quadrula apiculata*)	River Cooter (*Pseudemys Concinna*)
Bluegill (*Lepomis macrochirus*)	Fragile Papershell (*Leptodea fragilis*)	pond slider (*Trachemys scripta*)
Channel Catfish (*Ictalurus punctatus*)	Alabama Orb (*Quadrula asperata*)	Gulf Coast Smooth Softshell Turtle (*Apalone calvata*)
Flathead Catfish (*Pylodictis olivaris*)	Ebonyshell (*Fusconaia ebena*)	Alabama Map Turtle (*Graptemys pulchra*)

Fish	Mussels	Amphibians and Reptiles
Redbreast Sunfish (*Lepomis auritus*)	Yellow Sandshell (*Lampsilis teres*)	Gulf Coast Spiny Softshell (*Apalone spinifera aspera*)
Redear Sunfish (*Lepomis microlophus*)	Gulf Pigtoe (*Fusconaia cerina*)	American Alligator (*Alligator mississippiensis*)
Spotted Bass (*Micropterus punctulatus*)	Monkeyface Mussel (*Quadrula metanevra*)	Florida Banded Water Snake (*Nerodia fasciata pictiventris*)
Striped Bass (*Morone saxatilis*)	Butterfly Mussel (*Ellipsaria lineolata*)	
Walleye Perch (*Sander vitreus*)	Elephant ear (*Elliptio crassidens*)	
White Bass (*Morone chrysops*)	Fawnsfoot (*Truncilla donaciformis*)	
White Crappie (*Pomoxis annularis*)		

One population of Asian Clams (*Corbicula spp.*) is known to inhabit the upstream portion of the Alabama River outside the study area at the U.S. Highway 80 bridge. No other aquatic invasive species are known to occur within the study area.

The FWOP conditions would be similar to existing conditions.

*3.2.2.2 Terrestrial Species**

Wildlife species vary throughout the Southern Mixed Forest Province. Their presence depends on age and thickness of timber stands, percent of deciduous trees, proximity to clearings, and bottom-land forest types (Bailey, 1995). Though Alabama is more diverse in aquatic species, a variety of terrestrial species exist within the State including 62 native mammal species (Manno and Paemelaere, 2016). According to the 2019 Article h-1284 written by Dr. Thomas Haggerty:

> *"Few states can match Alabama's rich diversity of birds...Currently, the Alabama Ornithological Society recognizes 433 species that have been seen in the state. From this list, about 158 are considered regular breeders within Alabama's borders…"*

Some common species throughout Alabama and the study area are included in **Table 5**. **Figure 19** shows the location of known terrestrial invasive species within the study area.

Table 5: Terrestrial Species within the Study Area

Mammals	Birds	Reptiles
Eastern Cottontail Rabbit (*Sylvilagus floridanus*)	Blue Jay (*Cyanocitta cristata*)	Gopher Tortoise (*Gopherus Polyphemus*)
Raccoon (*Procyon lotor*)	Northern Mockingbird (*Mimus polyglottos*)	Green Anole (*Anolis carolinensis carolinensis*)
Norway Rats	American Crow	Eastern Fence Lizard

Mammals	Birds	Reptiles
(*Rattus norvegicus*)	(*Corvus brachyrhynchos*)	(*Sceloporus undulates*)
Grey mouse (*Pseudomys albocinereus*)	American Goldfinch (*Spinus tristis*)	Mole Skink (*Plestiodon egregious*)
White-tailed Deer (*Odocoileus virginianus*)	American Robin (*Turdus migratorius*)	Five-Lined Skink (Plestiodon fasciatus)
Greater Mouse-Eared Bat (*Myotis myotis*)	Barn Swallow (*Hirundo rustica*)	Southern Copperhead (*Agkistrodon contortrix contortrix*)
Little Brown Bat (*Myotis lucifugus*)	Barred Owl (*Strix varia*)	Eastern Worm Snake (*Carphophis amoenus amoenus*)
Groundhog (*Marmota monax*)	Blue-gray Gnatcatcher (*Polioptila caerulea*)	Northern Black Racer (*Coluber constrictor constrictor*)
American Red Fox (*Vulpes vulpes fulvus*)	Carolina Chickadee (*Poecile carolinensis*)	Timber Rattlesnake (*Crotalus horridus*)
Striped Skunk (*Mephitis mephitis*)	Carolina Wren (*Thryothorus ludovicianus*)	Eastern Ribbon Snake (*Thamnophis sauritus sauritus*)
Coyotes (*Canis latrans*)	Red-tailed Hawk (*Buteo jamaicensis*)	Eastern Glass Lizard (*Ophisaurus ventralis*)

The FWOP conditions would be similar to existing conditions.

*3.2.3 Protected Species**

The Alabama SWAP categorizes species throughout the State with the Greatest Conservation Need Priorities 1-5, 5 being the highest conservation concern. These species are protected through Alabama State regulations and can be found in the periodically updated SWAP. All Federally protected species receive a State priority ranking.

*3.2.3.1 Threatened and Endangered Species**

3.2.3.1.1 Existing Setting

The Endangered Species Act (ESA) "provides for the conservation of species that are endangered or threatened throughout all or a significant portion of their range, and the conservation of the ecosystems on which they depend." The ESA makes it illegal to "take" a Federally listed species, such as T&E, without a permit. "Take" is defined by the ESA as "to harass, harm, pursue, hunt, shoot, would, kill, trap, capture, or collect or attempt to engage in any such conduct." The U.S. Fish and Wildlife Service (USFWS) has statutory authority for the assessment of Federally listed or petitioned species on the land or in freshwater.

Because of the unique and complex ecosystem, the Alabama Rivers and Streams Network was formed to aid in conservation efforts. The Alabama Rivers and Streams Network is a conglomeration between non-profit organizations, private companies, State and Federal agencies, and concerned citizens that have classified watersheds and river reaches within the state of Alabama into Strategic Habitat Units (SHUs) and Strategic

River Reach Units (SRRUs) which have the capacity to support viable and healthy aquatic habitats, populations of imperiled species, and provide good opportunities for restoration and recovery. As shown in **Figure 20** the study area encompasses SRRU number 24 (Lower Alabama River) and lies adjacent to SHU number 27 (Upper Cahaba River). Priority species within the Lower Alabama River SRRU and Upper Cahaba River SHU includes numerous Federally listed T&E and other at-risk species (Alabama Rivers and Streams Network, 2020). Those Federally listed species occurring within Dallas County, Alabama, are referenced in **Table 6**.

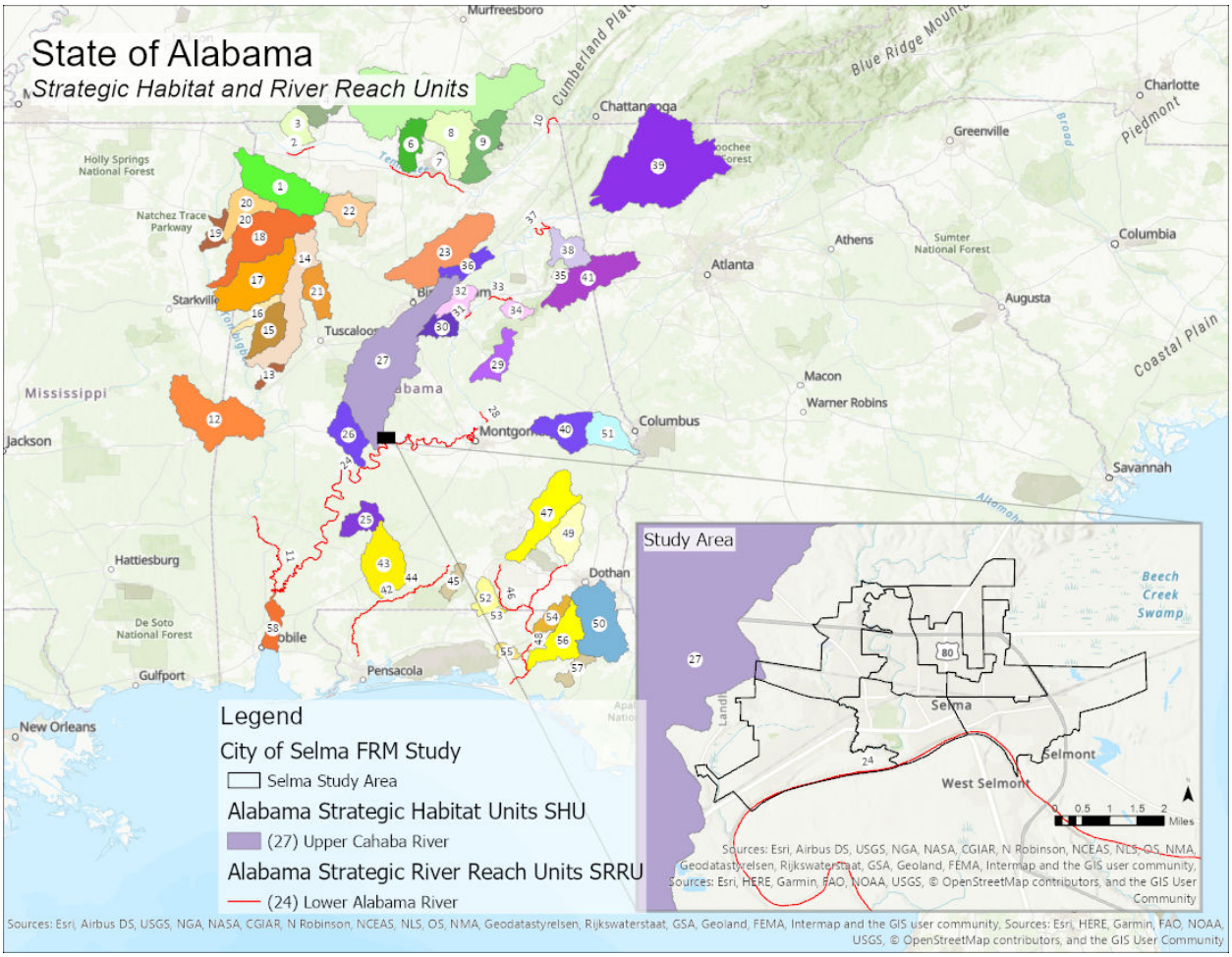

Figure 20: Strategic Habitat and River Reach Units in the State of Alabama

Additionally, results of recent collections of environmental DNA (eDNA) from water samples have detected the Alabama and Gulf sturgeon in the Alabama River from below Robert F. Henry. Though Robert F. Henry Lock and Dam sits approximately 30 RM upstream of the Edmund Pettus bridge, the importance of the finding is statistically significant. Although most eDNA detections were from areas below the first passage barrier on the Alabama River (Claiborne lock and dam), there were eDNA detections past two passage barriers (Pfleger et al. 2016). Gulf Sturgeon at Claiborne Lock and Dam were detected both by eDNA and by sonic tag (Rider et al. 2016) and by eDNA below Robert F. Henry (Pfleger et al. 2016). Since 2010, the USACE in cooperation with ADCNR has been conducting voluntary conservation locking measures to provide

potential fish passage during the spring spawning season at Claiborne and Millers Ferry lock and dam. The detection of Alabama and Gulf Sturgeon eDNA above these hydro projects could indicate the potential for fish to pass through these navigation locks. However, further study is needed to determine the correct path of passage and to what extent.

Table 6: Official Species List for Federally Listed Threatened and Endangered Species within Dallas County dated May 5, 2020

Common Name	Scientific Name	Federal Status	State Rank	Habitat
Red-cockaded Woodpecker	*Picoides borealis*	E	S2	Open, mature pine woodlands
Wood Stork	*Mycteria americana*	T	S2N	Forested/herbaceous wetland
Alabama Sturgeon	*Scaphirhynchus suttkusi*	E	S1	Main channels of major rivers in areas below the Fall Line
Alabama Moccasinshell	*Medionidus acutissimus*	T	S1	Sand and gravel substrate in clear water of moderate flow in small to large rivers
Heavy Pigtoe	*Pleurobema taitianum*	E	S1	Gravel with large component of coarse sand in water exceeding 6 m with variable current
Orangenacre Mucket	*Lampsilis perovalis*	T	S2	High quality stream and small river habitat on stable sand/gravel/cobble substrate in moderate to swift currents
Ovate Clubshell	*Pleurobema perovatum*	E	S1	Sand/gravel shoals and runs of small rivers and large streams
Southern Clubshell	*Pleurobema decisum*	E	S2	Highly oxygenated streams with sand and gravel substrate in shoals of large rivers to small streams

Common Name	Scientific Name	Federal Status	State Rank	Habitat
Tulotoma Snail	*Tulotoma magnifica*	T	S2	Riffles and shoals on the undersides of large rocks
Alabama Canebrake Pitcher-plant	*Sarracenia rubra ssp. alabamensis*	E	S1S2	Sandhill seeps, swamps, and sloping bogs along the Fall Line Hills that divide the upper Coastal Plain and Piedmont physiographic regions
Georgia Rockcress	*Arabis georgiana*	T	S1	Shallow soil accumulations on rocky bluffs, ecotones of gently sloping rock outcrops, outcrops along rivers, and sandy loam along eroding riverbanks
Price's Potato-bean	*Apios priceana*	T	S2	Open, mixed-oak forests, forest edges and clearings on river bottoms and ravines, being unable to tolerate deep shade

Key: Federal Rank = T: Threatened; E: Endangered - State Rank = S1: Critically Imperiled; S2: Imperiled; S3: Vulnerable; S4: Apparently Secure; S5: Secure; SX: Presumed Extirpated; SH: Historical (Possibly Extirpated); SNR: Unranked

In addition to the Official Species List shown in **Table 6**, eDNA of Alabama and Gulf sturgeon shows the presence of the species within the Alabama River. Four Federally listed mollusk species that are currently considered extirpated from the Alabama River but were historically documented throughout the area include Flat Pigtoe (*Pleurobema marshalli*), Inflated Heelsplitter (*Potamilus inflatus*), and Southern Combshell (*Epioblasma penita*).

Within the study area, suitable habitat is present for the Alabama Sturgeon, Gulf Sturgeon, Tulotoma Snail, Heavy Pigtoe, Orangenacre Mucket, and Southern Clubshell. The Alabama Sturgeon is critically imperiled and is believed to be extant within the Alabama River. The Heavy Pigtoe is also critically imperiled; however, the last surviving population of Heavy Pigtoe in the entire Continental U.S. is located approximately 1 RM upstream of the U.S. Highway 80 Bridge. (Garner and Buntin, 2011). During the 2011 Heavy Pigtoe survey, Orangenacre Mucket and Southern Clubshell were observed as well. Of the entire species range for Tulotoma Snail, only five surviving populations exist within the Alabama River. Notably, the largest and healthiest population of Tulotoma

Snail is located immediately downstream of the Edmund Pettus Bridge within the study area (Garner at. al, 2011).

Designated critical habitats for the Alabama Sturgeon, Orangenacre Mucket, and Southern Clubshell are present within the Alabama River throughout the study area. The USFWS has identified five Primary Constituent Elements (PCE(s)) necessary for the conservation for the Alabama Sturgeon: (1) a range of flows with a minimum 7-day flow of 4,640 cfs during normal hydrologic conditions, measured in the Alabama River at Montgomery; (2) river channel with stable sand and gravel river bottoms, and bedrock walls, including associated mussel beds; (3) limestone outcrops and cut limestone banks, large gravel or cobble such as that found around channel training devices, and bedrock channel walls that provide riverine spawning sites with substrates suitable for egg deposition and development; (4) long sections of free-flowing water to allow spawning migrations and development of eggs and larvae; and (5) water temperature not exceeding 90 °Fahrenheit (32 °Celsius), dissolved oxygen content over 4 milligrams per liter, and potential of hydrogen (pH) within the range of 6.0 to 8.5.

The USFWS has identified six PCE(s) essential for the conservation of the Orangenacre Mucket and Southern Clubshell. The SRRU Unit 24, which includes the section of the Alabama River within the study area, has been identified as containing the PCEs to a degree that allows the survival of these species. These elements are: (1) geomorphically stable stream and river channels and banks; (2) a flow regime (i.e., the magnitude, frequency, duration, and seasonality of discharge over time) necessary for normal behavior, growth, and survival of all life stages of mussels and their fish hosts in the river environment; (3) Water quality, including temperature, pH, hardness, turbidity, oxygen content, and other chemical characteristics necessary for normal behavior, growth, and viability of all life stages; (4) sand, gravel, and/or cobble substrates with low to moderate amounts of attached filamentous algae, and other physical and chemical characteristics necessary for normal behavior, growth, and viability of all life stages; (5) fish hosts with adequate living, foraging, and spawning areas for them; and (6) few or no competitive or predaceous nonnative species present. All efforts will be made to avoid affecting the critical habitat during this project.

*3.2.3.1.2 Future Without Project Conditions**

Additional Federally listed species as well as critical habitat could be proposed under FWOP conditions.

*3.2.3.2 Migratory Birds**

The Migratory Bird Treaty Act (MBTA) makes it illegal to “take, possess, import, export, transport, sell, purchase, barter, or offer for sale, purchase, or barter” a species identified in 50 CFR § 10.13. The USFWS has statutory authority and responsibility for enforcing the MBTA under 16 U.S.C. 703-712. The USFWS recently proposed in the Federal Register (Vol. 83, No. 229, November 28, 2018) both adding and removing species. Migratory species protected by the MBTA are internationally protected through conventions between the U.S. and Canada, Mexico, Japan, and Russia. Any species protected through one or more of the four international conventions is qualified for protection under the MBTA.

The study area is located in the Mississippi Flyway zone as shown in **Figure 21**. No stopover sites are known to occur within the study area; however, migratory birds, such as the Common Ground-Dove (*Columbina passerine exigua*) occasionally utilize the study area as a resource.

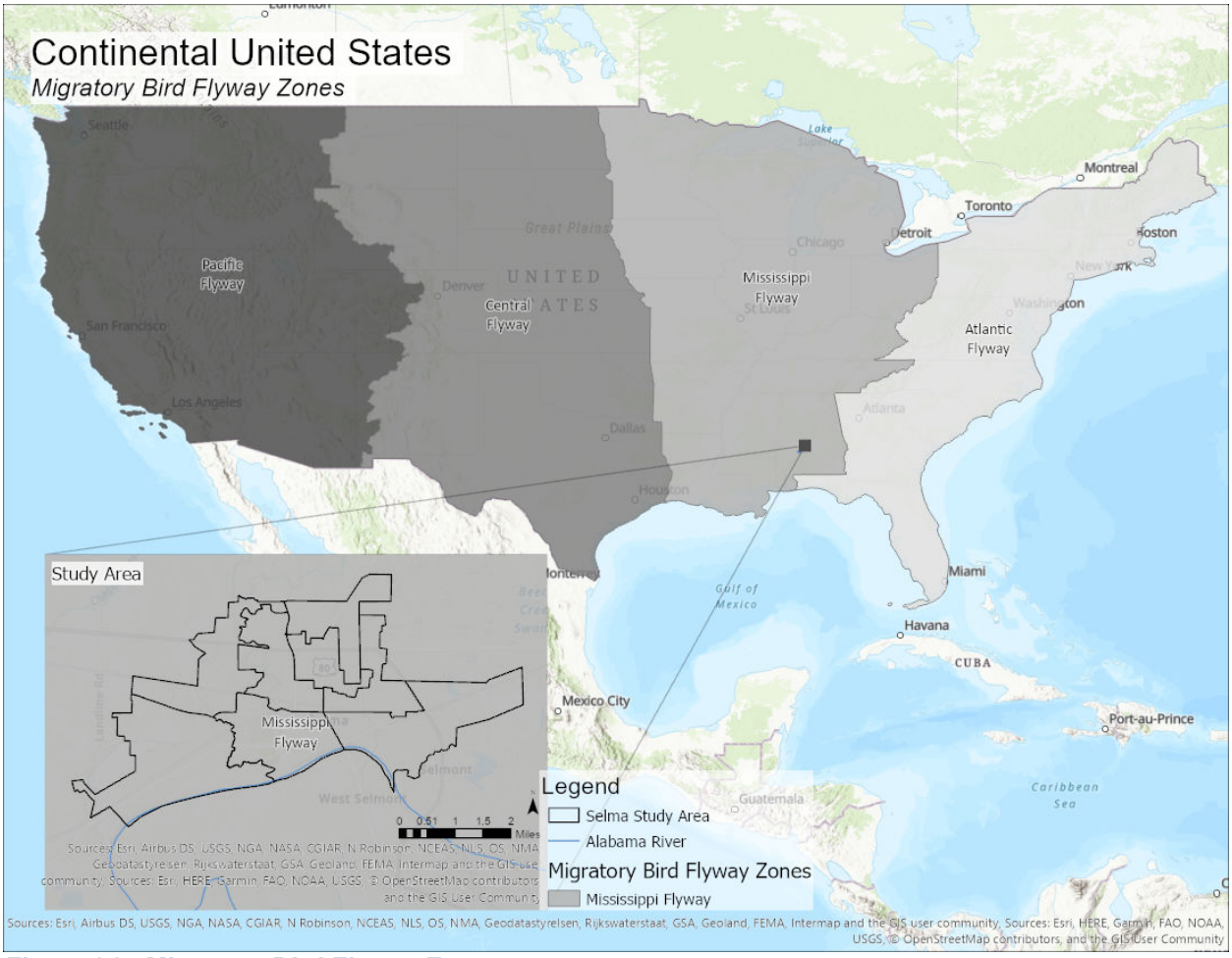

Figure 21: Migratory Bird Flyway Zones

The FWOP conditions would be similar to existing conditions.

*3.2.3.3 Bald and Golden Eagles**

3.2.3.3.1 Existing Setting

The Bald and Golden Eagle Protection Act (BGEPA) prohibits the "taking" of Bald Eagles (*Haliaeetus leucocephalus*) or Golden Eagles (*Aquila chrysaetos*) as defined in 16 U.S.C. 668-668c. "Take" is defined by the BGEPA as to "pursue, shoot, shoot at, poison, wound, kill capture, trap, collect, molest or disturb." "Disturb" is further defined as "to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available, 1) injury to an eagle, 2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior, or 3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior." The BGEPA extends to activities occurring near nests when eagles are not present.

According to the National Bald Eagle Management Guidelines dated May 2007, Bald Eagles primarily nest near aquatic habitat in mature or dead trees. Man-made structures such as power-poles and communication towers also serve as nesting sites for some Bald Eagles. Bald Eagle nests are distinctly large at four to 6-ft in diameter and 3-ft deep weighing more than 1,000 pounds. Nests are generally constructed with large sticks and lined with soft and pliable greenery such as moss, grass, or lichens.

There are no known Bald or Golden Eagle nests within the study area; however, according to the ADCNR, there are confirmed nests within Dallas County, Alabama. Bald Eagles primarily inhabit forested habitat adjacent to large river systems. As one of the largest riverine systems in Alabama, the probability of active and inactive nests surrounding the Alabama River are high.

*3.2.3.3.2 Future Without Project Conditions**

Under FWOP conditions the possibility for Bald Eagle population increase is plausible.

*3.2.4 Wetlands**

Section 404 of the CWA establishes a program to regulate the discharge of dredged or fill material into Waters of the U.S., including wetlands. Wetlands are defined as jurisdictional when three criteria are met: hydrologic connectivity, hydric soils, and hydrophyte vegetation (USACE, Wetlands Delineation Manual, 1987). No delineations have been conducted as part of this feasibility study. However, as shown in **Figure 22** the presence of small isolated wetlands may occur within the study area. This is primarily due to the highly urbanized environment. The surrounding area has a substantially greater amount of potential jurisdictional wetlands; however, no formal efforts to delineate wetland boundaries have occurred.

Activities in Waters of the U.S. regulated under this program include fill for development, water resource projects (such as dams and levees), infrastructure development (such as highways and airports), and mining projects. Section 404 requires a permit before dredged or fill material may be discharged into waters of the U.S. The basic premise of the program is that no discharge of dredged or fill material may be permitted if: (1) a practicable alternative exists that is less damaging to the aquatic environment (i.e., avoid) or (2) the nation's waters would be significantly degraded.

FWOP conditions would be similar to existing conditions. No large-scale land use development within the study area that would decrease potential wetland habitats is anticipated.

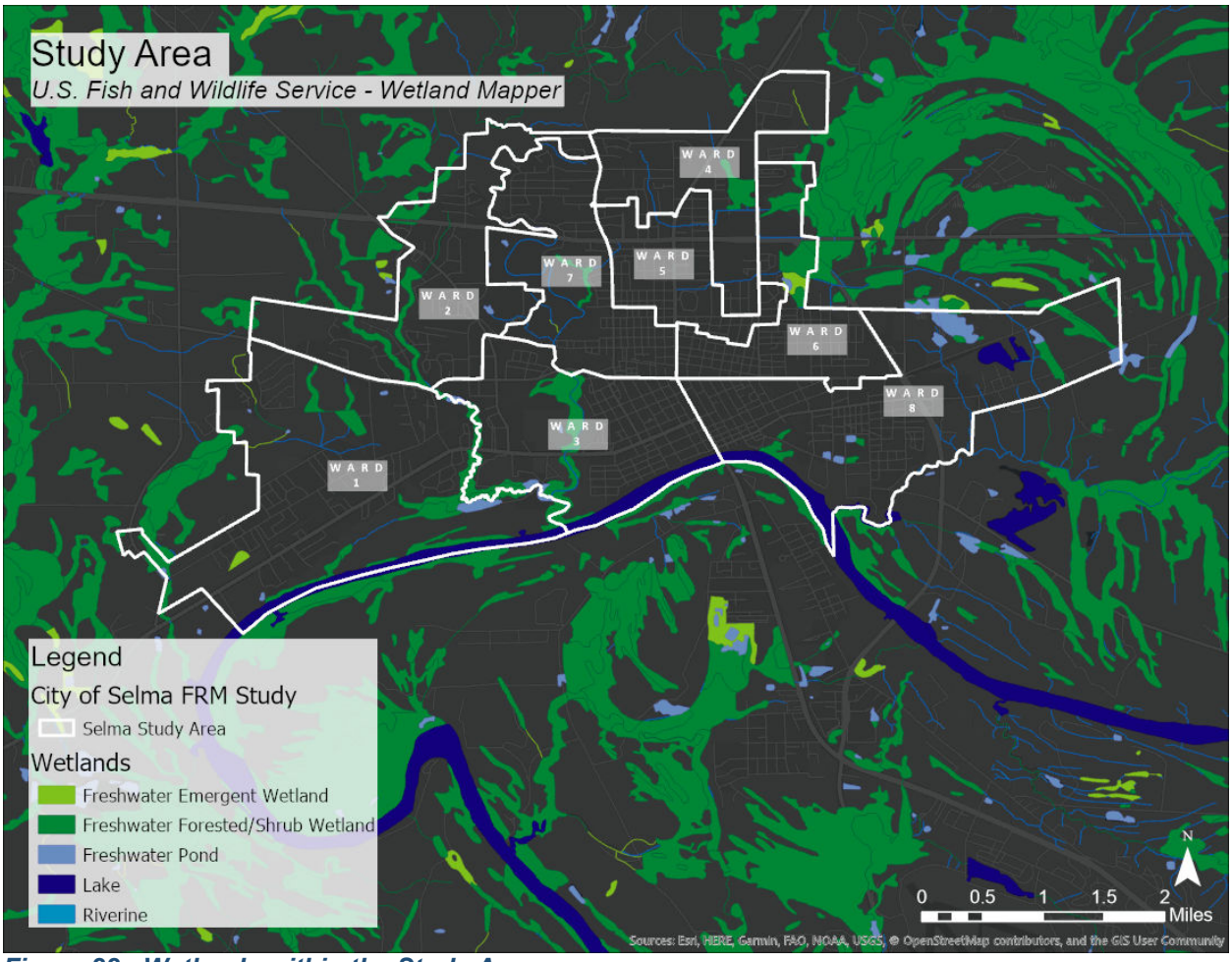

Figure 22: Wetlands within the Study Area

3.3 Cultural and Historic Resources*

*3.3.1 Architectural**

3.3.1.1 Existing Setting

The City of Selma was first recorded under the name *Ecor Bienville* in the early 1700s, settled in the early 1800s, and incorporated by the Alabama State Legislature in 1820 (Water Ave NR). The majority of structures in Downtown Selma and the surrounding area, southwest of J L Chestnut Blvd, contribute to one or more of five National Register Historic Districts in the city. These include Water Avenue District, Old Towne District, Riverview District, Ice House District, and Civil Rights Historic District. These districts, particularly Water Avenue and the Civil Rights Districts, were listed on the NRHP for their significance to historic events such as the American Civil War and the Civil Rights Movement. This area of Selma also contains arguably the most historic stretch of the Selma to Montgomery National Historic Trail and the Edmund Pettus Bridge, a National Historic Landmark. Some of the structures along Water Avenue and some further away from the river contributed to significant events of the Civil Rights Movement including events leading to the Selma to Montgomery Marches of 1965.

The Edmund Pettus Bridge and the structures along the blocks of Water Avenue on either side of the bridge, the Selma Riverfront, comprise an immediately recognizable landscape. The structures served as the backdrop to the one of the most pivotal events of the Civil Rights Movement known as Bloody Sunday. The iconic images from this event sparked an international awareness to the injustices faced by African Americans in the United States in the 1960s and lead to the passing of the Voting Rights Act of 1965.

Several structures along the Selma Riverfront are under threat of condemnation due to existing geologic and hydrologic conditions. One structure, previously located at 900 Water Avenue, has been demolished due to erosion of the riverbank (See **Figure 3**). Existing structures considered most at-risk on the riverfront edge are located in the 1000 and 1100 blocks of Water Avenue and Bienville Park. These 10 structures plus Bienville Park are all listed on the NRHP and contribute to the Water Avenue Historic District unless otherwise stated. A brief description is below:

- Bienville Park: located on the bluff at the intersection of Water Avenue and Lauderdale Street and contains a c. 1930 commemorative stone of the early 1700s designation of Selma as *Ecor Bienville*. The stone has been moved from the river and placed on a modified foundation closer to the road as the stone experienced significant settlement at its previous location.

Structures located at 1000-1002, 1004, 1008, 1010, 1012, 1014, and 1018 Water Avenue (see **Image 4**) are row of c. 1870-1890 two-story brick commercial buildings that have been used for various business.

Image 4: Water Avenue Downstream of the Edmund Pettus Bridge

Of note are 1012, 1014, and 1018 Water Avenue:

- 1012 Water Avenue served as the National Voting Rights Museum until unsafe conditions caused by several factors, including foundation stability, which led to the structure to be condemned and the museum to relocate.
- 1014 Water Avenue previously served as the headquarters for the Dallas County White Citizens' Council (WCC) in the 1950s and 60s. Events that occurred in, around, and in association with this structure and the WCC directly influenced the Civil Right Movement and legislation such as the Civil Rights Act 1957, 1960, and 1964 and the Voting Rights Act of 1965.
- 1018 Water Avenue has served as the Selma Times-Journal Building since the early 1920s. The Selma Times-Journal served a significant role in reporting the historic events that took place in Selma during the 1950s and 60s.

Structures located at 1110, 1112, and 1118-1124 Water Avenue are a row of two-story commercial structures constructed c. 1880 (**Image 5**).

Image 5: Water Avenue Upstream of the Edmund Pettus Bridge

A fire in 1984 resulted in the destruction of the structure located at 1100 Water Avenue. This parcel now serves as lookout area for the Edmund Pettus Bridge.

*3.3.1.2 Future Without Project Conditions**

FWOP conditions would be significantly changed in regard to the integrity and viewshed of the Water Avenue and Civil Rights Historic Districts. Historic aerial photos (**Image 1**, **Image 2**, and **Image 3**) demonstrate a projected loss of bank stability over time, directly impacting the structural integrity. These projections have been recently realized with one of the contributing historic properties of the Water Avenue and Civil Rights Historic Districts undergoing demolition and another being condemned from public use due to the structural instability. Over time, a complete loss of the Selma Riverfront could be expected.

*3.3.2 Cultural and Archaeological Resources**

3.3.2.1 Existing Setting

The study area contains a number of nationally significant cultural and archeological sites, including the 1865 Civil War Battle of Selma and the 1965 Selma to Montgomery Voting Rights Marches. A portion of the Nationally Registered Selma to Montgomery Trail runs through the study area.

*3.3.2.2 Future Without Project Conditions**

FWOP conditions would be significantly changed regarding the integrity and viewshed of a number of cultural and archaeological sites. The severe erosion and sloughing along the bankline has diminished the integrity of archeological sites along the riverbank. The potential loss of bankline and structures along the riverfront due to erosion and potential bank failure will significantly impact the viewshed of the Edmund Pettus Bridge and historic Downtown Selma.

3.4 Socioeconomics*

*3.4.1 Land Use**

Land use within the study area is highly developed as shown in **Figure 23**. Historically, the study area incorporated agriculture and farmland with commercial export, establishing itself as one of the most important river towns in the South during the 1830s – 1860s. After the Civil War, the economic focus of the region shifted from agricultural goods such as cotton to capitalizing on transportation systems such as railroads. This led to increased urbanization in the study area up to the peak population of 28,385 in 1960. The population has faced a steady decline since that time due, in part, to changing agricultural practices and the loss of Craig Air Force Base in 1977. As a result, further urbanization of the study area is not anticipated.

Within the extent of the study area, FWOP conditions would be similar to existing conditions; however, as discussed in the climate change analysis in **Section 3.1.4.2** metropolitan cities in the headwater portions would experience additional development which would result in an increase of 2% in flow over a 50-year POA.

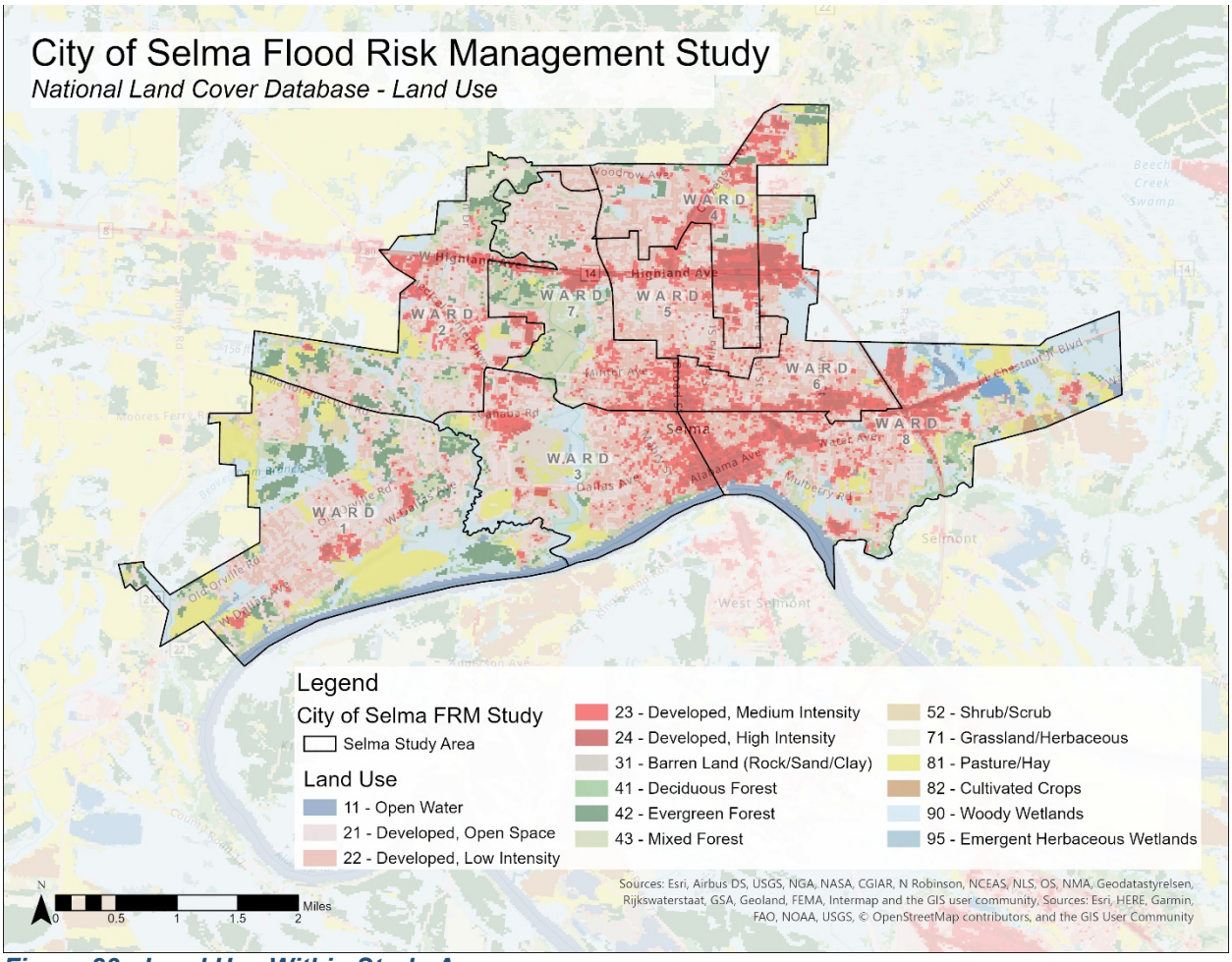

Figure 23: Land Use Within Study Area

*3.4.2 Noise**

Ambient noise of the study area is consistent with urban and suburban zones. The study area includes the Historic Riverfront Park and the downtown area of Selma is less than a mile away from the proposed bankline stabilization project. Traffic, construction, and community events contribute to occasional higher levels of steady noise.

The FWOP conditions would be similar to existing conditions.

*3.4.3 Aesthetics**

3.4.3.1 Existing Setting

Aesthetics is a set of principles concerned with the nature and appreciation of beauty of natural environments. The general aesthetics of the study area is moderately to heavily urbanized.

According to the Planning P&G dated 1983, “Aesthetic attributes are perceptual stimuli that provide diverse and pleasant surroundings for human enjoyment and appreciation. Included in this category are sights, sounds, scents, tastes, and tactile impressions and the interactions of these sensations, of natural and cultural resources.”

As stated in **Section 3.3.1**, the historic viewsheds of the Edmund Pettus Bridge, the riverfront of the Alabama River, and the Water Avenue Historic District contribute greatly to the aesthetics of the study area.

*3.4.3.2 Future Without Project Conditions**

If the bank is left unaddressed, the migration of soil out from under building foundations could continue. This FWOP scenario could ultimately threaten the properties listed on the NRHP (discussed in **Section 3.3.1.1**) and may lead to future condemnations of some buildings. Since the existing buildings comprise the viewshed of the Edmund Pettus Bridge, loss of buildings would affect the aesthetics as well.

*3.4.4 Recreation**

According to the City of Selma Recreation and Communities homepage, which was last updated February 9, 2017, there are six community parks with two additional parks proposed for construction. Activities available to the public includes sports such as tennis, soccer, basketball, baseball, and volleyball and recreation such as playgrounds, water parks, walking trails, etc. Pockets of community greenspace occur throughout the city as well. The Selma Senior Center provides educational, recreational, socialization, fitness, etc. to citizens aged 55 years or older. A popular 12-acre park within the study area is the Historic Riverfront Park which includes an overlook of the Edmund Pettus Bridge. Work was done in 2012 to renovate the historic train depot into an amphitheater and construct an adjacent river walk using concrete pathways. Significant erosion along the bank at this park prompted a Section 14 investigation and is anticipated to result in an emergency bank stabilization project by Summer 2022. The Selma City Marina at RM 207.3 is a small boat access channel within the study area that the USACE maintains on an as-needed basis. This location serves as an access point for many recreational boaters, hunters, and fisherman.

Additionally, an annual Riverfront Market Festival showcases artists and other vendors which draws local crowds. This festival is staged along Water Avenue and is typically held on the second Saturday of each October.

The FWOP conditions would be similar to existing conditions. Because land use within the study area is not anticipated to change significantly, recreation would not vary greatly.

