North Landing Bridge Replacement Feasibility Study/Environmental Assessment

Atlantic Intracoastal Waterway

US Army Corps of Engineers ®

Norfolk District
803 Front Street
Norfolk, VA 23510

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Cooperating agencies: U.S. Environmental Protection Agency, U.S. Coast Guard, U.S. Department of the Navy

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Executive Summary

This integrated Feasibility Report and Environmental Assessment is for the North Landing Bridge Replacement Study. North Landing Bridge (Federal project) is a federally owned and operated bridge spanning the Atlantic Intracoastal Waterway (AIWW) in Chesapeake, VA. The results of engineering, economic, environmental, and real estate investigations performed for this Feasibility Study were used to determine if improvements to the constructed Federal project are warranted and if necessary, to seek additional authorization where not already granted for improvements to the North Landing Bridge (Figure 0-1).

The Norfolk District portion of AIWW, including provision for bridges, was authorized in the River and Harbor Acts of 1910, 1912, 1917, 1918, and 1933. The study authority for this project lies in Section 216 of the Flood Control Act of 1970 (Public Law 91-611).

> *The Secretary of the Army, acting through the Chief of Engineers, is authorized to review the operation of projects the construction of which has been completed and which were constructed by the Corps of Engineers in the interest of navigation, flood control (flood damage reduction), water supply, and related purposes, when found advisable due to significantly changed physical or economic conditions, and to report, thereon to Congress with recommendations on the advisability of modifying the structures or their operations, and for improving the environment in the overall public interest.*

Under existing USACE policy, the Norfolk District has the responsibility to maintain the North Landing Bridge in an acceptable condition. While there is no similar responsibility to upgrade the bridge to meet current traffic conditions, USACE has the ability under Section 216 to evaluate whether or not there should be upgrades made to a project and to report to Congress on the findings.