*3.4.5 Industry**

3.4.5.1 Existing Setting

An assessment of regional industry benefits including tourism, recreation, and income shared between Selma and local towns illuminates interdependencies and supports Federal interests in the region (i.e., Maxwell/Gunter Air Force Base (AFB), National Historic Landmarks, and Civil Rights Trails). Several large employers in Selma and the surrounding area include: International Paper Company, Honda Lock-America, and Bush Hog. International Paper's Dallas County, Alabama, location employs more than 500 people.

Because of the lack of "brick and mortar" industry due to a shift in focus from transportation and agriculture, the City of Selma has transformed a lot of its economic

efforts into Heritage Tourism. The Alabama Department of Tourism (ADOT) reported 1,028 jobs in Dallas County to be supported by tourism in 2018. The ADOT reported Dallas County generated $75,781,018 in tourism revenue in 2018, a 7.1 percent increase over 2017. Although these numbers encompass all of Dallas County, it can be inferred that the majority of these tourism dollars stem from the heritage tourism concentrated in downtown Selma.

*3.4.5.2 Future Without Project Conditions**

FWOP conditions would result in continued bankline instability which would result in continued degradation of infrastructure and weaken Selma's appeal for heritage tourism thus reducing tourism and its benefits to Selma.

*3.4.6 Demographics**

The population of Selma according to the U.S. Census Bureau estimate for 2017 was 18,310. Since the 2010 census there has been an 11.5% decrease to the city's population (shown in **Table 7**). Of the 18,310 Selma residents, 81.5% percent are reported to be minorities. The mean income for households in Selma is $37,272, and 33.4% of families and 41.4% of individuals are below the Federal poverty line. Of those below the poverty line, 63% of those are under 18, and 15.3% are 65 years or older (Selma, Alabama Population 2020).

Figure 24 shows a visual representation of the distribution for total population, percent minority, low income, and poverty. No substantial increase in population is anticipated under FWOP conditions.

Table 7: Selma Population Estimate

Geography	Census	Estimates Base	2010	2011	2012	2013	2014	2015	2016	2017
City of Selma, Dallas County, Alabama	20,756	20,756	20,785	20,505	20,199	19,786	19,612	19,270	18,833	18,310

Note: Estimates based on April 2010 Census for July 1st of shown year

*3.4.7 Public Safety**

3.4.7.1 Existing Setting

Current threats to public safety arise from flooding events and the consequences of riverbank erosion. Due to the slow rising floodwaters, minimal threats to public evacuation and first responder access exist.

*3.4.7.2 Future Without Project Conditions**

Continued riverbank erosion would lead to a failure of the riverbank foundations and thus increased condemnation of infrastructure.

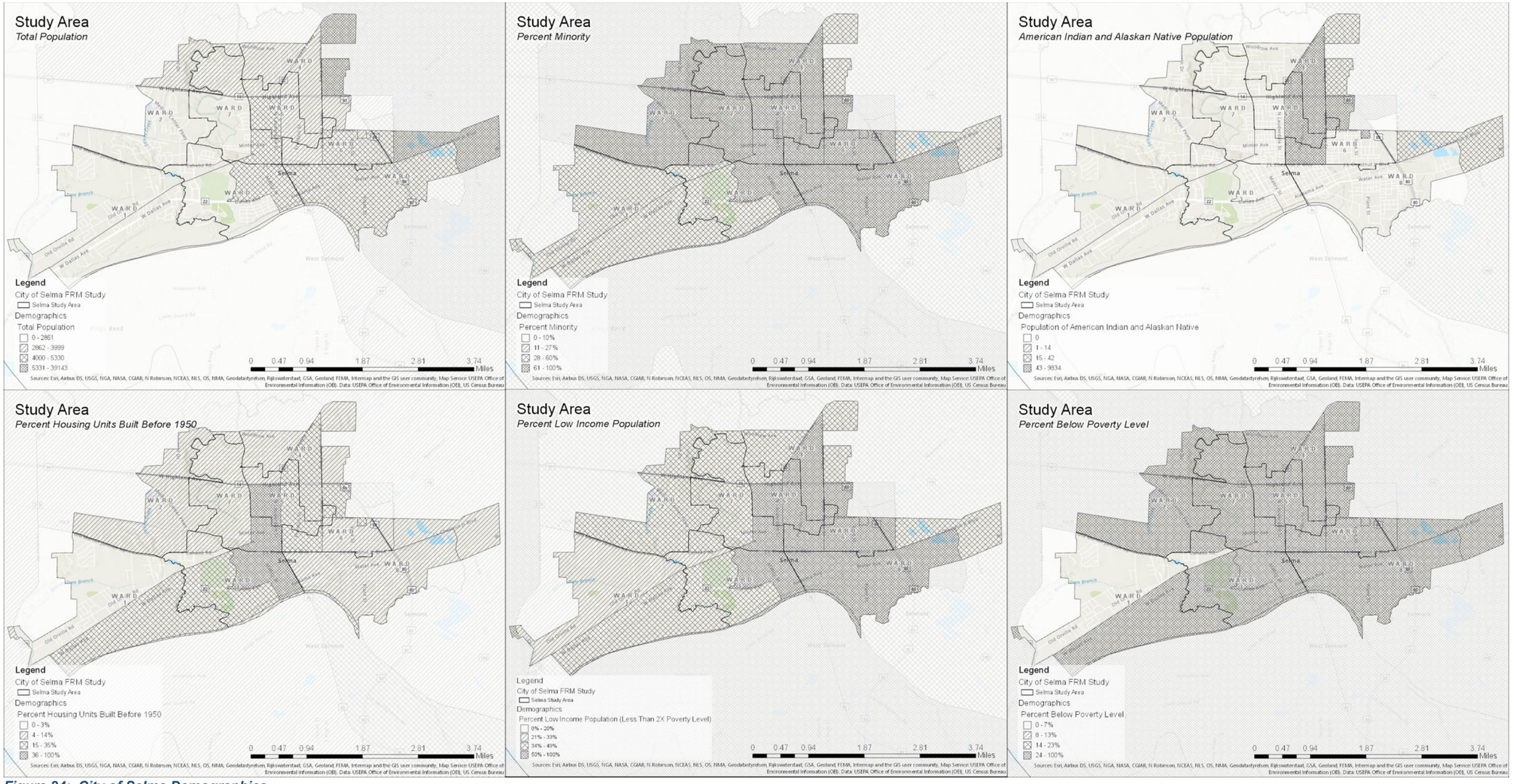

Figure 24: City of Selma Demographics

*3.4.8 Traffic and Navigation**

The Selma area is served by two railroad systems, a municipal airport, several motor freight lines, West Alabama Public Transportation, and Trailway Bus service. Major arteries of Interstates 65 and 85 intersect in Montgomery, which is a short 40-minute drive from the City of Selma. U.S. Highway 80, a four-lane thoroughfare, and Alabama Highways 14, 22, and 41 also serve the city. Water Avenue currently serves as the main road for the annual Selma Bridge Crossing Jubilee which draws in a significant volume of tourism traffic.

The Alabama River is considered a low-use navigable waterway. The USACE, Mobile District provides maintenance activities and maintenance dredging of the entire Alabama River navigation channel. However, the only section within the study area that the District maintains is the Selma City Marina small boat access channel at RM 203.7 (Six Mile Creek Public Use Area). This dredging amounts to about 1,000 cubic yards (cy) of material with open water disposal on an as-needed basis. Therefore, navigation within the Alabama River study area is predominantly utilized by local and visiting boaters and anglers.

FWOP conditions would be similar to existing conditions. It is not anticipated that any substantial increase in budget would occur that would allow this section of the Alabama River to be dredged on a more frequent basis.

4.0 PLAN SELECTION

Based on the six-step planning process, risk-informed decision making was used to select the best alternative for the study. **Figure 25** outlines the steps taken during the planning process, which are described in further detail in **Sections 4.1**, **4.2**, and **4.3**.

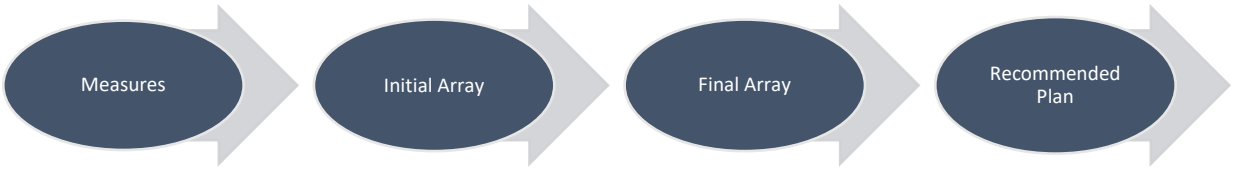

Figure 25: Plan Selection Process

4.1 Measures

Plan formulation is the process of building alternative plans that meet planning objectives and avoid planning constraints. Alternative plans are a set of one or more management measures functioning together to address one or more planning objectives. With the problems, opportunities, objectives, and constraints in mind, measures were developed in accordance to ER 1105-2-100. Measures were derived based on feedback gathered from the Planning Charette on October 23, 2018. These measures were then evaluated and screened on their ability to meet study objectives and avoid constraints. The criteria for screening the initial measures by using professional judgment included: 1) was it implementable, 2) would it significantly reduce flooding, 3) would it be part of a solution that consistently meets the planning objectives and, 4) what is the relative effectiveness to other measures. These measures along with the initial array of alternatives were presented at the AMM held on January 16, 2019.

Identified measures are separated into two categories: structural and non-structural. Each measure considered for this study is referenced in **Table 8**. All measures are separable and were evaluated based on their independent merit. Measures which were screened out are highlighted in blue. The structural measures carried forward were combined into varying alternatives. The Flood Warning System, also termed Floodplain Management/Emergency Evacuation Plan (FMEEP), was determined to be applicable to any alternative that may be chosen and therefore was not explicitly stated within each alternative description.

Table 8: Study Measures

Structural Measures	Non-Structural Measures
Levee(s)/Floodwall(s)	Elevating Structures
Riverbank Stabilization	Acquisition/Buyouts
Pump Stations	Relocation of Structures
Culverts/Weirs/Sluice Gates	Flood Warning System (FMEEP)
Bridge Modification (screened out)	Land Use Regulation Changes (screened out)
In-Line/Off-Line Detention (screened out)	Green/Natural Infrastructure (screened out)
Channel Diversion (screened out)	Floodproofing of Structures (screened out)
Channel Modification (screened out)	

4.1.1 Definition of Each Measure

Structural:

- Levee(s) Floodwall(s): Levees are a man-made embankment used to prevent flooding and are often built to keep high river levels from overflowing the banks where flooding would be undesirable or cause damage.
- Riverbank Stabilization: Riverbank stabilization is used to protect banklines and inland properties from deterioration caused by erosion due to flooding or increases in overland flow. Methods for riverbank stabilization typically include placing earthen material and riprap to armor the bank or other methods that reduce erosive pressure.
- Pump Stations: Pump stations are used in conjunction with levees to drain flood water from the interior section of the levee. Alone they do not provide flood protection, but when used as part of a levee system they prevent flooding by pumping floodwaters out of flood prone areas.
- Culverts/Weirs/Sluice Gates: Sluice gates are hydraulic structures that can be opened and closed to control the flow of water through an opening. These structures could be used to prevent flood waters from backing up tributaries that feed main stem rivers. During high flow events, as the river rises water may begin to flow up local tributaries causing flooding from the backwater effect of the main river.
- Bridge Modification: Bridges over rivers and streams can create flow constrictions which reduce hydraulic conveyance of water and may cause water to back up on the upstream side of the bridge. Replacement of the bridge or modifications to the size and/or location of structures such as bridge piers and abutments can relieve

the constriction of flow and may reduce flood elevations upstream of the bridge. It is important to note that such modifications can also exacerbate flooding downstream of the bridge due to the increased hydraulic conveyance through the bridge.

- In-Line/Off-Line Detention: In-line/off-line detention is the temporary storage of flood waters used to reduce the peak flood elevation downstream. These structures act to reregulate an incoming flood by storing floodwater and slowly releasing them back into the river. In-line detention would be a dam or weir structure completely crossing the river and creating a flood pool on the main stem of the river. Off-line detention would involve diverting flood waters to a detention pond for temporary storage located adjacent to the river.
- Channel Diversion: Channel diversion involves redirecting flood waters from an upstream point to a downstream along the same river, bypassing a portion of the river and reducing flood risks along the portion of the river that was bypassed. This typically involves the creation of a channel capable of bypassing a specified amount of flow.
- Channel Modification: Channel modification consists of the enlargement of the stream channel to increase capacity and lower adjacent and upstream water surface elevations.

Non-Structural Measures:

The following definitions are provided based on the 2019 USACE Field Guide for Conducting Nonstructural Assessments:

- Elevating Structures: Should be considered for lifting an existing structure to an elevation which is at least equal to or greater than the design water surface elevation, which could be the 1% annual chance flood elevation. The final elevation should place the first floor and associated ductwork, plumbing, mechanical and electrical systems above the projected water surface elevation.
- Acquisition/Buyouts: Consists of acquiring the at-risk structure and land that the structure sits upon. The structure is then demolished. The land where the structure had been originally located is purchased, becoming deed restricted in order to prevent development from occurring in the future, and becomes available for open land management as stipulated by the National Flood Insurance Program (NFIP).
- Relocation of Structures: Consists of acquiring the at-risk structure and land that the structure sits upon. Requires physically moving the existing at-risk structure away from the flood hazard area to a location which is completely outside of the floodplain. The land where the structure had been originally located is purchased, becoming deed restricted in order to prevent development from occurring in the future, and becomes available for open land management as stipulated by the NFIP.
- Flood Warning System: Relies upon stream gages and rain gages for collecting hydrologic information, and computer modeling to determine the impacts of flooding for areas of potential flood risk. A flood warning system, when properly installed and calibrated, is able to identify the time available for people occupying

the floodplain to safely implement temporary measures or to evacuate the area. For this study this measure was later renamed as the FMEEP.

- Land Use Regulation Changes: Based on the NFIP which requires minimum standards of floodplain regulation. For communities where future growth and expansion has been identified, restrictive land use regulations may be a deterrent to life loss and property damage.
- Green/Natural Infrastructure: An environmental solution such as wetland creation or the use of tree rootballs to provide an alternate natural approach to flood damage reduction or erosion.
- Floodproofing of Structures: Can be achieved through either dry or wet methods. Dry methods consist of waterproofing the structure to prevent flood waters from entering. Wet methods require all construction and finishing materials to be water resistant and all utilities elevated above the design flood elevation.

4.1.2 Evaluation and Screening of Measures

Measures were screened based on their ability to meet the study objectives and avoid constraints as well as preliminary professional judgement of engineering feasibility and broad environmental impacts. The evaluation of each measure is discussed below:

Structural

- Levee(s)/Floodwall(s) – Carried Forward: Due to flood inundation seen in Ward 6 and Ward 8, this measure could potentially meet study objectives.
- Riverbank Stabilization – Carried Forward: Due to the severe erosion along the Alabama River this measure would meet the study objectives to reduce the threats to properties listed on the NRHP.
- Pump Stations – Carried Forward: All levees and floodwalls would require pump stations; therefore, this measure was carried forward.
- Culverts/Weirs/Sluice Gates – Carried Forward: Similar to pump stations, levees and floodwalls generally require culverts/weirs/sluice gates; therefore, this measure was carried forward.
- Bridge Modification – Screened Out: Modification was considered for several bridges along tributaries in Selma as well as the main stem Alabama River. It was discovered that only one bridge analyzed created a minor constriction that may cause any flooding to the study area and would only have a minor effect to less than ten (10) structures in extremely infrequent flood events. It was determined that bridge modification would not be a cost-effective measure and was screened out.
- In-Line / Off-Line Detention – Screened Out: Detention was determined to be impractical based on the volume of flood water storage that would be needed to effectively reduce flooding from the 17,000 square mile basin upstream of Selma. The amount of land necessary to create enough storage would require approximately 100 square miles to be acquired and this was not a practical alternative.
- Channel Diversion – Screened Out: Considerations were given to several sites to utilize channel diversion and there was no practical location to construct a channel capable of effectively diverting enough flood waters to reduce flood risks to any

structures in the study area. Additionally, there were concerns of the significant cultural and environmental impacts within the Alabama River such as critical habitats and farmlands in the area that would be adversely impacted by channel construction.

- Channel Modification – Screened Out: Channel modification was determined to be impractical along the Alabama River near Selma. There were no constriction points identified which could be modified to effectively increase conveyance and reduce flooding. Furthermore, preliminary hydraulic modeling showed that increased storage in the Alabama River would not produce a meaningful reduction in peak river stages for flood events that affected structures in the study area. Additionally, modifying the river would adversely impact significant cultural and environmental resources due to known cultural Civil War sites within the Alabama River watershed.

Non-Structural

- Elevating Structures – Carried Forward: This measure would be implementable if applied at a level the NFS could carry out.
- Acquisition/Buyouts – Carried Forward: This measure would be implementable if applied at a level the NFS could carry out.
- Relocation of Structures – Carried Forward: This measure would be implementable if applied at a level the NFS could carry out.
- Flood Warning System – Carried Forward: Though the Alabama River exhibits a slow rising flood stage, citizens would benefit from evacuation routes and zones if given ample notice. This measure could be beneficial in conjunction with any alternative.
- Land Use Regulation Changes – Carried Forward: New structures are required to meet current building codes and municipal restrictions. Several structures within Ward 8 are abandoned and/or heavily degraded. As structures are removed due to blight and/or condemnation, land use regulations would ensure that no further development would occur within certain flood prone areas. Additionally, through inclusion with the FMEEP land use regulation would urge no future development within flood prone areas; therefore, this measure could be combined with the FMEEP and determined to be applicable with any alternative.
- Green/Natural Infrastructure – Screened Out: Wetland conversion and recreational area conversion were considered as a green infrastructure; however, this measure was impractical due to the topography of the surrounding area and the volume of water that overtops the riverbanks.
- Flood proofing Structures – Screened Out: Would not be effective in floods greater than three feet; flooding in impacted areas is either above three feet or impacted structures are at a higher elevation.

4.2 Alternatives

From the screened measures, multiple alternative plans were developed, either from a single measure or multiple measures combined. Alternatives were combined based on their ability not only to address objectives and avoid constraints, but also for technical feasibility, environmental acceptability, and being economically justified, as well as for the

level of life safety risk reduction and cultural resource protection that could be realized. **Table 9** provides a listing of the initial array of alternatives along with a brief description of each. Additionally, because a FMEEP could be combined with any alternative, it was not incorporated into each alternative description.

Table 9: Initial Array of Alternatives Description

Array of Alternatives	Plan Description
No Action Alternative (NAA)	No Federal undertaking would occur and the results would be consistent with FWOP conditions.
Alt. 1: Non-Structural (A-Buyouts, B-Raise Structural Elevation, Structural move)	There are two (2) non-structural alternatives considered. Alternative 1.A includes buyouts which entails the acquisition of parcels, relocation of inhabitants, and demolition of structures. Alternative 1.B includes elevating structures or moving structures altogether out of the floodplain within Ward 8.
Alt. 2: 1967 Selma Levee	1967 Selma Levee with Selmont Levee alignment with floodgates/pumps where needed, buyout as necessary
Alt. 3: Optimized (Short) Selma Levee	Shortened/optimized levee alignment, U.S. Highway 80 tie in, floodgates/pump station where needed, buyout as necessary
Alt. 4: Bank Stabilization	Provide bank stabilization along all or part of RM 256-261
Alt. 5: Bank Stabilization + Buyouts	Combines Alternatives 4 & 1.A-Buyouts
Alt. 6: Optimized Selma Levee (L3) + Buyouts + Bank Stabilization	Combines Alternatives 3 & 4 & Partial Non-Structural Alt.1 in areas not within the Optimized Levee alignment
Alt. 7: Optimized Selma Levee (L3) + Valley Creek Levee + Pump Station & Sluice Gate + Bank Stabilization	Combines Alternatives 3 & 4 & a smaller levee at Valley Creek & a pump station with a sluice gate at Beaver Dam Branch (maximum structural protection)
Alt. 8: Optimized Selma Levee (L3) + Valley Creek Levee + Buyouts + Bank Stabilization	Combines Alternative 6 plus Valley Creek levee (only purchase, relocation or raising elevation in the Ward 1 considered)
Alt. 9: Optimized Selma Levee (L3) + Valley Creek Levee + Buyouts	Combines Alternative 3, levee at Valley Creek (purchase, relocation or raising elevation in the Ward 1 considered)
Alt. 10: Optimized Selma Levee (L3) + Valley Creek Levee + Pump Station with Sluice Gate	Alternative 7 with No bank stabilization (maximum structural protection without bank stabilization)

The initial array of alternatives was presented at the AMM IPR on January 16, 2019, and were approved by the Vertical Team for continued evaluation and comparison. The initial array of alternatives was screened to identify a focused array of alternatives.

4.2.1 Screening Criteria

The alternatives were evaluated and screened throughout the formulation process using the following criteria:

Engineering Criteria

- The plan must represent sound, acceptable, and safe engineering solutions; and
- The plan must minimize impacts to the existing structures along the riverbank.

Environmental Criteria

- Fully complies with all relevant environmental laws, regulations, policies, and executive orders;
- Represents an appropriate balance between environmental sustainability and economic benefits; and
- Developed in a manner that is consistent with the USACE Environmental Operating Principles (EOPs).

Economic Criteria

- Tangible benefits of a plan must exceed economic costs, and
- Each separable unit of improvement must provide benefits at least equal to costs.

Planning Criteria

- Four planning criteria: completeness, effectiveness, efficiency, and acceptability; and
- Four P&G Accounts: NED, RED, OSE, and EQ.

4.2.2 Initial Array of Alternatives Overview

The initial round of screening was presented at an IPR held June 26, 2019 and captured in a Memorandum to the Chief of Planning and Policy Division at SAD dated August 1, 2019 (see **Appendix G**). A number of recommendations for buyout options were identified that included recreation benefits as part of the array of alternatives. It was determined no additional benefits would derive from recreation in the buyout area as Ward 8 is too far removed from the economic/tourism hub of downtown Selma. Further analysis of the economic and tourism benefits of downtown Selma are detailed in **Appendix C**.

The remaining alternatives were then further refined to include identification for sub-options of the buyout and levee alignments. These were presented at the IPR held October 9, 2019. Discussion on the feasibility of each of the options are provided in **Section 4.2.2.1**.

Table 10 demonstrates a qualitative check to determine which of the initial alternatives met study objectives and avoided constraints. Alternatives that either met and/or partially met the objectives and avoided constraints were kept for further consideration. After additional review and coordination, a reassessment of the levees as a structural

alternative was conducted (See Memorandum to the Chief of Planning and Policy dated January 22, 2020 included in **Appendix G**). Consequently, levee alignments (Alt. 2 - 1967 Levee and Alt. 3 - Optimized Levee) were further evaluated. All screened out alternatives are denoted in blue highlight and discussed in **Section 4.2.2.1.**

Table 10: Screening of Initial Array into Focused Array of Alternatives

Alternative Description	Feasible	Meets Objectives	Avoids Constraints
Alt. 1.A – Buyout	Yes	Partially	Partially
Alt. 1.B – Elevation/Relocation of Structures (screened out)	No	Yes	Partially
Alt. 2 – 1967 Levee	Yes	Yes	Partially
Alt. 3 – Optimized Levee	Yes	Yes	Partially
Alt. 4 – Bank Stabilization+ Riprap	Yes	Partially	Yes
Alt. 5 – Bank Stabilization + Buyout	Yes	Yes	Partially
Alt. 6 – Optimized Levee + Buyout + Bank Stabilization	Yes	Yes	Partially
Alt. 7 – Optimized Levee + Valley Levee + Pump Station/Gates + Bank Stabilization (screened out)	No	Partially	No
Alt. 8 – Optimized Levee + Valley Levee + Buyout + Bank Stabilization (screened out)	No	Yes	No
Alt. 9 – Optimized Levee + Valley Levee + Buyout (screened out)	No	Partially	No
Alt. 10 – Optimized Levee + Valley Levee + Pump Station w/ Sluice Gate (screened out)	No	No	No

4.2.2.1 Evaluation and Screening Discussion of Initial Array and Options

4.2.2.1.1 Alternative 1.A: Buyout Options

4.2.2.1.1.1 Buyout Option 1 (330 parcels) and Option 2 (157 parcels)

As discussed in **Section 3.1.1.1**, the majority of flooding occurs in Ward 8. As such, buyout options were targeted for this area. Buyout option 1 selected the majority of Ward 8 in order to reduce the greatest amount of structures at risk for flood damages. Out of a total of approximately 1,032 parcels in Ward 8, 330 parcels for option 1 were identified for buyouts; however, implementation of this option would cause significant impacts to the social fabric in the City of Selma. Similarly, option 2 was refined to 157 parcels to reduce the adverse impacts while still removing a large portion of residents within Ward 8. For owner-occupants, Housing of Last Resort (49 CFR § 24.404, 2019) will ensure availability of DSS housing, notwithstanding cost implications; however, for tenant-occupants, preliminary market research has indicated a shortage of DSS rental

accommodations that would be within the financial capability of the displaced and within the general project area. In the opinion of the USACE, Mobile District Real Estate Division, the City of Selma does not have sufficient manpower to manage and/or execute this level of relocation assistance/buyout in accordance with P.L. 91-646; therefore, these options were screened out from further analysis and not selected as the Alternative 1.A buyout footprint.

4.2.2.1.1.2 Buyout Option 3 of 25 parcels

This buyout footprint was reduced to 25 parcels based on the number structures in Ward 8 that received greater flood damages at higher flood depths during the 0.1 AEP, or 10-year, flood event. This option excluded certain industrial parcels in 0.1 AEP. As such, this option was chosen as the Alternative 1.A buyout footprint.

Since 25 owners would be involved, and several of these would involve non-residential displacements, hypothetically a P.L. 91-646 involuntary relocation would be plausible potentially impacting the schedule and viability of the alternative. Shortage of DSS tenant-based housing would also be a prevailing issue. Furthermore, there would be concern whether the City of Selma has the capability to execute the plan in accordance with P.L. 91-646. The USACE, Mobile District, Real Estate Division opinion is the same for each of the buyout options.

4.2.2.1.2 Alternative 1.B: Elevation/Relocation of Structures

Elevation and/or relocation of homes out of Ward 8 was screened due to the age and condition of the structures. Implementation of this alternative would have caused irreparable damage to the structures due to their instability.

4.2.2.1.3 Alternative 2: 1967 Levee Alignment

Because this alternative was previously evaluated in the 1967 USACE FRM Study, this alignment was carried forward for comparison purposes.

4.2.2.1.4 Alternative 3: Optimized Levee Alignment Options

4.2.2.1.4.1 L2 Option

This alignment focused solely on the Selma portion of the 1967 levee alignment. Preliminary professional judgment determined that this alignment would not provide additional benefits, as compared to L3 option (**Section 4.2.2.1.4.2**), but would cost a substantial amount more; therefore, this alignment was not selected as the “optimized” footprint.

4.2.2.1.4.2 L3 Option

Alignment L3 footprint ran across the southern portion of Ward 8 with a tie-in feature to U.S. Highway 80. A review of the HEC-River Analysis System model showed that U.S. Highway 80 could withstand flooding up to the 0.1 AEP (100-year) flood event with added features such as clay revetment and floodgates. This design was the least costly levee alignment while protecting the same amount of structures; therefore, this footprint was selected as the “optimized levee alignment.”

4.2.2.1.4.3 L5 Option

The footprint of L5 was essentially the same as L3; however, the levee ran parallel with U.S. Highway 80 rather than utilizing a tie-in feature. Like L2, preliminary professional judgment determined that this alignment would not provide additional benefits as compared to L3 and would cost a substantial amount more; therefore, this alignment was not selected as the "optimized" footprint.

4.2.2.1.5 Alternative 4: Bank Stabilization

Alternative 4 was initially designed to focus on 1,500 linear ft of bankline along Water Avenue in Selma based on areas most vulnerable to erosion and sloughing. The bulk of the erosion was occurring in the area between Church and Franklin Streets, which coincidentally was where properties listed on the NRHP were located. Bank stabilization was carried forward and further refined as discussed in **Section 4.2.3.1.3**.

4.2.2.1.6 Alternatives 5 and 6: Combinations

Alternatives 5 and 6 were carried forward because they are varying combinations of Alternative 1.A Option 3, Alternative 4, and/or Alternative 3 Optimized Levee Alignment Option L3.

4.2.2.1.7 Alternatives 7-10: Combinations with Valley Creek Levee Alignment

The analysis showed that of the structures within the Valley Creek floodplain very few were affected by the 0.01 AEP (100-year) flood event or less; therefore, this alignment was not selected as a standalone levee alignment, but rather was combined with the "Optimized Levee" in Alternatives 7-10. Preliminary professional judgment determined that these alignments would be cost prohibitive (both initial construction cost and maintenance), would not provide additional benefits, have the potential to impact cultural and environmental resources, and would likely induce flooding in the adjacent town of Selmont, Alabama.

4.2.3 Focused Array of Alternatives

After further refinement and screening of the initial array as discussed in **Section 4.2.2**, the focused array of alternatives was developed and is listed in **Table 11**. The Focused Array of Alternatives was presented to the vertical team at a post-AMM IPR in June 2019.

Table 11: Focused Array

Focused Array of Alternatives
Alt. 1.A – Buyout
Alt. 2 – 1967 Levee
Alt. 3 – Optimized Levee
Alt. 4 – Bank Stabilization
Alt. 5 – Bank Stabilization + Buyout
Alt. 6 – Optimized Levee + Buyout + Bank Stabilization

4.2.3.1 Evaluation and Screening Discussion of Focused Array and Options

The focused array of alternatives was screened based on their ability to meet objectives, avoid/minimize constraints and adherence to the four planning criteria. Bank stabilization construction methods, or "options", were evaluated based on professional judgment and engineering feasibility to inform the selection for Alternative 4. Of the entire focused array, only Alternative 2 was screened out from further analysis.

4.2.3.1.1 Alternatives 1.A, 3, 5, and 6

No Further refinement was needed for these Alternatives. These alternatives were carried forward based on professional judgement and engineering feasibility.

4.2.3.1.2 Alternative 2

Alternative 2 met the study objectives but did not avoid the study constraints, in particular the City of Selma's ability to maintain a large levee system. Furthermore, this alternative is more costly and has the potential to have greater environmental and cultural impacts when compared with Alternative 3. **Table 12** provides a first cost estimate that shows Alternative 2 is significantly higher than the cost of the other alternatives as shown in **Table 17**.

The first costs were stated in average annual terms using the Fiscal Year (FY) 20 Federal discount rate of 2.75% and a 50-year POA. Interest during construction (IDC) was added to the rough order of magnitude (ROM) first costs assuming 48 months for construction of Alternative 2. Annual O&M costs were included.

Table 12: Cost Calculation for Alternative 2

Alternative	First Cost	IDC	O&M	Average Annual Cost
2	$297,070,000	$16,717,347	$184,000	$11,806,972

**based on October 2021 price level*

A preliminary qualitative environmental impacts analysis, based on professional judgment, for Alternative 2 showed high impacts across nearly all resources within the surrounding area as shown in **Table 13**.

Table 13: Environmental Impacts of Alternative

Factors	Alt. 2 (1967 Levee)
Physical Environment	HIGH
Wetlands	HIGH
Federally Protected Species	HIGH
Cultural Resources	HIGH
Socioeconomics	HIGH

Table 14 shows the outputs from the Regional Economic System Model (RECONS) analysis for Alternative 2. This analysis includes factors for regional development, which is expected due to the greater cost anticipated by a more robust levee design; however, the O&M burden on the NFS would be significant.

Table 14: Regional Economic System Model for Alternative 2

Factors ($000)	Alt. 2 (1967 Levee)
First Costs	$297,070
Local Capture	$176,172
Output	$216,799
Jobs	1,249*
Labor Income	$64,527
Value Added	$91,070
Results Discussion	*Jobs generated are short-term resulting from construction spending.

Based on this analysis, Alternative 2 was screened out from further consideration.

4.2.3.1.3 Alternative 4 Bank Stabilization Options

Alternative 4 was further refined to approximately 1,000 linear ft to protect existing properties listed on the NRHP along Water Avenue between Lauderdale and Washington Streets (RM 259 and 260). The downstream limit was selected due to existing structure loss which would not derive substantial benefits from inclusion within the footprint. The existing erosion control features upstream and immediately adjacent to the refined footprint further delineated the limits of the proposed footprint. Construction methods, presented as "options", included a range of river bankline stabilization techniques that were based on similar USACE projects.

4.2.3.1.3.1 Bank Stabilization Option 1, Sheet Pile Wall

This option consists of driving sheet pile into the ground to form a continuous wall. The sheet pile would be driven to the necessary embedment as determined by design. Additionally, dependent upon the final configuration, the sheet pile wall would likely require tie backs at a set spacing along the wall, anchored into the existing earth on the dry side of the wall.

Vibrations from the placement (driving) of the sheet-pile wall could affect existing structures and foundations and lead to failure of the structures. Contractors may be reluctant to assume the liability for this construction method. Because this variant of the alternative could negatively impact the stability of the properties listed on the NRHP along the bankline, this option was screened out from further evaluation and comparison.

4.2.3.1.3.2 Bank Stabilization Options 2a/b, Riprap and/or Extension

This option consists of reinforcing the bank by providing a large amount of riprap/large stone to the existing bank, creating a more gradual slope that extends out into the river. This construction method presents both constructability and aesthetic concerns. This method would require a severe setback and the toe would extend far into the Alabama River, which would cause navigation impediments. As such, this configuration was screened out from further analysis.

4.2.3.1.3.3 Bank Stabilization Option 3, Cast in Place

This option consists of dewatering, excavating, prepping the foundation, constructing formwork, and pouring a continuous cast-in-place concrete wall along the length of bank to be stabilized. This construction method is aesthetically pleasing; however, it requires coffer dams and dewatering which adds a significant amount to the cost of construction. Environmental impacts resulting from the dewatering would be substantial; therefore, this configuration was screened out from further analysis.

4.2.3.1.3.4 Bank Stabilization Option 4, Soldier-Pile Wall and Riprap

This option is similar to the sheet pile wall discussed above. It consists of utilizing intermittently spaced piles, commonly referred to as soldier piles, which form part of the main structural resisting system. As opposed to the driving method of embedding the sheet piles, the soldier piles can be installed into pre-drilled holes and grouted in-place. Horizontally spanning members, commonly referred to as lagging, span between the soldier piles and collect most of the retained earth pressures which are then transferred to the soldier piles. A concept of the Soldier-Pile Wall is provided in **Figure 37**. Riprap will be used to reinforce the upstream and downstream ends of the wall.

Since driving the piles can be avoided, construction is not likely to affect existing structures and foundations. This option also presents the least environmentally damaging impacts to natural resources, cultural artifacts, and UXOs; therefore, this configuration was selected as the Bank Stabilization structural design for Alternative 4.

*4.2.4 Final Array of Alternatives**

As a result of the above evaluation and Vertical Team coordination, the following were identified as the final array of alternatives:

- Alternative 1.A (Buyout);
- Alternative 3 (Optimized Levee);
- Alternative 4 (Bank Stabilization);
- Alternative 5 (Bank Stabilization and Buyout); and
- Alternative 6 (Combination of Alternative 1.A and 5, but with a modified buyout footprint to capture parcels within Ward 8 and outside the levee alignment).

*4.2.4.1 Description of Work to be Performed**

*4.2.4.1.1 No Action Alternative**

The NAA is based upon a 50-year POA in which no work is performed. This alternative is representative of the FWOP condition which is the baseline from which to evaluate all other alternatives.

*4.2.4.1.2 Alt. 1A: Buyouts**

Approximately 25 parcels were identified within the buyout footprint encompassing approximately 170 acres as shown in **Figure 26**. Implementation of this alternative would require acquisition of structures and relocation of inhabitants. Structures would then be demolished. Staging areas for demolition would be located within each parcel. Access would be obtained using existing roads. This alternative would take approximately 18 months to complete.

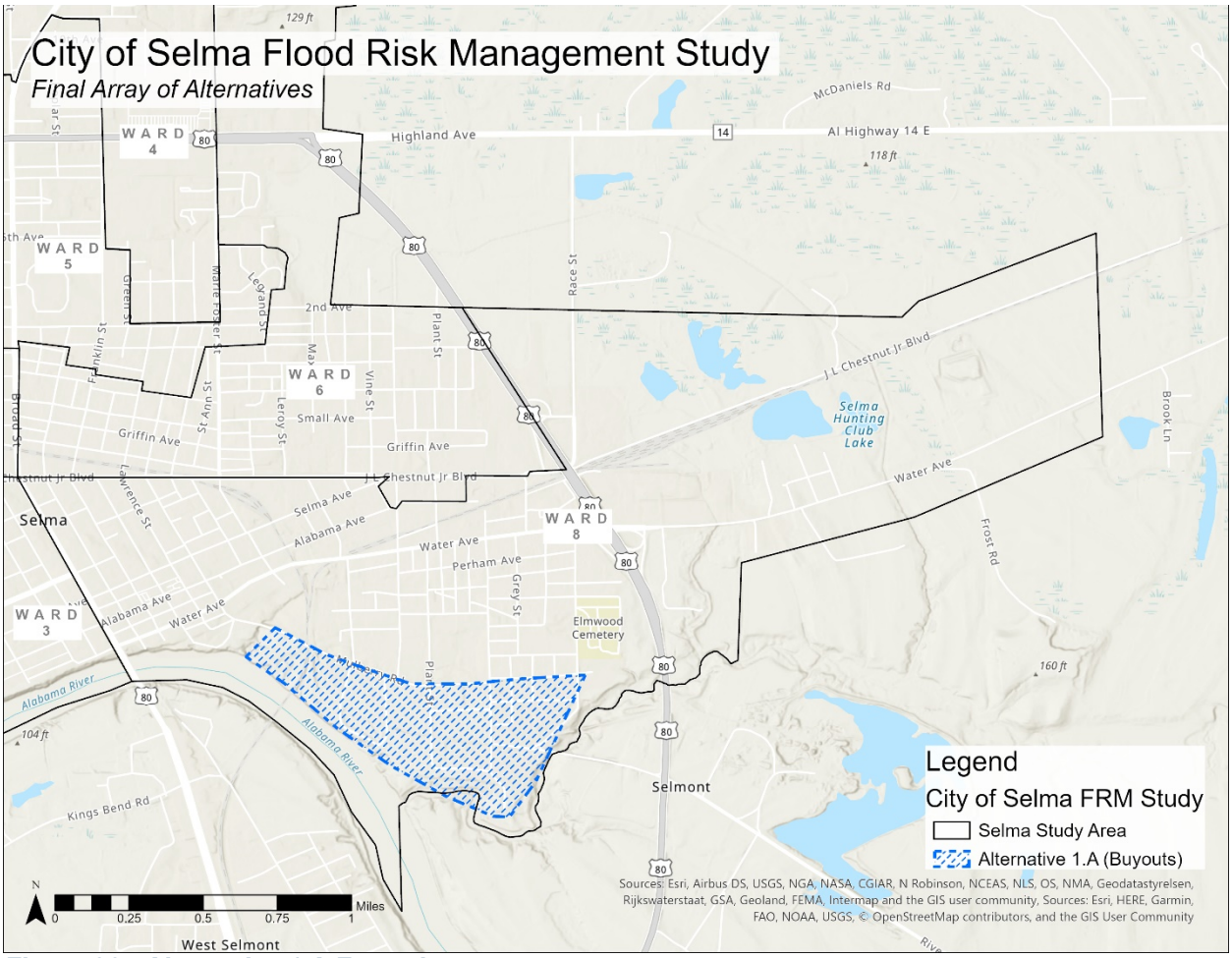

Figure 26: Alternative 1.A Footprint

*4.2.4.1.3 Alt. 3: Optimized Levee Alignment**

The entirety of the Alternative 3 optimized levee alignment is shown in **Figure 27**. This alignment is comprised of two components: (1) "new" levee construction, and (2) U.S. Highway 80 revetment and reinforcement. The alignment would span approximately 1.6 mi of "new" levee construction across the southern portion of Ward 8 and approximately 2.0 mi of U.S. Highway 80 revetment and reinforcement for a total of 3.6 mi. The base of the "new" levee within Ward 8 would span approximately 94-ft wide; therefore, the "new" levee construction would encompass approximately 18 acres. Two flood gates would be placed at intersections along U.S. Highway 80. **Table 15** itemizes the quantities of fill material for each section of the alternative. Disposal areas would be required to place excavated material. Staging areas would also be required to contain all construction material necessary to build the levee and reinforce U.S. Highway 80; however, potential locations for this alternative have not been identified. Access would be obtained using existing roads. This alternative would take approximately 36 months to complete.

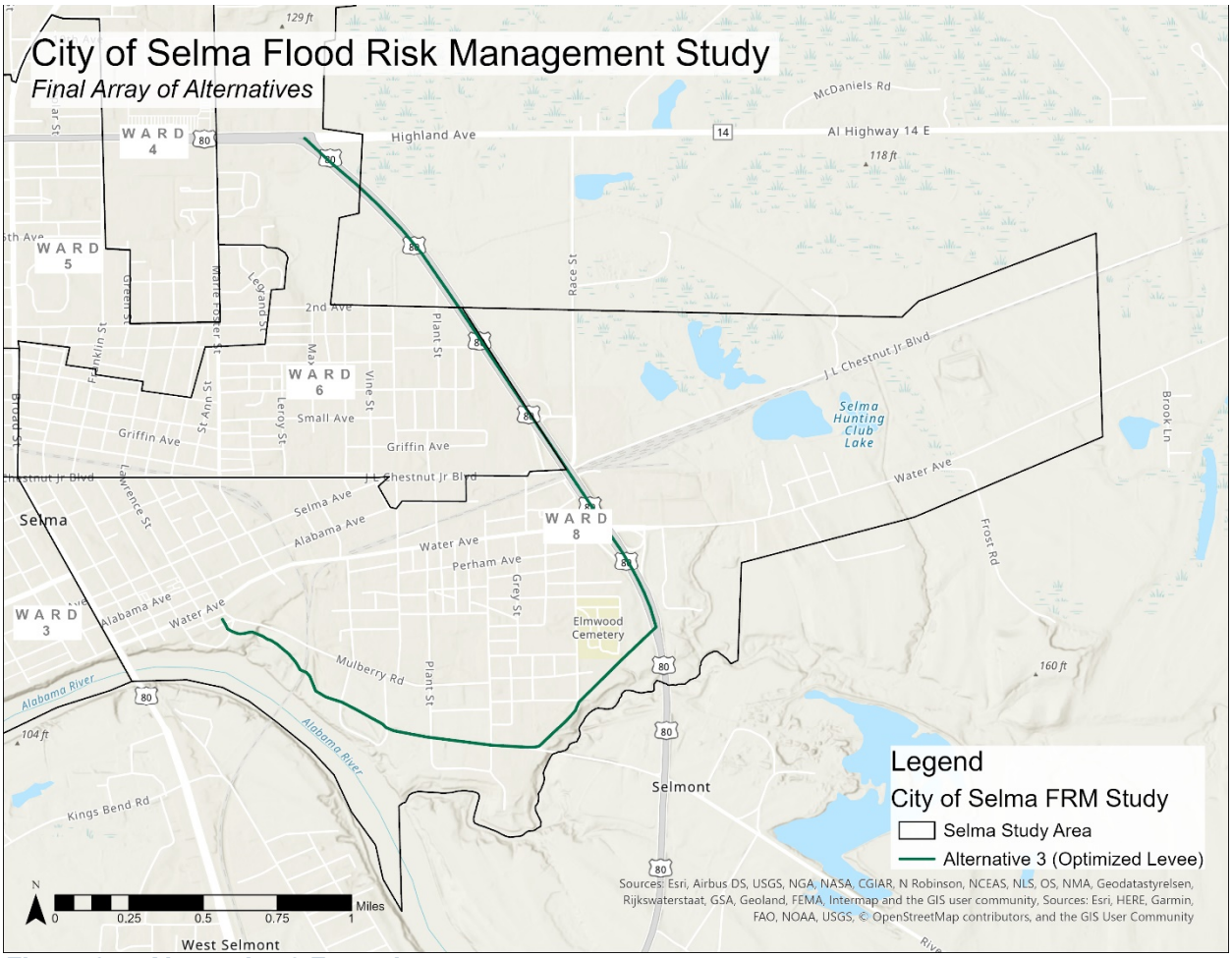

Figure 27: Alternative 3 Footprint

Table 15: Levee Alignment Fill Materials and Quantities

Material	Levee (1.6 mi)	U.S. Highway 80 (2.0 mi)
Clay Core	80,592 cy	40,000 cy
Select Fill	241,777 cy	60,000 cy
Total Fill	322,369 cy	100,000 cy

*4.2.4.1.4 Alt. 4: Bank Stabilization**

The footprint for Alternative 4 is shown in **Figure 28**. Staging, construction, and access would occur from the Alabama River. **Table 16** is a preliminary/conceptual estimation of materials and quantities necessary for construction. Approximately 96 H–Piles would be set at approximately 8-ft on center throughout the approximate 1,000 linear ft of design length and would be drilled in place. Tiebacks would be required for each H-Pile. Concrete wall panels will be placed between each H-Pile and riprap will cap each end. The geotechnical investigation along Water Avenue was conducted in January 2021. The H-Piles would be lowered into holes drilled using equipment such as an auger, then each H-Pile would be grouted at the location of each hole using material similar to Portland cement concrete. At this phase of the study it has not been determined if clearing and grubbing of the riverbank would be required; however, the maximum potential vegetation

removal would encompass eight (8) acres. In total, this alternative would take approximately 30 months to complete.

Table 16: Soldier-Pile Wall Materials and Quantities

Material	Quantities per ~1,000 linear ft
H-Piles (lengths vary from 10-ft to 50-ft)	96 (approximate)
Steel Anchor Tiebacks	188 (approximate)
Concrete Lagging	465 cy
Geotextile Fabric	10,000 square yards (sy)
Granular Fill	12,500 cy
Sand Fill	1,900 cy
Riprap	12,333 cy
Total Fill	**26,733 cy (approximate)**

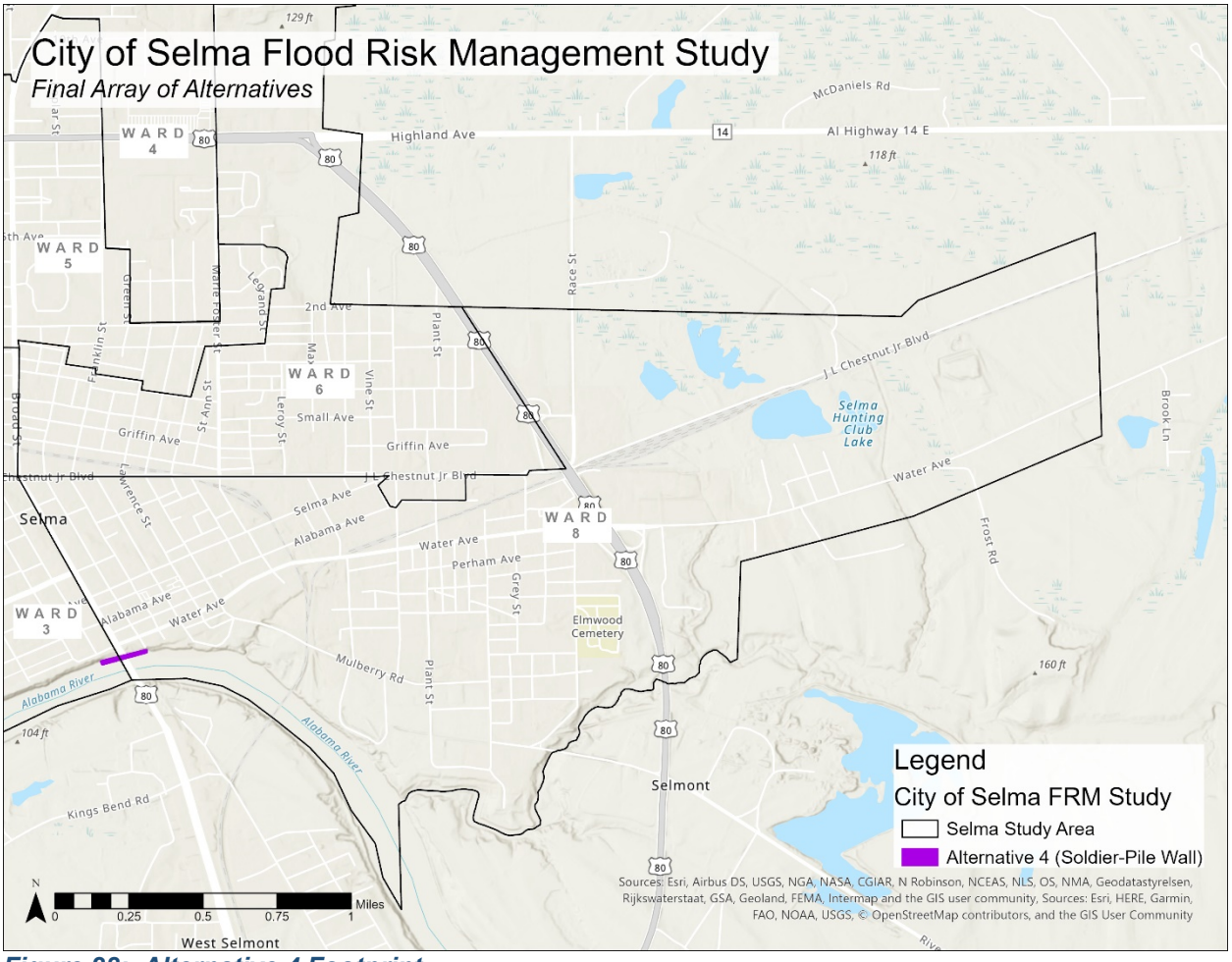

Figure 28: Alternative 4 Footprint

*4.2.4.1.5 Alt. 5: Bank Stabilization and Buyout**

Alternative 5, shown in **Figure 29**, is a combination of Alternatives 1.A and 4 accounting for approximately 178 acres. This alternative would take approximately 30 months to complete.

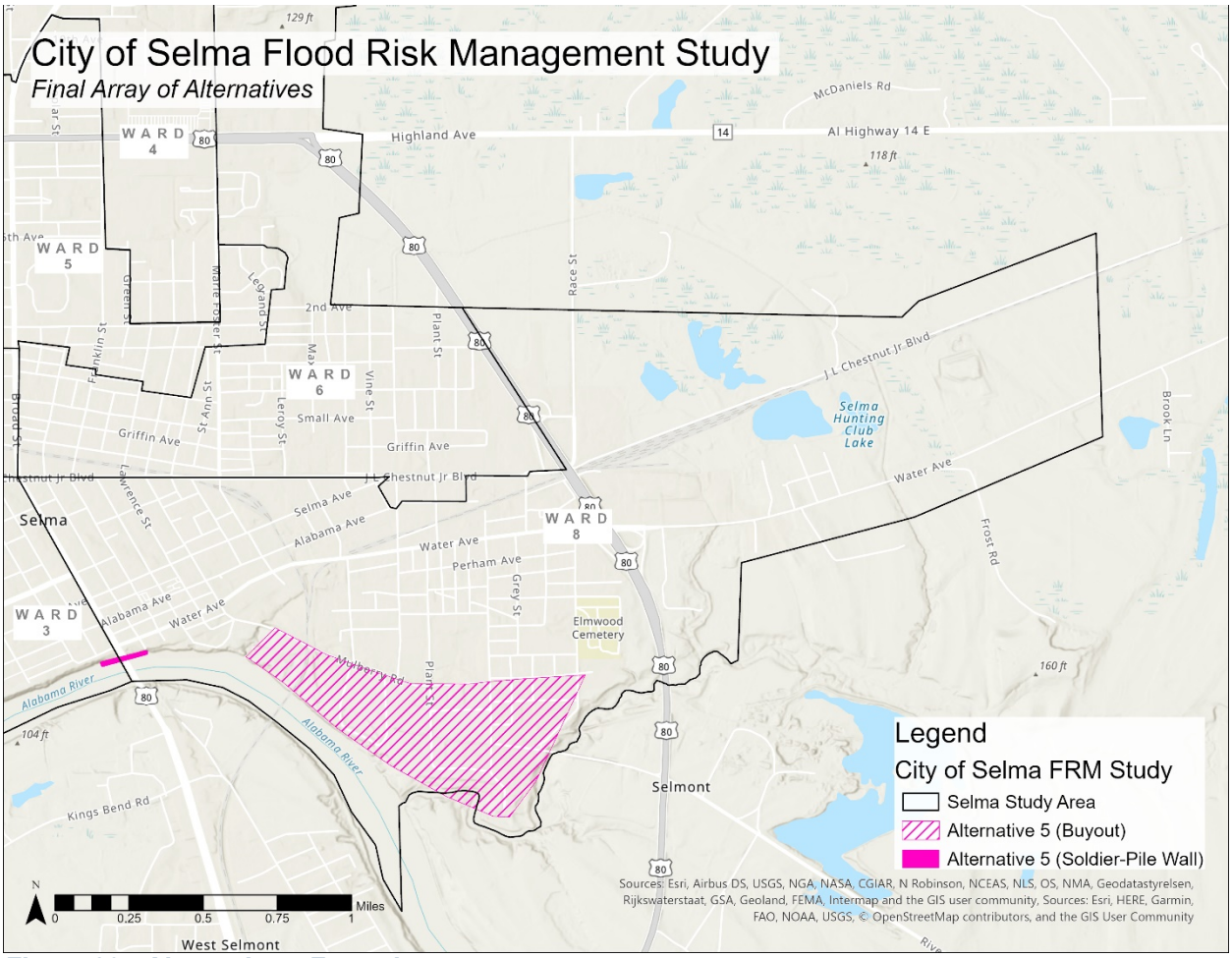

Figure 29: Alternative 5 Footprint

*4.2.4.1.6 Alt. 6: Optimized Levee Alignment, Bank Stabilization, and Buyout**

Alternative 6 is a combination of Alternatives 3 and 5 with the exception of buyout footprint, as shown in **Figure 30**. A total of nine (9) parcels in Ward 8 identified within the 68-acre buyout footprint for this alternative would be located outside the levee alignment. This alternative would take approximately 42 months to complete.

4.2.4.2 Comparison of Final Array

The alternatives were then evaluated using the objective/constraint criteria, engineering feasibility and cost, and assessed in the four P&G accounts of NED, RED, EQ and OSE. The NED analysis determines the plan that maximizes net benefits to the Nation. RED evaluates the regional economic activity of the study area. EQ is analyzed through the NEPA impacts analysis which is detailed in **Section 5.0**. The OSE assessed historic importance, life and safety, social connectivity, and social vulnerability. Additionally, a Least Cost Analysis was performed as directed.[1]

[1] Memorandum for the Commander dated July 16, 2020 from HQ USACE to SAD

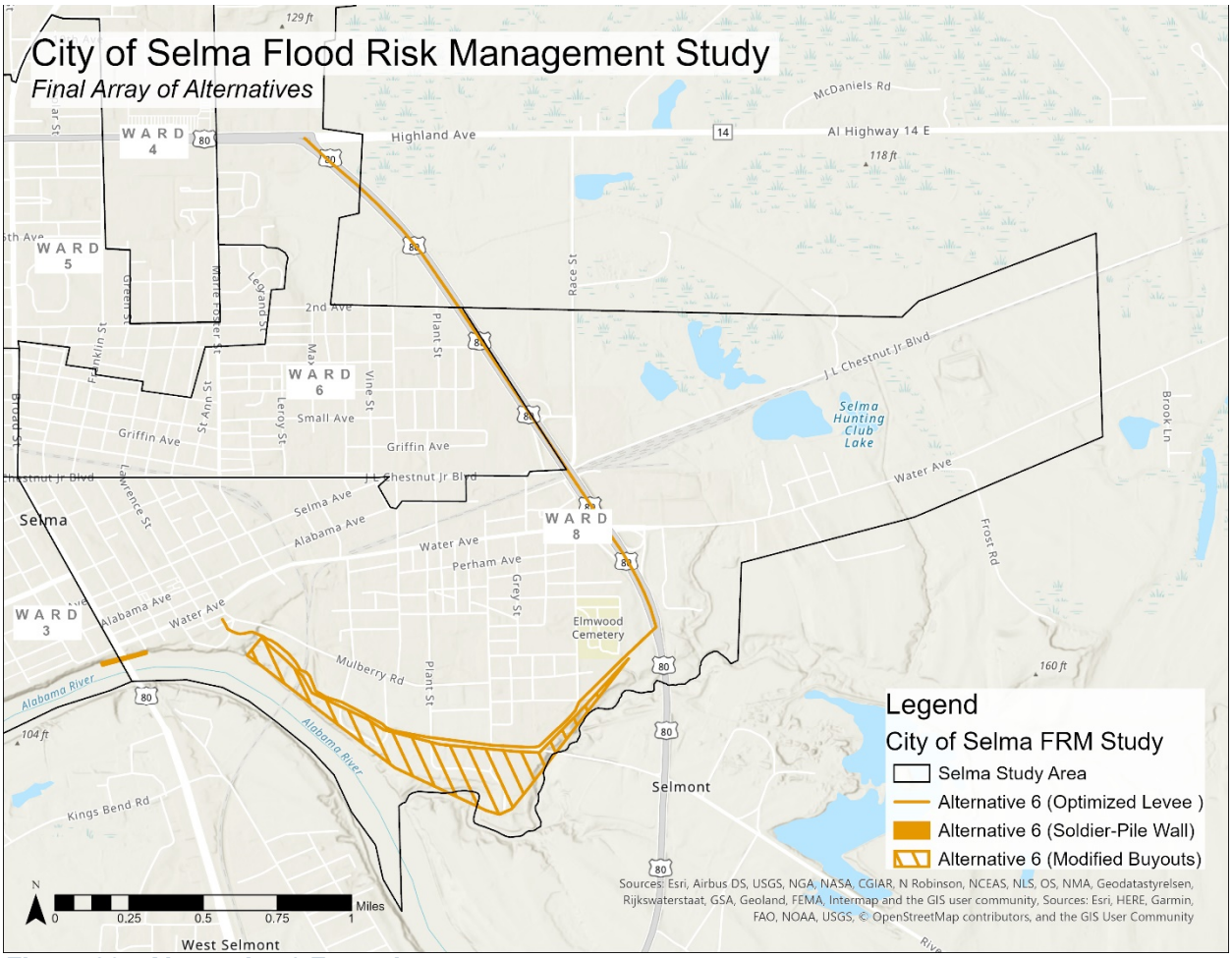

Figure 30: Alternative 6 Footprint

4.2.4.2.1 Economic Analysis

4.2.4.2.1.1 Economic Cost and Benefit Analysis (NED)

Continuing the evaluation process, first cost estimates were developed for the final array of alternatives that were evaluated. The ROM costs were provided by Mobile District's Cost Engineering Section based on October 2019 price levels. For comparison to the benefits, which are average annual flood damages reduced, the first costs were stated in average annual terms using the FY20 discount rate of 2.75% and a 50-year POA. The IDC was added to the ROM first costs assuming 18 months for Alternative 1.A, 36 months for Alternative 3, 30 months for Alternatives 4 and 5, and 42 months for Alternative 6. In addition, annual O&M costs were also added to the alternatives. **Table 17** displays the results of the costs calculation.

Table 17: Project Alternative Costs

Alternative	First Cost	IDC	O&M	Average Annual Cost
1.A	$4,950,000	$102,000	-	$187,000
3	$74,040,000	$4,167,000	$27,000	$2,924,000

Alternative	First Cost	IDC	O&M	Average Annual Cost
4	$27,537,000	$955,000	$4,000	$1,059,000
5	$32,400,000	$1,124,000	$4,000	$1,246,000
6	$104,860,000	$5,140,000	$29,500	$4,104,000

For the final array of alternatives, the equivalent annual benefits were then compared to the average annual cost to develop net benefits and a benefit-to-cost ratio (BCR) for each alternative. The net benefits for each alternative were calculated by subtracting the average annual costs from the equivalent average annual benefits, and a BCR was derived by dividing average benefits by average annual costs. Net benefits were used for identification of the NED plan in accordance with the Federal objective. For comparative purposes, **Table 18** summarizes the equivalent annual damages (benefits), average annual costs, first cost, net benefits, and BCR for each alternative. A range is presented to incorporate transparency in the estimation of benefits (reference **Appendix C** for more information). Risk-informed planning should incorporate transparency in the estimation of benefits. The primary role in dealing with risk and uncertainty is to characterize to the extent possible the different degrees of risk and uncertainty and to describe them clearly so that decisions can be based on the best available information.

Table 18: Final Array Comparison of Benefits and Costs

Alternative	Average Annual Benefits	Average Annual Costs	First Cost	Net Benefits	Benefit-to-Cost Ratio
1.A	$111,000	$187,000	$4,950,000	($76,000)	0.59
3	$361,000	$2,924,000	$74,040,000	($2,563,000)	0.12
4	$4,759,000-$36,000	$1,059,000	$27,537,000	$3,700,000-($1,023,000)	4.50-0.03
5	$4,870,000-$147,000	$1,246,000	$32,400,000	$3,624,000-($1,099,000)	3.91-0.12
6	$5,120,000-$397,000	$4,104,000	$104,860,000	$1,016,000 ($3,707,000)	1.25-0.1

As a result of the comparison of the alternatives, no alternatives were identified as NED Plans in accordance with the Federal objective; therefore, there is no NED plan.

Moreover, a NED Exception was granted for the Selma Alabama FRM Study (MFR from the ASA(CW) to HQ USACE dated June 10, 2020). In support of the approval that was granted by ASA (CW) for the NED Exception, HQ, USACE, in an endorsement MFR, dated 16 July 2020, allowed for an analysis of the erosion control measure using Section 14 methodology of the Flood Control Act of 1946 (Public Law 79-526), as amended, for emergency streambank and shoreline protection for public facilities and services. This methodology calls for formulation and evaluation of an alternative using the least cost approach. The plan is justified if the total cost of the alternative is less than the costs to relocate the threatened structures as stated below:

> *"The proposed TSP includes river embankment stabilization via a retaining wall to protect historic buildings in the downtown area adjacent to the Edmund Pettus Bridge. Stream bank stabilization can be considered in the formulation of a project for Selma in accordance with Section 1203 of WRDA 2018. It needs to be demonstrated that the recommended plan is the least cost plan to mitigate the erosion. That analysis has not been completed and it was not discussed in the exception request. The approach to formulating a project under Section 14 of the Flood Control Act of 1946, as amended, could be applicable to the Selma study. For Section 14 investigations, the formulation and evaluation of alternatives focus on the least cost alternative solution. The least cost plan is justified if the total costs of the proposed alternative are less than the costs to relocate the threatened facility. The monetary cost of relocation of the structures, and the potential impacts to historic resources including the view shed should be analyzed at an appropriate level of detail to determine the costs of relocation."* [2]

A range of construction methods was evaluated for Alternative 4, which included a range of bank stabilization techniques that were based on similar USACE projects. And the result from this least cost analysis is described in **Section 4.2.4.2.1.2** wherein the Soldier-Pile Wall is justified because the total costs of the proposed alternative are less than the costs to relocate the threatened facility. Moreover, the benefits for the Soldier-Pile Wall were not based on traditional FRM benefits (i.e., inundation reduction compared to the future without project condition), but instead benefits were derived using the methodology found in a Section 14 Study (i.e., as cost avoidance relocation). However, the benefits for the buyouts and levee were derived based on inundation reduction benefits.

4.2.4.2.1.2 Bank Stabilization Least Cost Analysis

As stated in **Section 1.1**, this study was granted the permission to continue evaluating bank stabilization in accordance with Section 1203 of Water Resources Development Act of 2018 as authorized.[3] Additionally, HQUSACE allowed for an erosion control measure using CAP Section 14 methodology of the Flood Control Act of 1946 (Public Law 79-526), as amended, for emergency streambank and shoreline protection for public facilities and services.[4] This methodology calls for formulation and evaluation of alternatives using the least cost approach. The plan is justified if the total cost of the proposed alternative is less than the costs to relocate the threatened structures.

In the case of the Selma FRM study, the control measure that reduces flood induced erosion is a Soldier-Pile Wall which is approximately 1,000 linear ft with riprap end caps and seeks to stabilize a portion of the northern bank of the Alabama River in Selma, Alabama. The approximately 10 structures along the proposed riverbank within this reach are within the Water Avenue Historic District, which is listed in the NRHP. Although the market value of these estimated 10 structures is approximately $5.4 million, the historic and regional economic value of these structures and what they represent for not only the City of Selma but for the nation and the local economy cannot be overstated. The structures are within the viewshed of the Edmund Pettus Bridge, one of the most

[2] *Id*.
[3] *Id*.
[4] *Id*.

recognizable Civil Rights sites in the U.S. and comprise the tourism hub of Selma, Alabama. Loss of these structures would be detrimental to Selma's economy and the negative economic impacts would reverberate significantly in Civil Rights tourism throughout the region of central Alabama (this is investigated more in the RED analysis).

Many of the threatened structures were constructed during the late 1800s or early 1900s making relocation exorbitantly expensive, if not impossible. Adding to the difficult nature of replacement cost is the fact that these structures were built on the edge of the bank, implying relocation would have to be carefully conducted brick by brick (i.e., deconstruction and then reconstruction). Taking these factors into account brings potential relocation costs to approximately $132.0 million.[5] This relocation effort would also reduce the historic integrity of these structures, jeopardizing their current listing on the NRHP, in addition to irrevocably altering the viewshed for the Edmund Pettus Bridge. **Table 19** outlines the least cost alternative method using the Section 14 methodology in which the cost analysis utilized the relocation cost as a base comparison.

Table 19: Bank Stabilization Least Cost Analysis

Alternative	Construction Costs	O&M Costs	Average Annual Cost
Relocation (base cost)	$132,000,000[6]	$0	Not evaluated
Soldier-Pile Wall	$27,537,000	$4,000	$1,059,000

4.2.4.2.1.3 Regional Economic Development Analysis (RED)

A qualitative assessment of assumed regional industry benefits, tourism, and income shared between Selma and local towns with Federal interest in the region (i.e., Maxwell/Gunter AFB, National Historic Landmarks/Trails, Navigation interest, etc.) was conducted. There are a number of top employers in the region that provide jobs to the residents of Selma and the surrounding area, they include: International Paper Company, Honda Lock-America, Bush Hog, and American Apparel, each employing more than 500 people between Selma and Montgomery.

The larger RED analysis demonstrated overall regional ties to various business interests (local and international) in the area. The local analysis within Selma shows a steady decline in population with fluctuations occurring with various plant closures and change over in textile industry needs as the nation/world move from hard textiles products to more computer-based commodities and outsourcing of jobs overseas. The RED analysis focused on heritage tourism in Selma, Alabama and its interdependency with other Civil Rights tourism in central Alabama.

The structural instability along Water Avenue, including properties, roadways, and utilities, present a direct threat to Selma's ability to maintain heritage tourism and thus a direct threat to the financial stability of the city, the county, and the region, as the annual Selma Bridge Crossing Jubilee attracts national and international visitors and vendors,

[5] Approximated costs are based on best professional engineering judgment. This value was further refined as explained in **Section 4.3.2.2.1**.
[6] *Id*.

many of whom tour the entire Selma to Montgomery Trail. The bank stabilization alternative provides RED benefits since this alternative proposes to reduce the likelihood of bank failure, thus protecting the regionally significant economic interest along Water Avenue.

With regards to buyouts and levees, there would be a temporary benefit to RED due to construction but over time, RED benefits would become zero sum. For the case of buyouts, it is assumed that due to the limited housing availability in Selma, residents would be relocated to Montgomery. Although this would create a positive economic impact in Montgomery (i.e., population increase), the impact to Selma would be negative.

In short, when the economic activity lost in the study area can be transferred to another area or region in the national economy, these losses cannot be included in the NED account. However, the impacts of the employment, income, and output of the regional economy are considered part of the RED account. The input-output macroeconomic model RECONS was used to address the impacts of the construction spending and buyout associated with the RECOMMENDED PLAN. For this Regional analysis, the RED effects of implementing the Alternatives are displayed in **Table 20**. Alternative 5 is not displayed within the table since it is a combination of Alternatives 1.A and 4, and using the first cost of Alternative 1.A (a buyout or acquisition measure) is not a suitable input to the RECONS model. Thus, in connection to the transitive property, it too would be inappropriate to use the addition of the first costs of Alternative 1.A and Alternative 4 as an input for the first cost of Alternative 5, hence its omission. A detailed discussion of the full RECONS results is included in **Appendix C**.

Table 20: Regional Economic System Model for Final Array of Alternatives

Factors ($000)	**Alt. 1.A Buyouts**	**Alt. 3 Optimized Levee**	**Alt. 4 Bank Stabilization**	**Alt. 6 Opt. Levee & Bank Stabilization & Buyouts**
First Costs	$4,950	$74,040	**$27,537***	$104,860
Local Capture	N/A	$43,908	$16,283	$62,185
Output	N/A	$54,034	$20,038	$76,526
Jobs	N/A	311**	115**	440**
Labor Income	N/A	$16,082	$5,964	$22,777
Value Added	N/A	$22,698	$8,417	$32,146
Results Discussion	Buyout costs may not be appropriate inputs to RECONS.	**Jobs generated are short-term resulting from construction spending.	*Excludes Buyouts **Jobs generated are short-term resulting from construction spending.	**Jobs generated are short-term resulting from construction spending.

4.2.4.2.2 Environmental Quality (EQ)

This report was developed to comply with NEPA, applicable Federal laws, Executive Orders, and USACE policies and guidelines. An EQ assessment of the direct, indirect, and cumulative impacts of affected resources is discussed in **Section 5.0**.

4.2.4.2.3 Other Social Effects (OSE)

Due to the unique social factors present in the City of Selma, an OSE analysis was conducted to assess any possible impacts the final array of alternatives may have on factors such as Historic Importance, Life and Safety, Community Resiliency and Cohesion, and Social Vulnerability.

The analysis found that a NAA would have negative impacts on all social factors. Properties listed on the NRHP would be threatened by bank failure. Life and safety concerns would be introduced by bank failure and subsequent infrastructure failure, in addition to property damage seen in Ward 8. Community Resiliency would be significantly reduced due to needed continuous repairs and replacement of infrastructure in Ward 8 and along the riverfront. Community Cohesion would continue to decline as the City would not be able to prioritize retention of businesses and residents. Social Vulnerability would intensify as threats to community cohesion and resiliency would continue.

For a non-structural alternative (buyouts/relocation), since the buyouts are outside of a known historic district, there are no anticipated impacts for Historic Importance. However, removing residents from the floodplain creates a beneficial impact in the Life and Safety Social Factor. Buyouts/Relocation, regardless of the magnitude, presents a beneficial impact to Community Resiliency as it lessens the burden of the City and its residents to repair and maintain structure and infrastructure within the floodplain. A buyout/relocation would have adverse impacts on Community Cohesion and Social Vulnerability. Many residents in the buyout area are low-income and due to Selma's limited housing market, many of these residents would be displaced outside of Selma and possibly outside of Dallas County. The relocated residents would likely incur a significant increase to their cost of living. The city of Selma would also lose a portion of its tax base.

A levee alternative produces significant negative impacts to the social vulnerability of Selma. Despite it immediately reducing life and safely risk from inundation provided by its protection, a levee also introduces new life and safety risk associated with potential failure. The alternative could have significant impact on any unknown cultural resources sites within the levee alignment but these impacts can be mitigated. While a levee would have positive impacts on Community Resiliency, Cohesion, and Social Vulnerability, as it would reduce the burden of repairs and the burden of providing essential emergency services associated with the structures and their residents in Ward 8, the deleterious O&M costs associated with this alternative would far outweigh the positive effects and thus be detrimental all social factors assessed. A limited buyout would have no effect on the factors of Community Cohesion and Social Vulnerability due to the buyout’s targeted nature.

A bank stabilization alternative produces positive benefits for all Social Factors assessed, particularly Historic Importance and Community Resiliency. Stabilizing the failing northern bank of the Alabama River will protect Nationally Registered properties, thus eliminating the city's burden of repairing and replacing infrastructure and preserving its commercial property tax base along Water Avenue. This would result in improved Community Resiliency. This alternative also reduces Life and Safety concerns associated with roadway cave-ins and structure condemnations. This alternative will

have more indirect impacts to Social Factors such as Community Cohesion and Social Vulnerability as it can be reasonably assumed that the City of Selma would be able to prioritize resident and business retention and attraction due to the revitalization of one of the top tourist destinations in the region.

4.2.4.3 Evaluation and Screening Discussion of Final Array

An impacts analysis (**Section 5.0**) was performed for each alternative within the Final Array and was used in the decision-making/screening process through consideration of adverse and beneficial impacts.

4.2.4.3.1 Alternative 1.A (Buyout)

Alternative 1.A is not economically justified, does not improve community resilience, and provides no protection to historic resources along the threatened riverbank.

Although a NED Exception was endorsed for the Selma Alabama FRM Study it was determined that buyouts do not provide the best solution to flooding concerns within the City of Selma.[7] As no buyout plan was incrementally justified on net annual benefits, the primary driver for addressing flooding is life safety. Successful implementation of a FMEEP provides a more cost-effective solution to addressing life safety than buyouts. Based on a qualitative assessment of the velocity and depth of flooding and the nature of the floodplain, a blueprint was developed for a FMEEP for certain areas of Selma.

Furthermore, this alternative may be impacted by the sponsor's willingness to prioritize the buy-outs and provide the upfront funding, their ability to provide the resources for the acquisitions and relocations, the limited availability of DSS housing within the city, and the USACE requirement that buy-outs be mandatory in accordance with P.L. 91-646.

For these reasons, this alternative was not selected as the Recommended Plan.

4.2.4.3.2 Alternative 3 (Optimized Levee Alignment)

As shown in the P&G Accounts analysis, Alternative 3 is not economically justified, does not protect historic resources along the Alabama River, and adversely impacts the human and natural resources in the surrounding area through induced flooding. Construction of the optimized levee would require mitigation from induced flooding for the affected areas in Selmont and downstream reaches of the Alabama River. O&M costs of the optimized levee would exceed what the City of Selma could provide. Though Alternative 3 would address the problems and meet the objectives of the study, this alternative was not selected as the Recommended Plan due to the economic viability of the alternative.

4.2.4.3.3 Alternative 4 (Bank Stabilization)

The P&G Accounts analysis shows that Alternative 4 would provide the most benefits under RED and OSE. ER 1105-2-100 describes the process for the calculation of benefits for an FRM study; however, the majority of benefits for an FRM study using the HEC-Flood Damage Reduction Analysis model largely accrue from inundation reduction benefits. The model fails to capture the damage(s) that may be caused by the repeated inundation of foundations and soils sitting on a bluff, as the case for Selma's Historic

[7] HQ USACE, *supra*.

Riverfront. According to the Engineering study, the historic structures in Selma are threatened by erosion. The erosion process is associated with, but not limited to, the slow and lengthy flooding from the Alabama River which saturates the underlying Mooreville Chalk geologic layer. The chalk is somewhat impervious, causing concentrated groundwater to exit the bank slopes within the overburden material as this layer becomes saturated. This continual process could potentially result in material loss beneath the building foundations which, over time, would destabilize the buildings.

Consequently, this study utilizes the approach to formulating a project as applied under CAP Section 14 of the Flood Control Act of 1946, as amended. As in Section 14 projects, the formulation and evaluation focus on the least cost alternative solution and that alternative plan is considered to be justified if the total costs of the alternative is less than the costs to relocate the threatened facility. The costs for the relocation of the structures and the potential degradation of the historic viewshed are evaluated in the comparison of the final array and the results are described in the System of Accounts. The Soldier-Pile Wall design is the most cost effective and least environmentally damaging. Combined with an FRP, Alternative 4 was selected as the Recommended Plan.

4.2.4.3.4 Alternative 5 (Bank Stabilization + Buyouts)

As stated in **Section 4.2.4.3.1**, it was determined that buyouts were not an effective approach to address flooding concerns within the City of Selma given that a FRP could better address life safety concerns and would be a more cost effective solution. Combined with the challenges of the real estate requirements, buyouts were removed from further discussion. As such, Alternative 5 was not selected as the Recommended Plan.

4.2.4.3.5 Alternative 6 (Bank Stabilization + Optimized Levee Alignment + Modified Buyout)

Because buyouts and an optimized levee design were not selected as the Recommended Plan, as discussed in **Sections 4.2.4.3.1** and **4.2.4.3.2** neither was Alternative 6. Alternative 6 would provide no additional benefits through the combination of the two alternatives. Though the buyout location for Alternative 6 is located in a separate footprint, the same principle applies in that the City of Selma would be better served to implement a FMEEP. Additionally, the City of Selma would have limited capacity to acquire the real estate and maintain a levee system.

Alternative 6 is a more complete plan but comes with significant risk from an environmental impacts assessment and a cost to the overall project or with regards to the sponsor's ability to pay. Alternative 4 is the preferred plan as it meets study objectives, avoids constraints, unlike with a levee alignment that have significant environmental impacts.

4.3 Recommended Plan*

(This section is also known as the Proposed Action for NEPA purposes)

4.3.1 Recommended Plan During Draft Public Review

The Recommended Plan during the Draft Public and Agency Review period was Alternative 4 in conjunction with a FMEEP measure. **Figure 31** depicts the conceptual

design and footprint for the Soldier-Pile Wall. The FMEEP would identify hazards within the city limits, discuss effects of flooding and provide recommendation for addressing flood risk through responsible future development of the floodplain. The FMEEP would also provide a detailed plan for the City to implement the use of emergency notification and evacuation of flood prone areas in the event of an approaching flood event.

Figure 31: Site Plan for Bank Stabilization

*4.3.1.1 Design and Construction Methods**

Bank stabilization would be achieved through a Soldier-Pile Wall with riprap caps on the upstream and downstream ends. Construction of the wall would be accomplished via barge from the Alabama River. Potential staging areas to load barges would be determined during PED. Access would be obtained via river. The conceptual design including construction materials was developed in order to estimate first costs of the alternative, which are listed in **Table 16**.

Figure 32 depicts an artist's rendering of the Soldier-Pile Wall to provide the Public with a visualization and does not reflect the exact quantities associated with the engineering design drawings. Prior to construction, any UXOs within the footprint would be identified and relocated. Additionally, coordination with the USFWS, including relocations for Tulotoma Snails within the footprint, would be required prior to any ground disturbance activities.

Figure 32: Bank Stabilization Conceptual Artist's Rendering

4.3.1.2 Four Planning Criteria

To address the Four Planning Criteria, a synopsis of the Recommended Plan only is listed below; however, following the Smart Planning Process ensured adherence to the criteria listed below:

- *Acceptable*: The City of Selma supports the bank stabilization because it will limit the flood induced erosion threatening the historic landmarks along the Alabama River adjacent to the Edmund Pettus Bridge. Coordination with Federal and State Agencies aims to achieve satisfaction through compatibility with laws, regulations, and policies. The plan is feasible from a technical perspective as it relates to engineering constructability, has minimal environmental impacts, and is policy compliant.[8]
- *Effective*: The plan addresses the specific FRM problems by developing a FMEEP which addresses loss of life and residual risk through cost effective means. **Section 2.0** stated one problem for this study is the existing erosion occurring along the downtown Selma riverbank. This plan limits the flood induced erosion threatening the historic structures that sit along the riverbank by armoring. This plan also reduces shoaling downstream by reducing erosion rates of the riverbank within the Recommended Plan footprint; therefore, this plan alleviates the specified problems and achieves the specified opportunities.
- *Efficient*: Through incorporation of the FMEEP, the plan is the most cost-effective means of alleviating the specified problems. Additionally, selection of the Soldier-Pile Wall construction method produces the most efficient means of achieving bank stabilization as discussed in **Section 4.2.3.1.3**. The plan is the least damaging

[8] *Id.*

structural solution to the natural and human environment. This plan also provides a good/service by reducing erosion and sediment inputs into the Alabama River, thus potentially reducing the need for frequent dredging activities downstream.