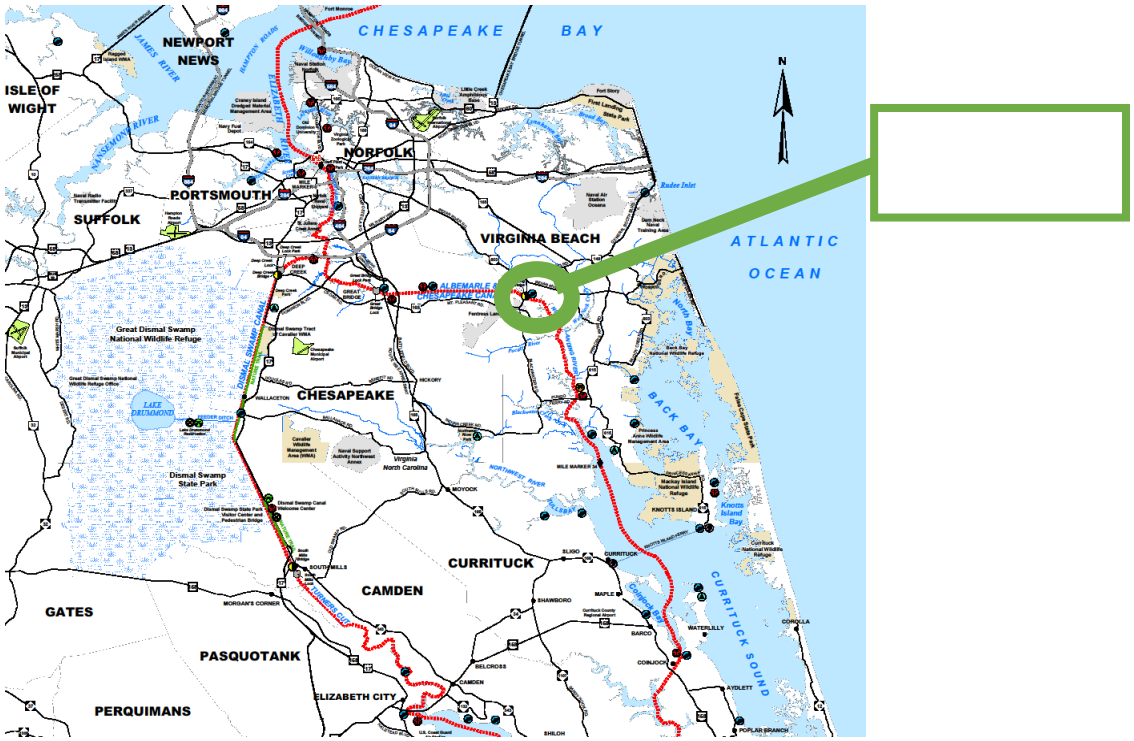

Figure 0-1 Study Area.

Description of the Report

This Feasibility Report and Environmental Assessment (EA) documents the Feasibility Study process and presents the results of investigations and analyses conducted to evaluate modifications to the structure to improve its ability to efficiently serve the current and future needs. 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, adverse impacts, and feasibility of those alternatives; and (5) identification of a National Economic Development (NED) Plan and Recommended Plan.

Purpose and Need

The study is a recommendation of an Initial Assessment completed in 2012. As reported in the 2012 Initial Assessment, the North Landing Bridge does not meet Virginia Department of Transportation (VDOT) standards as it does not conform to either existing traffic level of service (LOS) standards or current design vehicle load limits for traffic volumes. The bridge has been determined to be structurally deficient and functionally obsolete based on this assessment. Table 0-1 below compares the existing bridge design with the current VDOT standards.

Table 0-1. Bridge Criteria

Item	Recommended Criteria	Existing Bridge
Clear Roadway Width	40 feet	24 Feet
Design Load	HL-93	HS20-44

Bridge Criteria

- Based on a rural collector road system VDOT manual of the structure and bridge division measured between curbs
- The existing double-swing bridge has high operation, maintenance, rehabilitation, and repair (OMMR&R) costs at approximately $608,000 per year. The bridge has frequently had to close for repairs due to malfunction and/or allisions. These problems create the following risks and impacts:
    - Current and future increasing costs to navigation commerce due to vessel delays.
    - Current and future increasing costs to road commerce due to traffic delays and forced detours.
    - Future increasing risk to Navy readiness by delaying fuel deliveries to Naval Air Station Oceana (NAS Oceana) in the case of a bridge shutdown in the closed position.

Alternatives and the Recommended Plan

Utilizing the USACE Planning Process as specified in ER 1105-2-100, plan formulation was conducted with a focus on achieving the Federal objective of water and related land resources project planning, which is to contribute to the NED consistent with protecting the Nation's environment, pursuant to national environmental statutes, applicable executive orders, and other Federal planning requirements. Plan formulation also considers all effects, beneficial or adverse, to each of the four evaluation accounts identified in the Principles and Guidelines (1983), which are NED, Environmental Quality, Regional Economic Development, and Other Social Effects.

Alternative plans consisting of either a fixed or moveable bridge option were considered. The NED benefits are generated by addressing inefficiencies in the existing transportation system to lower transportation costs. Net benefits are calculated by subtracting the total cost to construct and maintain the improvements over a 50-year study period from the total transportation cost savings that would be generated by the proposed improvements over that period. While the period of analysis for this project is 50 years, the design life of the bridge is 75 years and meets local standards. The design life is based on American Association of State Highway and Transportation Officials (AASHTO) and VDOT guidelines for 75 years. The NED Plan is the alternative that reasonably maximizes net benefits while remaining consistent with the Federal

objective of protecting the nation's environment. Where two cost-effective plans produce similar net benefits, the less costly plan is identified as the NED plan, even though the level of outputs may be less. However, a more expensive plan can be recommended if costs are similar and the plan meets more criteria, as defined by the Project Delivery Team (PDT), then the lesser expensive plan.

In this study, the high rise fixed bridge alternatives generated significant annual net benefits. The movable bridge alternatives did not provide significant benefits. After careful consideration, the USACE identified the alternative that reasonably maximizes annual net benefits as the NED Plan. The Recommended Plan is the NED plan. Hydraulic concerns, such as backwater flooding and sea level rise, were considered in the plan selection. Sea level rise curves for the low, intermediate and high curves were assessed for the Recommended Plan (see Section 6.1.4 Bridge Dimensions and 6.7 Sea Level Change and Navigation Structures for more information). The plan recommends a new two-lane, high rise, fixed bridge along the eastern alignment of the current bridge. There were two plans that were similar in cost and in specifications, an eastern and western alignment. The PDT chose the eastern alignment as the Recommended Plan because it has the greatest net benefits. The bridge dimensions and costs for the recommended plan are as follows:

Fixed Bridge Width (ft.): 46'-4"
Length: 3360'-0"
Min. Vertical Clearance (ft.)*: 69.45
Structure Depth (ft.): 8'-0"
Prop. Roadway Elevation (ft.): 78.00
Total Project First Cost Rounded: $98,494,000
Total Cost Eastern Alignment (First Cost + Interest during Construction): $102,404,000
Annualized OMRR&R Cost (Over 50 year study period): $184,578
.

Cost and Benefits

The USACE examined potential impacts on navigational traffic, vehicular traffic, and the frequency of operation and maintenance on the AIWW North Landing Bridge. Total project costs are listed in Table 0-2 for the east alignment of the two-lane, high rise, fixed bridge. Benefits (Table 0-3) used in the study for the future with and future without-project conditions include: recreational and commercial navigational transportation cost savings, reductions in the operating costs of vehicular traffic from re-routings or miles traveled, vehicular drive time or opportunity cost savings associated with draw-bridge related traffic delays, and cost of in-kind bridge replacement. A vehicular traffic study, analyzing changes in vehicle miles and hours traveled over time and under varying conditions, was conducted by an Architecture/Engineering (AE) firm. Navigational traffic delay reductions were estimated using the Waterway Limited Cost Estimator for Navigation (WLCEN) model from the Planning Center of Expertise for Inland Navigation (PCX-IN). Future bridge OMMR&R costs were computed with the help of the Norfolk District's Engineering Branch. The varying outputs were summed and compared against movable and fixed span bridge alternatives to derive mean benefit to cost ratios (BCRs).

Table 0-2. Recommended Plan Total Project Costs (FY 20 Cost 100% Federal / 0% Non-Federal)

Cost Item	East Alignment Contingency (24%)
	Fixed
Roads and Bridges	$75,809,000
Relocations	$1,555,000
Cultural Resource Preservation	$558,000
Lands and Damages	$2,790,000
Planning, Engineering, and Design	$11,595,000
Construction Management	$6,187,000
Total Project First Cost (Rounded)	$98,494,000

Table 0-3. Recommended Plan Average Annual Costs and Average Annual Benefits

Cost Item	East Fixed
Total Project First Cost (Rounded) Includes 27.9% Contingency	$98,494,000
Interest During Construction	$3,909,887
Annualized Investment Cost	$3,999,385
Annualized OMRR&R Cost	$184,578
Total Average Annual Cost (Rounded)	$4,184,000
Average Annual Benefits (Vehicle Traffic)	$11,320,863
Average Annual Benefits (Mariner Traffic)	$414,780
Total Average Annual Benefits (Rounded)	$11,736,000
Benefit Cost Ratio	**2.8**
Net Benefits	**$7,552,000**

Environmental Impacts and Mitigation

The project will have both short-term and long-term effects on wetlands; there will be both temporary and permanent moderate impacts on bottomland forested wetlands due to the placement of fill for bridge abutments and approaches, concrete pilings and footings, as well as temporary construction access impacts. Approximately 0.94 acres of permanent direct fill wetland impacts are anticipated; however, a wetland delineation and further design will be needed to ascertain the impact. All permanent wetland impacts will be mitigated in-kind, utilizing wetland mitigation bank or in-lieu-fee credits offsite. The preliminary wetland mitigation requirements, according to the Uniform Mitigation Assessment Methodology (UMAM), are approximately 6.93 in wetland mitigation credits for the Recommended Plan, within the service area for this project. All temporarily disturbed wetlands will be restored to preexisting conditions, planted with native tree species, and monitored for at least five years until successful regeneration is ascertained.