- *Complete*: Extensive Vertical Team coordination was conducted to thoroughly evaluate all alternatives which ensures that this Recommended Plan is well thought out. The plan does not rely on Federal/State Agencies or other non-project components to achieve implementation or benefits. Regardless of the evaluated benefits, riverbank stabilization and FMEEP is in the public interest. The plan addresses the study goals and objectives to reduce the life and safety risk to persons within the floodplain through effective evacuation methods. The plan also reduces flood induced erosion which threatens the historic landmarks/structures along the Alabama River by armoring the riverbank. The plan provides and accounts for necessary investments and actions to ensure realization of the planned FRM goals and objectives specific to the Recommended Plan.

4.3.1.3 Four Planning Accounts

Per ASA(CW) Memorandum dated January 5, 2021, Subject: Policy Directive – Comprehensive Documentation of Benefits in Decision Document, **Table 21** summarizes the Four Planning Accounts.

Table 21: Summary of the Four Planning Accounts Assessed for the Recommended Plan

Benefit Category	Soldier-Pile Wall
NED	Is the Least Cost Plan
RED	Would generate over 200 full-time equivalent jobs, over $10 million in labor income, and $18 million in gross regional product.
OSE	Produced positive benefits for all Social Factors assessed, particularly Historic Importance and Community Resiliency.
EQ	Assessed environmental impacts and determined that no significant impacts to resources within the study area would occur.

4.3.1.4 Life Safety and Residual Risk

Modeled flood frequency events suggest that life safety risks in the study area are primarily due to high flood elevations or water depths, lack of access for emergency vehicles, and the potential of localized areas with high velocities of flowing flood waters. Flooding within the study area of Selma, Alabama is primarily observed in Ward 6 and Ward 8, which is located on the upstream right bank of the Alabama River near downtown Selma. Ward 8 is the first area where flooding typically occurs and the flooding of structures such as buildings located along and near the banks of the Alabama River in downtown Selma begins at the 0.04 AEP flood stage (25-year event). At this stage, flood depths are minor (less than 1 foot) and have minimal impacts to the structures. Life safety

risk with respect to these depths is very low and major highways are still accessible by motor vehicles. Flood depths and life safety risks increase as flood waters begin moving inland into Ward 8 at the 0.02 AEP flood stage (50-year event). Flooding of some structures along the river are over 2-ft and several access roads to the area closest to the Alabama River begin to flood, cutting off access to the structures being flooded at the 0.02 AEP stage. Flooding becomes widespread throughout Wards 8 and begins in Ward 6 at the 0.01 AEP flood stage (100-year event) with flood depths in excess of 6-ft in some locations of Ward 8.

Hydraulic modeling of Selma shows flood water velocities remain below 2-ft per second throughout most of the study area for all events modeled, which is considered a flow velocity for flood waters that presents little life safety risk. However, there are localized areas of higher velocities exceeding 5-ft per second in Ward 8. These are primarily at locations where the grade of the ground changes significantly and quickly, such as over elevated roadways. It is also possible that additional localized high velocity zones may occur during flood events but are not observed in model results. For instance, overflowing stormwater outfalls and culverts have not been modeled in the urban area to a degree that would accurately show some resulting localized high velocity zones.

The recommendation to address life safety in these areas through the FMEEP, which is part of the Recommended Plan, would address life safety in two ways. First, it would provide the City of Selma with a comprehensive plan to direct evacuations of areas forecast to experience flooding. The Alabama River is a slow-moving river due to the gradual sloped terrain below the fall line, where the topography transitions from fairly-steep in the headwaters of the basin to extremely flat in the vicinity of Selma. Flooding in Selma from the Alabama River is typically the result of significant precipitation occurring in the middle of the basin near Childersburg and Gadsden, Alabama as well as the northern portion of the basin near Rome, Georgia. Flood waters from these locations typically take several days to reach peak stage at Selma, Alabama; therefore, a properly utilized emergency evacuation component would provide adequate time for the City to prepare and move residents out of flood prone areas. Flood forecasting is currently provided by the Southeast River Forecast Center using existing stream gages near Selma, at the Robert F. Henry Lock and Dam, and within Montgomery, Alabama; however, an evacuation plan would assist the City in directing the evacuation of residents based on certain forecasted flood elevations. This would include recommended locations to be evacuated, safe evacuation routes, and identification of those locations that would be inaccessible, all based on a forecasted flood elevation. Second, the floodplain management component would address future use of the floodplain within the city limits. As structures are condemned in the future and residents move out of heavily flood prone areas, responsible redevelopment of the floodplain or prohibiting development in the floodplain can reduce residual and life safety risk in the future.

Residual Risk is the flood risk that remains in the study area after a Recommended Plan is implemented. The existing residual risk would be neutral or the same with the plan in place without further implementation of the FMEEP. In theory, this plan could reduce flood risk with respect to life safety and flood damages (by preventing redevelopment) from the areas it covers. If followed, residents could have adequate time to fully evacuate. In practice, this will greatly reduce life safety risk but not eliminate it. Even mandatory

evacuations are often ignored by residents who decide to accept the risk of remaining in flood prone locations during a flood event. Historically, it has been impractical to fully enforce a complete evacuation of an area. Furthermore, future floodplain management of the area will ultimately be at the discretion of the City of Selma to enforce. It will likely involve local legislation to enforce the recommendations laid out in the floodplain management portion of the plan to prevent residential redevelopment of the floodplain. In this case, residual risk is directly correlated to the degree at which this document is utilized and enforced by the City of Selma.

Risks associated with the Soldier-Pile Wall are not directly tied to flood risk. However, as with any structure, there is risk associated with failure. The piles for the wall are augured into the ground and anchored into the bank with tiebacks. It is possible that failure of the piles or a tieback could occur, however the wall is being designed with appropriate recommended factors of safety to reduce this risk. Since this wall is intended to have a walking path on top of the compacted backfill, it is possible that a catastrophic failure of the wall could lead to risk of loss of life for anyone on the walkway. However, this is highly unlikely for two reasons. First, this would be caused by a design or construction deficiency in the wall. This would be very unexpected in general. Also, failure of the wall would almost certainly not be catastrophic; that is, an immediate and sudden failure of the wall resulting in loss of containment of backfill into the river. Failure would likely be gradual and occur over time allowing for the hazard to be identified and access closed to the wall. Immediate risk to people located in the buildings along the bankline would also be very low. While the wall is designed to reduce erosion, it will not be bearing load from the structures. The remaining structures still have foundations that support each of them and, this will continue to be the case. Failure of the wall would not be expected result in a catastrophic failure any structures foundation. Therefore, risk to life safety for the wall is very low.

4.3.2 Refined Recommended Plan

The draft IFR/EA then underwent concurrent Public, Policy, and Agency review. Following the Agency Decision Milestone (ADM), field investigations were conducted to update the site plan and design of the bank stabilization to include Soldier-Pile Wall and other erosion control features as required. Additionally, comments received during the concurrent review process led to refinement of the FMEEP into a Flood Response Plan (FRP). Therefore, the Recommended Plan was refined and is Alternative 4 with an FRP.

*4.3.2.1 Soldier-Pile Wall Design Updates**

The Recommended Plan includes bank stabilization with a Soldier-Pile Wall along approximately 1,000 linear ft of the riverbank and bluff at the proposed project site. Cost optimization of the Soldier-Pile Wall occurred during the Focused Array of Alternatives evaluation, as discussed in **Section 4.2.3.1.3**. Refinement of the design utilized field investigations to determine alignment, embedment depths, Soldier-Pile lengths, tie-back requirements, material quantities, and other design parameters.

A conceptual site plan of the bank stabilization is shown on **Figure 33** and the real estate parcels are shown in **Figure 34**.

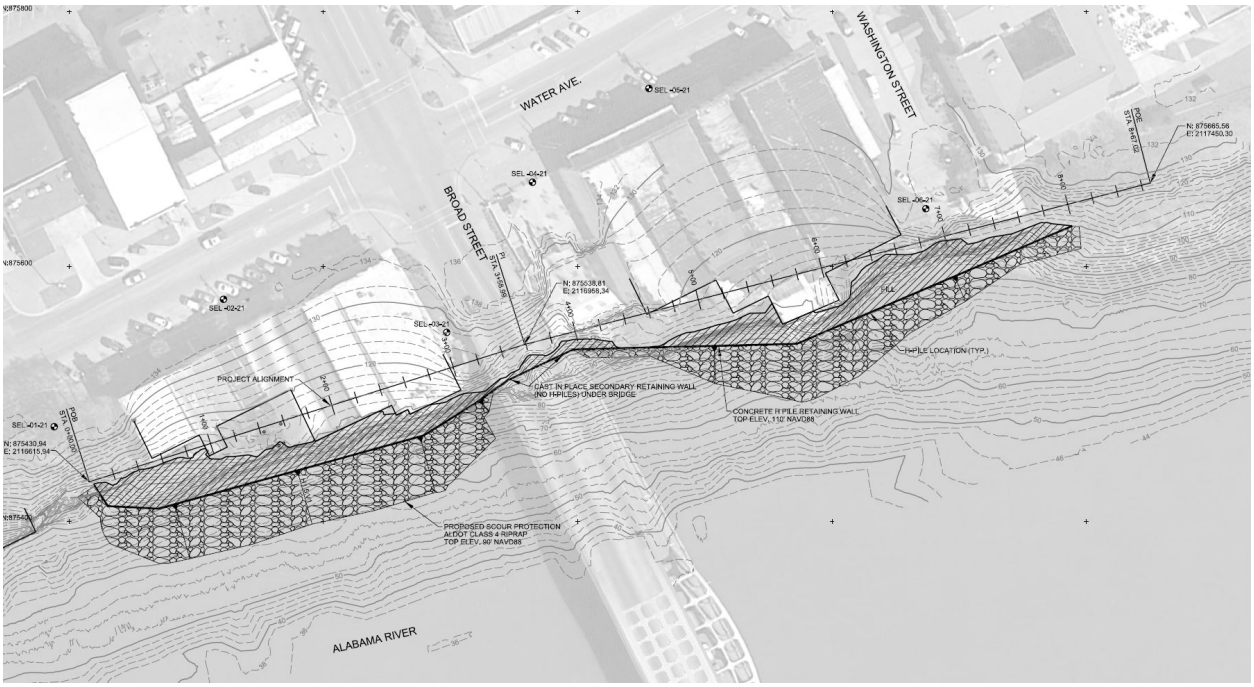

Figure 33: Refined Site Plan for Soldier-Pile Wall

Figure 34: Real Estate Parcel Mapping

The Soldier-Pile Wall will be constructed to a top elevation of 110-ft which is above the Mooreville chalk and overburden soil layer interface where groundwater seepage is observed and erosion is occurring. Additional erosion control features such as a secondary retaining wall and riprap may be implemented as required during the PED phase. Soldier piles will be placed vertically into pre-drilled holes and grouted in place and reinforced precast concrete lagging panels will be installed between each soldier pile creating a retaining wall structure. Tie-back anchors will be installed at multiple levels between soldier piles and the riverbank to provide lateral support. Installation of piles directly under the bridge would not be practical considering the limited vertical clearance and obstruction to crane support. Where required to pass under the bridge, a shorter, cantilevered reinforced concrete wall or T-wall section of bank stabilization is being considered. Based on the proposed wall alignment, the toe elevation of the cantilevered concrete or T-wall section under the bridge will be in the range of approximately 90-ft to 100-ft (i.e., above the Alabama River normal pool elevation, 84.3-ft NAVD88 and would not require cofferdams for construction). Integral to the bank stabilization plan would be a drainage system constructed to address both seepage waters and flood waters behind the lagging wall. This drainage system would employ a very porous gravel backfill material (e.g., #57 stone) behind the wall to adequately drain during river drawdown events. Filter/geotechnical fabric will completely wrap the gravel backfill material to prevent seepage waters from eroding upper horizon soils. The drainage system will include a perforated header pipe extending parallel to the slope of the bank with laterals which outfall to the face of the lagging wall. Grouted riprap will be placed behind the wall at the “heal” (i.e., bottom of wall) to retain backfill material from escaping beneath any potential voids at the interface of the bottom of the Soldier-Pile Wall and the riverbank. Graded topsoil and seeding will be placed above the top of the wall sloping back to the buildings along the riverbank at a slope no greater than 5:1 (H:V) to allow for mowing and maintenance. Field investigations and surveys completed during the study found that the elevations where the building foundations intersect the bluff vary along the bluff in the project area from approximately 108-ft to approximately 128-ft. A secondary cast-in-place retaining wall structure is proposed to be constructed in areas along the proposed project site where determined necessary to retain soils above the top of wall elevation of 110-ft. Conceptual section views of the bank stabilization with and without the proposed secondary retaining wall are shown on **Figure 35** and **Figure 36**, respectively.

Modification to the conceptual bank stabilization design such as riprap end caps, additional scour protection at the toe of the wall, and other erosion control features may be determined necessary during Preconstruction, Engineering, and Design (PED). Additional details of design analysis and supporting documentation can be found in **Appendix A - Section A.8**.

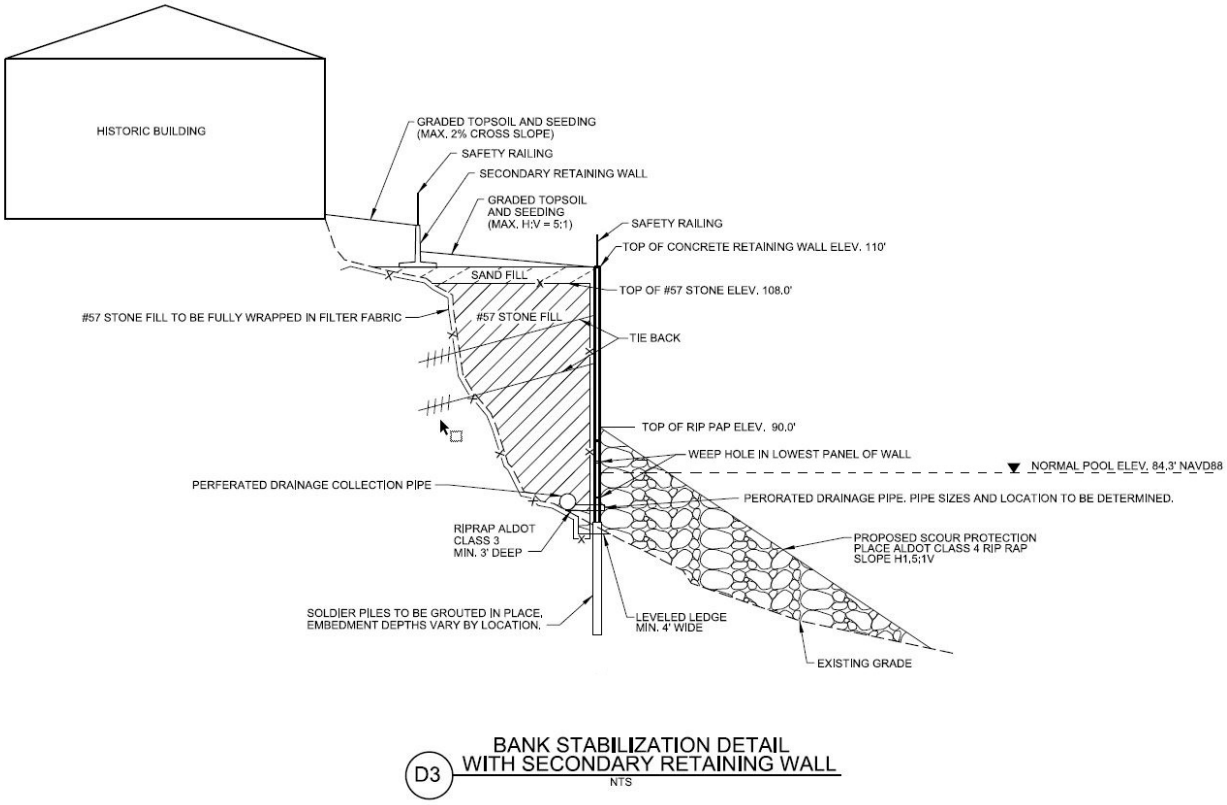

Figure 35: Conceptual Section View for Bank Stabilization in areas where secondary retaining wall is required

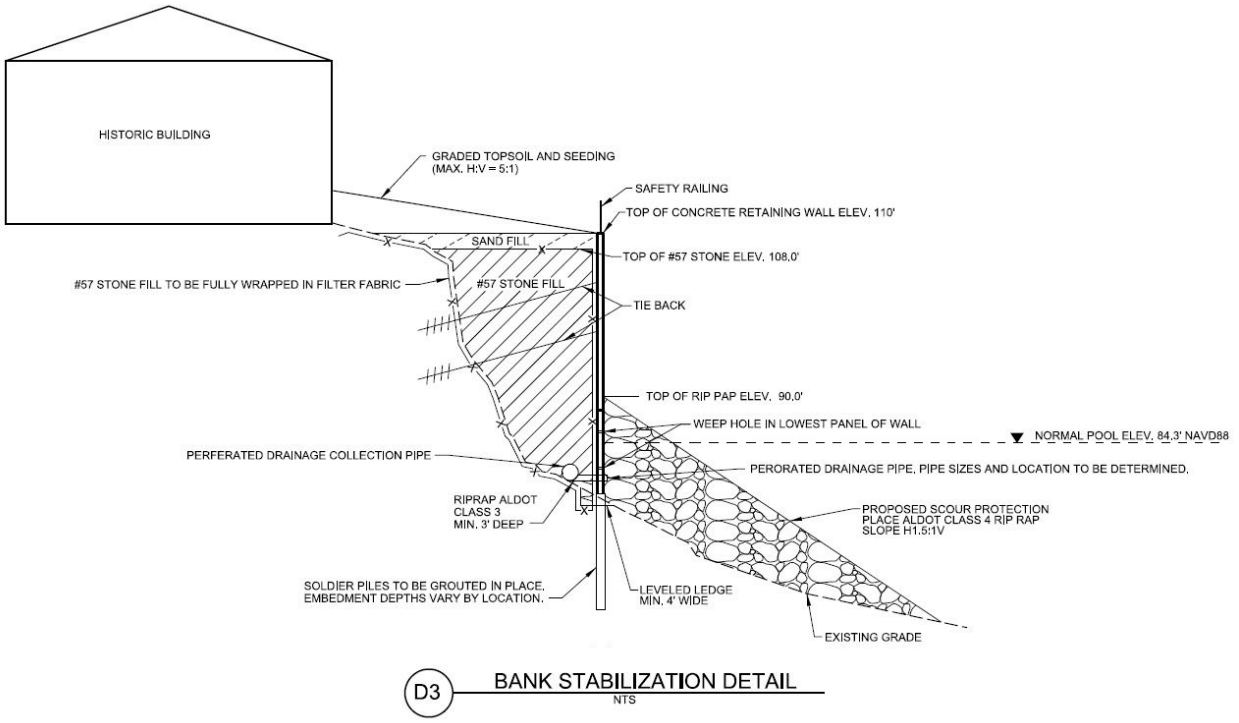

Figure 36: Conceptual Section View for Bank Stabilization in areas where secondary retaining wall is not required

4.3.2.1.1 Design Considerations – Threatened Structures

There are 10 structures located along the riverbank adjacent to the footprint of the Soldier-Pile Wall. As shown in **Image 1**¸ **Image 2**, and **Image 3**, most buildings appear to be within 10-ft of the top edge of the bank (where the bank line drops abruptly).

The original structures are composed of unreinforced load bearing masonry walls. More specifically, the masonry walls are a multi-wythe system where the wythes are directly tied together with header bricks and are not separated by a cavity. These walls either extend down to a concrete wall footing or potentially bear upon the rock that can be seen in available photos. The load bearing masonry also may bear upon slightly wider concrete foundation walls.

The floors and roofs are supported with wood framing and sheeting. The majority of the structures are in need of immediate maintenance in order to ensure their continued preservation.

4.3.2.1.2 Design Considerations – Structural

Due to the presence of the Mooreville chalk material below the surface and the proximity to threatened structures, the piles would be installed vertically into predrilled holes and grouted in-place. This encasement and soldier pile embedment would assist in resisting the bending moment developed from the driving forces exerted by the retained soil. The concrete lagging spans horizontally between these piles forming the retaining wall structure. In this scenario, the piles are cantilevered, and therefore tie-back anchors are used to decrease the required pile embedment depth, decrease the pile size, or increase the pile spacing. The use of tie backs is especially advantageous where walls exceed 15-ft in height. However, adequate space must be available to provide tie-backs. The theoretical concept for a Soldier-Pile Wall is illustrated in **Figure 37**.

Using existing geotechnical information, results from field investigations, and assumptions, a preliminary analysis and design was performed to determine an expected configuration of Soldier-Pile size, pile spacing, and thickness of concrete lagging. Results of the feasibility analysis and design recommend the use of W21x73 steel pile sections, pile spacing of 8-ft, and 8” thick concrete lagging panels. Additional details of design and analysis can be found in **Appendix A**.

4.3.2.2 Soldier-Pile Wall Refinements

Cost optimization of the Soldier-Pile Wall occurred during the Focused Array of Alternatives evaluation, as discussed in **Section 4.2.3.1.3**. As such, refinement of the design utilized field investigations to determine alignment, embedment depths, Soldier-Pile lengths, tie-back requirements, and material quantities.

4.3.2.2.1 Refined Benefits

One such refinement is the cost of relocation for those structures that made up the viewshed. As used to determine the Recommended Plan, the cost of relocation of these structures would be counted as the benefit of the Soldier-Pile Wall (i.e., cost avoided) because the opportunity cost of constructing the Soldier-Pile Wall to protect the viewshed would be the cost of relocating these structures. Therefore, the cost of relocation was further refined to include estimated component costs of relocation considering historic

data and concurrent USACE projects cost (e.g., the Selma Section 14) as shown in **Table 22**.

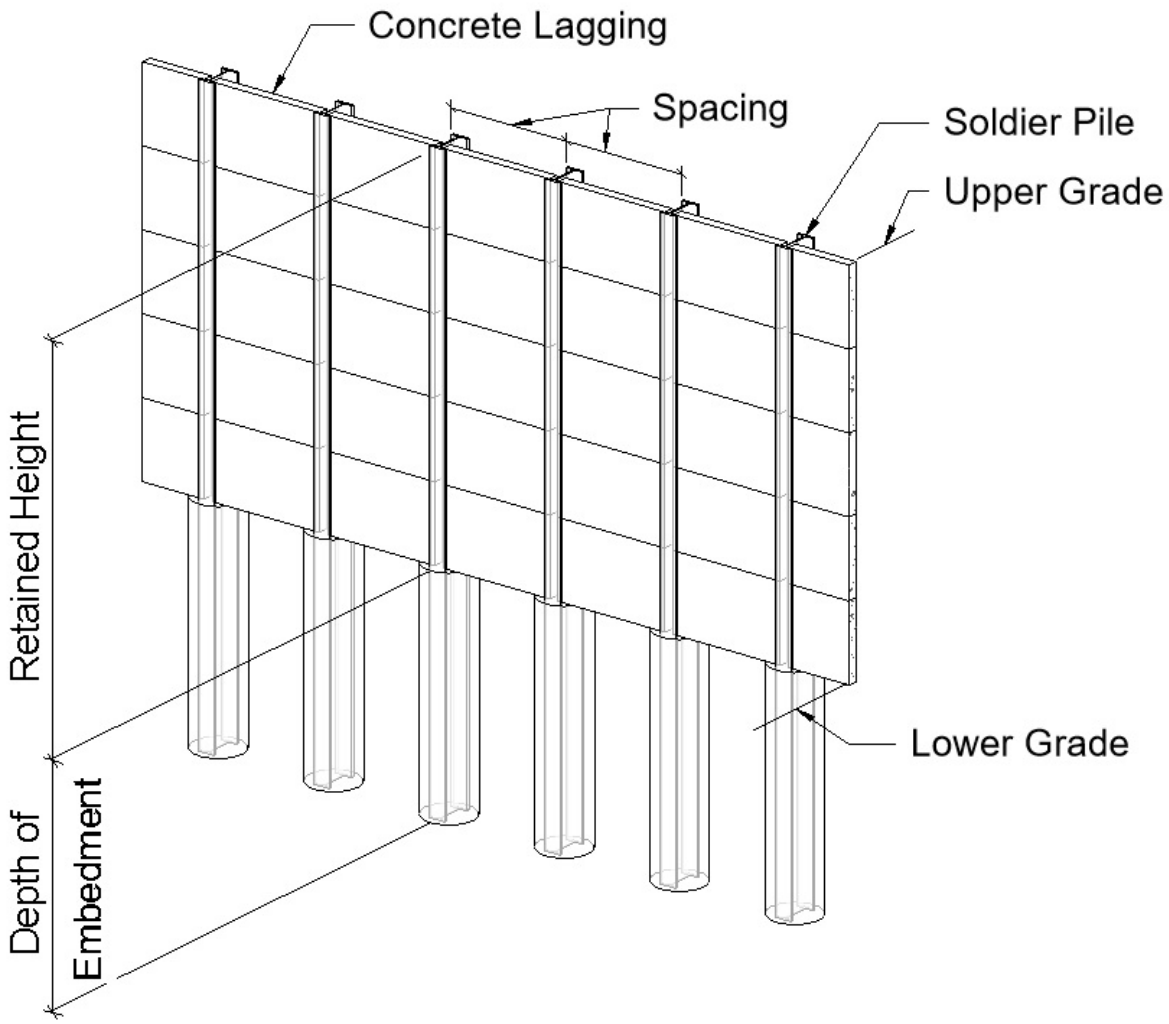

Figure 37: Example of Soldier-Pile Wall Concept

Table 22: Components of Relocation Cost

Components	Description	Unit of Measure	Unit Price	Estimated Amount
Construction Estimate	Site Work	Lump Sum	$208,000	$208,000
Construction Estimate	Structure Relocation	Lump Sum	$42,000,000	$42,000,000
Construction Estimate	Utility Relocation	Lump Sum	$2,500,000	$2,500,000
Construction Estimate	New Foundation Construction	Lump Sum	$910,000	$910,000

Components	Description	Unit of Measure	Unit Price	Estimated Amount
			Total Construction Cost	**$45,618,000**
	Contingency	40%		$18,247,200
	E&D	20%		$9,123,600
	S&A	6%		$2,737,080
			Grand Total	**$75,725,880**
Real Estate Acquisition and Relocation	Lands and Damages	Lump Sum	$2,500,000	$2,500,000
Real Estate Acquisition and Relocation	Relocation Assistance	Lump Sum	$780,000	$780,000
Real Estate Acquisition and Relocation	Admin Cost	Lump Sum	$200,000	$200,000
			Total Real Estate Cost	**$3,480,000**
	Contingency	25%		$870,000
	E&D	20%		$696,000
	S&A	6%		$208,800
			Grand Total	**$5,254,800**
		Total Cost of Project	**Lump Sum**	**$80,980,680**

Estimated relocation costs was refined to be approximately $81 million. Using the same methodology prescribed to derive the benefits for the Soldier-Pile Wall referenced in **Appendix C**, the present worth of this relocation cost is about $79 million in year 1, 2025, based on the FY21 discount rate of 2.5% as shown in **Table 23**. Likewise, based on the assume year relocated and the FY21 discount rate, the average annual costs were derived. As referenced earlier, the cost of relocation of these structures would be counted as the benefit of the Soldier-Pile Wall; therefore, the average annual costs of relocation would be the average annual benefits of the Soldier-Pile Wall also shown in **Table 23** .

Table 23: Present Worth and Average Annual Benefits of Relocation Cost

Category	Amount
Present Worth	$79,024,000
Average Annual Benefits	$2,786,000

4.3.2.2.2 Refined Costs

Continuing the optimization process, first cost estimates for the Soldier-Pile Wall was further refined from the original ROM cost (i.e., estimated to identify the Recommended Plan). This cost was provided by Mobile District's Cost Engineering Section Division in October 2021 price levels. For comparison to the benefits, the first costs were stated in average annual terms using the FY21 discount rate of 2.5% and a 50-year period of analysis. Moreover, interest during construction was updated to reflect 18 months, and annual operation and maintenance (O&M) costs were also included. **Table 24** summarizes the refined first cost and average annual costs.

Table 24: Summary of Costs

Cost	Amount
Project First Cost	$23,897,000
Interest During Construction	$448,000
Average Annual First Cost	$858,000
Annual OMRR&R Cost	$31,000
Average Annual Annualized Costs	$889,000

4.3.2.2.3 Plan Benefits and Costs

The benefits of implementing the Soldier-Pile Wall were not based on traditional FRM benefits (i.e., inundation reduction compared to the future without project condition) but instead benefits derived using the methodology found in a Section 14 study (i.e., as costs avoidance of relocation). Benefits were calculated based on cost of constructing the Soldier-Pile Wall compared to the relocation costs of the viewshed. **Table 25** provides a summary of the annual costs and benefits of the plan discounted at 2.5% over a 50-year period in October 2021 price level.

Table 25: Benefits and Costs for Recommended Plan

Item	Amount
Average Annualized Benefits	$2,786,000
Average Annual Annualized Costs	$889,000
Net Benefits	$1,897,000
BCR	3.13

4.3.2.2.4 Project First Cost

Table 26 shows the project first cost apportionment for the City of Selma FRM study and is based on October 2021 price levels.

Table 26: Project First Cost Apportionment Summary

Cost Item	Federal (USACE)	Non-Federal Sponsor	Project First Costs
Initial Construction*	$15,533,000	$8,142,000	$23,675,000

Cost Item	Federal (USACE)	Non-Federal Sponsor	Project First Costs
Lands, Easements, Right of Way, Relocations, and Disposal sites (LERRDs)**	$0	$222,000	$222,000
First Costs by Entity	**$15,533,000**	**$8,364,000**	**$23,897,000**
Cost Share Percentages	65%	35%	--
OMRR&R	**--**	**$31,000**	**--**

Includes PED, FRP, and Construction Management Fee
LERRDs Disclaimer: Subject to change based on appraisal, actual costs, and Real Estate review of credit package

4.3.2.3 Flood Response Plan

There are currently two floodplain management documents available to the City of Selma. One is the Dallas County Natural Hazard Mitigation Plan. Among its objectives, this plan performs a risk assessment and makes broad recommendations on objectives to reduce risk associated with natural hazards. It does broadly and briefly discuss the continued "enforcement of flood ordinances to ensure no development occurs in flood prone areas (all jurisdictions)". This plan is stated as "being updated" at this time. The other is the Selma, Alabama Code of Ordinances. This, among many other things, prohibits the development of structures below the base flood elevation.

Based on these findings, addressing floodplain management through an FMEEP as recommended in the initial Recommended Plan during draft public review provides little extra benefit to reducing life safety risk. If the hazard mitigation plan and City ordinances are followed, development in the base flood zone (100-year) would be highly discouraged to the extent practical and allowable.

However, neither the City Ordinances nor the existing Dallas County Mitigation Plan address the immediate response the City could take in the event of a flood. That is, what action should be taken to prepare, and respond to a flood event to ensure life safety. A focused FRP would fill this gap. This plan would address actions the City could take in the event of an incoming flood. These include.

- The identification of flood prone areas though floodplain mapping of several forecasted stages based on Southeast River Forecast Center river stage forecast;
- The identification of flood fighting actions (if applicable) to reduce impacts
- The appropriate level of response based on Southeast River Forecast Center river stage forecast;
- Evacuation routes for inhabited, flood prone areas; and
- Identification of critical infrastructure at risk.

This document would ensure that the objective related to life safety is fully addressed for study.

5.0 ENVIRONMENTAL CONSEQUENCES*

5.1 Environmental Impacts*

A qualitative assessment of the final array of alternatives was conducted to analyze and consider environmental impacts to resources within the study area during the decision-making/screening process. The NAA is consistent with FWOP conditions, which is the baseline from which to compare all alternatives.

Pursuant to NEPA, this chapter addresses the impacts in proportion to their significance (40 CFR § 1502.2.b, 2019). Significance requires consideration of context and intensity (40 CFR § 1508.27, 2019). The depth of analysis of the alternatives corresponds to the scope and magnitude of the potential environmental impact. Impacts are considered to be any adverse or beneficial consequences on the human or natural environment caused by the implementation of an action and include any irreversible or irretrievable commitments of resources should the action be implemented. In addition, impacts on the human and natural environment can be considered to be direct or indirect. Direct impacts are those that are caused by the action and occur at the same time and place (40 CFR § 150.8.8.a, 2002). Indirect impacts are those that are caused by the action and are later in time or further removed in distance but are still reasonably foreseeable (40 CFR § 1508.8.b, 2002). The NEPA requires a Federal agency to consider not only the direct and indirect impacts of a proposed action, but also the cumulative impacts of the action.

The terms "adverse" and "beneficial" are used in this document with respect to impacts from the proposed action and are defined as the following:

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

From the purpose of this analysis, the magnitude of impacts is classified as *de minimis*, minor, moderate, or significant and defined as the following:

- *De minimis*: A resource was not affected, or the effects were at or below the level of detection; changes were not of any measurable or perceptible consequence.
- Minor: Effects on a resource were detectable, although the effects were localized, small, and of little consequence to the sustainability of the resource.
- Moderate: Effects on a resource were readily detectable, long-term, localized, and measurable.
- Significant – a substantial, or potentially substantial, change to a resource at a degree which the majority of the resource will either be eliminated or unable to stabilize and continue to decline.

The conceptual model depicted in **Figure 38** summarizes the direct and indirect relationship between each resource as well as the impacts that a levee, Soldier-Pile Wall, and buyout components would have on those resources within the study area. Impacts are color coordinated with the respective component and represent the key impacts that each component has on the environment as a whole.

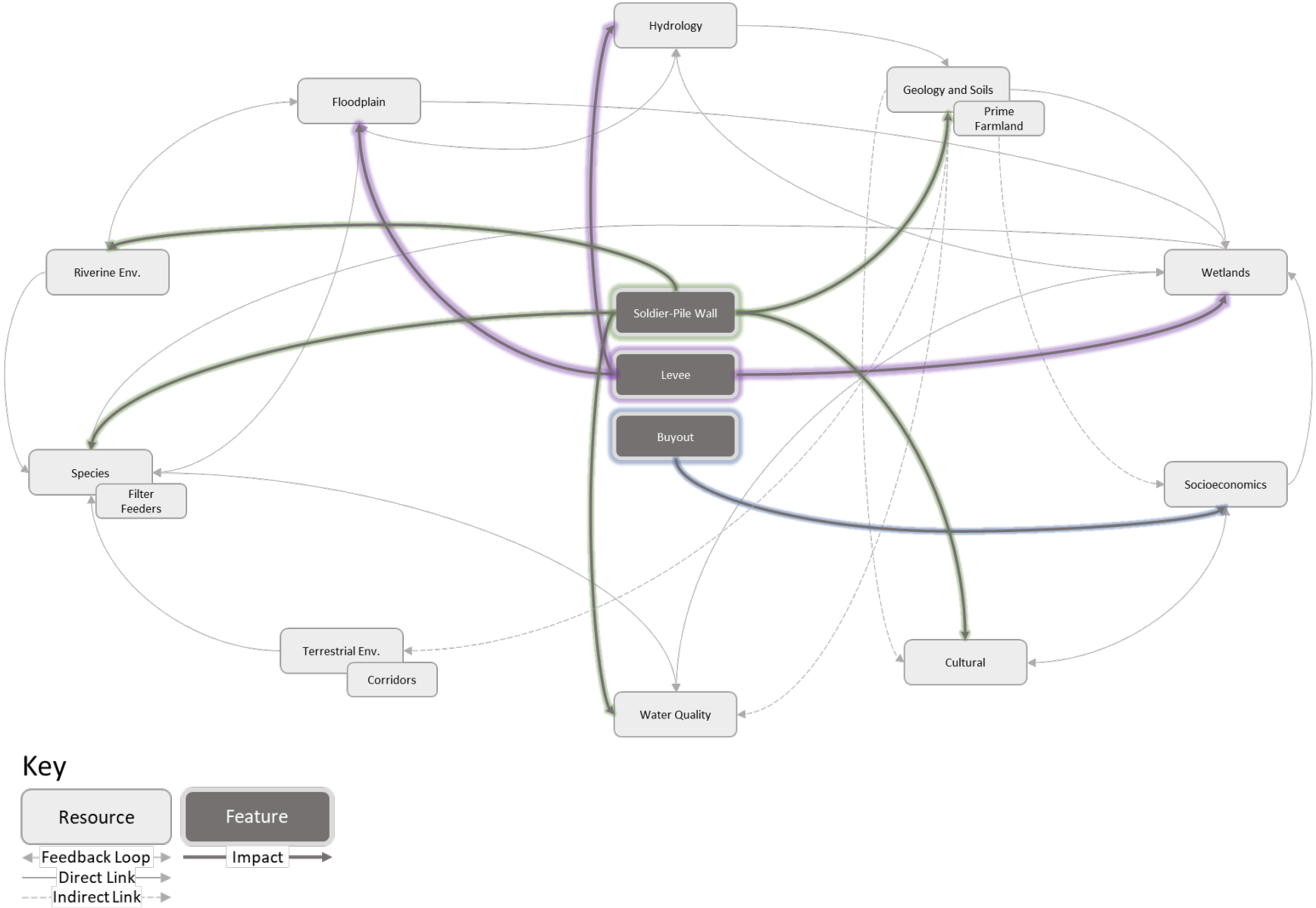

Figure 38: Conceptual Environmental Model Depicting Impacts to Resources

*5.1.1 Physical Environment**

*5.1.1.1 Water Resources**

*5.1.1.1.1 Hydrology**

5.1.1.1.1.1 No Action Alternative Impacts*

Direct Impacts: No construction or demolition would occur as a result of the NAA; therefore, no changes to the topography would occur which could alter hydrology. As such, there would be no significant impacts to hydrology.

Indirect Impacts: Under FWOP conditions the Alabama River is anticipated to continue experiencing frequent flood events. Hydrology within this reach of the Alabama River flows through the river channel and overtops into the surrounding floodplain. The climate change assessment literature review revealed some consensus in an increase in the severity and frequency of storms in the southeast region but no consensus of an increase or decrease in future hydrology. Analysis of historic precipitation records show annual precipitation to be a variable for the region throughout the period of record. It appears there may be more extremes occurring in recent years, such as extreme low annual precipitation values. However, the overall trends appear to be constant or increasing slightly. This is reinforced by the analysis using the Climate Hydrology Assessment Tool which showed no increase in annual maximum monthly over the hindcast period and a very small increase of approximately 2,000 cfs in project annual maximum monthly flows through 2099. Development of the floodplain could alter the permeable surface conditions which could have an impact on hydrology. Modeling of basin hydrology based on the USEPA ICLUS dataset showed substantial development (i.e., land use changes) would occur within the headwaters of the Alabama River which would result in increased runoff and increase peak flows by 2%. This increase would occur as a result of actions far outside of the study area; therefore, no significant indirect impacts to the study area would occur as a result of the NAA.

5.1.1.1.1.2 Alternative 1.A (Buyouts) Impacts*

Direct Impacts: The alternative would neither result in the construction of any floodplain blocking structures nor addition of impervious surfaces; therefore, no direct impacts to hydrology would occur.

Indirect Impacts: The buyout footprint is not large enough to have a significant impact on the hydrology of the study area. Removal of the structures would increase the floodplain; however, not enough to reduce flooding impacts in the study area; therefore, no significant indirect impacts to hydrology are anticipated.

5.1.1.1.1.3 Alternative 3 (Optimized Levee) Impacts*

Direct Impacts: The levee alignment would have wide-spread direct impacts on hydrology within and surrounding the study area through induced flooding. Increased damages would occur as isolated pockets within Ward 1 of Selma as well as the City of Selmont. These impacts would be significant.

Indirect Impacts: FWOP conditions show an increase in land use changes in the headwater portions of the Alabama River which would alter the hydrology regime within the study area. Although no substantial land use changes would occur as a result of the optimized levee alignment, an increase of peak flow due to headwater land use changes would indirectly compound the direct effects of induced flooding. Therefore, these impacts would be significant.