There will be both short-term and long-term moderate adverse effects on land use, including privately owned property. There will be displacements of three parcels, as well as permanent impacts on land parcels which will be permanently converted to roadway and right-of-way. Temporary construction access will have short-term, minor adverse effects on existing land uses as well. Project design will minimize impacts to private property to the extent practicable. Property owners will be compensated according to real estate laws and requirements.

The federally endangered northern long-eared bat has the potential to occur in the project area. There are six known maternal roosting trees near the Action Area. Approximately 15 acres of forested habitat clearing is anticipated; however the closest roosting tree is over 1,000 feet from the limits of clearing. The project will cause temporary and permanent, indirect impacts to habitat used by the Northern long-eared bat. The USACE will rely on the Programmatic Biological Opinion prepared by the U.S. Fish and Wildlife Service for this species. Voluntary measures will be adhered to as practicable. No other effects on special status species are anticipated. There are no Essential Fish Habitat (EFH) resources in the study area, so none will be impacted.

Removal of the existing bridge constitutes an adverse effect to the Albemarle and Chesapeake Historic District. Archaeological surveys have been initiated but have not been completed due to not having access to all private property, and will be deferred through the Programmatic Agreement until the properties are acquired. A Programmatic Agreement has been prepared and finalized to address and mitigate adverse effects. It should be noted that while Concurring Parties are invited and encouraged to sign the PA, only Signatories are required to sign.

There will be long-term moderate beneficial effects to transportation and navigation. Traffic noise effects are anticipated to be minor to moderate, and will be analyzed and may be mitigated as practicable and appropriate through the design of the project.

During construction, there will be minor short-term impacts to wildlife, soils, aquatic species, utilities, transportation, navigation, aesthetics, noise, air quality, and water quality. These will be minimized utilizing best management practices.

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List of Acronyms and Abbreviations

AASHTO - American Association of State Highway and Transportation Officials
AICUZ – Air Installations Compatible Use Zone
AIWW – Atlantic Intracoastal Waterway
APZ – Accident Potential Zone
ASA – Assistant Secretary of the Army
AST – Aboveground Storage Tank
ACC - Albemarle and Chesapeake Canal Route
BCR – Benefit-to-cost ratio
BFE – Base Flood Elevation
CAA – Clean Air Act
CERCLA – Comprehensive Environmental Response, Compensation and Liability Information System
CSRM – Coastal Storm Risk Management
CWA - Clean Water Act
CW – Civil Works
CZMA - Coastal Zone Management Act
dBA – A-weighted decibel
Db – decibel
DNL – Day-Night Average Sound Level
DOD – Department of Defense
DMME - Virginia Department of Mines, Minerals, and Energy
DSC - Dismal Swamp Canal Route
EA – Environmental Assessment
EFH - Essential Fish Habitat
EO – Executive Order
ESA - Endangered Species Act
ESI - Environmental Sensitivity Index
FAA – Federal Aviation Administration
FCSA – Federal Cost Share Agreement
FEMA – Federal Emergency Management Agency
FHWA – Federal Highway Administration
FIRM – Flood Insurance Rate Map
FONSI - Finding of No Significant Impact
FWCA - U.S. Fish and Wildlife Coordination Act
FY – Fiscal Year
GIS – Geographic Information System
H & H – Hydrology and Hydraulics
HEC-FDA - Hydrologic Engineering Center-Flood Damage Risk Reduction Analysis
IA – Initial Assessment
JLUS – Joint Land Use Study
LERRD - Lands, Easements, Rights-of-Way, Relocations, and Disposal
LOS – Level of Service
LPP – Locally Preferred Plan
MSE - Mechanically Stabilized Earth
MSFCMA - Magnuson-Stevens Fishery Conservation and Management Act
MSL – Mean Sea Level