5.1.1.1.1.4 Alternative 4 (Bank Stabilization) + FRP Impacts*

Direct Impacts: No significant change to the Alabama River would occur as a result of the Soldier-Pile Wall. Construction would not require either coffer dams or any other means to direct the flow of the river. The immediate vicinity may experience increased velocity during flood events; however, the potential for increased velocities and scouring adjacent to the proposed Soldier-Pile Wall would be considered and addressed during the PED phase of the project. Therefore, the anticipated impacts would be minor.

Indirect Impacts: No significant indirect impacts would occur.

5.1.1.1.1.5 Alternative 5 (Bank Stabilization + Buyouts) Impacts*

Direct Impacts: Inclusion of Soldier-Pile Walls and other bank stabilization measures may increase the velocity of floodwaters which could lead to scouring. The Soldier-Pile Wall would be designed to reduce velocity during the PED phase of the project; therefore, no significant adverse impacts to hydrology would occur as a result of the alternative.

Indirect Impacts: The demolition of structures within the floodplain would indirectly benefit hydrology by decreasing impervious ground surface; however, benefits would be insignificant due to the small portion of structures within the buyout footprint. Additionally, the Alabama River experiences flooding due to riverbank overtopping from accumulated rainfall in the upper portion of the river. A minor land use change would not contribute significantly to reduce flooding depths in the study area. As such, there would be no significant impacts to the hydrology.

5.1.1.1.1.6 Alternative 6 (Combination) Impacts*

Direct Impacts: The levee alignment would have significant direct impacts on hydrology within and surrounding the study area. Induced flooding from the levee would cause increased flood damages within isolated pockets of Ward 1 of Selma as well as the City of Selmont. The Soldier-Pile Wall would not result in induced flooding. Overall, the alternative would have significant direct impacts to hydrology.

Indirect Impacts: The alternative includes buyouts and demolition of structures outside the levee alignment and would be consistent with indirect impacts related to Alternative 5 buyout impacts; however, at a lesser magnitude due to a smaller footprint. The buyout footprint would convert a maximum amount of 68 acres. This conversion from 68 acres of developed land use to floodplain habitat would not alleviate the amount of induced flooding caused from the levee component. Therefore, the indirect impacts to hydrology would not be significant.

*5.1.1.1.2 Water Quality**

5.1.1.1.2.1 No Action Alternative*

Direct Impacts: No construction within Waters of the U.S. would occur as a result of the NAA; therefore, no significant impacts to water quality are anticipated.

Indirect Impacts: Should the NAA be selected, no stabilization of the riverbank would occur. Erosion would lead to increased turbidity and may result in long-term degradation. Additionally, due to the potentially lead-contaminated riverbank, continued erosion may transport harmful material downstream further expanding the footprint of decreased water quality. Thus, the NAA would have a minor adverse indirect impact on water quality within and surrounding the study area.

5.1.1.1.2.2 Alternative 1.A (Buyouts) Impacts*

Direct Impacts: No demolition would occur within the immediate vicinity of streams. Demolition within each parcel would contain runoff through the use of Best Management Practices (BMPs); therefore, no significant adverse impacts are anticipated as a result of the alternative.

Indirect Impacts: Conversion of residential structures to an extension of the floodplain may contribute towards increased wetland habitat. Wetlands are a significant resource for clean water quality. Should the parcels eventually convert to wetlands habitat, minor beneficial impacts to water quality may occur; however, these impacts would be *de minimis* due to the small footprint of the alternative. As such, there would be no significant impacts.

5.1.1.1.2.3 Alternative 3 (Optimized Levee) Impacts*

Direct Impacts: No impaired waterbodies are classified within or near the proposed levee alignment. The optimized levee alignment would not cross any stream or waterbodies and would not directly affect water quality. Access would be obtained using existing roads. Potential staging areas have not been identified; however, should any staging occur within or nearby Waters of the U.S. additional coordination would be required to obtain Water Quality Certification (WQC) from ADEM. As such, there would be no significant impacts.

Indirect Impacts: Construction of the levee may increase turbidity because of runoff; however, BMPs would be used to minimize the amount. Potential runoff would not enter impaired waterbodies for criteria pollutants. To complete the full levee alignment, approximately 322,369 cy of material would be required to construct the levee and 100,000 cy of material would be required to fortify U.S. Highway 80. Runoff not captured using BMPs would minimally increase turbidity. These effects would subside upon project completion and would revert to preconstruction conditions; therefore, adverse impacts to water quality would be minor and no significant impacts are anticipated.

5.1.1.1.2.4 Alternative 4 (Bank Stabilization) + FRP Impacts*

Direct Impacts: No impaired waterbodies for criteria pollutants are located near the Soldier-Pile Wall footprint. Construction of the Soldier-Pile Wall would require 96 pilings to be drilled into the riverbed. Dredging would not be required. Additionally approximately

12,333 cy of riprap and 12,500 cy of granular material would be placed behind the Soldier-Pile Wall to ensure stability of the riverbank; therefore, roughly 26,733 cy of material would be directly placed within the Alabama River. This may result in a localized temporary minor increase in turbidity but would subside upon construction completion. As such, there would be no significant impacts. Coordination with ADEM has been conducted and WQC was received on November 10, 2020. The USACE shall abide by all 17 Terms of the WQC, which is included in **Appendix B**.

Indirect Impacts: The footprint of the Soldier-Pile Wall lies within the middle of the largest and healthiest Tulotoma Snail population, which are benthic filter feeder species. These species contribute towards water quality within the study area. Relocation of these Federally protected species would occur prior to implementation to a suitable location in the immediate vicinity; therefore, the indirect adverse impacts to water quality would not be significant given that the species will remain within or nearby the study area.

5.1.1.1.2.5 Alternative 5 (Bank Stabilization + Buyouts) Impacts*

Direct Impacts: No impaired waterbodies for criteria pollutants are located near the buyout boundaries. Demolition would not occur within or adjacent to any rivers or streams; therefore, demolition from buyouts would not directly affect water quality. Construction of the Soldier-Pile Wall would cause increased turbidity within the immediate and downstream vicinity and would subside upon completion. BMPs would be utilized to minimize the spread of turbidity. No impacts to water quality would occur from the FRP. As such, there would be no significant impacts.

Indirect Impacts: Conversion of developed parcels into floodplain may benefit water quality through the possibility of long-term wetlands development; however, a substantially large wetland surface area would be required to have an effect; therefore, the benefits related to conversion of 25 parcels into undeveloped land are anticipated to be *de minimis*. As such, there would be no significant impacts.

5.1.1.1.2.6 Alternative 6 (Combination) Impacts*

Direct Impacts: The combined impacts from Alternatives 3 and 5 would occur.

Indirect Impacts: The combined impacts from Alternatives 3 and 5 would occur.

*5.1.1.2 Geology and Soils**

*5.1.1.2.1 No Action Alternative Impacts**

Direct Impacts: In general, activities that would contribute to significant geologic or soil alteration would include but are not limited to fracking, injection wells, and large-scale grading. Under the NAA, no construction/demolition, staging, or land use changes would occur; therefore, no direct impacts to the geology and soils within the study area would occur.

Indirect Impacts: Indirect effects of the NAA would adversely impact geology and soils of the riverbank as continued erosion would occur under FWOP conditions. Erosion of the riverbank could negatively affect additional resources such as water quality, riverine habitat, cultural resources, aesthetics, as well as public health and safety; therefore, minor adverse indirect impacts to geology and soils would occur.

*5.1.1.2.2 Alternative 1.A (Buyouts) Impacts**

Direct Impacts: The scope of this alternative identified structures within Ward 8 below Mulberry Road. The City of Selma has been heavily developed for many years; therefore, the majority of the original topsoils have been removed and replaced with red clay suitable for construction of structures and buildings. The removal of these structures would not directly result in the restoration of the original topsoils, nor would the surface grade be substantially altered. As such, there would be no significant impacts.

Indirect Impacts: Though the geology and soils beneath the structural foundations have been degraded, reintroduction of native soils from flooding events could occur over many decades. Thus, indirect benefits could occur to the soils within the buyout footprint as a result of this alternative but are anticipated to be *de minimis*; however, because the alternative would not limit flood induced erosion, the alternative would have an overall minor adverse indirect impact to geology and soils.

*5.1.1.2.3 Alternative 3 (Optimized Levee) Impacts**

Direct Impacts: The Alternative 3 levee alignment totals approximately 3.6 mi including 1.6 mi of "new" construction and 2.0 mi of U.S. Highway 80 reinforcement. Construction, which would require extensive grading within Ward 8 and reinforcement of U.S. Highway 80. Approximately 322,369 cy of fill would be required to construct the levee portion and 100,000 cy of material would be required to reinforce U.S. Highway 80.

Disposal areas would be required to place excavated material. Access would be obtained using existing roads. Staging areas would also be required to contain all construction material; however, potential locations have not been identified. No significant impacts are anticipated.

Indirect Impacts: Impacts resulting from this action would be consistent with the FWOP conditions. Continued flooding events may transport additional sediment to study area floodplain; however, sediment accrual as a result of this phenomenon are anticipated to be *de minimis*. No significant geological events, such as major earthquakes, are anticipated to occur under FWOP conditions; however, because the alternative would not limit flood induced erosion, the alternative would have an overall minor adverse indirect impact to geology and soils.

*5.1.1.2.4 Alternative 4 (Bank Stabilization) + FRP Impacts**

Direct Impacts: Construction of the Soldier-Pile Wall would span approximately 1,000 linear ft and would use H-Piles to support concrete walls. Geotechnical investigations have been completed along Water Avenue. Additional investigations will be performed along the Alabama River during the planning, engineering, and design (PED) phase to finalize existing geology, slope, and soils conditions for design. Any underlying geology and soils would be buried beneath the structure. As such, no significant impacts would occur.

Indirect Impacts: Inclusion of hard structures (e.g., retaining walls) within a riverine environment could lead to increased velocity and scouring of the riverbed immediately surrounding the structure. Under FWOP conditions, continued erosion would occur;

therefore, compared to FWOP conditions the alternative impacts would be neutral and not significant.

*5.1.1.2.5 Alternative 5 (Soldier-Pile Wall + Buyouts) Impacts**

Direct Impacts: No significant direct impacts to buyout footprint geology and soils would occur, as detailed **Section 5.1.1.2.2**. Geology and soils underlying the footprint of the Soldier-Pile Wall would be directly impacted; however, the full extent is unknown at this time. Once subsurface surveys are completed the full scope of direct impacts will be analyzed. As such, no significant impacts are anticipated.

Indirect Impacts: As stated in **Section 5.1.1.2.2** though the removal of structures would not immediately result in the restoration of the original topsoils, a reintroduction of native soils may occur from flooding events over a period of many decades; therefore, compared to FWOP conditions the alternative impacts would be neutral and not significant.

*5.1.1.2.6 Alternative 6 (Combination) Impacts**

The combined effects of Alternatives 3 and 5 would occur.

*5.1.1.3 Prime and Unique Farmlands**

*5.1.1.3.1 No Action Alternative Impacts**

Direct Impacts: The majority of prime and unique farmland soils occur in the surrounding areas. Under the NAA, no construction or land acquisition would occur that would directly convert any designated prime or unique farmlands; therefore, no direct impacts would occur.

Indirect Impacts: Impacts resulting from this action would be consistent with the FWOP conditions. No significant land use development is anticipated under FWOP conditions; therefore, no significant alterations or conversions of prime and unique farmlands would occur as a result of this action. In summary no significant indirect impacts would occur.

*5.1.1.3.2 Alternative 1.A (Buyouts) Impacts**

Direct Impacts: The study area is heavily urbanized and no prime and unique farmlands occur within the footprint of the buyout locations; therefore, no direct impacts would occur as a result of the alternative.

Indirect Impacts: Conversion of residential parcels into a floodplain setting could have a positive benefit to prime and unique soils over a long period of time through the possible reintroduction of unique soils following flooding events; however, these indirect benefits are anticipated to be minor and not significant.

*5.1.1.3.3 Alternative 3 (Optimized Levee) Impacts**

Direct Impacts: Alternative 3 would require construction of a levee and reinforcement of U.S. Highway 80 within Ward 8. Much of the prime and unique soils within the City of Selma were removed during development of the city. Access would be obtained using existing roads. The complete levee alignment would not directly impact prime and unique farmland soils; however, unidentified staging areas may be placed over this resource. Coordination with the USDA Natural Resources Conservation Service (NRCS) identified prime farmlands within the corridor of the proposed levee alignment. Additional

coordination would be required should the location of any staging result in the conversion of designated prime and unique farmlands. As such, no significant impacts are anticipated.

Indirect Impacts: Construction of a levee would contribute to induced flooding of the surrounding areas. A flood-depth increase of up to 1-ft in some locations over a 100-year period was modeled, as represented in **Figure 39**. An increase of flooding in areas operated as farmland may result in crop yield decrease, which may be significant to the landowners.

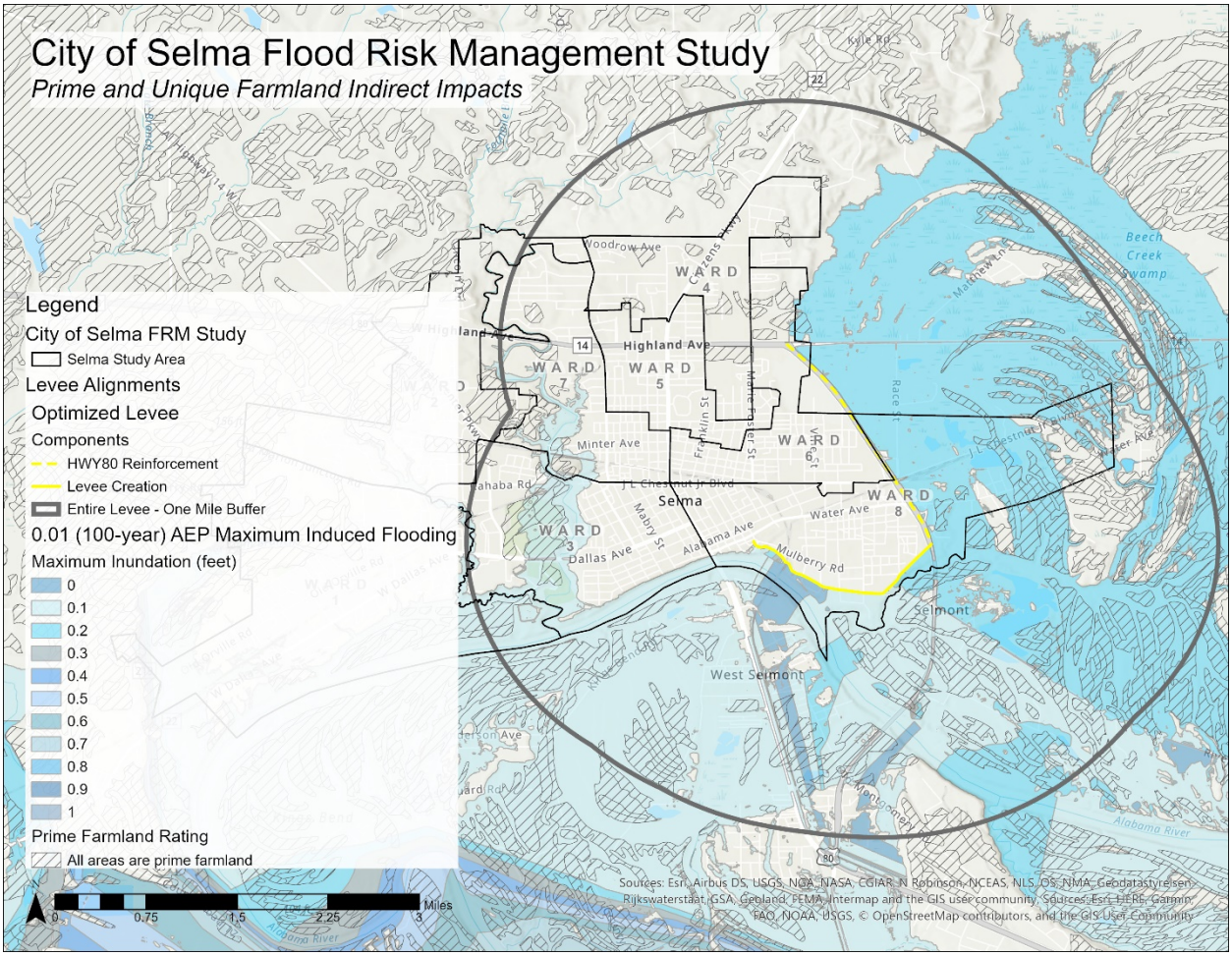

Figure 39: Optimized Levee Indirect Impacts to Prime and Unique Farmlands

*5.1.1.3.4 Alternative 4 (Bank Stabilization) + FRP Impacts**

Direct Impacts: No prime and unique farmland soils occur within the footprint of the alternative. As such, no direct impacts would occur to the resource.

Indirect Impacts: No significant induced flooding would occur because of the alternative; therefore, no indirect impacts to prime and unique farmlands would occur.

*5.1.1.3.5 Alternative 5 (Bank Stabilization + Buyouts) Impacts**

Direct Impacts: The majority of prime and unique farmlands have been removed due to the heavily urbanized development; therefore, no direct impacts to prime farmlands would occur under FWOP conditions.

Indirect Impacts: The alternative would not significantly induce flooding into the surrounding area; therefore, no indirect impacts to prime farmlands would occur under FWOP conditions.

*5.1.1.3.6 Alternative 6 (Combination) Impacts**

Direct Impacts: Due to the heavy land use development of the study area, no direct impacts to prime and unique farmlands are anticipated with respect to the direct footprint of each component of the alternative. Access for optimized levee construction would be obtained using existing roads while access to construct the Soldier-Pile Wall would occur via river. Parcels within the buyout footprint may be utilized for staging areas which may impact prime or unique farmland soils.

Indirect Impacts: The optimized levee alignment would induce flooding throughout a wide-spread area which could indirectly impact prime and unique farmlands and may significantly impact landowners.

*5.1.1.4 Climate**

*5.1.1.4.1 No Action Alternative Impacts**

Direct Impacts: No construction, staging, or demolition would occur that would permanently increase emissions within the study area. As a result, no significant direct impacts are anticipated.

Indirect Impacts: As discussed in **Section 3.1.4.2**, the study area FWOP conditions would not be drastically changed from current conditions. Additionally under FWOP conditions, the study area is anticipated to remain in a similar state with respect to development, recreation, traffic, and land use; therefore, no significant increased emissions which could indirectly affect the study area climate are anticipated from heavy machinery and/or vehicular use. Additionally, no construction would occur as a result of the NAA. As a result, no significant indirect impacts to the climate are anticipated.

*5.1.1.4.2 Alternative 1.A (Buyouts) Impacts**

Direct Impacts: Emissions have the capability of influencing climates whenever they occur in a significant quantity for a long and continuous period of time; however, increased emissions from demolition activities would be temporary and localized. BMPs would be used to reduce an accumulation of harmful chemicals. Additionally, vegetation has the capability of impacting the climate on a large-scale due to the relationship between water vapor and photosynthesis; however, no significant amount of vegetation would be lost because of the alternative. Consequently, the alternative would not have a significant impact on the study area climate.

Indirect Impacts: With the removal of structures, traffic within the buyout footprint would be reduced; however, such a reduction would not accumulate enough to benefit the climate. As such, no significant impacts would occur.

*5.1.1.4.3 Alternative 3 (Optimized Levee) Impacts**

Direct Impacts: Heavy machinery would be used during the construction of the levee. A fully developed construction timeframe was not developed; however, based on professional judgment, construction would occur over approximately 36 months. Because the study area is not located within or near a nonattainment zone for air quality, the potential for human influence on climate change in this region is minimal. Additionally, BMPs would be used to limit the accumulation of emissions. Upon completion, air quality would revert to normal conditions and would have no influence on the climate. As such, no significant impacts are anticipated.

Indirect Impacts: Implementation of the levee may result in increased local transportation time due to increased travel distance required to commute around the levee alignment; however, these increases are anticipated to be minor and would not significantly air quality within the study area. As such, no significant impacts to the climate would occur.

*5.1.1.4.4 Alternative 4 (Bank Stabilization) + FRP Impacts**

Direct Impacts: Construction of the Soldier-Pile Wall would occur throughout a one-year process and would increase emissions from heavy machinery temporarily. Those emissions would dissipate upon completion of the alternative. BMPs would be utilized to reduce harmful accumulations of toxic chemicals. No significant amount of vegetation would be removed during construction. Additionally, the FRP would temporarily increase traffic as select areas evacuate; however, because the population is low no significant emission accumulation would occur. As such, the alternative would not contribute significantly to climate change or otherwise have any influence on the study area climate.

Indirect Impacts: No indirect impacts to the climate are anticipated because of the alternative.

*5.1.1.4.5 Alternative 5 (Bank Stabilization + Buyouts) Impacts**

Direct Impacts: Construction of the Soldier-Pile Wall and demolition of the residential structures would occur over approximately 30 months and would require heavy machinery to complete. BMPs would be used to reduce the accumulation of emissions which would reduce the overall effect on the study area climate. Additionally, no significant amount of vegetation loss would occur that could have an influence on the climate; therefore, no significant impacts to climate would occur because of the alternative.

Indirect Impacts: Implementation of the alternative would not result in increased local transportation. Construction of the Soldier-Pile Wall would be necessary to maintain stability of the riverbank for the protection of the historical structures, trails, and districts. Without the integrity of the historical resources, traffic would be reduced; therefore, implementation of the alternative would result in maintaining the existing traffic conditions and consequently air quality. As such, no indirect impacts to the climate are anticipated because of this alternative.

*5.1.1.4.6 Alternative 6 (Combination) Impacts**

Direct Impacts: Construction of the Soldier-Pile Wall and levee as well as demolition of the residential structures would occur require heavy machinery over a period of

approximately 42 months to complete. BMPs would be used to limit the accumulation of emissions which would reduce the overall influence those emissions have on climate change. No significant amount of vegetation would be removed; therefore, no significant impact to the climate is anticipated.

Indirect Impacts: Implementation of the levee may result in increased local transportation time due to increased travel distance required to commute around the levee alignment; however, these increases are anticipated to be minor. Given that the study area is not located within or near a nonattainment zone, vehicular emissions from the study area would not contribute towards climate change. As such, no significant impacts would occur.

*5.1.1.5 Air Quality and Greenhouse Gasses**

*5.1.1.5.1 No Action Alternative Impacts**

Direct Impacts: Adverse impacts to air quality primarily occurs via emissions from natural (e.g., volcanic eruptions) and man-made contributions. No project construction, meaning no heavy machinery or emission releases, would occur because of the NAA. Additionally, no natural geologic features or natural phenomenon, such as methane leaks, occur within the study area. As a result, no significant direct impacts are anticipated.

Indirect Impacts: While adverse impacts to air quality are primarily driven by emissions, vegetation plays a considerable role in filtering air chemicals (Baldauf and Nowak, 2014). Though abundant vegetation can benefit air quality, a significant reduction in vegetation would have the opposite effect. Under FWOP conditions, no significant increase or decrease to vegetation is anticipated to occur within or surrounding the study area. Additionally, the study area is anticipated to remain in a similar state with respect to development, recreation, traffic, and land use; therefore, no significant indirect impacts are anticipated.

*5.1.1.5.2 Alternative 1.A (Buyouts) Impacts**

Direct Impacts: Demolition within the 25 parcels would temporarily and locally increase emissions from heavy machinery. Duration of this alternative would last approximately 18 months. Upon completion, air quality would revert to pre-construction levels. Because the study area is not located within or near a nonattainment zone for Air Quality, neither a State Implementation Plan nor additional restrictions to emission standards are required; therefore, no significant direct adverse impacts to air quality would occur as a result of the alternative.

Indirect Impacts: Removal of residential structures would reduce local traffic through the buyout footprint which could have a minor beneficial impact in the immediate vicinity; however, these changes would be minor and not significant.

*5.1.1.5.3 Alternative 3 (Optimized Levee) Impacts**

Direct Impacts: Because the study area is not located within or near a nonattainment zone for Air Quality, neither a State Implementation Plan nor additional restrictions to emission standards are required. Construction of the levee would require the use of heavy machinery. Duration of this alternative would last approximately 36 months.

Following completion, air quality would revert to normal conditions and no significant impacts would occur.

Indirect Impacts: A loss of vegetation has the potential to reduce the capacity of air chemical filtration; however, a significant amount of loss is necessary before adverse effects to air quality are realized. Alternative 3 would not remove a significant portion of vegetation from either levee footprint or staging areas. Access would be obtained using existing roads; therefore, no significant adverse indirect impacts to air quality is anticipated as a result of this alternative.

*5.1.1.5.4 Alternative 4 (Bank Stabilization) + FRP Impacts**

Direct Impacts: Construction of the Soldier-Pile Wall would temporarily increase emissions from the use of heavy machinery over the course of 30 months. Because the study area is not located within or near a nonattainment zone for Air Quality, neither a State Implementation Plan nor additional restrictions to emission standards are required. BMPs would be used to minimize toxic chemical accumulation. Upon completion, air quality would revert to pre-construction levels. Additionally, during flood events select locations identified within the FRP would evacuate; however, the low population of the study area would not be capable of contributing to a significant accumulation of emissions during these events. Following evacuations, the air quality would revert to normal levels; therefore, no significant adverse impacts to air quality are anticipated.

Indirect Impacts: No indirect impacts to air quality are anticipated because of the alternative. The Soldier-Pile Wall would neither contribute to the filtration of air nor would it increase the spread of air chemicals.

*5.1.1.5.5 Alternative 5 (Bank Stabilization + Buyouts) Impacts**

Direct Impacts: The study area is not located within a nonattainment zone and does not require maximum emission standards be met through a State Implementation Plan. Construction of the Soldier-Pile Wall and demolition of the residential structures would require the use of heavy machinery over the course of 30 months at which time air quality would revert to normal conditions. As such, no significant impacts would occur.

Indirect Impacts: As explained above, vegetation can influence air quality. The alternative would involve the removal of structures and vegetation of the parcels. As such, the increased vegetation would have a minor beneficial impact; however, the amount of increased vegetation is anticipated to be *de minimis* and benefits received because of this alternative cannot be quantified. As such, no significant impacts would occur.

*5.1.1.5.6 Alternative 6 (Combination) Impacts**

Direct Impacts: Direct impacts for this alternative would be an accumulation of impacts discussed for Alternative 3 and 5. This alternative would require the longest hours and use of heavy machinery and would have the most adverse impacts to air quality from other alternatives. Duration of this alternative would last approximately 42 months. Upon completion air quality would revert to normal conditions. Therefore, no significant impacts are anticipated.

Indirect Impacts: Parcel acquisition for Alternative 6 differs in amount and location from Alternative 5. The minor beneficial impacts from conversion of developed parcels to floodplain would not offset the direct impacts caused from an even greater amount of emission releases. Regardless, no significant indirect impacts are anticipated.

*5.1.1.6 Hazardous, Toxic, and Radioactive Waste (HTRW)**

*5.1.1.6.1 No Action Alternative Impacts**

Direct Impacts: As stated in **Section 3.1.6**, HTRW material, including UXOs, could exist within the riverbank of the downtown Selma vicinity. Numerous structures within the study area could contain toxic materials such as lead based paint. The City of Selma has conducted assessments of potential HTRW concerns since 2018. Surveying is anticipated to continue under the FWOP conditions which could reveal additional RECs; however, under the NAA no construction on the riverbank or structural demolition would occur. As such, no addition or removal of HTRW material would occur, and no significant impacts are anticipated.

Indirect Impacts: Sites containing HTRW material can be harmful to the natural and human environment. During the construction phase, the contractor will adhere to all applicable laws and regulations for the handling of UXOs as set forth in the design, plans, and specifications. Disturbance of these sites could result in the disbursement of harmful materials to the surrounding environment. Because the NAA does not include stabilization of the riverbank, erosion of the potential lead contaminated material could continue to carry harmful contaminants downriver. Additionally, aquatic species which utilize the riverbank for habitat and/or life cycle needs would remain in contact with harmful materials. In summary, minor adverse impacts would occur.

*5.1.1.6.2 Alternative 1.A (Buyouts) Impacts**

Direct Impacts: No sites containing RECs are located within the buyout footprint. Residential structures within the buyout footprint may contain lead-based paint, asbestos, and/or toxic mold. Should the presence of these materials be noted prior to implementation, demolition crews approved through the USEPA and the Occupational Safety and Health Administration (OSHA) would remove the contaminants. The alternative would not contribute to an accumulation of HTRW within the City of Selma; therefore, the alternative may have a minor benefit the study area through the potential removal of contaminated structures.

Indirect Impacts: Because the alternative does not contain a solution to limit flood induced erosion, continued flooding would spread potentially contaminated materials further downstream. This would be consistent with FWOP conditions. As such, no significant impacts would occur.

*5.1.1.6.3 Alternative 3 (Optimized Levee) Impacts**

Direct Impacts: No HTRW material would be used in construction of the levee. All material would be obtained from locally approved borrow areas. Structures within the alignment of the levee would be demolished. These structures have the potential to contain HTRW material; therefore, demolition crews approved through the USEPA and

OSHA would be contracted in the event that HTRW materials are discovered. Overall, no significant direct impacts would occur.

Indirect Impacts: No solution to limit flood induced erosion would occur; therefore, continued flooding would spread potentially contaminated materials further downstream. This would be consistent with FWOP conditions; therefore, no significant impacts are anticipated.

*5.1.1.6.4 Alternative 4 (Bank Stabilization) + FRP Impacts**

Direct Impacts: The Soldier-Pile Wall footprint lies directly over potential UXOs. These UXOs are a potential HTRW source as they may contain lead, which may have leached into the riverbed soil. An investigative survey will be conducted to target specific locations for UXO removal. Although removal of these UXOs would benefit the study area by removing a potential source of contamination these impacts are anticipated to be minor. Implementation of a FRP would not contribute to increased HTRW material.

Indirect Impacts: Should any UXOs be removed from the riverbed, potential benefits to water quality may occur and would be minor. The UXOs are likely lead-based products and could leech contaminants into the riverbed. Removal of this material may benefit water quality; however, the any existing material has been in place since the Civil War era and removal of the contaminant source would be of minor benefit.

*5.1.1.6.5 Alternative 5 (Bank Stabilization + Buyouts) Impacts**

Direct Impacts: The alternative would demolish the existing structures within approximately 25 parcels in Ward 8 of the study area. The majority of these structures are over 50 years old and may contain HTRW material; therefore, demolition crews approved through USEPA and OSHA would be contracted in the event that HTRW materials are discovered. Additionally, the riverbank within the Downtown section of Selma may contain lead-contaminated material. This contamination is likely to have occurred from UXOs from the Civil War era that was placed within the river. Prior to implementation, UXO removal would occur which may create a minor beneficial impact to the surrounding soils; therefore, the alternative would have an overall beneficial impact on the study area.

Indirect Impacts: No significant indirect impacts are anticipated as a result of the alternative.

*5.1.1.6.6 Alternative 6 (Combination) Impacts**

Direct Impacts: The combined impacts from Alternatives 3 and 5 would occur; however, due to the reduced buyout footprint of Alternative 6 those impacts would be lesser.

Indirect Impacts: No significant indirect impacts are anticipated because of the alternative.

*5.1.2 Biological Resources**

*5.1.2.1 Vegetation**

*5.1.2.1.1 No Action Alternative Impacts**

Direct Impacts: The NAA does not involve construction, demolition, or any activities which would involve the grading of soils and vegetation; therefore, no direct impacts are anticipated because of the NAA.

Indirect Impacts: As stated previously, no significant land development within and surrounding the study area is anticipated under the FWOP conditions. Because the NAA would not reduce flooding extent, depth, or timing, and would not reduce the hydrologic saturation that vegetation would receive over a 50-year POA. Anticipated FWOP hydrologic conditions account for a 2% increase in peak flow due to upstream land use development; therefore, impacts of this alternative would not be significant.

*5.1.2.1.2 Alternative 1.A (Buyouts) Impacts**

Direct Impacts: Staging and demolition for the alternative would occur within each parcel. Access would be obtained using existing roads; therefore, no additional disturbance to vegetation would occur through implementation. As such, no significant impacts would occur.

Indirect Impacts: The buyout footprint spans approximately 170 acres total. Conversion of the residential structures to floodplain habitat would result in primary succession species, such as woody vegetation, growth within each parcel; therefore, the alternative may beneficially impact Ward 8, albeit minor.

*5.1.2.1.3 Alternative 3 (Optimized Levee) Impacts**

Direct Impacts: The total length of the entire levee alignment is approximately 3.6 mi. Of the total length, approximately 1.6 mi would account for construction of the levee section and 2.0 mi would account for the reinforcement of U.S. Highway 80. Because the study area is considered highly developed, vegetation within the alternative footprint has been subjected to frequent human disturbance; therefore, no significant adverse impacts to vegetation are anticipated as a result of the alternative.

Indirect Impacts: Vegetation within and surrounding the study area experiences flooding on a recurring basis; however, the alternative would cause significant induced flooding within the City of Selmont as well as isolated pockets within the City of Selma Ward 1. Under the FWOP conditions, the study area and surrounding environment would continue to experience frequent flood events. This pattern compounded with induced flooding would accumulate to increased stress on vegetation within and surrounding the study area as a result of the alternative. These impacts are anticipated to be minor.

*5.1.2.1.4 Alternative 4 (Bank Stabilization) + FRP Impacts**

Direct Impacts: Construction of the Soldier-Pile Wall would result in the removal of vegetation along approximately 1,000 linear ft of riverbank. Removal of vegetation would be necessary to maintain structural integrity. Considering the existing degradation of the riverbank, this impact would be minor. No impacts to vegetation would occur from the addition of the FRP.

Indirect Impacts: No vegetation would be permitted to grow within the footprint of the Soldier-Pile Wall following construction completion; however, the net loss of vegetation would be minimal. Therefore, no significant indirect impacts are anticipated.

*5.1.2.1.5 Alternative 5 (Bank Stabilization + Buyouts) Impacts**

Direct Impacts: Vegetation along the riverbank is minimal due to the extreme vertical slope and continued erosion. The maximum terrestrial acreage accounts for eight acres. Staging and access for Soldier-Pile Wall construction would occur via barge. The approximate buyout footprint accounts for 170 acres, and staging for demolition of existing structures would occur within each identified parcel. Access for demolition would be obtained using existing roads. The alternative would require properties to be seeded with native grasses following demolition activities. Maintenance of the acquired properties would require regular invasive species removal. Conversely, maintenance of the Soldier-Pile Wall would require vegetation removal to ensure structural integrity. Overall, the alternative would result in a maximum increase of 162 acres of vegetated land as a result of acquisition and would provide a minor benefit.

Indirect Impacts: Land use changes of existing parcels from developed to floodplain would result in increased vegetation growth within parcels identified for acquisition and demolition. In total this would account for approximately 170 acres for potential increased grasses, trees, and shrub species and would have a minor benefit.

*5.1.2.1.6 Alternative 6 (Combination) Impacts**

Direct Impacts: A maximum conversion of 68 acres from developed land use to floodplain habitat within the buyout footprint of parcels outside the levee alignment would occur. A decrease in vegetation would occur through levee and Soldier-Pile Wall construction. The amount of converted land use for the construction of the Optimized levee would span approximately 18 acres. The maximum terrestrial area of the Soldier-Pile Wall footprint is approximately eight acres; therefore, the maximum terrestrial land use conversion with the potential to increase vegetation is approximately 42 acres. As such, the alternative may provide a minor benefit to vegetation.

Indirect Impacts: No significant indirect impact on vegetation within and surrounding the study area.

*5.1.2.2 Fish and Wildlife Resources**

*5.1.2.2.1 Aquatic Species**

5.1.2.2.1.1 No Action Alternative Impacts*

Direct Impacts: No construction, demolition, or staging would occur within or adjacent to the Alabama River as a result of the NAA; therefore, no direct impacts to aquatic species would occur.

Indirect Impacts: Though the study area lies between two USACE locks and dams, the aquatic species richness is considered high. Diversity is essential to the stability of the regional ecosystem. Under FWOP conditions, an increasingly eroded riverbank would have compounding effects to the aquatic environment within and downstream of the study area. Increased erosion would result in decreased water quality, habitat, and foraging conditions for aquatic species; therefore, the NAA would result in minor adverse indirect impacts to the environment.

5.1.2.2.1.2 Alternative 1.A (Buyouts) Impacts*

Direct Impacts: Demolition activities typically do not create a significant amount of runoff. Minor amounts of sedimentation runoff into aquatic habitat would be avoided by using BMPs; therefore, no significant impacts to aquatic species would occur.

Indirect Impacts: Removal of structures within the floodplain may create increased wetland habitat which could benefit amphibian species. The buyout footprint would have the maximum capability of converting 170 acres into wetlands; however, conversion would take many decades to occur due to the non-native red clay soils used for creating the structural foundations within each parcel. Consequently, any indirect benefit of the alternative would be minor and not significant.

5.1.2.2.1.3 Alternative 3 (Optimized Levee) Impacts*

Direct Impacts: No activities would occur within or adjacent to the Alabama River nor its tributaries as a result of the alternative; therefore, no direct impacts are anticipated as a result of Alternative 3.

Indirect Impacts: Though floodplain territory is considered terrestrial, aquatic species are linked to floodplain importance for numerous benefits during flood events (such as carbon transport, spawning, and foraging access). For example, a reduction in floodplain acreage would reduce carbon transport necessary for aquatic invertebrate growth and fecundity which would then decrease prey sources for megafauna in the region. Because the study area is considered highly developed with poor floodplain quality, a reduction of floodplain acreage as a result of levee construction would not yield a significant adverse impact. Conversely, induced flooding throughout the surrounding area would allow for increased floodplain inundation benefits for aquatic species. These impacts, however, would be minor and not significant.

5.1.2.2.1.4 Alternative 4 (Bank Stabilization) + FRP Impacts*

Direct Impacts: Construction of an approximate 1,000 linear ft Soldier-Pile Wall would occur within the Alabama River. No channel diversion would be necessary. Construction of the 96 H-Piles would be driven into the riverbed and 465 cy of concrete panels would be slid in-between each pile. A total of 12,500 cy of granular fill and 1,900 of sand fill would be filled behind the Soldier-Pile Wall. Approximately 12,333 cy of riprap would be used for endcaps on the upstream and downstream ends of the structure. BMPs would be used to reduce increased turbidity within and downstream of the study area. Riverine habitat within the Soldier-Pile Wall footprint would be permanently removed for the Alabama River. Benthic species within this footprint would be impacted during construction. Fishes and other pelagic species would migrate from the construction zone. Upon completion of construction, aquatic species would return; therefore, direct impacts resulting from construction to aquatic species would be minimal. No impacts to aquatic species would occur from the addition of the FRP.

Indirect Impacts: No significant increase in river stage would occur because of the alternative. Inclusion of hard substrates and structures within a riverine environment could potentially lead to riverbed scour; however, the Soldier-Pile Wall would be designed to minimize increased velocity in the immediate vicinity of the project. Consequently, indirect impacts would be minor.

5.1.2.2.1.5 Alternative 5 (Bank Stabilization + Buyouts) Impacts*

Direct Impacts: The Soldier-Pile Wall would result in temporary and isolated decreased water quality during construction. BMPs would be used to minimize adverse impacts to aquatic resources. Pelagic fish (meaning fish that primarily inhabit the water column), amphibians, and aquatic reptiles within the area would relocate during this time; however, species would return once conditions improve upon project completion. Conversely, construction activities would result in the mortalities of any existing benthic aquatic species within the direct footprint of the Soldier-Pile Wall. Riverine habitat within the Soldier-Pile Wall footprint would be removed resulting from construction; however, the amount of habitat loss is minimal compared to the available riverine habitat in the surrounding area. As such, no significant impacts would occur.

Indirect Impacts: Though aquatic habitat reduction would occur because of Soldier-Pile Wall construction, the alternative would ultimately provide a minor benefit to aquatic species within the surrounding area. The stabilization of the riverbank would reduce the amount of erosion which in turn would improve the water quality, riverine habitat, and foraging conditions in the immediate and downstream environment.

5.1.2.2.1.6 Alternative 6 (Combination) Impacts*

Direct Impacts: During construction of the Soldier-Pile Wall, most aquatic species would vacate the study area and return upon project completion. However, construction activities would result in the mortality of some benthic (i.e., bottom-dwelling) species. The Soldier-Pile Wall would permanently remove aquatic riverine habitat; however, that amount is minimal when compared to the available riverine habitat in the surrounding area. As such, no significant impacts would occur.

Indirect Impacts: The optimized levee alignment would result in the permanent disconnection of floodplain within Wards 6 and 8; however, induced flooding in the surrounding area would increase floodplain inundation necessary for aquatic species. The Soldier-Pile Wall would ultimately benefit aquatic species by stabilizing the riverbank. Additionally, a conversion of 68 acres of developed parcels into floodplain habitat would benefit aquatic species reliant on floodplain connectivity. Induced flooding would also benefit aquatic species by increasing carbon transport following flood events. In summary, the alternative may have an overall indirect minor benefit to aquatic species.

*5.1.2.2.2 Terrestrial Species**

5.1.2.2.2.1 No Action Alternative Impacts*

Direct Impacts: No terrestrial habitat loss would occur under the NAA. Additionally, no ground disturbances that could result in species' mortality would occur; therefore, no direct adverse impacts to terrestrial species are anticipated as a result of the NAA.

Indirect Impacts: Theoretically, construction or demolition activities temporarily increase noise volume within the local area which results in the temporary and isolated migration of terrestrial species. Since no activities would occur under the NAA, no indirect adverse impacts to terrestrial species are anticipated.

5.1.2.2.2.2 Alternative 1.A (Buyouts) Impacts*

Direct Impacts: Removal of structures would potentially increase terrestrial habitat by 170 acres for species within the immediate surrounding and may provide a minor benefit.

Indirect Impacts: Additional terrestrial habitat may lead to increased food sources for common species throughout the buyout footprint. As such, the alternative may have a minor indirect benefit to terrestrial species.

5.1.2.2.2.3 Alternative 3 (Optimized Levee) Impacts*

Direct Impacts: Construction of the optimized levee would not likely result in direct species mortality. Species within the area would relocate during construction activities; however, terrestrial species may not be capable of returning to previously occupied areas due to habitat fragmentation. Consequently, the alternative would negatively impact terrestrial species within the study area. These impacts are anticipated to be moderate.

Indirect Impacts: Construction of the optimized levee would result in the fragmentation of terrestrial habitat. Fragmentation of terrestrial habitat eliminates migration between previously used corridors, which could lead to species population divergence. Common terrestrial species within the study area have acclimated to the human environment; however, the amount of habitat fragmentation would result in a moderate adverse impact to terrestrial species within the study area.

5.1.2.2.2.4 Alternative 4 (Bank Stabilization) + FRP Impacts*

Direct Impacts: The alternative would have no significant direct impacts on terrestrial habitats or species.

Indirect Impacts: The Soldier-Pile Wall would not induce flooding within existing terrestrial habitat. Continued flooding would occur within the study area; however, existing species have acclimated. Evacuation of specific locations within the study area may lead to temporary increased noise which may indirectly distract terrestrial species; however, species within the study area have acclimated to a metropolitan surrounding and would not be determinately impacted from the FRP. Consequently, no significant indirect impacts to terrestrial species would occur.

5.1.2.2.2.5 Alternative 5 (Bank Stabilization + Buyouts) Impacts*

Direct Impacts: No terrestrial species mortality would likely occur during demolition activities. Staging areas would be located within each parcel identified for acquisition. Access for demolition would be obtained using existing roads while access for Soldier-Pile Wall construction would be obtained via river. Any existing species within the immediate vicinity would relocate during demolition activities and would return upon project completion; therefore the alternative would have no significant impacts to terrestrial species within the study area.

Indirect Impacts: Demolition activities would increase noise volumes immediately surrounding the alternative footprint. Noise level increases would cause existing species to relocate; however, species would return upon project completion. Demolition of existing structures within Ward 8 would result in a potential increase of 170 acres of terrestrial habitat; therefore, the alternative would have minor beneficial impacts to terrestrial species.

5.1.2.2.2.6 Alternative 6 (Combination) Impacts*

Direct Impacts: No mortality is anticipated as a result of the alternative. Existing species within the immediate vicinity of project construction and demolition would vacate the area; however, due to the levee feature vacated species may not be capable of returning to the original location following completion. Consequently, the alternative would negatively impact terrestrial species within the study area. These impacts are anticipated to be moderate.

Indirect Impacts: The levee alignment would serve as a barrier within a wildlife corridor which is necessary for wildlife movement and migration. Though Alternative 6 contains acquisition and demolition, benefits with regards to increased habitat area would not offset the amount of habitat fragmentation that would occur. Therefore, the alternative would have a moderate impact to terrestrial species.

*5.1.2.3 Protected Species**

*5.1.2.3.1 Threatened or Endangered Species**

5.1.2.3.1.1 No Action Alternative Impacts*

Direct Impacts: Under the NAA, no construction, staging, or demolition would occur; therefore, there would be no direct impacts to Federally listed T&E within the study area.

Indirect Impacts: As described within **Section 3.2.3.1** there are seven Federally listed T&E known to occur within Dallas County, Alabama. The official record of Federally listed species is included in **Table 6**. Habitat suitable for Federally listed Tulotoma Snail occurs within the riverine reach of the study area. No adverse impacts to suitable habitat surrounding the study area is anticipated under FWOP conditions; however, within the study area, long-term continual erosion may negatively impact suitable habitat. These impacts are minor and gradual over a long-term timeframe; therefore, the impacts of the NAA are minor.

5.1.2.3.1.2 Alternative 1.A (Buyouts) Impacts*

Direct Impacts: The likelihood of T&E presence within the buyout footprint is low. No suitable habitat exists within each parcel. These parcels have been maintained as residential property which involves regular mowing; therefore, the alternative would not directly impact T&E species.

Indirect Impacts: Indirect benefits could occur as the parcels would be converted to floodplain habitat. One such species that could particularly benefit from this conversion is the Price's Potato-Bean which relies on lightly disturbed areas where bluffs descent to streams. These benefits would be minor.

5.1.2.3.1.3 Alternative 3 (Optimized Levee) Impacts*

Direct Impacts: Potential modification to suitable habitat for the Federally threatened Georgia Rockcress and Price's Potato-bean could occur as a result from staging during construction; therefore, this alternative could have slight adverse impacts to Federally listed species. However, no significant impacts are anticipated.

Indirect Impacts: Induced flooding would have the potential to alter the hydric soils of wetland habitats and rights-of-way in the surrounding area. This alteration would negatively affect potential suitable habitat for the Federally endangered Alabama canebrake pitcher-plant, Federally threatened Georgia Rockcress, and Federally threatened Price's Potato-bean in the surrounding areas. However, no significant impacts are anticipated.

5.1.2.3.1.4 Alternative 4 (Bank Stabilization) + FRP Impacts*

Direct Impacts: The footprint of the Soldier-Pile Wall lies within suitable habitat for the Tulotoma Snail, as identified by ADCNR. Of the entire species population, the largest and healthiest population occurs within the study area. This population has not been formally delineated, so the exact range is unknown; however, one can assume that the population spans the entire length of the Soldier-Pile Wall footprint due to the presence of suitable habitat. For this reason, the USACE determined that the alternative "may affect and is likely to adversely affect" the Tulotoma Snail. Through early technical assistance, potential Reasonable and Prudent Measures (RPMs), such as relocation surveys, were identified as ways minimize the impacts to the species and avoid jeopardizing the continued species existence.

Additionally, critical habitats for the Alabama Sturgeon, Orangenacre Mucket, and Southern Clubshell, exist within footprint of the alternative and throughout the study area. Technical coordination with the USFWS suggests the study area meets all PCEs necessary to sustain classification as critical habitat. Though the riverbed may experience erosional processes periodically, the "stability" required for species' needs is less than what's required for the human environment; therefore, the USACE, Mobile District determined that the alternative "may affect and is not likely to adversely affect" critical habitat for these species.

Formal consultation with the USFWS under Section 7 of the ESA is complete. A copy of the final Biological Opinion (BO) is included in **Appendix B**.

Indirect Impacts: The surrounding area contains a large amount of suitable habitat for T&E reliant on disturbed areas and wetlands. Since the Soldier-Pile Wall would not significantly induce flooding within the surrounding area, existing wetlands would maintain their current hydrologic pattern. Additionally, no substantial changes to land use development within and surrounding the study area is anticipated; therefore, no indirect impacts to T&E would occur.

5.1.2.3.1.5 Alternative 5 (Bank Stabilization + Buyouts) Impacts*

Direct Impacts: No impacts to Federally listed terrestrial T&E within the buyout footprint would occur. Access for demolition would be obtained using existing roads. Staging and construction would occur within each parcel, which contain highly degraded habitat not suitable to Federally listed species; therefore, no direct mortality is anticipated. The Soldier-Pile Wall feature would eliminate suitable habitat for the Tulotoma Snail. Previous surveys conducted by the ADCNR observed a substantial population of Tulotoma Snail within the footprint of the Soldier-Pile Wall. Construction of the Soldier-Pile Wall would result in the direct mortality of the species.

Indirect Impacts: Minor beneficial impacts to terrestrial T&E would occur as a result of habitat conversion within Ward 8. As developed land is converted to floodplain habitat, increased potential habitat for the Price's Potato-Bean may occur. Combined with no direct adverse impacts, these indirect benefits would result in an overall beneficial impact to terrestrial species; however, no indirect impacts would occur to aquatic T&E.

5.1.2.3.1.6 Alternative 6 (Combination) Impacts*

Direct Impacts: Alternative 6 would result in the direct mortality of the Tulotoma Snail and the permanent loss of suitable habitat for the species as well as critical habitat for the Alabama Sturgeon, Orangenacre Mucket, and Southern Clubshell.

Indirect Impacts: Because the alternative would result in induced flooding, suitable habitat for Federally listed species within the City of Selmont may be negatively impacted.

*5.1.2.3.2 Migratory Birds**

5.1.2.3.2.1 No Action Alternative Impacts*

Direct Impacts: No construction, staging, or demolition would occur because of the NAA; therefore, no impacts to migratory birds would occur.

Indirect Impacts: Floodplain and wetland areas are prime targets for migratory bird foraging and resting habitat. Under FWOP conditions, the continued flooding and limited land use development within the study area would maintain existing floodplain and wetland habitat; therefore, under the NAA no adverse impacts to migratory birds would occur.

5.1.2.3.2.2 Alternative 1.A (Buyouts) Impacts*

Direct Impacts: Implementation of the alternative would not result in the direct mortality of any migratory bird species. Migratory birds would vacate the immediate vicinity upon initial staging and access activities; however, species would return following demolition completion. No tree removal would be required for access since existing roads would be utilized. Staging and demolition would occur within each parcel; therefore, no nest disturbance or destruction would occur. Therefore, no significant impacts are anticipated.

Indirect Impacts: Noise generated from demolition activities would cause migratory birds to vacate the immediate vicinity of the buyout footprint; however, upon completion noise levels would revert to normal levels and migratory birds would relocate at will. Therefore, no significant impacts are anticipated.

5.1.2.3.2.3 Alternative 3 (Optimized Levee) Impacts*

Direct Impacts: No direct mortality would occur because of the optimized levee construction. Migratory birds within the vicinity of construction activities would relocate during implementation and would resume normal activities upon project completion. The optimized levee alignment lies within a heavily developed footprint; therefore, tree removal would be minimal. As such, no significant impacts are anticipated.

Indirect Impacts: Increased noise volumes would disrupt natural behavior of migratory birds within the immediate vicinity of construction, access, and staging activities; however, upon project completion noise volumes would revert to pre-construction conditions.

Additionally, induced flooding may adversely alter floodplain and wetland habitat within and surrounding the study area; therefore, the alternative would result in minor adverse impacts to migratory birds within and surrounding the study area.

5.1.2.3.2.4 Alternative 4 (Bank Stabilization) + FRP Impacts*

Direct Impacts: Limited vegetation exists along the riverbank. While the possibility of bird nests within this vegetation is minimal, their presence is plausible. Prior to vegetation removal, a qualified biologist will survey for active nests; however, due to the steep terrain of the bluff, removal of nests may not be possible. These impacts are anticipated to be minor. No impacts to migratory birds would occur as a result of the FRP.

Indirect Impacts: Migratory birds would vacate the immediate vicinity during construction activities due to increased noise levels. Following construction completion migratory birds would resume normal activity. As such, no significant impacts are anticipated.

5.1.2.3.2.5 Alternative 5 (Bank Stabilization + Buyouts) Impacts*

Direct Impacts: As with Alternative 4, Alternative 5 may involve the removal of nested trees within the footprint of the Soldier-Pile Wall. Coordination with the USFWS would be required for this alternative.

Indirect Impacts: The natural behavior of migratory birds within the immediate vicinity of construction and demolition activities would be impacted as increased noise levels occur. Species would revert to normal behavior once noise volumes revert to pre-construction conditions upon project completion. As with Alternative 3, land use conversion may increase the probability of wetland creation within the study area over long-term trends; however, these minor benefits would be insufficient to outweigh the adverse effects of noise disturbance; therefore, the alternative would have no significant adverse impacts on migratory birds within the study area.

5.1.2.3.2.6 Alternative 6 (Combination) Impacts*

Direct Impacts: No direct mortality would occur because of the optimized levee construction. Migratory birds within the vicinity of construction activities would relocate during implementation and would resume normal activities upon project completion. Direct impacts to species may occur through nested tree removal during construction of the Soldier-Pile Wall. Coordination with the USFWS would be required.

Indirect Impacts: Increased noise volumes would disrupt natural behavior of migratory birds within the immediate vicinity of construction and demolition activities; however, upon project completion noise volumes would revert to pre-construction conditions. Floodplain and wetland areas are prime targets for migratory bird foraging and resting habitat. Induced flooding may adversely alter floodplain and wetland habitat within and surrounding the study area. The limited land use conversion from developed parcels bordering the levee to floodplain habitat may increase the probability of wetland creation within the study area over long-term trends; however, these benefits would not be sufficient to offset the adverse impacts as a result of induced flooding. As such, minor indirect adverse impacts to migratory birds may occur as a result of foraging habitat loss in the surrounding area.

*5.1.2.3.3 Bald and Golden Eagles**

5.1.2.3.3.1 No Action Alternative Impacts*

Direct Impacts: No active or inactive Bald Eagle nests are located within the study area. Additionally, no construction, staging, or demolition would occur under the NAA. As such, no tree removal would occur; therefore, no direct impacts of the NAA are anticipated.

Indirect Impacts: No significant land use developments involving tree removal would occur under the FWOP conditions; therefore, no indirect impacts would occur.

5.1.2.3.3.2 Alternative 1.A (Buyouts) Impacts*

Direct Impacts: No eagle nests, active or inactive, are located within the buyout footprint; therefore, no direct impacts to the species are anticipated. No surveys have been conducted to locate eagle nests within a three-mile buffer. Coordination with USFWS and ADCNR would be required to ensure no adverse impacts to Bald Eagle would occur.

Indirect Impacts: Indirect impacts to Bald Eagles are not anticipated. No significant land use development within the study area is anticipated; therefore, no indirect noise disturbances to the species would occur.

5.1.2.3.3.3 Alternative 3 (Optimized Levee) Impacts*

Direct Impacts: The optimized levee alignment would not require tree removal; however, construction activity could potentially occur within the three-mile buffer zone of active eagle nests. Coordination with USFWS and ADCNR would be required to ensure no adverse impacts to Bald Eagles would occur.

Indirect Impacts: Bald Eagles nest and forage within floodplain habitats. Modification to this suitable habitat would negatively impact Bald Eagles. The fragmented floodplain within Ward 8 and induced flooding in the surrounding area caused by the alternative would potentially alter floodplain characteristics; however, the amount of anticipated changes would be minor. Consequently, no significant indirect impacts to Bald Eagles would occur.

5.1.2.3.3.4 Alternative 4 (Bank Stabilization) + FRP Impacts*

Direct Impacts: Limited vegetation exists along the riverbank. The alternative footprint does not either contain active or inactive bald or golden eagle nests; therefore, no direct impacts would occur to the species. No bald or golden eagles would be impacted from the FRP.

Indirect Impacts: No Bald Eagle surveys have been conducted to identify Bald Eagle nests within a three-mile buffer of the alternative footprint. Should any nests be present, construction activities may disturb eagle nesting behavior. Construction activities may disturb foraging behavior; however, it is presumed that Bald Eagle would forage in a nearby location outside of the study area. Therefore, no significant indirect impacts are anticipated.

5.1.2.3.3.5 Alternative 5 (Bank Stabilization + Buyouts) Impacts*

Direct Impacts: Limited vegetation exists along the riverbank. Additionally, neither active nor inactive bald or golden eagle nests exist within the alternative footprint; therefore, no direct impacts would occur to the species.

Indirect Impacts: Construction activity could potentially occur within the three-mile buffer zone of active eagle nests. Coordination with the USFWS and the ADCNR would be required to ensure no adverse impacts to Bald Eagles would occur. Increased floodplain habitat from the buyout footprint could potentially benefit Bald Eagles; however, the amount of converted land use would be minimal and would still be near an active metropolitan area. Consequently, no significant indirect impacts to Bald Eagles would occur.

5.1.2.3.3.6 Alternative 6 (Combination) Impacts*

Direct Impacts: The levee alignment may not require substantial tree removal. Therefore, the resulting impacts to bald and golden eagles would not be significant.

Indirect Impacts: Construction activity could potentially occur within the three-mile buffer zone of active eagle nests. Coordination with the USFWS and the ADCNR would be required to ensure no adverse impacts to Bald Eagles would occur. The alternative would convert a maximum of 68 acres of developed parcels to floodplain habitat in parcels outside the levee alignment. The alternative would also cause induced flooding within the surrounding area. The buyout footprint would not offset the amount of fragmented floodplain created from the levee. Additionally, induced flooding could potentially alter floodplain characteristics. The amount of these anticipated changes would be minor; therefore, no significant indirect impacts to Bald Eagles would occur.

*5.1.2.4 Wetlands**

*5.1.2.4.1 No Action Alternative Impacts**

Direct Impacts: No placement of dredged or fill material would enter wetland areas under the NAA; therefore, no adverse impacts are anticipated.

Indirect Impacts: Jurisdictional wetlands are required to meet three criteria: hydrologic connectivity, hydric soils, and hydrophyte vegetation. Under FWOP conditions, the study area would continue to experience flooding events. Established wetlands within the floodplain would maintain their hydrologic connectivity. Soil transport during flooding events is a common occurrence in fluvial regions; however, soil accumulation trends in impounded systems appear primarily within the river channel. Any soil accumulation not contained within the river channel would be spread throughout the floodplain. Thus, the resulting accumulation within wetlands would be considered *de minimis* and would not impact existing hydric soils. Likewise, wetland vegetation would continue to thrive under FWOP conditions; therefore, impacts to wetlands within and surrounding the study area are not anticipated to be significant.

*5.1.2.4.2 Alternative 1.A (Buyouts) Impacts**

Direct Impacts: No wetland delineations have occurred; however, the likelihood of jurisdiction wetland presence within each parcel is low. **Figure 40** shows the presence

of hydric soils within the entire footprint of the alternative; however, developed parcels have degraded wetland habitat through previously introduced construction materials and continued lawn maintenance. Furthermore, demolition of structures would be confined within each parcel; therefore, no significant impacts to wetlands would occur.

Indirect Impacts: The alternative would demolish structures within each of the 25 parcels and have the potential to increase habitat by 170 acres. Because the buyout footprint is within the floodplain, demolition of each structure may lead to wetland conversion over a long-term period. The existing parcels contain red-clay soil used for structural foundations which are not classified as wetland soils; however, introduction of acidic soils may occur over many decades provided the parcels remain undeveloped. Consequently, the alternative may have minor benefits to wetlands.

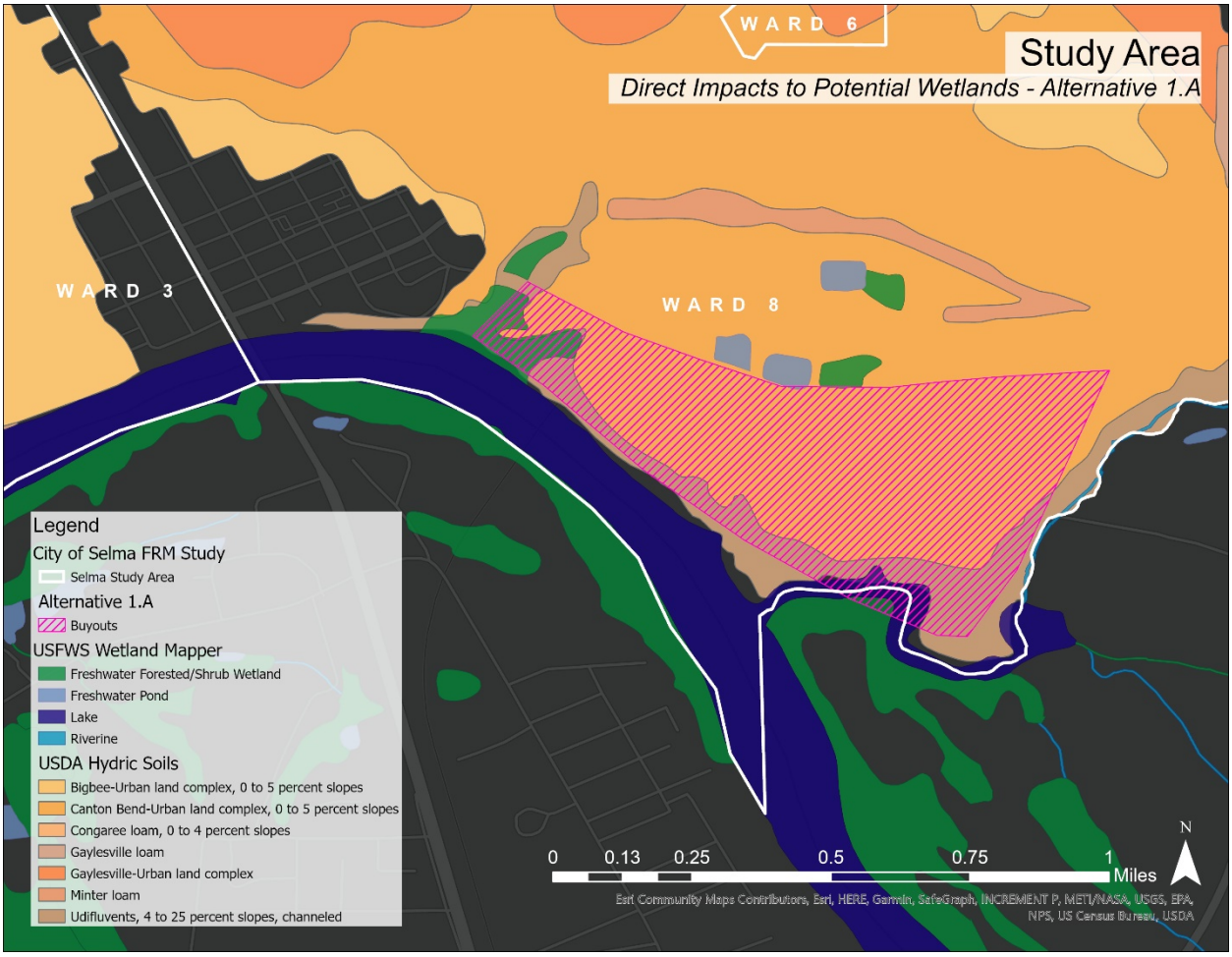

Figure 40: Direct Impacts to Potential Wetlands within Alternative 1.A Footprint

*5.1.2.4.3 Alternative 3 (Optimized Levee) Impacts**

Direct Impacts: As shown in **Figure 41** on page 111, the optimized levee alignment would eliminate potential wetlands within the direct footprint. Additional wetlands would be disconnected from the floodplain thus having the potential to sever hydrologic connectivity in the northern portion of Ward 6. Mitigation would be required for any impacts to jurisdictional wetlands.

Indirect Impacts: Construction of the alternative would result in induced flooding in the City of Selmont and within isolated pockets in the City of Selma. Much of the surrounding area, including the City of Selmont, is comprised of wetlands due to the low-lying elevation of the floodplain. Because the three components of jurisdictional wetlands are comprised of vegetation, soils, and hydrology, alteration of the existing hydrologic pattern would contribute to adverse effects on wetlands. Under FWOP conditions, peak flows within the study area would increase by 2%; therefore, long-term compounding factors, such as induced flooding, may alter wetlands surrounding the study area as a result of the alternative. Mitigation requirements would require a quantitative analysis before coordination for the alternative could be complete.

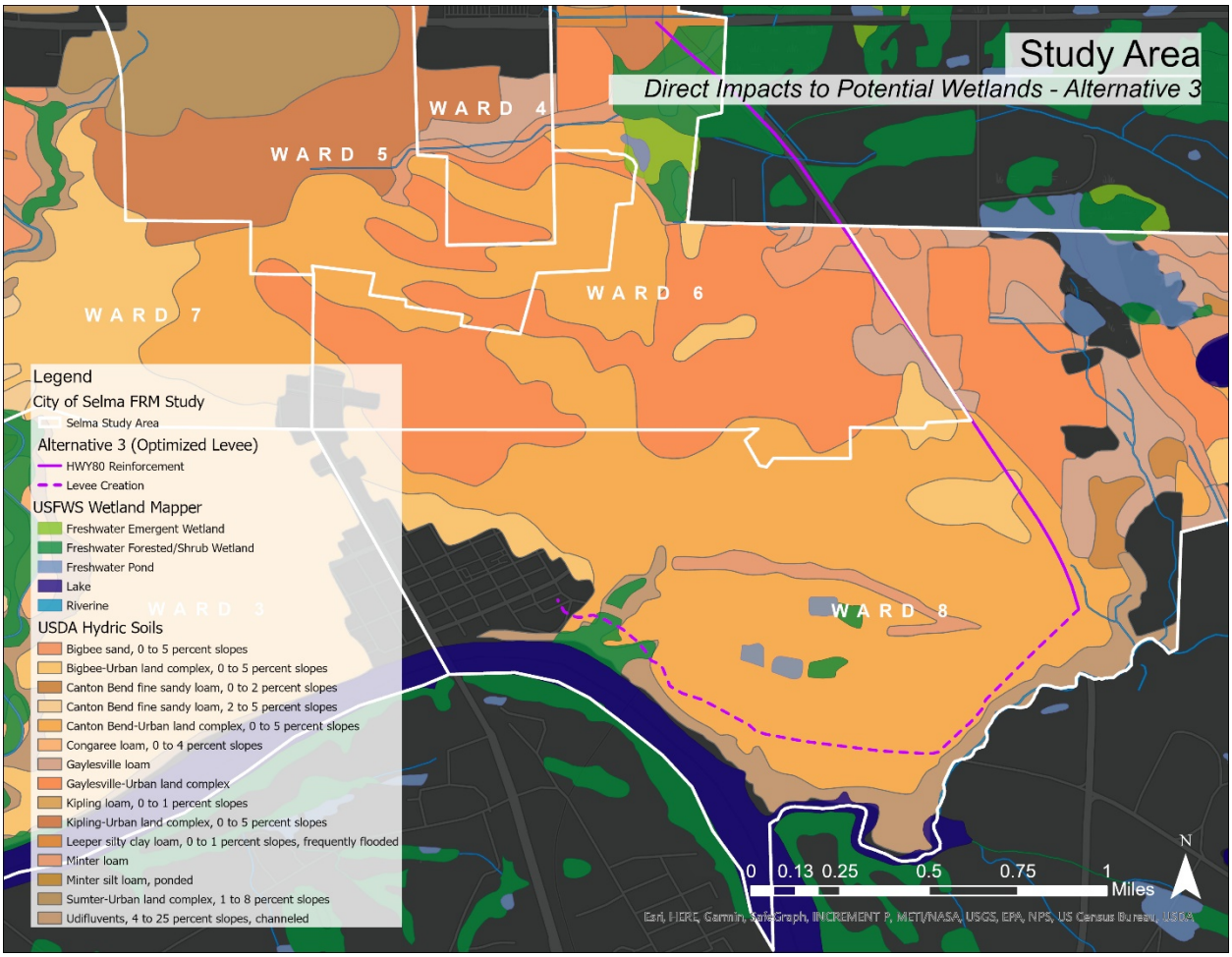

Figure 41: Alternative 3 impacts to potential wetlands

*5.1.2.4.4 Alternative 4 (Bank Stabilization) + FRP Impacts**

Direct Impacts: The Soldier-Pile Wall footprint does not encompass jurisdictional wetlands. A desktop review found that no hydric soils are present within the footprint of Alternative 4 (**Figure 42** on page 112**)**. Additionally, based on field observations conducted March 2, 2021, no hydrophytic vegetation was observed. The geographical situation of the cliff side also presents a low likelihood of depressional areas suitable for wetland development.

Given that the footprint lacks two of the three required criteria to meet jurisdictional wetland classification, the USACE, Mobile District determined that no jurisdictional wetlands are present within Alternative 4 footprint. WQC has been obtained and a 404(b)(1) evaluation has been completed. Both documents are included in **Appendix B**. Additionally, no potential wetlands would be impacted as a result of the FRP. Therefore, no loss of wetlands would occur, and no compensatory mitigation is required.

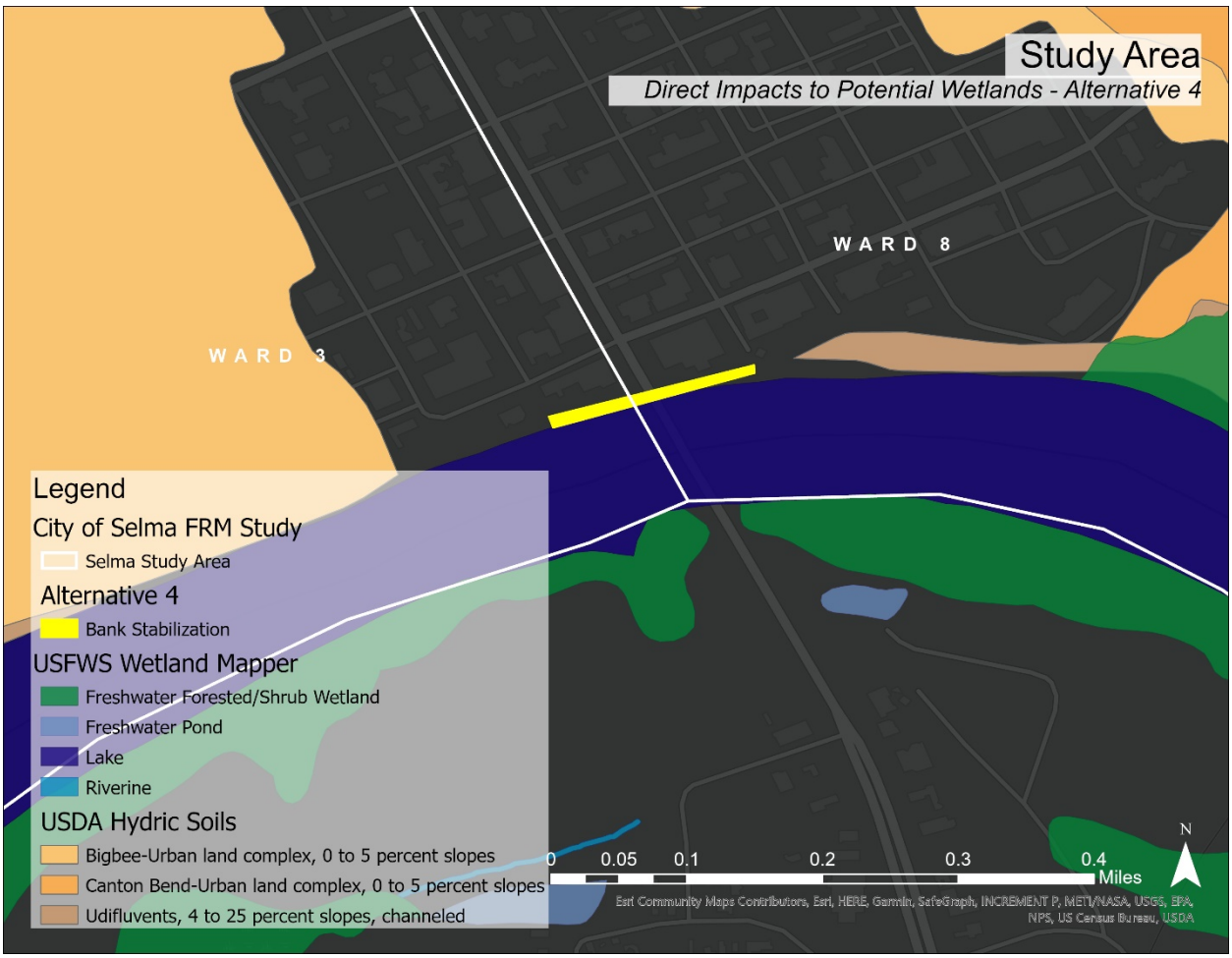

Figure 42: Alternative 4 Direct Impacts to Wetlands

Indirect Impacts: This alternative would not disconnect potential wetlands from the floodplain; therefore, existing wetlands within the surrounding area would maintain their hydrologic connectivity and would not be indirectly adversely impacted.

*5.1.2.4.5 Alternative 5 (Bank Stabilization + Buyouts) Impacts**

Direct Impacts: Staging and access for Soldier-Pile Wall construction would be obtained via river. As shown in **Figure 43** on page 113, the buyout boundary may encroach on potential wetlands. Activities related to buyouts include acquisition and demolition of existing structures. Staging for demolition would occur in each identified parcel. Access would be obtained using existing roads. Because each parcel is developed with owner occupancy, the potential for jurisdictional wetlands is minimal. Jurisdictional wetland surveys would be required to calculate mitigation needs.

Indirect Impacts: The conversion from developed land use to floodplain habitat within Ward 8 could allow for long-term wetland conversion; however, the likelihood is minimal. Consequently, no significant impacts to wetlands are anticipated.

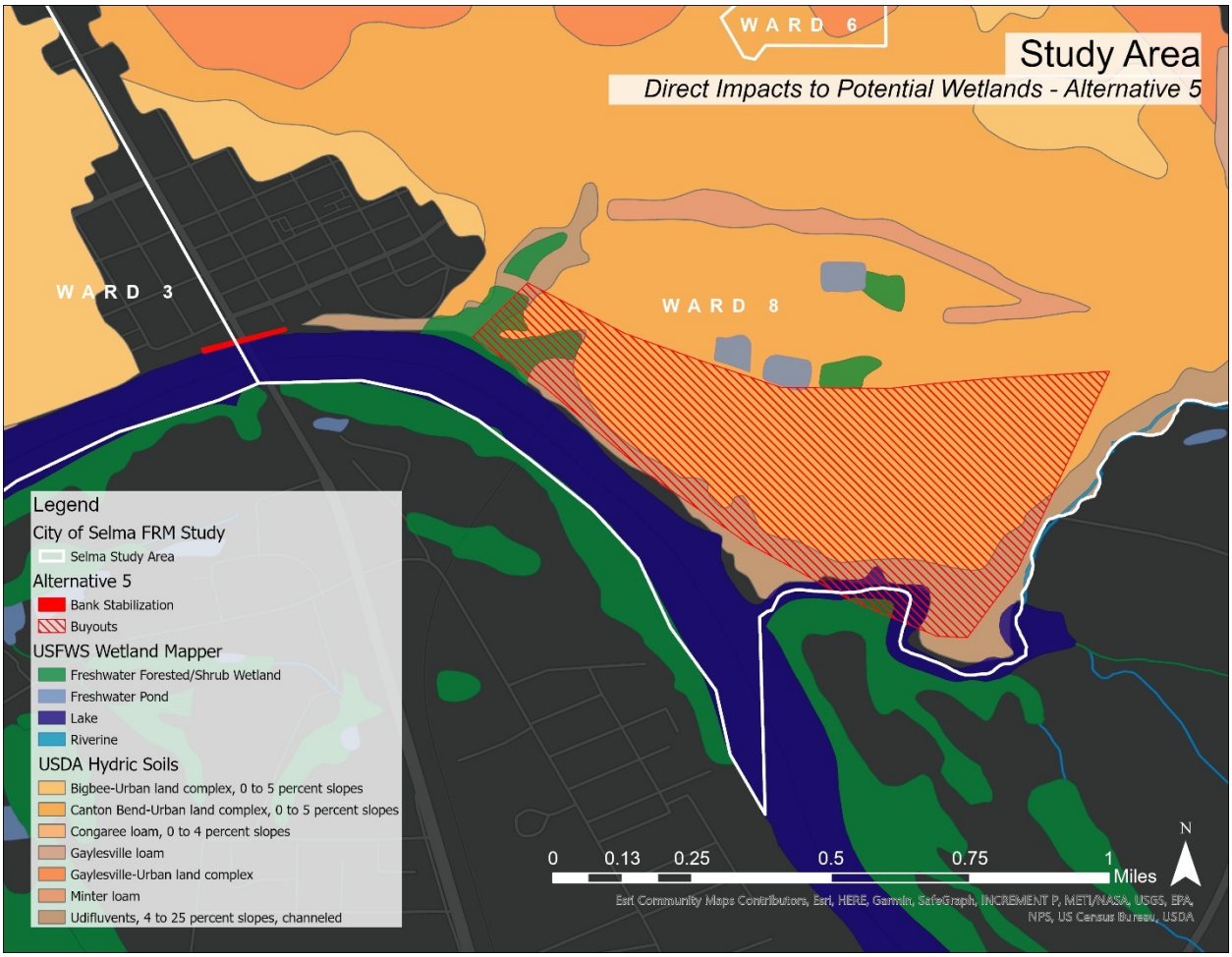

Figure 43: Alternative 5 encroachment on existing wetlands

*5.1.2.4.6 Alternative 6 (Combination) Impacts**

Direct Impacts: As shown in **Figure 44** on page 114, this alternative has the highest impacts to wetlands compared to all other alternatives. Wetland delineations would be required to determine mitigation needs.

Indirect Impacts: Though Alternative 6 features demolition of structures within the 68-acre buyout footprint, these potential minor benefits would not offset the adverse impacts resulting from the floodplain disconnection within the study area. Additionally the optimized levee footprint may contribute to widespread indirect impacts to surrounding wetlands through induced flooding; therefore, the alternative would have adverse impacts to wetlands within the study area.