NAAQS - National Ambient Air Quality Standards
NACCS – North Atlantic Coast Comprehensive Study
NAD – North Atlantic Division
NALF – Naval Auxiliary Landing Field
NAS – Naval Air Station
NAVD - North American Vertical Datum
NED – National Economic Development
NEPA - National Environmental Policy Act
NHPA - National Historic Preservation Act
NMFS - National Marine Fisheries Service
NMFS - National Marine Fisheries Service
NOAA – National Oceanographic and Atmospheric Administration
NRHP - National Register of Historic Places
NWI - National Wetlands Inventory Project
OMRR&R - Operations, Maintenance, Repair, Rehabilitation and Replacement
PA – Programmatic Agreement
PCB - Polychlorinated Biphenyls
PCBT - prestressed concrete bulb-T
PDT – Project Delivery Team
ROI – Region of Influence
RSLR – Relative Sea Level Rise
SAV - Submerged Aquatic Vegetation
TMDL – Total Maximum Daily Load
TP – Total Phosphorus
TSS - Total Suspended Solids
USACE – United States Army Corps of Engineers
USEPA – U.S. Environmental Protection Agency
USFWS - U.S. Fish and Wildlife Service
USGS - United States Geological Survey
USN – U.S. Navy
UST – Underground Storage Tank
VCRIS - Virginia Cultural Resource Information System
VDCR – Virginia Department of Conservation and Recreation
VDGIF – Virginia Department of Game and Inland Fisheries
VDEQ - Virginia Department of Environmental Quality
VDHR - Virginia Department of Historic Resources
VDH - Virginia Department of Health
VDOT - Virginia Department of Transportation
VDP - Vehicles per Day
VIMS - Virginia Institute of Marine Science
VMRC – Virginia Marine Resources Commission
WRDA - Water Resources Development Act

1 Introduction

This Final Feasibility Report has been produced to present the study process used to select a plan for the replacement of the U.S. Army Corps of Engineers (USACE) Atlantic Intracoastal Waterway (AIWW) North Landing Bridge. The bridge is located entirely in the City of Chesapeake but spans the AIWW and connects the City of Chesapeake and the City of Virginia Beach.

1.1 Study Authority

Under existing USACE policy, the Norfolk District has the responsibility to maintain the North Landing Bridge in an acceptable condition; however, there is no similar responsibility to upgrade the bridge to meet current traffic conditions. Any replacement or rehabilitation of the bridge under USACE Operations, Maintenance, Repair, Rehabilitation and Replacement (OMRR&R) programs would be accomplished “in-kind” (a two-lane bridge only). In order to provide betterments (more than two lanes) or to have a non-Federal entity take ownership of a replacement bridge, Congressional authorization and funding would be required. In the case of the North Landing Bridge, Section 216 of the Flood Control Act of 1970 (Public Law 91-611) would be the proper path to Congressional authorization and funding. It authorizes the Secretary of the Army and the Chief of Engineers to undertake investigations to determine the feasibility of modifying or replacing completed projects or their operations. If the Section 216 report would recommend such modifications, the report would be used as the basis to obtain Congressional authorization and Federal funding. The study authority lies in Section 216 of the Flood Control Act of 1970 (Public Law 91-611):

> *The Secretary of the Army, acting through the Chief of Engineers, is authorized to review the operation of projects the construction of which has been completed and which were constructed by the Corps of Engineers in the interest of navigation, flood control (flood damage reduction), water supply, and related purposes, when found advisable due to significantly changed physical or economic conditions, and to report, thereon to Congress with recommendations on the advisability of modifying the structures or their operations, and for improving the environment in the overall public interest.*

1.2 Study Purpose and Scope

The purpose of the study is to evaluate alternatives for replacing the USACE-owned North Landing Bridge that crosses the AIWW near the boundary line between the Cities of Chesapeake and Virginia Beach and to determine the feasibility of transferring the replacement facility and all associated OMRR&R responsibilities to the City of Chesapeake, which has expressed an interest. This Feasibility Study will:

- Identify the plan that reasonably maximizes national economic development benefits while being technically feasible and environmentally sustainable; and
- Recommend a plan for future action.

The final report recommends Congress authorize construction of a bridge replacement alternative.

1.2.1 Purpose and Need for USACE Action

This study is a recommendation of an Initial Assessment completed in 2012. As reported in the 2012 Initial Assessment, the North Landing Bridge does not meet Virginia Department of Transportation (VDOT) standards as it does not conform to either existing traffic level of service (LOS) standards or current design vehicle load limits for traffic volumes. The bridge has been determined to be structurally deficient and functionally obsolete. This study develops and evaluates potential planning solutions to contribute to national economic development consistent with the USACE inland navigation mission, applicable executive orders, and other Federal Planning requirements.

1.2.2 Objectives

The main objective of the project is to reduce or eliminate delays to navigation and vehicle traffic over the 50 year period of analysis and reduce safety hazards to vessels and vehicles over the 50 year period of analysis. Lastly, USACE will aim to reduce bridge OMRR&R costs over the 50 year period of analysis.

1.2.3 Scope

The study scope included an investigation of both major rehabilitation and replacement as possible alternatives. The associated roadway (Route 165), bridge approaches, and all operation equipment fall under the study scope. Other features of the project associated with the bridge and roadways include, but are not limited to, abutments, supporting piers, pile foundation, fender system, mechanical and electrical systems, and operator's control house.

1.2.4 Study Area

The study area (Figure 1-1 and Figure 1-2) includes the North Landing Bridge along with the AIWW and local traffic systems in the vicinity. The bridge crosses the AIWW near the boundary line between the Cities of Chesapeake and Virginia Beach about 150 miles southeast of Washington D.C. It is located at the eastern border of Chesapeake and the southwestern border of Virginia Beach in a relatively rural section of both cities. The bridge lies entirely within Chesapeake. It services vehicular traffic traveling Route 165 between the cities of Chesapeake and Virginia Beach. The bridge also services boat traffic to include both local and transient vessels plying the AIWW.