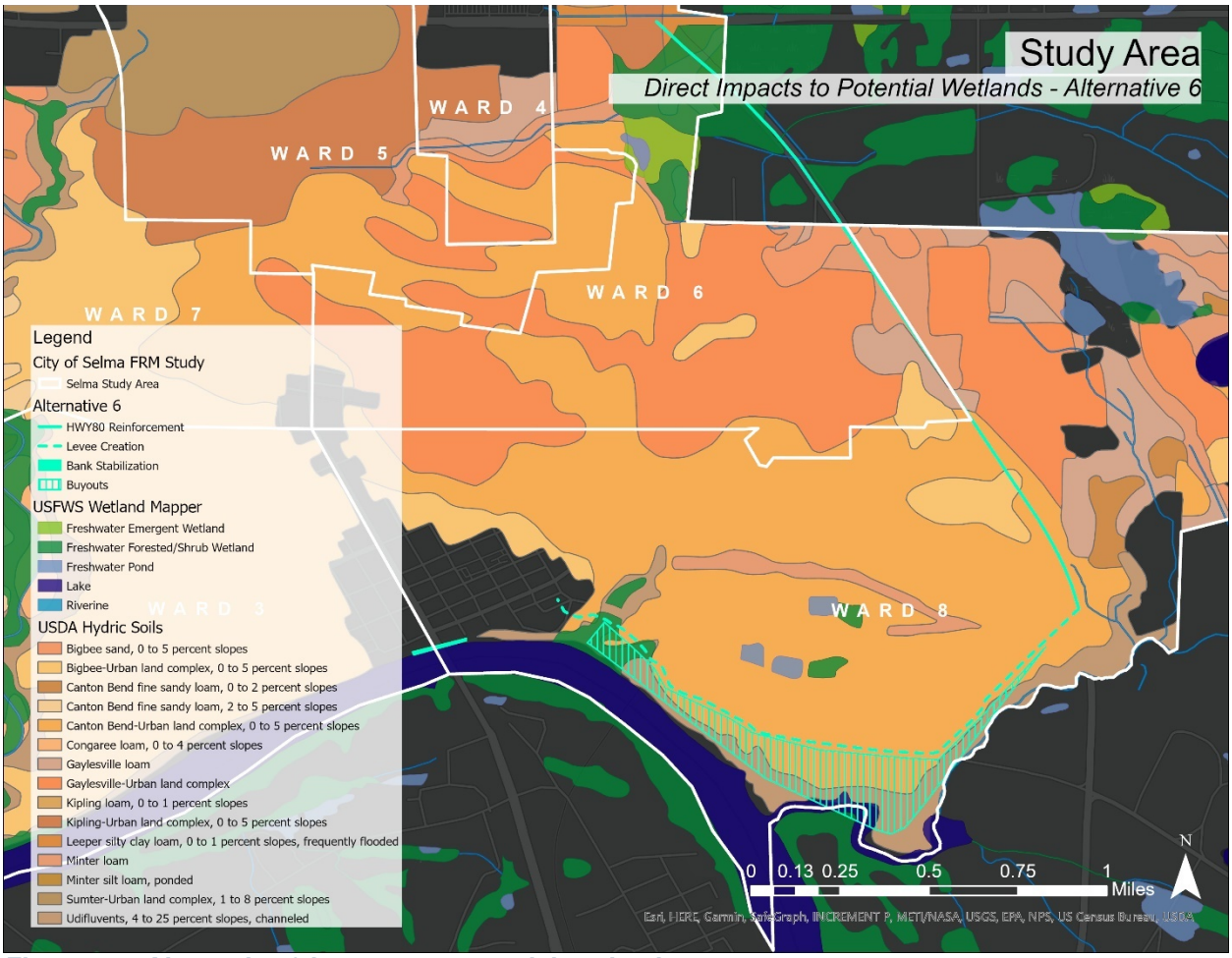

Figure 44: Alternative 6 impacts to potential wetlands

*5.1.3 Cultural and Historic Resources**

*5.1.3.1 Architectural**

*5.1.3.1.1 No Action Alternative Impacts**

Direct Impacts: The NAA produces negative impacts to architectural cultural resources as the degraded bankline threatens the structural integrity of Nationally Registered Historic Properties.

Indirect Impacts: Potential loss of these structures as a result of the NAA negatively impacts the viewshed of the Edmund Pettus Bridge and Water Avenue Historic District.

*5.1.3.1.2 Alternative 1.A (Buyouts) Impacts**

Direct Impacts: The removal of structures would negatively impact communities' social cohesion.

Indirect Impacts: The removal of structures would impact the viewshed of the Edmund Pettus Bridge and the Water Avenue.

*5.1.3.1.3 Alternative 3 (Optimized Levee) Impacts**

Direct Impacts: Alternative 3 would have negative impacts to structures within the footprint of the levee alignment as these would have to be removed.

Indirect Impacts: Alternative 3 would have negative impacts to the viewshed of the Edmund Pettus Bridge and the Water Avenue.

*5.1.3.1.4 Alternative 4 (Bank Stabilization) + FRP Impacts**

Direct Impacts: Alternative 4 would have beneficial impacts to the properties listed on the NRHP with the bank stabilization footprint.

Indirect Impacts: Alternative 4 could have negative impacts to viewshed as the viewshed of the Edmund Pettus Bridge and the Water Avenue Historic District would be altered. These impacts can be mitigated through construction of a natural bankline and Memorandum of Agreement (MOA) among the National Park Service (NPS), the Alabama Historical Commission (AHC) State Historic Preservation Officer (SHPO), and the USACE.

*5.1.3.1.5 Alternative 5 (Bank Stabilization + Buyouts) Impacts**

Direct Impacts: Alternative 5 would produce beneficial impacts in regard to the bank stabilization for architectural cultural resources as the stabilization alternative would protect the structural integrity of properties listed on the NRHP. The buyout component of the alternative would have negative impacts due to the removal of structures from a historic district.

Indirect Impacts: Alternative 5 would have similar negative impacts to Alternatives 1 and 4.

*5.1.3.1.6 Alternative 6 (Combination) Impacts**

Direct Impacts: Alternative 6 would produce similar impacts as Alternatives 3 and 5.

Indirect Impacts: Alternative 6 would produce similar impacts as Alternatives 3 and 5

*5.1.3.2 Cultural and Archaeological Resources**

*5.1.3.2.1 No Action Alternative Impacts**

Direct Impacts: The NAA would continue to produce negative impacts to cultural and archaeological resources as known archaeological sites along the bankline are losing integrity due to the severe erosion and sloughing.

Indirect Impacts: The NAA has no foreseeable indirect impacts to archaeological resources.

*5.1.3.2.2 Alternative 1.A (Buyouts) Impacts**

Direct Impacts: Alternative 1 could produce impacts to archaeological sites within the buyout footprint but these impacts could be mitigated through archaeological investigation.

Indirect Impacts: There are no foreseeable indirect impacts to archaeological resources.

*5.1.3.2.3 Alternative 3 (Optimized Levee) Impacts**

Direct Impacts: Alternative 3 could potentially produce negative impacts to archaeological resources as there is a highly likelihood archeological sites could lie within the optimized levee alignment. These effects could be mitigated with archaeological investigation.

Indirect Impacts: There are no foreseeable indirect impacts to archaeological resources.

*5.1.3.2.4 Alternative 4 (Bank Stabilization) + FRP Impacts**

Direct Impacts: Alternative 4 would have adverse impacts to archaeological sites along the bank but these impacts could be mitigated through archeological data recovery. These efforts would be captured in a MOA among the NPS, the Alabama SHPO, and the USACE.

Indirect Impacts: There are no foreseeable indirect impacts to archaeological resources.

*5.1.3.2.5 Alternative 5 (Bank Stabilization + Buyouts) Impacts**

Direct Impacts: Alternative 5 would have similar impacts to Alternatives 1 and 4

Indirect Impacts: Alternative 5 has no foreseeable indirect impacts to archaeological resources.

*5.1.3.2.6 Alternative 6 (Combination) Impacts**

Direct Impacts: Alternative 6 would have similar impacts as Alternatives 3 and 5.

Indirect Impacts: Alternative 6 has no foreseeable indirect impacts to archaeological resources

*5.1.4 Socioeconomics**

*5.1.4.1 Land Use**

*5.1.4.1.1 No Action Alternative Impacts**

Direct Impacts: No changes to land use within the study area would occur as a result of the NAA. Therefore, no impacts would occur as a result of the NAA.

Indirect Impacts: No significant development would occur under the NAA. The study area and surrounding areas are not anticipated to undergo a significant growth. However continued riverbank erosion is anticipated. Should no protection measures be implemented, structures along Water Avenue would continue to be condemned. No future development would occur at these condemned locations thus limiting future annual Selma Bridge Crossing Jubilee occurrences; therefore, the NAA may have moderate adverse impacts to land use and subsequent resources.

*5.1.4.1.2 Alternative 1.A (Buyouts) Impacts**

Direct Impacts: The buyout footprint contains 25 parcels of residential properties. Demolition of these structures would occur following relocation of occupants. These parcels would be prohibited from further development and would revert to floodplain

habitat; therefore, land use within the buyout footprint would change from developed to undeveloped lands. The effects of this change would be minor.

Indirect Impacts: No protection of the vulnerable properties listed on the NRHP would occur under this alternative. Without bank stabilization, impacts to tourism and the regional economy would occur, which could indirectly impact land use due to the loss of revenue which supports land use development; however, these impacts would be minor overall.

*5.1.4.1.3 Alternative 3 (Optimized Levee) Impacts**

Direct Impacts: Parcels within the footprint of the alternative would be acquired to construct the optimized levee alignment. U.S. Highway 80 would remain a main thoroughfare through the study area. Overall, the alternative would have a minor direct impact on land use.

Indirect Impacts: Parcels within the interior portion of the optimized levee alignment are predominantly residential properties. Construction of the optimized levee would allow the interior parcels to remain residential; however, parcels within the immediate footprint of the levee alignment would be acquired for construction of the levee. Hypothetically, residents within Ward 8 may desire to build new structures or rebuild existing structures; however, construction of the optimized levee would not improve the economy. Therefore, residents would not have an increased capacity to significantly develop Ward 8. Overall, the alternative would have no significant indirect impacts to land use.

*5.1.4.1.4 Alternative 4 (Bank Stabilization) + FRP Impacts**

Direct Impacts: Land use within the immediate footprint of the alternative is undeveloped. Construction of the Soldier-Pile Wall would convert the existing land use to low intensity development. As stated in **Section 4.3** the FRP would provide recommendation for addressing flood risk through responsible future development of the floodplain. Overall, the alternative would have a minor direct impact on land use.

Indirect Impacts: The Soldier-Pile Wall would reduce flood induced erosion which could aid in the City's attempts to strengthen structural foundations along Water Avenue. Should bank stabilization be implemented, properties listed on the NRHP within the Historic Downtown District of the City of Selma may be protected from future destruction. In addition, the annual Selma Bridge Crossing Jubilee relies heavily on the integrity of the historical path that Representative John Lewis and Dr. Martin Luther King Jr walked. Prevention of future erosion would protect this integral landmark from future destruction; therefore, this alternative would have a significant benefit to the study area when compared against FWOP conditions.

*5.1.4.1.5 Alternative 5 (Bank Stabilization + Buyouts) Impacts**

Direct Impacts: Buyouts would convert approximately 170 acres from residential land to undeveloped floodplain. These parcels would be prohibited from further development. Overall, the alternative would have a minor direct impact on land use.

Indirect Impacts: The Soldier-Pile Wall would stabilize the eroding riverbank which may aid in the preservation of the properties listed on the NRHP atop the bluff. Maintaining the integrity of properties listed on the NRHP and their associated land use would help to

maintain tourism and commerce associated with the annual Selma Bridge Crossing Jubilee and Heritage Tourism; therefore, the Soldier-Pile Wall would significantly benefit land use within the study area when compared against FWOP conditions.

*5.1.4.1.6 Alternative 6 (Combination) Impacts**

Direct Impacts: The Optimized levee alignment would convert approximately 18 acres of residential land within the direct footprint of the alignment within Ward 8. Acquisition of parcels located within the levee footprint would be required. Buyouts would convert 68 acres outside the optimized levee alignment from residential land to undeveloped floodplain. Relocation assistance to displaced persons would be offered. Fee and easement interests acquired would prohibit further development. Overall, the alternative would have a minor impact to land use.

Indirect Impacts: The Soldier-Pile Wall would reduce future erosion which could aid in the attempts to strengthen structural foundations along Water Avenue. Construction of the Soldier-Pile Wall would significantly reduce the threats to properties listed on the NRHP within the Water Avenue Historic District; therefore, through bank stabilization, land use of Water Avenue would not change and would serve to maintain existing cultural resources, tourism, and industry. Compared against FWOP conditions, the Soldier-Pile Wall would provide a significant benefit to the study area.

*5.1.4.2 Noise**

*5.1.4.2.1 No Action Alternative Impacts**

Direct Impacts: The study area and its surrounding are not located within a high-density metropolitan area. Metropolitan cities such as Montgomery or Birmingham experience regular elevated noise levels due to continual traffic and construction. The study area experiences minimal traffic during the majority of the year. Under the NAA, no construction or demolition would be implemented; therefore, there no impacts to noise levels would occur.

Indirect Impacts: No indirect impacts would occur as a result of the NAA.

*5.1.4.2.2 Alternative 1.A (Buyouts) Impacts**

Direct Impacts: Demolition within each of the 25 parcels would increase noise levels temporarily and would return to normal conditions upon completion. As such, no significant impacts would occur.

Indirect Impacts: Less residential structures would result in less localized traffic, which would indirectly reduce noise levels; however, this impact would be minor and not significant.

*5.1.4.2.3 Alternative 3 (Optimized Levee) Impacts**

Direct Impacts: Construction, access, and staging would increase noise volumes within average limits; however, this disturbance would cease upon project completion. As such, no significant impacts would occur.

Indirect Impacts: Residential commute timeframes may increase due to potential road realignments. Increased in commute times may increase the noise volumes; however, these increases are anticipated to be minor and not significant.

*5.1.4.2.4 Alternative 4 (Bank Stabilization) + FRP Impacts**

Direct Impacts: The Soldier-Pile Wall would take approximately 30 months to complete. This would increase noise levels in the immediate vicinity of the footprint; however, noise volumes would return to normal conditions upon completion of the project. Evacuation from areas identified within the FRP during flooding events would temporarily increase noise from the increased traffic; however, noise would recede once evacuation is complete. Overall, no significant impacts would occur.

Indirect Impacts: The Soldier-Pile Wall would be constructed to provide bank stabilization to the properties listed on the NRHP along the bluff. These structures are integral to the tourism during the annual Selma Bridge Crossing Jubilee. Survival of these structures, and the associated tourism would mean no change to long term noise levels. No significant increase in land use development is anticipated; therefore, no indirect impacts to noise would occur.

*5.1.4.2.5 Alternative 5 (Bank Stabilization + Buyouts) Impacts**

Direct Impacts: Construction, access, staging, and demolition activities would increase noise volumes within average limits; however, this disturbance would cease upon project completion. As such, no significant impacts would occur.

Indirect Impacts: Removal of structures within Ward 8 would decrease the amount of traffic flow; therefore, a potential decrease in noise volumes could occur as a result of the decreased traffic. However, this benefit would be *de minimis*.

*5.1.4.2.6 Alternative 6 (Combination) Impacts**

Direct Impacts: Construction, access, staging, and demolition activities would increase noise volumes within average limits; however, this disturbance would cease upon project completion. As such, no significant impacts would occur.

Indirect Impacts: Residential commute timeframes may increase due to road realignments. An increase in commute times would increase the noise volumes; however, these increases are anticipated to be minor and not significant.

*5.1.4.3 Aesthetics**

*5.1.4.3.1 No Action Alternative Impacts**

Direct Impacts: Current aesthetics of the study area show a naturally meandering river with eroded cliffs and perilously close structures. High development is located within the central portion of the area and less developed areas with more vegetation are located on the western portion. No construction or demolition would be implemented under the NAA; therefore, no direct impacts to the aesthetics of the study area would occur.

Indirect Impacts: The city viewshed is historic in that many of the existing buildings are listed on the NRHP. Continued erosion of the riverbed under FWOP conditions would result in the destruction of these properties listed on the NRHP which would permanently

degrade the historic viewshed of Downtown Selma; therefore, the NAA would have significant adverse impacts.

*5.1.4.3.2 Alternative 1.A (Buyouts) Impacts**

Direct Impacts: Implementation of the alternative would convert the existing aesthetics to floodplain terrain; therefore, the alternative would have direct impacts on the aesthetics of Ward 8 and the Historic District. These impacts are anticipated to be minor.

Indirect Impacts: No bank stabilization features are captured within the alternative; therefore, the riverbank would continue to degrade. Existing structures would continue to be threatened and may be condemned following bank failures. Consequently, the aesthetics of downtown Selma would be indirectly negatively impacted under the alternative over a period of 50 years and may significantly impact the study area.

*5.1.4.3.3 Alternative 3 (Optimized Levee) Impacts**

Direct Impacts: The optimized levee alignment would require the acquisition of parcels within the direct footprint of the levee alignment. Structures within those parcels would be demolished. Additionally, construction of the levee would create a visual barrier for residents of Ward 8 and would have direct adverse impacts to the aesthetics of the Historic District; however, these impacts would be minor and not significant.

Indirect Impacts: There would be no significant indirect impacts to aesthetics.

*5.1.4.3.4 Alternative 4 (Bank Stabilization) + FRP Impacts**

Direct Impacts: No adverse impacts to aesthetics would occur as a result of the FRP. Under FWOP conditions the riverbank would continue to degrade, and existing properties listed on the NRHP would likely be condemned and demolished. Though the construction of a Soldier-Pile Wall and riprap encasement would permanently alter the aesthetics of the natural riverfront, the inclusion of a structure to maintain the integrity of the properties listed on the NRHP would only serve to benefit the aesthetics. Additionally, the design of the Soldier-Pile Wall would be consistent with the historical background of the study area; therefore, compared to FWOP conditions, this alternative would have significant benefits the aesthetics of the study area.

Indirect Impacts: There would be no significant indirect impacts as a result of the alternative.

*5.1.4.3.5 Alternative 5 (Bank Stabilization + Buyouts) Impacts**

Direct Impacts: Direct impacts would occur from the Soldier-Pile Wall; however, all efforts would be made to design the wall in a beneficial manner. These benefits would be significant.

Indirect Impacts: Impacts would be consistent with Alternatives 1.A and 4.

*5.1.4.3.6 Alternative 6 (Combination) Impacts**

Direct Impacts: Construction of the optimized levee would have minor adverse impacts to aesthetics in Ward 8. Though the Soldier-Pile Wall would significantly benefit aesthetics, the appearance of the optimized levee may reduce the overall benefits that could be achieved.

Indirect Impacts: Aesthetic impacts related to Alternative 6 would be a combination of Alternatives 3 and 5; although impacts relating to the buyout component would be scaled down due to the smaller footprint.

*5.1.4.4 Recreation**

*5.1.4.4.1 No Action Alternative Impacts**
Direct Impacts: No construction, staging, or demolition would occur under the NAA; therefore, no impacts to recreational activities or recreational traffic would occur.

Indirect Impacts: Under the NAA, no construction would occur and FWOP conditions would be realized. Without a proposed plan to strengthen and/or protect riverbank conditions, use of existing overlook parks could be reduced and/or eliminated. Currently the USACE, Mobile District is pursuing a Selma CAP Section 14 Project that is in D&I to reduce the severe erosion along the bankline of the Historic Riverfront Park, which emphasizes the necessity for bank stabilization measures. In summary, the NAA would be consistent with FWOP conditions and would have minor adverse impacts to recreation.

*5.1.4.4.2 Alternative 1.A (Buyouts) Impacts**
Direct Impacts: The alternative has no recreational features and would not require the elimination of any municipal parks; therefore, no direct impacts to recreation would occur.

Indirect Impacts: The annual Riverfront Market Festival occurs on Water Avenue. Without a bank stabilization feature, the alternative may indirectly cause a decline in projected recreational use due to the likely condemnation of existing properties listed on the NRHP; however, these impacts are anticipated to be minor.

*5.1.4.4.3 Alternative 3 (Optimized Levee) Impacts**
Direct Impacts: Construction of the levee may disrupt and alter traffic patterns as local routes may be realigned. Rerouted commutes would likely result in minor impacts to not only daily commuters but also visitors to Selma. Access for construction would be obtained using existing roads. Staging areas would be identified and selected near workstations while considering impacts to municipal parks. Should any staging occur within a municipal park, areas would be restored to pre-project conditions following construction completion. Overall, these impacts are anticipated to be minor.

Indirect Impacts: A qualitative analysis shows that induced flooding from the optimized levee alignment would spread throughout the surrounding area, including the City of Selmont, and may impact widespread recreation. Public recreational parks and facilities within the induced flooding extent would be inaccessible to the public during flooding events. These impacts are anticipated to be minor.

*5.1.4.4.4 Alternative 4 (Bank Stabilization) + FRP Impacts**
Direct Impacts: No impacts to recreation would occur from the FRP. When compared to FWOP conditions, the annual Riverfront Market Festival would benefit from construction of a Soldier-Pile Wall as future erosion would be reduced. These impacts are anticipated to be minor.

Indirect Impacts: No significant indirect impacts to recreation would occur.

*5.1.4.4.5 Alternative 5 (Bank Stabilization + Buyouts) Impacts**

Direct Impacts: Access for Soldier-Pile Wall construction would be obtained via river. Staging would be accomplished via barge. Construction and staging of Soldier-Pile Wall may disrupt fishing; however, anglers would be able to relocate to other areas of the river. Access, staging, and demolition activities for buyouts would not disrupt recreational events or activities since all impacts would be contained within each parcel and existing roads. As such, no significant impacts are anticipated.

Indirect Impacts: Construction of the Soldier-Pile Wall would benefit the annual Riverfront Market Festival through the stabilization of the riverbank; however, these impacts are anticipated to be minor.

*5.1.4.4.6 Alternative 6 (Combination) Impacts**

Direct Impacts: Construction of the optimized levee may disrupt local recreational traffic and activities during implementation. However, these impacts are anticipated to be minor and would revert to normal conditions upon completion.

Indirect Impacts: Construction of the Soldier-Pile Wall would benefit recreation through the stabilization of the riverbank. Conversely, induced flooding would impact widespread areas not currently experiencing the extent and/or magnitude of flooding which may disrupt recreation during flooding events. Overall, no significant impacts are anticipated.

*5.1.4.5 Industry**

*5.1.4.5.1 No Action Alternative Impacts**

Direct Impacts: No industries would be bought or relocated under the NAA; therefore, no direct impacts would occur.

Indirect Impacts: Flood induced erosion along the riverbank could lead to condemnation of local businesses. The City of Selma and Dallas County, Alabama are highly dependent on the annual Selma Bridge Crossing Jubilee which largely contributes to the Heritage Tourism, a significant economic driver. Heritage Tourism is reliant upon the historic viewshed of the Edmund Pettus Bridge; therefore, without any solution to stabilize the bankline a significant threat to industries, such as Heritage Tourism, would occur. Additionally, continued flooding within Ward 8 would occur, which would impact the R.L. Zeigler Packing Company (hence forth referenced as Zeigler Plant); therefore, the significant adverse impacts to industry are anticipated.

*5.1.4.5.2 Alternative 1.A (Buyouts) Impacts**

Direct Impacts: The proposed alternative would not directly impact existing industries within the buyout footprint. Only residential structures would be acquired and demolished. As such, no significant impacts are anticipated.

Indirect Impacts: Because the buyout footprint does not encompass the nearby Zeigler Plant, the industry would continue to be impacted by flooding. Additionally, the buyout footprint contains no risk-reduction solutions for the properties listed on the NRHP along Water Avenue. Without a proposed solution these properties listed on the NRHP, which are integral to the Heritage Tourism industry, would continue to be threatened from future

erosion; therefore, the alternative would have significant adverse indirect impacts to the industries within the study area.

*5.1.4.5.3 Alternative 3 (Optimized Levee) Impacts**

Direct Impacts: The optimized levee alignment would be located directly north of the Zeigler Plant which would not reduce flooding impacts to the industry. In addition, the optimized levee alignment would cause additional commute time and distance to employees as roadways are rerouted to accommodate for the levee. Overall, minor direct impacts are anticipated.

Indirect Impacts: Induced flooding to the Zeigler Plant may cause temporary closures during flood events. Additionally, potential revenue losses may occur as continued erosion of the riverbank may reduce Heritage Tourism. As such, significant indirect impacts are anticipated.

*5.1.4.5.4 Alternative 4 (Bank Stabilization) + FRP Impacts**

Direct Impacts: The Soldier-Pile Wall would have significant benefits to the Heritage Tourism industry by significantly reducing the threat of erosion, which leads to condemnation and demolition. As explained in **Sections 4.2.4.2.1.3** (RED) and **4.2.4.2.3** (OSE), this industry has an important role not only for the City of Selma but also the region. Overall, significant direct benefits are anticipated.

Indirect Impacts: The non-structural component of the Recommended Plan is the FRP; therefore, the Zeigler Plant within Ward 8 would continue to experience flood damages. Because the Alabama River flooding is slow-rising, citizens within the City of Selma would have ample notice to evacuate as outlined in the FRP. Production of the Zeigler Plant may be temporarily impacted as employees evacuate; however, production would return to normal once citizens arrive home following flood events. These impacts would be minor and would not offset the benefits obtained from reducing the threat to the Heritage Tourism.

*5.1.4.5.5 Alternative 5 (Bank Stabilization + Buyouts) Impacts**

Direct Impacts: No buyouts or relocation of local industries would occur as a result of the alternative; however, no flood-risk reduction to the Zeigler Plant would occur. These impacts are anticipated to be minor.

Indirect Impacts: The Soldier-Pile Wall would significantly benefit local and regional tourism through the increased bank stabilization.

*5.1.4.5.6 Alternative 6 (Combination) Impacts**

Direct Impacts: The alternative may cause additional time and distance to local employees as they reroute around the optimized levee alignment; however, these impacts are anticipated to be minor.

Indirect Impacts: The Soldier-Pile Wall would significantly benefit local and regional tourism, but the optimized levee may have minor adverse impacts to local commuters. The Zeigler Plant would continue being impacted from flooding events and may experience temporary closures. Overall, the alternative would have a significant benefit to industry through bank stabilization.

*5.1.4.6 Demographics**

*5.1.4.6.1 No Action Alternative Impacts**

Direct Impacts: No construction or demolition would occur; therefore, the social fabric of the community would not be altered. As such, no significant impacts are anticipated.

Indirect Impacts: The NAA would not increase revenue to the local community. Under FWOP conditions the community is anticipated to remain a disenfranchised minority population. As such, significant indirect impacts are anticipated.

*5.1.4.6.2 Alternative 1.A (Buyouts) Impacts**

Direct Impacts: The alternative would remove tenants within the 25 parcels in Ward 8. This would reduce the population within a disenfranchised community. The parcels would then be prohibited from further development. Compared to the entire study area parcels, this reduction would be minimal; therefore, the alternative would have a minor direct adverse impact to the demographics.

Indirect Impacts: As shown in **Section 4.2.4.2.3** (OSE), the additional burden on the City of Selma to carry out a buyout alternative would force the relocation of these tenants outside the study area due to the limited DSS housing. This would indirectly and adversely impact Community Cohesion and Social Vulnerability. These impacts are anticipated to be moderate.

*5.1.4.6.3 Alternative 3 (Optimized Levee) Impacts**

Direct Impacts: The optimized levee alignment would be predominantly located along U.S. Highway 80; however, approximately 1.6 mi of levee would be created within Ward 8 which could fragment the community. Overall, these impacts are anticipated to be minor.

Indirect Impacts: The alternative would have no indirect impacts to demographics. No permanent jobs or resources would be created as a result of the alternative. As such, no significant boost to citizens' livelihoods would occur.

*5.1.4.6.4 Alternative 4 (Bank Stabilization) + FRP Impacts**

Direct Impacts: No changes would occur to the study area population or income earnings. Construction would not contribute to permanent job creations nor would it draw a substantial population increase. As such, no significant impacts would occur.

Indirect Impacts: Through construction of a Soldier-Pile Wall, however, Heritage Tourism would continue to operate as outlined in the existing conditions. The dependency on this industry cannot be overstated. Loss of this revenue could impact over 1,000 jobs which would significantly devastate the economy of the study area. This would trickle down to the livelihoods of individual citizens; therefore, the alternative would benefit the study area when compared against FWOP conditions. These impacts are anticipated to be minor.

*5.1.4.6.5 Alternative 5 (Bank Stabilization + Buyouts) Impacts**

Direct Impacts: Ward 8 is composed of over 300 structures. The alternative would require acquisition of 25 parcels and relocation of tenants within Ward 8. Though Ward

8 is a severely economically depressed community, tenant dwellings are predominantly located within Ward 8 the southern portion of the Ward. Acquisition and relocation are generally favorable to homeowners as monetary value can be obtained; however, tenants do not receive the same benefits and instead typically receive negative effects from mandated relocation. Due to the limited DSS housing, relocation may require tenants to be established in neighboring communities due to the inadequate availability within the City of Selma. Should citizens be relocated outside the study area, the alternative would permanently remove those residents from the local demographic. Overall, these impacts are anticipated to be minor.

Indirect Impacts: Because the Soldier-Pile Wall would reduce riverbank erosion, the local economy driven by tourism would continue to sustain the City of Selma and in turn no additional hardships would be inflicted upon the community. Therefore, no significant indirect impacts to demographics are anticipated.

*5.1.4.6.6 Alternative 6 (Combination) Impacts**

Direct Impacts: The alternative would require the acquisition and demolition of structures outside the levee alignment within Ward 8. Residents would be relocated; however, limited comparable DSS housing is available within the City limits. Additionally, the City of Selma has marginal professional real estate capability to implement the acquisition of unprotected structures outside of levee alignment in accordance with Federal laws and regulations. The reduction of citizens would have a minor adverse impact to the demographics.

Indirect Impacts: The optimized levee alignment may fragment the local community and have a minor adverse impact on demographics.

*5.1.4.7 Public Safety**

*5.1.4.7.1 No Action Alternative Impacts**

Direct Impacts: No construction, staging, or demolition would occur; therefore, no direct threats and/or risks to public safety would occur under the NAA.

Indirect Impacts: No reduction in flooding extent or depth would occur under the NAA. Additionally, as stated under FWOP conditions the riverbank would continue to erode which would contribute to significant concerns for public safety from continued bank failures. As such, there would be adverse impacts from the NAA.

*5.1.4.7.2 Alternative 1.A (Buyouts) Impacts**

Direct Impacts: Demolition activities would be barricaded to prevent members of the public from accessing a hazardous work site; therefore, no direct impacts to public safety would occur.

Indirect Impacts: Because the alternative does not incorporate bank stabilization, the public safety risk for the eroding bank and structural instability would still occur; therefore, the alternative would have minor indirect adverse impacts to public safety with respect to the structures and infrastructure along Water Avenue.

*5.1.4.7.3 Alternative 3 (Optimized Levee) Impacts**

Direct Impacts: Local residents would be prohibited from entering construction and staging zones. Additionally, increased flooding protection from the optimized levee alignment would reduce flood risk within Ward 8; however, flooding depths to the majority of structures within Ward 8 are below first floor elevations across a broad area; therefore, the amount of substantial risk reduction is minimal. Overall, no significant impacts would occur.

Indirect Impacts: Operation of flood gates could present a risk to public safety during installation and preparation of the structure during eventual flooding events. Installation of flood gates could also produce a transfer of risk as citizens may need to be evacuated during flooding events and emergency crews would have limited access to flood prone areas. Additionally, no bank stabilization would occur and increased threats to public safety in the downtown area would continue. Most importantly, the optimized levee alignment would cause induced flooding and may increase threats to public safety in a broader area during flooding events. Overall, these impacts are anticipated to be minor.

*5.1.4.7.4 Alternative 4 (Bank Stabilization) + FRP Impacts**

Direct Impacts: There are several factors that cause the erosion of the riverbank. Erosion of the riverbank occurs at an unpredictable rate; therefore, the USACE cannot confirm with high confidence the concerns for public safety. However, the erosion process leads to condemnation of threatened structures. Should any persons be present in the event of a spontaneous structural collapse, the concern for public safety would be paramount; therefore, the alternative would reduce the public safety concern to occupants and pedestrians along Water Avenue. Additionally, the FRP would identify areas at risk during flood events and would create a notification and evacuation system. This addresses the risk to life-safety during flooding events while being cost effective and efficient; therefore, the alternative would provide a minor benefit to the study area.

Indirect Impacts: No significant indirect impacts are anticipated.

*5.1.4.7.5 Alternative 5 (Bank Stabilization + Buyouts) Impacts**

Direct Impacts: Local residents would be prohibited from entering construction, staging, and demolition zones. Removal of residents that experience first floor elevation flooding would reduce the risk to public safety. Additionally, the Soldier-Pile Wall would eliminate threats to public safety from future bank failures. Overall, these benefits are anticipated to be minor.

Indirect Impacts: Maintenance of the Soldier-Pile Wall may present a minor risk to public safety as persons would be required to remove encroaching vegetation; however, herbicides could be applied at a greater distance and reduce the risk to public safety. As such, these impacts are anticipated to be minor.

*5.1.4.7.6 Alternative 6 (Combination) Impacts**

Direct Impacts: Local residents would be prohibited from entering construction, staging, and demolition zones. Additionally, decreased flooding risk from the levee alignment would eliminate flooding within Ward 8; however, the majority of flood depths within Ward

8 are below first floor elevations so risk reduction is minimal. Overall, these benefits are anticipated to be minor.

Indirect Impacts: Operation and maintenance of the flood gates and Soldier-Pile Wall may present increased risks to public safety; however, these impacts are anticipated to be minor.

*5.1.4.8 Traffic and Navigation**

*5.1.4.8.1 No Action Alternative Impacts**

Direct Impacts: No terrestrial or riverine construction, staging, or demolition would occur; therefore, no impacts to existing transportation and navigation would occur.

Indirect Impacts: Continued erosion of the riverbank under FWOP conditions would lead to additional road closures as roads would be unsafe to travel due to lost foundation material. This would have negative impacts on resources such as historic trails, structure, town, and recreation which collectively account for a large portion of traffic during the annual Selma Bridge Crossing Jubilee. A reduction of these resources would contribute to a reduction in overall traffic during a brief period of time. Likewise, continual erosion of the riverbank would accumulate in the immediate and downstream portions of the Alabama River; thereby decreasing the overall navigation channel depth. These impacts are anticipated to be minor; therefore, the impacts of the NAA are not significant.

*5.1.4.8.2 Alternative 1.A (Buyouts) Impacts**

Direct Impacts: Through the removal of residential structures within Ward 8, local traffic would be reduced; however, the amount of traffic reduction would be minimal. As such, these impacts are anticipated to be minor.

Indirect Impacts: The navigational channel within the Alabama River may be negatively impacted as a result of the alternative. Without bank stabilization the riverbank would continue to erode. Although the Alabama River is a low-use system, navigational maintenance dredging is performed at varying frequencies; however, the Selma City Marina small boat access channel is performed on an as-needed basis. Eventually sedimentation may build up with enough capacity to reduce the navigational channel, thus causing a negative impact to navigation; however, sediment accumulation to that extreme would take many decades. Consequently, these impacts to traffic and navigation are anticipated to be minor.

*5.1.4.8.3 Alternative 3 (Optimized Levee) Impacts**

Direct Impacts: Construction, access, and staging activities would block or impede traffic in the immediate vicinity of work. The alignment of the levee would permanently realign and/or remove existing roads; therefore, a minor change to existing roadways would occur. No construction would occur in the river, however, so no disruption to navigation would occur. Overall, these impacts are anticipated to be minor.

Indirect Impacts: The alternative would have similar indirect impacts to that of the NAA. In addition, induced flooding would cause transportation disruption during flooding events in areas not accustomed to deeper flood depths. No change to navigation would occur

as a result of the optimized levee alignment. Overall, these impacts are anticipated to be minor and not significant.

*5.1.4.8.4 Alternative 4 (Bank Stabilization) + FRP Impacts**

Direct Impacts: Traffic would be temporarily impacted during evacuation as identified within the FRP; however, traffic would reduce to normal conditions upon completion. The alternative would also reduce the erosional processes along the riverbank which would reduce the build-up of sedimentation within the Alabama River. Though the Alabama River is designated as a low-use system, a reduction is sediment accrual would have a minor benefit navigation compared to FWOP conditions.

Indirect Impacts: No significant indirect impacts are anticipated as a result of the alternative. The Soldier-Pile Wall would not permanently change navigational use within the Alabama River. Temporary increase would occur through implementation due to the need to construct from barge platforms; however, upon construction completion navigational use would revert to normal conditions.

*5.1.4.8.5 Alternative 5 (Bank Stabilization + Buyouts) Impacts**

Direct Impacts: No roadblocks would be necessary during buyout demolition activities. Access would be gained using existing roads and staging would occur within each parcel. Traffic may be slowed due to increased activity; however, these impacts would be temporary and minor. Staging, access, and construction of the Soldier-Pile Wall would occur via river access through barges. Navigation would be directed around construction activities; however, since the Alabama River is considered low-use no significant impacts to commercial navigation are anticipated. These minor impacts to navigation would return to pre-construction conditions following project completion. Overall, no significant impacts are anticipated.

Indirect Impacts: The alternative would indirectly benefit navigation as the amount of sediment accrual would be reduced; however, this benefit would be minor.

*5.1.4.8.6 Alternative 6 (Combination) Impacts**

Direct Impacts: Construction, access, staging, and demolition for the complete alternative would impact traffic and navigation. Construction of the optimized levee alignment would cross existing roads which may be permanently realigned and/or removed to reroute around the optimized levee. Navigation impacts during construction of the Soldier-Pile Wall would return to preconstruction conditions following project completion. Overall, these impacts are anticipated to be minor.

Indirect Impacts: The Cities of Selma and Selmont would experience increased flooding depths and extents which may prevent localized traffic during flooding events. Benefits to Water Avenue may occur as a result of the Soldier-Pile Wall. Likewise, minor benefits to navigation would occur as sediment accrual within the channel would be reduced as a result of bank stabilization. Overall, these impacts are anticipated to be minor.

5.2 Cumulative Impacts*

As stated in **Section 1.0**, preparation of this FR/EA was conducted under the 1978 CEQ NEPA regulations; and in accordance with the 1978 CEQ NEPA regulations, a thorough

cumulative assessment considers past, present, and future action which affect the study area. Cumulative Effects were analyzed using overlay mapping and GIS to define the spatial bounds of the area. Construction of Millers Ferry Lock and Dam (1974) and R.F. Henry Lock and Dam (1971) defines the baseline (past) whereas the future bound was set at 50-years. A qualitative ecosystem analysis and social impact analysis were used to analyze effects to the resources. Past activities within the surrounding area include construction of the R.F. Henry Lock and Dam upstream of the City of Selma. Past activities within the study area include lining the bank with debris to reduce riverbank erosion. Recently, FEMA conducted emergency bank stabilization using concrete blocks along the downtown riverfront. Additionally, the USACE completed a Continuing Authorities Program (CAP) Section 14 Study which identified a bank stabilization solution located upstream of the FRM study but within the City limits. Construction of the CAP bank stabilization solution is considered a reasonably foreseeable action as funding has been allocated for the Design and Implementation phase of the project. The City of Selma has future plans to develop the riverfront property to include a riverwalk and revitalization although no funding to complete the work has been allocated at this time.

Collectively, bank stabilization efforts have resulted in decreased erosion in the immediate locations; however, each effort in itself has not been substantial enough to reduce erosion throughout the entire reach of the study area.

*5.2.1 Physical Environment**

Two noteworthy resources to evaluate for cumulative effects are (1) geology and soils and (2) hydrology. Other resources considered include water quality, prime and unique farmlands, climate, air quality and greenhouse gasses, and HTRW; however, cumulative impacts were not identified for these resources and are not discussed further.

Geology and Soils: Historical erosion lead to local citizens creating a makeshift bank stabilization structure using brick debris from a local closed manufacturer. These bricks were dumped over the bank haphazardly; however, their effectiveness is evident by the fact that the bricks are still in place and serving their function within the immediate vicinity of their location. This was not enough to prevent further erosion in the adjacent riverbank. The ongoing erosion culminated in the 2016 FEMA bank stabilization armament using riprap along the downtown riverfront. This project was localized to a small footprint and was not robust enough to prevent erosion from occurring elsewhere. As such, the USACE became recently involved through a CAP Study which identified a bank stabilization alternative to address riverbank erosion upstream of Alternative 4 footprint.

Each of the aforementioned projects on its own encompasses a minor footprint and is not enough to reduce riverbank erosion of the downtown area. Collectively and cumulatively with Alternative 4, these projects would serve to reduce further erosion of the downtown Selma area. None of these projects mentioned have any anticipated impact to the proposed alternative mentioned in this report.

Hydrology: Though the operation of dams occurring along the Alabama River occurs as a “run-of-the-river” system, construction of the Miller’s Ferry Lock and Dam lead to an overall increase in river stage elevation under normal flow conditions (approximately 15 ft) at the area of Selma, Alabama. However, this increase in normal flow river stage does

not affect the peak stages associated with high flow events in the area such as the ones considered for this analysis. During high flow events Miller's Ferry becomes a true run of river project, passing all inflows until such time that the river naturally rises, inundating the dam. Through hydrologic modeling using the USEPA ICLUS dataset for future land use a peak flow increase of 2% was identified over a 50-year period based on reasonably foreseeable increased land use development occurring within the Alabama River Basin located several miles north of the study area. Cumulatively, increased river stage combined with increased peak flow would result in increased riverbank erosion under FWOP conditions. Therefore, implementation of Alternatives 4 and 5 would serve to protect the downtown riverfront from future erosion. Conversely, Alternatives 3 and 6 would significantly impact hydrology within the surrounding area whereas Alternatives 1.A would have no effect.

*5.2.2 Biological Resources**

Resources considered include vegetation, aquatic species, terrestrial species, T&E species, migratory birds, bald and golden eagles, and wetlands. Of those, cumulative impacts were identified for T&E species. All others are not discussed further.

Threatened and Endangered Species: The primary concern for biological resources with respect to this study is T&E species. The State of Alabama has one of the highest concentrations of Federally listed species in the nation. Construction of the Locks and Dams throughout the Alabama River has caused a significant strain on the aquatic migratory fish species upon which mussels are reliant. In particular, the Alabama Sturgeon is critically imperiled and the Heavy Pigtoe is reduced to one surviving population located one mile upstream of Alternative 4. Construction of past bank stabilization activities would have created temporary increases in turbidity, but would not have resulted in significant cumulative impacts to vulnerable filter feeders within the study area. The footprint of Alternative 4 encroaches on the stronghold of the Tulotoma Snail; however, these impacts will be reduced through Reasonable and Prudent measures identified during ESA coordination. The bank stabilization component of Alternatives 5 and 6 would mirror the exact footprint of Alternative 4 and would have the same aquatic impacts. Alternatives 3 and 6 would impact Federally listed terrestrial species significantly more than Alternatives 1.A. and 5. Additionally, through a comprehensive strategy the City of Selma plans a "Downtown Revitalization" to include a riverbank walk which will run parallel with the Alabama River. (*Community* 2016). Such a structure would need to be coordinated with the appropriate agencies to obtain proper permitting and to reduce overall environmental impacts.

*5.2.3 Cultural and Historic Resources**

Architectural: An important concern for cultural resources are the architectural structures lining the bankline of the project area. These structures are contributing buildings to two historic districts and compose the viewshed of Downtown Selma and the Edmund Pettus Bridge. Geological and Hydraulic investigations have shown significant erosion in the project area present a direct threat to the stability and integrity of these structures. Continued erosion would also lessen their integrity, structurally and historically. Without bank stabilization measures, these structures could be lost.

Archaeological: A relevant concern for cultural resources are known archaeological sites within the study and proposed project area. The City of Selma was the location of the Civil War battle, the Battle of Selma and archaeological investigations show that archaeological evidence of this event could remain in the area. Archaeological investigations also suggest that severe erosion along the northern bankline could have negatively impacted the integrity of these sites over time. Therefore, the proposed alternative could be seen as a method to reduce further erosion and thus further loss of valuable archaeological information about the study area.

*5.2.4 Socioeconomics**

Resources considered include land use, noise, aesthetics, recreation, industry, demographics, public safety, and traffic and navigation. Of those, cumulative impacts were identified for industry. All others are not discussed further.

Industry: The driving force behind this study is two-fold: the historical significance of the study area, which contributes to the City's and the Region's most recognizable tourist attraction. Each year, it is estimated that a range of 200-400 thousand citizens gather to partake in the annual Selma Bridge Crossing Jubilee. During the 2015 Annual March, upwards of 1 million people attended including President Barack Obama. Past activity (such as historical citizens' attempts at bank stabilization) combined with present activity (such as the FEMA armoring) eliminated the rate of erosion within the immediate footprints of the respective locations. Reasonably foreseeable actions, such as implementation of the Selma CAP Section 14 recommended plan, would contribute to a sustained Industry in Future With Project conditions. Alternatives 4 would cumulatively benefit the study area by protecting structures listed on the NRHP thereby sustaining the Industry. Likewise, the bank stabilization components of Alternatives 5 and 6 would have similar cumulative benefits to the Industry. Alternatives 1.A and 3 would cumulatively impact the Industry by not providing the necessary bank stabilization for sustained Industry.

5.3 Public Laws and Executive Orders*

*5.3.1 Environmental Justice (Executive Order 12898)**

Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority and Low-Income Populations* dated February 11, 1994 directs all Federal agencies to determine whether a "proposed action" would have a disproportionately high and adverse impact on minority and/or low-income populations. The City of Selma's population, as a whole, is predominately low-income and minority persons and meets the requirements of an Environmental Justice community. However, within Ward 8 a microcosm exists where homeowners predominantly occupy the northern portion and tenant dwelling occupants comprise the lower portion.

5.3.1.1 No Action Alternative

Under FWOP conditions, continued erosion would cause additional Historic structures to be demolished, which in turn would impact the Heritage Tourism industry. This industry generates a significant portion of revenue for the City of Selma. The NAA would not result

in disproportionate effects to low-income minority population as the effects would be felt uniformly across the community.

5.3.1.2 Alternative 1.A (Buyouts)

Homeowners within Ward 8 are typically located within the northern portion of the area whereas the lower portion is mostly comprised of tenant occupants. The buyout footprint would displace tenant occupants at a higher rate than homeowners. Additionally, due to limited DSS housing within the City limits displaced persons would be relocated outside the City of Selma. Because homeowners receive greater benefits from Federal assistance as compared to tenants, the buyout footprint would disproportionately affect citizens within Ward 8.

5.3.1.3 Alternative 3 (Optimized Levee)

Similarly, to buyouts, the optimized levee footprint would fragment the community which would disproportionately affect citizens within Ward 8.

5.3.1.4 Alternative 4 (Bank Stabilization) + FRP

Compared to FWOP conditions, construction of a Soldier-Pile Wall would benefit the community as the Heritage Tourism industry would be maintained. No buyouts would be required to implement the alternative. Additionally, the Recommended Plan is the only solution to preserve the integrity of the properties listed on the NRHP, which play an integral role in the City's ability to sustain economic resources. Therefore, no disproportionate effects to minority or low-income populations would occur as impacts would be felt equally across a disenfranchised community.

5.3.1.5 Alternative 5 (Bank Stabilization + Buyouts)

Though Alternative 5 would benefit the City of Selma as a whole, disproportionate effects to the community would still occur as a result of the buyout footprint.

5.3.1.6 Alternative 6 (Combination)

Alternative 6 would disproportionately effect citizens within Ward 8 as a result of community fragmentation.

*5.3.2 Protection of Children (Executive Order 13045)**

Executive Order 13045, The Protection of Children from Environmental Health Risks and Safety Risks, was issued April 23, 1997. Executive Order 13045 applies to significant regulatory actions that concern an environmental health or safety risk that could disproportionately adversely affect children. Environmental health risks or safety risks refer to risks to health or to safety that are attributable to products or substances that the child is likely to encounter or ingest.

Alternatives 1.A, 3, 4, 5, and 6 are not anticipated to impact the health and safety of children. Barriers and other measures would be implemented during construction to ensure protection of non-project workers, including children. Conversely, the NAA may present greater risks to public safety of children as erosion is anticipated to continue at an unpredictable rate.

5.4 Other NEPA Considerations*

5.4.1 Any Irreversible or Irretrievable Commitments of Resources Which Would Be Involved Should the Recommended Plan Be Implemented*

Any irreversible or irretrievable commitments of resources involved in the Recommended Plan have been considered and are either unanticipated at this time or have been considered and determined to present minor impacts. The Recommended Plan is reversible, albeit costly. Reclamation, if needed, would include removal of the Soldier-Pile Wall and restoration of the riverbank; however, considering the degraded nature of the existing riverbank and the continual hydrological forces which contribute towards degradation, complete restoration of the riverbank may not be feasible.

5.4.2 Adverse Environmental Effects Which Cannot Be Avoided*

Any adverse environmental effects which cannot be avoided should the Recommended Plan be implemented are expected to be minor individually and cumulatively. These include riverine habitat loss and suitable habitat for Federally protected species. Additionally, relocation of the Tulotoma Snail would stress the species to a point where some mortality may occur.

5.4.3 The Relationship Between Local Short-Term Uses of the Human Environment and Maintenance and Enhancement of Long-Term Productivity*

The Recommended Plan constitutes a short-term use of man's environment, will result in minimal environmental impacts, and is not anticipated to affect long-term productivity. The Recommended Plan is compatible with surrounding uses and is the only solution to prevent additional condemnation of properties listed on the NRHP.

5.5 17 Points of Environmental Quality*

As specified by Section 122 of the Rivers, Harbors & Flood Control Act of 1970 (P.L. 91-611), 17 environmental quality categories of impacts were reviewed and considered in arriving at the final determination. As laid out in **Table 27**, long-term significant adverse impacts from the Recommended Plan to these identified points are not anticipated. Temporary minor impacts from constructions activities would occur in some categories.

Table 27: Seventeen Points of Environmental Quality Effects Considered

Points of Environmental Quality	Recommended Plan Effects
Noise	No significant adverse impacts
Displacement of people	No significant adverse impacts
Aesthetic values	No significant adverse impacts
Community cohesion	No significant adverse impacts
Desirable community growth	No significant adverse impacts
Tax revenues	No significant adverse impacts
Property values	No significant adverse impacts
Public facilities	No significant adverse impacts
Public services	No significant adverse impacts
Desirable regional growth	No significant adverse impacts
Employment	No significant adverse impacts

Business and industrial activity	No significant adverse impacts
Displacement of farms	No significant adverse impacts
Man-made resources	No significant adverse impacts
Natural resources	No significant adverse impacts
Air	No significant adverse impacts
Water	No significant adverse impacts

5.6 Mitigation Considerations*

No compensatory mitigation is required for Alternative 4 based on the desktop review and March 2, 2021 field observations, which resulted in the determination that no jurisdictional wetlands are present within the proposed action footprint. An MOA has been executed to mitigate for any adverse risks to historic properties.

6.0 ENVIRONMENTAL COMPLIANCE*

This Study was conducted in accordance with the USACE EOPs which were developed to ensure each mission includes totally integrated sustainable environmental practices. The seven re-energized EOPs are available at the following webpage: http://www.usace.army.mil/Missions/Environmental/Environmental-Operating-Principles/.

Federal laws and EOs applicable to the Recommended Plan, and, if applicable, their status is presented in **Table 28**. The Recommended Plan is in compliance with NEPA.

Table 28: Public Law Environmental Compliance Status

STATUS	PUBLIC LAW (US CODE)/EXECUTIVE ORDER
Compliant	Archeological and Historic Preservation Act of 1974, as amended (54 U.S.C. 3125)
Compliant	Bald and Golden Eagle Protection Act (16 U.S.C. § 668 et seq)
Compliant	Clean Air Act of 1972, as amended (42 U.S.C. 7401 et seq)
Compliant	Clean Water Act of 1972, As Amended (33 U.S.C. 1251 et seq)
Compliant	Federal Water Pollution Control Act of 1972, as amended (33 U.S.C. 1251 et seq)
N/A	Comprehensive Environmental Response, Compensation & Liability Act of 1980 (42 U.S.C. 9601)
Compliant	Endangered Species Act of 1972 (16 U.S.C. 1531)
Compliant	Executive Order 11988, Floodplain Management
Compliant	Executive Order 12898, Environmental Justice
Compliant	Executive Order 13045, Protection of Children
Compliant	Fish and Wildlife Coordination Act of 1958, as amended (16 U.S.C. 661)
N/A	Flood Control Act of 1944, as amended, Section 4 (16 U.S.C. 460b)
N/A	Historic and Archeological Data Preservation (16 U.S.C. 469)
N/A	Migratory Bird Conservation Act of 1928, as amended (16 U.S.C. 715)
Compliant	Migratory Bird Treaty Act of 1918, as amended (16 U.S.C. 703)
Partial*	NEPA of 1969, as amended (42 U.S.C. 4321 et seq)
Compliant	National Historic Preservation Act, as amended (154 U.S.C. 300101 et seq.)

N/A	Native American Religious Freedom Act of 1978 (42 U.S.C. 1996)
N/A	Native American Graves Protection and Repatriation Act (25 U.S.C. 3001)
N/A	National Trails System Act (16 U.S.C. 1241)
N/A	Noise Control Act of 1972, as amended (42 U.S.C. 4901 et seq)
N/A	Rehabilitation Act of 1973 (29 U.S.C. 794)
N/A	Resource Conservation and Recovery Act of 1976 (42 U.S.C. 6901-6987)
N/A	River and Harbor Act of 1888, Section 11 (33 U.S.C. 608)
N/A	River and Harbor Act of 1899, Sections 9, 10, 13 (33 U.S.C. 401-413)
N/A	River and Harbor and Flood Control Act of 1962, Section 207 (16 U.S.C. 460d)
Compliant	River and Harbor and Flood Control Act of 1970, Sects 122, 209 and 216 (33 U.S.C. 426 et seq)
N/A	Submerged Lands Act of 1953 (43 U.S.C. 1301 et seq)
N/A	Superfund Amendments and Reauthorization Act of 1986 (42 U.S.C. 9601)
N/A	Toxic Substances Control Act of 1976 (15 U.S.C. 2601)
N/A	Wild and Scenic River Act of 1968 (16 U.S.C. 1271 et seq)

**** full compliance achieved with signed FONSI***

6.1 Consultation and Coordination*

In accordance with Section 1005 of the Water Resources Reform and Development Act of 2014, cooperating agency letters dated January 24, 2019 and February 12, 2019 were mailed to Federal and State agencies and are included in **Appendix B**. An Interagency Meeting was held on June 10, 2019 to gather environmental data and discuss alternatives. The Memorandum for Record of the Interagency Meeting is included in **Appendix B**. Additionally, Agency Workshops with the Alabama SHPO were held on October 28, 2019 and August 4, 2020. Electronic correspondence for participation of the USACE AMM, TSP, and ADM Meetings were submitted to each agency identified in **Table 29**. Cooperating and Participating Agencies also received copies of the Draft and Final IFR/EA to review.

Table 29: Section 1005 Compliance with Federal and State Agencies

Agency	Charette (October 2018)	COOP Agency Letters (February 2019)	AMM (January 2019)	Agency Scoping Meeting (June 2019)	TSP (June 2020)	Review of Draft Report (August 2020)	ADM (December 2020)	Review of Final Report (April 2021)
USEPA Region 4	Attended	Cooperating	✓	Attended	Accepted	✓	Accepted	✓
FEMA Region 4	✓	✓	✓	✓	✓	-	✓	-
Federal Highway Administration	✓	Declined	✓	✓	✓	-	✓	-
USGS Southeast Region	✓	✓	✓	✓	✓	-	✓	-

Agency	Charette (October 2018)	COOP Agency Letters (February 2019)	AMM (January 2019)	Agency Scoping Meeting (June 2019)	TSP (June 2020)	Review of Draft Report (August 2020)	ADM (December 2020)	Review of Final Report (April 2021)
USFWS Southeast Region	✓	✓	✓	✓	✓	-	✓	-
USFWS Daphne Field Office	✓	✓	✓	Attended	✓	-	Accepted	-
Department of Interior Atlanta Region	✓	✓	✓	✓	✓	-	Accepted	-
AHC	Attended	Cooperating	✓	Attended	Attended	✓	Accepted	✓
Advisory Council on Historic Preservation	--	--	--	--	Attended	-	✓	-
NPS	Attended	Participating	✓	Attended	✓	✓	Accepted	✓
U.S. Department of Housing and Urban Development	✓	✓	✓	✓	✓	-	Accepted	-
NRCS	Attended	✓	✓	✓	✓	-	Accepted	-
ADCNR	✓	✓	✓	✓	✓	-	Accepted	-
ADEM	✓	✓	✓	✓	✓	-	✓	-
Alabama Secretary of State	✓	✓	✓	✓	✓	-	✓	-
Alabama Emergency Management Agency	Attended	Participating	✓	Attended	Attended	✓	Accepted	✓
Alabama Department of Transportation	✓	Cooperating	✓	Attended	✓	✓	Accepted	✓
Alabama Department of Public Health	✓	Participating	✓	✓	✓	✓	Accepted	✓

✓=correspondence was sent

6.1.1 Endangered Species Act*

The USFWS issued a BO dated December 21, 2020 which stated that the proposed action would not jeopardize the Tulotoma snail population. Terms and Conditions include conducting a trans-relocation within 30-days of construction. A copy of the BO is included in **Appendix B.**

6.1.2 Fish and Wildlife Coordination Act*

According to the *Water Resources Development Under the Fish and Wildlife Coordination Act* report dated November 2004, "The FWCA [Fish and Wildlife Coordination Act] provides a basic procedural framework for the orderly consideration of fish and wildlife conservation and enhancement measures in Federally constructed, permitted, or licensed water development projects. The FWCA provides that, whenever any waterbody is proposed to be controlled or modified "for any purpose whatever" by a Federal agency or by any "public or private agency" under a Federal permit or license, the action agency is required first to consult with the wildlife agencies, "with a view to the conservation of fish and wildlife resources in connection with that project."

The Selma FRM Feasibility Study is considered a Federal project for the purpose of evaluating the manipulation of a body of water. The USACE coordinated closely with the USFWS Daphne Field Office regarding the study. The USFWS and the USACE agreed that the FWCA would be satisfied should FWCA language be included within a BO with the caveat that the language is clear and distinct from ESA language. This solution was agreed upon during the February 27, 2020 IPR with the Vertical Team.

6.1.2.1 USACE Position*

The USACE accepts and agrees with the USFWS FWCA statement contained within the BO.

6.1.3 National Historic Preservation Act*

The USACE is head federal agency for the Selma FRM Feasibility Study (Undertaking). In consultation with the Alabama SHPO and the NPS, the USACE has taken into account direct, indirect, and cumulative effects for the Undertaking. The USACE has afforded Federally Recognized Tribes and the Advisory Council on Historic Preservation (ACHP) the opportunity to comment and the ACHP has chosen to participate. In accordance with 36 CFR 800, the Undertaking was determined to have adverse effects on historic properties eligible or listed on the NRHP. An MOA was drafted in consultation with the Alabama SHPO, ACHP, and NPS and the Alabama SHPO and ACHP agreed to be signatories. Comments were received by the Alabama SHPO and have been addressed. The MOA was finalized May 2021.

6.1.4 Public Involvement*

6.1.4.1 Charette*

A study Charette was held in the City of Selma on October 23, 2018. Attendees included members of the Project Delivery Team (PDT), City Council Officials, as well as Federal and State Agencies such as NPS, AHC, and the USEPA. Topics discussed included flooding frequency and inundation, but more importantly the erosion issues of the downtown riverbank area.

*6.1.4.2 Public Meeting**

A public meeting was held in the City of Selma on November 7, 2018. One member of the public attended; however, one local news station conducted an interview with members of the PDT. A virtual public meeting was held on October 7, 2020 via Facebook live stream on the U.S. Army Corps of Engineers, Mobile District Facebook Page. No comments were received during the virtual public meeting.

*6.1.5 Public and Agency Review**

The draft IFR/EA was made available on the USACE Selma Webpage at <https://www.sam.usace.army.mil/Missions/Program-and-Project-Management/Civil-Projects/Selma-Alabama-Flood-Risk-Management-Feasibility-Study/Selma-Document-Library/>, and underwent a 30-day Public and Agency review period which concluded on October 16, 2020. Members of the Public and Agencies were notified of the draft IFR/EA review period via Public Notice Number FP20-AL01-07 which was posted to the USACE Planning and Environmental Public Notice webpage at <https://www.sam.usace.army.mil/Missions/Planning-Environmental/Public-Notices/Article/2350917/joint-public-notice-selma-alabama-flood-risk-management-feasibility-study/ > and distributed via email on September 17, 2020. A distribution list of Public and Agency individuals is included in **Appendix B**. No comments were received.

6.2 Areas of Concern

The presence of UXOs within the Recommended Plan footprint present some concern; however, the removal of any UXO material would occur during implementation. Close coordination with UXO specialists would occur during construction activities to ensure worker safety. Should UXOs be removed, documentation and disposal shall follow all applicable laws and regulations.

7.0 DESCRIPTION OF THE RECOMMENDED PLAN

7.1 Plan Components

Plan components of the Recommended Plan include the FRP and bank stabilization. The bank stabilization will be accomplished using approximately 1,000 linear ft of Soldier-Pile Wall and other erosion control features as described in **Section 4.3.2.1**. The FRP includes:

- The identification of flood prone areas though floodplain mapping of several forecasted stages based on Southeast River Forecast Center river stage forecast;
- The identification of flood fighting actions (if applicable) to reduce impacts;
- The appropriate level of response based on Southeast River Forecast Center river stage forecast;
- Evacuation routes for inhabited, flood prone areas; and
- Identification of critical infrastructure at risk.

7.2 Environmental Requirements

Environmental compliance requirements have been met as part of the planning process. Several environmental compliance activities would be necessary during plan implementation.

- **NHPA, Section 106** – Construction must occur in accordance with the MOA, which is included in **Appendix E** of the Final IFR/EA.
- **ESA, Section 7** – Relocation surveys for the Tulotoma Snail must be conducted prior to implementation. Commencement of work must not occur until the survey is complete.
- **HTRW** – Prior to implementation, full UXO removal must occur.
- **CWA, Section 401/404** – Design and Construction of the plan must comply with the ADEM WQC which is included in **Appendix B** of the Final IFR/EA.
- **CWA, Section 402** – The construction contractor would be required to obtain a CWA Section 402 NPDES stormwater permit from ADEM prior to implementation.

7.3 Real Estate Requirements

7.3.1 Land, Easements, Relocations, Right of Way, and Disposal Sites (LERRDs)

The proposed non-structural feature consists of development of a FRP that will address affected evacuation areas and necessary routes with advance notice through the utilization of nearby stream gages.

Soldier-Pile Wall construction is proposed along the bank of the Alabama River in Selma, Alabama commencing at Washington Street to a point paralleling with Lauderdale Street, and running adjacent to the footings of the Edmund Pettus Bridge. Further Engineering design refinements are anticipated in the PED phase which will have bearing on the LERRDs footprint.

The City of Selma is the NFS for the proposed project. Upon receipt of the formal notice to proceed with land acquisition from the USACE, Mobile District, Real Estate Division, the NFS has the responsibility to acquire all real estate interests required for the project, in accordance with Federal law, regulations, and policy, including P.L. 91-646, the Uniform Relocation Act, as amended. The NFS shall accomplish all alterations and relocations of facilities, structures and improvements determined by the government to be necessary for construction of the project.

LERRDs credit will be determined in accordance with the terms of the PPA, Office of Management and Budget Circular A-87, Chapter 12, ER 405-1-12, and applicable laws.

7.3.2 Land Acquisition

For the Soldier-Pile Wall features, 15 parcels are situated within the proposed construction area, and a preliminary acquisition estimate of 0.39 +/- of an acre will be required in Perpetual Bank Protection Easement (**see Appendix D**).

- In specific reference to the lands noted above, a portion of the Soldier-Pile Wall construction currently estimated at 0.11 +/- of an acre is situated within the Alabama Department of Transportation right-of-way for U.S. Highway 80 Business/Broad Street/Edmund Pettus bridge. It is anticipated that the Sponsor will need to obtain an approved Form MB-05 Grading/Landscaping Permit and MB-06a Cooperative Maintenance Agreement from ALDOT. As the current level of Engineering design progresses, coordination with Alabama Department of Transportation will be required for the small portion of the project area within the

State right-of-way. In addition, a segment currently estimated at 0.08 +/- of an acre is situated within the City of Selma right-of-way for Washington Street.

The UXO site is pending further onsite investigations during the construction phase to determine if real estate needs will be required.

All access and staging for construction within the study area is anticipated via barge on the Alabama River. Staging for barge loading will be determined during the PED phase of the project. Additional access is available via public right-of-way (Washington St and Broad St).

Reference **Appendix D** to this report for further information regarding real estate requirements for construction, operation, and maintenance of the project.

7.4 Operations, Maintenance, Repair, Rehabilitation and Replacement (OMRR&R)

The projected OMRR&R costs for the Soldier-Pile Wall are estimated to be $31,000 per year. Species control (e.g., herbaceous, woody, and invasive species growth) measures would be necessary, such as weeding and spraying. Intermittent inspections would be required to review structural integrity for things such as cracks, sloughing, and other signs of structural movement. No OMRR&R is necessary for the FRP; however, it would require updating at least once every five years. Implementation of the proposed RFP is the responsibility of the non-Federal Sponsor. This includes monitoring Southeast River Forecast Center forecast locations for forecasted floods, updating inundation maps, directing necessary evacuations, and ensuring the viability of the evacuation routes.

7.5 Risk and Uncertainty

The study assumptions, risks, and uncertainties have been identified in the Risk Register. Items of low and medium risk are included in the register and will be made available to the Agency Technical Review (ATR) team. Those items ranked as high risk are summarized in **Sections 7.5.1**, thru **7.5.4**.

7.5.1 Economic Assumptions, Risks, and Uncertainties

The NED Policy Exception allows for analysis and consideration for other system of account benefits, primarily OSE based on historic and cultural significance as determining criteria for plan selection and justification in lieu of a NED justified plan.[9]

7.5.2 Engineering Assumptions, Risks, and Uncertainties

The primary risks and uncertainties related to engineering are associated with the bank stabilization design relating to the site conditions as well as the constructability of the alternative. Due to this risk, the team conducted landside geotechnical investigations to better define existing sub surface conditions along the riverbank. Results from the geotechnical investigations confirmed geologic assumptions that a strong, dense Mooreville chalk material is present where the bottom of the wall will be embedded into the riverbank and also where the tie backs will be anchored, thus reducing these risks. However, additional risks and uncertainties remain related to the sub-surface geotechnical conditions in the river where soil strength parameters are currently assumed

[9] *Id*.

to be similar with existing available boring data at respective depths. The uncertainty with this assumption is that the sub-surface conditions may not be homogenous across the proposed alignment and a differing soil site condition could result in a more robust design or a re-design all together. To address this risk and uncertainty, additional borings are planned for locations in the river along the extents of the project site during PED phase. It should be noted that limited geotechnical information is available from the construction of the Edmund Pettus Bridge dating back to 1938.

There are uncertainties and risks associated with the implementation of the bank stabilization alternative, due to the condition of the buildings and the limited site accessibility. Given that buildings have been removed in the area due to instability, it is assumed that those still present are in a vulnerable state. Vibrations from construction activities could be enough to induce further damage to the remaining structures. This risk has been minimized by the Soldier-Pile Wall that the team is recommending. This construction method minimizes the vibrations introduced into the bank, as the wall will be predominantly constructed away from the bank, then backfill added between the bank and the wall. Self-compacting materials have been specified for the granular backfill. It is anticipated that upper backfill materials will use light compaction equipment to further minimize vibrations. During construction vibration monitoring of the existing structures will be required. Additionally, the vast majority of the construction shall take place from the water, therefore minimizing contact between heavy construction equipment and the bank.

The hydraulic modeling performed has some risk and uncertainties associated with the availability and quality of the data used within the model. The terrain data used in the model was from different datasets that were combined to create one continuous terrain file. The datasets were taken in different years and may have different vertical/horizontal accuracies, depending on the method of collection. The flows used in the model were computed using a frequency analysis using the gage data at Selma, Alabama. This analysis quantifies the uncertainty used by analyzing the data and displaying confidence bands.

Risks and uncertainties associated with the FRP are related to several items. Topography used to map floodplain inundation may show no flooding in flood prone locations due to inaccuracies in the topography. Model uncertainty also drives some variability in computed water surface elevations in the hydraulic model. For instance, seasonal variability in floodplain vegetation can affect roughness leading to slightly different flood elevations in different seasons for the same magnitude flood event. Also, built in uncertainly in forecasts from the Southeast River Forecast Center, relied on to take actions recommended by the plan, introduces uncertainty and adds risk. There is also a remaining life safety risk with this plan. In theory, this plan would eliminate flood risk with respect to life safety from the areas it covers. If followed, residents would have adequate time to fully evacuate. In practice, this will greatly reduce life safety risk but not eliminate it. Even mandatory evacuations are often ignored by residents who decide to accept the risk of remaining in a flood prone location during a flood. Historically, it has been impractical to fully enforce a complete evacuation of an area. Furthermore, future floodplain management of the area will ultimately be at the discretion of the city to enforce. It will likely involve locale legislation to enforce the recommendations laid out in the

Floodplain Management portion of this to prevent residential redevelopment of the floodplain. In this case residual life risk is directly correlated to the degree at which this document is utilized and enforced by the city of Selma. Additionally, the previously discussed risk and uncertainties associated with the hydraulic model carry over and apply to the FRP since the FRP is dependent on model output.

7.5.3 Real Estate Assumptions, Risks, and Uncertainties

The following assumptions, risks, and impacts are noted:

- Per the requirements of ER 405-1-12 an assessment was made of the NFS' real estate professional and legal capabilities and was endorsed by the City of Selma and countersigned by the USACE, Mobile District, Real Estate Division. Marginal Real Estate professional capability (Project-specific) was noted in the NFS Real Estate Acquisition Capability Assessment to be included in the Real Estate Plan. The REP is included in **Appendix D**. The risks include the professional capability and manpower of the Sponsor to acquire bank protection easements in the parameters of an anticipated construction schedule is assessed high. The consequence of this risk is that construction schedule may be delayed.
- Landowner attitudes and local support/opposition is uncertain due to lack of data regarding landowner reception to the proposed alternatives, outside of a conceptual level of analysis. The consequence to this risk would be condemnation, as a last resort, to acquire required LER for construction. No known anticipated patterns of support or opposition to the Recommended Plan have been identified in the course of this study; however, the risk is noted due to the potential to increase administrative, project costs, and schedule delays.
- Potential for cost increases due to fluctuations in the real estate market conditions and unforeseen administrative expenses are noted and have been accounted for with project contingency.
- There have been no preliminary UXO disposal sites identified. The risk to the study would include (1) not being able to acquire the necessary land for disposal, (2) additional cost for acquisition, (3) and potential schedule delays.

7.5.4 Environmental Assumptions, Risks, and Uncertainties

Risk management actions for UXOs would include following applicable laws and regulations during construction activities.

7.6 Plan Accomplishments

Implementation of Bank Stabilization would reduce the risk of damages caused by flood -induced erosion to properties adjacent to the Edmund Pettus Bridge. Furthermore, bank stabilization would reduce risk associated with hazards to life and safety caused by structural failure of structures adjacent to the Edmund Pettus Bridge along the Alabama Riverfront.

As discussed in **Section 4.3.1.3**, the FRP would reduce flood risk with respect to life safety and flood damages (by preventing redevelopment) from the areas it covers. The FRP would encourage the City of Selma to enforce the development restrictions within

the floodplain extent which, if followed, would reduce residual damage and life safety risk in the future.

Additionally, the FRP would recommend that should existing structures, in the future within the floodplain, be demolished due to blight or structural unsoundness, further development would be prohibited. Prohibiting redevelopment of demolished structures in the floodplain would realize the study objectives to reduce average annual flood damages and life safety risk.

Accordingly, the Recommended Plan would accomplish all study objectives.

7.7 Plan Implementation

Because of the City of Selma's historical significance and in consideration of other social effects, an NED Exception memo was endorsed.[10] The NFS construction cost contribution (typically 35 percent) is estimated to be valued at approximately $8,364,000.

A standard Design Agreement and PPA will be used to partner with the NFS for design and construction of the recommended plan. This section details the implementation and cost sharing requirements between the Federal government and the NFS.

7.7.1 Division of Plan Responsibilities

7.7.1.1 Federal Responsibilities

Federal responsibility is to provide the Federal cost sharing match, engineering service via either in-house resources or architectural engineering services to produce construction contract documents, award a construction contract, manage construction contract, turn over the project to the NFS, and provide an O&M manual to the NFS.

7.7.1.2 Non-Federal Responsibilities

Federal implementation of the project for structural flood risk management is subject to the non-Federal sponsor agreeing to perform, in accordance with applicable Federal laws, regulations, and policies, the required items of local cooperation for the project, including but not limited to the following:

1) Provide a minimum of 35 percent, up to a maximum of 50 percent, of construction costs, as further specified below:
   i. Provide, during design, 35 percent of design costs in accordance with the terms of a design agreement entered into prior to commencement of design work for the project;
   ii. Pay, during construction, a contribution of funds equal to 5 percent of construction costs;
   iii. Provide all real property interests, including placement area improvements, and perform all relocations determined by the Federal government to be required for the project;
   iv. Provide, during construction, any additional contribution necessary to make its total contribution equal to at least 35 percent of construction costs;

[10] *Id.*

2) Prevent obstructions or encroachments on the project (including prescribing and enforcing regulations to prevent such obstructions or encroachments) that might reduce the level of flood risk reduction the project affords, hinder operation and maintenance of the project, or interfere with the project's proper function;
3) Inform affected interests, at least yearly, of the extent of risk reduction afforded by the flood risk management features; participate in and comply with applicable Federal floodplain management and flood insurance programs; prepare a floodplain management plan for the project to be implemented not later than one year after completion of construction of the project; and publicize floodplain information in the area concerned and provide this information to zoning and other regulatory agencies for their use in adopting regulations, or taking other actions, to prevent unwise future development and to ensure compatibility with the project;
4) Operate, maintain, repair, rehabilitate, and replace the project or functional portion thereof at no cost to the Federal government, in a manner compatible with the project's authorized purposes and in accordance with applicable Federal laws and regulations and any specific directions prescribed by the Federal government;
5) Give the Federal government a right to enter, at reasonable times and in a reasonable manner, upon property that the non-Federal sponsor owns or controls for access to the project to inspect the project, and, if necessary, to undertake work necessary to the proper functioning of the project for its authorized purpose;
6) Hold and save the Federal government free from all damages arising from design, construction, operation, maintenance, repair, rehabilitation, and replacement of the project, except for damages due to the fault or negligence of the Federal government or its contractors;
7) Perform, or ensure performance of, any investigations for hazardous, toxic, and radioactive wastes (HTRW) that are determined necessary to identify the existence and extent of any HTRW regulated under CERCLA, 42 U.S.C. 9601-9675, and any other applicable law, that may exist in, on, or under real property interests that the Federal government determines to be necessary for construction, operation and maintenance of the project;
8) Agree, as between the Federal government and the non-Federal sponsor, to be solely responsible for the performance and costs of cleanup and response of any HTRW regulated under applicable law that are located in, on, or under real property interests required for construction, operation, and maintenance of the project, including the costs of any studies and investigations necessary to determine an appropriate response to the contamination, without reimbursement or credit by the Federal government;
9) Agree, as between the Federal government and the non-Federal sponsor, that the non-Federal sponsor shall be considered the owner and operator of the project for the purpose of CERCLA liability or other applicable law, and to the maximum extent practicable shall carry out its responsibilities in a manner that will not cause HTRW liability to arise under applicable law; and
10) Comply with the applicable provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, Public Law 91-646, as amended, (42 U.S.C. 4630 and 4655) and the Uniform Regulations contained in 49 C.F.R Part 24, in acquiring real property interests necessary for construction, operation,

and maintenance of the project including those necessary for relocations, and placement area improvements; and inform all affected persons of applicable benefits, policies, and procedures in connection with said act.

7.7.2 Implementation Schedule

Alternative 4 coupled with an FRP was endorsed as the Recommended Plan during the December 15, 2020 ADM milestone meeting. The Draft IFR/EA was released for a 30-day public review period which ended on October 16, 2020. The study activities to-date and the future activities until completion and their respective timeframes are as follows:

Scoping

1) Execute FCSA (October 9, 2018)
2) Scoping Meeting (October 23, 2018)

Alternative Evaluations and Analysis

3) Alternatives Milestone Meeting (January 16, 2019)
4) TSP Milestone (July 22, 2020)

Reviews

5) District Quality Control/Legal Review of Draft Report (August 24, 2020 – September 4, 2020)
6) Release of Draft Report (September 17, 2020)
7) Concurrent Reviews (ATR/Public/Policy (September 17, 2020 – October 29, 2020)
8) Address/Close-Out Review Comments (October 30, 2020 – November 19, 2020)

Finalize Feasibility Analysis

9) ADM (December 15, 2020)
10) Final IFR/EA Complete (May 28, 2021)
11) Chief of Planning Approval to Release Draft Report (July 19, 2021)
12) State and Agency Review (July 30, 2021 – September 1, 2021)
13) Chief's Report (October 7, 2021)

Table 30 shows the tasks to be completed during the PED phase of the project under the assumption that design funds would be received in the FY 22 Workplan and construction Funds would be obtained in the FY23 President's Budget. A two-year construction schedule was assumed to come up with the design/construction schedule for Selma.

Table 30: Project Schedule

Task	Schedule
Execute Design Agreement	April 2022
Initiate Design (funding dependent)	April 2022
100% Design Complete	January 2023
Execute PPA	April 2023
Real Estate acquisition/certification of lands	October 2023

Task	Schedule
Advertise for a Construction Contract	November 2023
Award a Construction Contract	March 2024
50% Construction Complete	December 2024
100% Construction Complete	October 2025
O&M Manual and Project Turnover	April 2026
Close Project	April 2026

7.7.3 Cost Sharing

The sponsor cost contribution (typically 35 percent) to this project is estimated to be valued at approximately $8,364,000.

7.7.3.1 Financial Requirements

Upon execution of a PPA and receipt of notice to proceed with land acquisition, the NFS must bear the upfront cost of land acquisition which is currently estimated to be $222,000.

7.7.3.2 Self-Certification of Financial Capability

Through extensive outreach, the NFS is anticipated to be fully financially capable of signing a Financial Capability Agreement.

7.7.4 Views of the Non-Federal Sponsor

The study partner is the City of Selma, who has been engaged since signing the FCSA in October 2018 and participating in the Planning Charette. The City fully supports the Recommended Plan which allows for bank stabilization and development of a FRP for the areas that receive repetitive damages and that would not adversely impact OSE within the community.

7.8 District Engineer's Recommendation / Signature Page

I have considered all significant aspects of the public interest. The aspects considered environmental, social, and economic effects; engineering feasibility; and any other elements bearing on the decision. There has been no controversy concerning this study or the proposed project and the NFS and local stakeholders are in support of the proposed action. The plan complies with all seven of the USACE Environmental Operating Principles.

Based on the analysis, Alternative 4 coupled with a FRP is the recommended plan. The plan includes the bank stabilization of approximately 1,000 linear ft using a Soldier-Pile Wall design and other erosion control features as required. The FRP will detail evacuation areas and routes necessary based on stream gage readings with advance notice. All Federal coordination is complete.

The first project costs are $23,897,000 and $31,000 estimated O&M costs to maintain the Soldier-Pile Wall. Operating and maintaining the Soldier-Pile Wall would require regular structural inspections and vegetation prevention and removal.

The recommendations contained herein reflect the information available at this time and current Departmental policies governing formulation of individual projects. They do not reflect program and budgeting priorities inherent in the formulation of a national Civil Works construction program nor the perspective of higher review levels within the Executive Branch. Consequently, the recommendations may be modified before they are transmitted to the Congress as proposals for authorization and implementation funding. However, prior to transmittal to the Congress, the sponsor, the States, interested Federal agencies, and other parties will be advised of any modifications and will be afforded an opportunity to comment further.

DATE: May 24, 2021

JOLY.SEBASTIEN.PIERRE.1132186762 Digitally signed by JOLY.SEBASTIEN.PIERRE.1132186762 Date: 2021.05.24 14:40:25 -05'00'

Sebastien P. Joly
Colonel, U.S. Army
District Commander

8.0 PROJECT DELIVERY TEAM AND LIST OF PREPARERS

Table 31 lists the functional PDT members and does not account for supervisory personnel or Vertical Team members. Each member of the PDT co-authored the IFR/EA.

Table 31: Project Delivery Team Members

MEMBER	DISCIPLINE
Bulger, Heather	Biologist
Burks, Fred	Plan Formulator
Caldwell, Timothy Jr.	Cost Engineer
Crane, Ryan B.	Engineer
Justice, Adam	Structural Engineer
Marr, Christian	Engineering Technical Lead
Matthews, Andrea	Attorney
Newell, David	Project Manager
Phillips, Stephen	Economist
Ralph, Bradner	Geotechnical Engineer
Smith, Alexandria	Anthropologist
Tetreau, John	Realty Specialist
Throop, Ashley	Hydraulic Engineer
Vongmony, Var	Economist

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