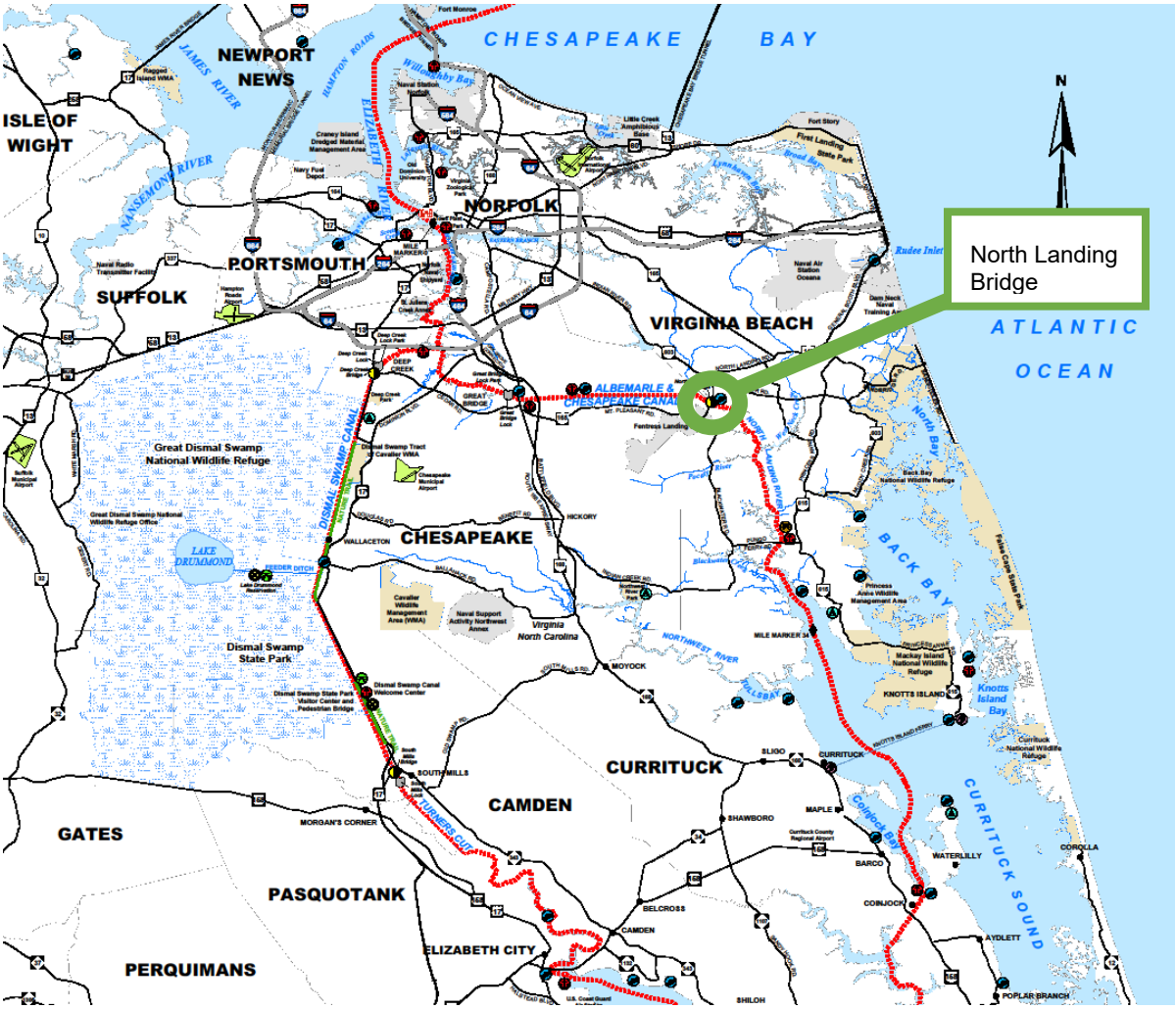


Figure 1-1. Study Area Map Showing the AIWW and Roadway Network in the Vicinity.

Figure 1-2. Map of Project Area

1.3 Problems, Opportunities, Objectives and Constraints

1.3.1 Problems

- The existing bridge has high maintenance costs totaling approximately $608k per year.
- The existing bridge design is dated and unreliable which causes both navigation vessel and vehicle traffic delays.
- There are no anchorages, and the channel restriction under the bridge results in safety hazards for vessels.
- The bridge has insufficient vehicle weight load rating and roadway geometry resulting in safety hazards for vehicle traffic.

Multiple issues were identified as contributors to these four major problems. For the first problem of high maintenance costs, specific issues include:

- The bridge is dated and the design is unreliable which causes frequent mechanical failures.
- Currently, parts of the bridge and its equipment flood during high water events, resulting in malfunctions and the need for repairs.

The specific issues contributing to the second problem, that the existing bridge design is dated and unreliable which causes navigation vessel and vehicle traffic delays, are:

- Frequent bridge shutdowns due to malfunctions lead to traffic delays and rerouting.
    - The bridge is the only crossing of the Albemarle and Chesapeake Canal Route (ACC) route of the AIWW for several miles to the east or west. Alternate routes are approximately 15 miles longer and trucks are not allowed on some of the detour roadways, making the bridge the only viable option available to most commercial traffic.
- The current channel under the bridge is constricted to 80 feet from 100 feet on the west approach and 120 feet on the east approach. This constriction causes vessels to slow down in order to pass underneath the bridge.

The specific issues contributing to the third problem of no anchorage for vessels that must wait for a bridge opening, are:

- Lack of anchorages within the queue areas causes a safety hazard for delayed vessels.
- The channel constriction under the bridge increases the hazard of allisions with the fenders and bridge structure.

The specific issues contributing to the fourth problem, insufficient load rating and roadway geometry, are:

- Illegal overloading of the bridge by vehicles over 13 tons is a common occurrence.
- Certain emergency service vehicles, such as fire trucks, exceed the rated bridge load requiring the City of Virginia Beach to request a load variance in 2008 for their fire trucks.
- The bridge has poor roadway geometry with no shoulders for vehicle traffic, leading to approximately 2-3 roadway accidents per year.

1.3.2 Opportunities

Opportunities are the desirable future outcomes which address the water resource problems and improve conditions in the study area. Opportunities identified for this analysis include:

- Reduce OMRR&R costs with a more reliable, low cost bridge design and operating equipment.
- Reduce or eliminate vehicle and vessel delays, including risk to Navy fuel deliveries.
- Improve navigation safety with anchorages and improved channel geometry under the bridge.
- Improve roadway safety with redesigned roadway geometry that meets current design standards.
- Improve emergency vehicle access with a new bridge design that meets current standards for weight capacity ratings.
- Increase economic potential of the area by bringing the bridge up to current design standards for weight limit to allow more commercial vehicles to cross.
- Improve local hydrology and wildlife passage.
- Provide pedestrian and bicycle access with sidewalks and/or bike lanes across the bridge.

1.3.3 Objectives

Federal Objective

The Planning Guidance Notebook (ER 1105-2-100, dated 22 April 2000) states that “water and related land resources project plans shall be formulated to alleviate problems and take advantage of opportunities in ways that contribute to study planning objectives and, consequently, to the Federal objective” (page 2-1). Plan formulation has been conducted for this Feasibility Study and EA with a focus on achieving the Federal objective of water and related land resources project planning, which is to contribute to National Economic Development (NED) consistent with protecting the Nation's environment, pursuant to national environmental statutes, applicable executive orders, and other Federal planning requirements (Principles and Guidelines, 1983).

Planning Objectives

The primary goal of this study is to develop and evaluate potential planning solutions to reasonably maximize national economic development consistent with the USACE inland navigation mission while protecting the Nation’s environment, by addressing the current bridge inefficiencies and the existing safety hazards for vessel and vehicle traffic. A secondary goal of this study is to reduce USACE infrastructure inventory by arriving at a solution that leads to the transfer of ownership of the bridge and its OMRR&R to a local sponsor. Specific objectives for this study are:

- Reduce or eliminate delays to navigation and vehicle traffic over the 50 year period of analysis.
- Reduce safety hazards to vessels and vehicles over the 50 year period of analysis.
- Reduce bridge OMRR&R costs over the 50 year period of analysis.

1.3.4 Planning Constraints

Constraints are conditions to be avoided or things that cannot be changed, which limit the development and selection of alternative plans. Specific constraints for this analysis include:

- Minimize disruptions to fuel transport to NAS Oceana. Fuel barges pass through the North Landing Bridge channel to get to the base fuel delivery system.
- Do not increase the current FEMA base flood elevation or increase/exacerbate flooding.
- Avoid bridge closures during construction. Bridge closure during construction may be unacceptable to the local citizens who rely on the bridge for commuting and commercial access.

Additional Planning Considerations:

- Minimize impacts to cultural resources. The Chesapeake and Albemarle Canal is listed in the National Register of Historic Places as a historic district to which the North Landing Bridge is a contributing property.
- Minimize impacts to valuable wetlands in the project area.
- Minimize impacts to threatened and endangered species and other environmental resources in the project area.
- Minimize real estate impacts as feasible. There is privately owned property in the project area and impacts to owners is probable. Private property acquisition can affect project implementation.

1.3.5 Period of Analysis

The following assumptions and parameters were taken into consideration for modeling and planning purposes:

- Discount Rate (i) – 2.75%
- Duration (n) – 50 years
- Base Year – 2027
- FY 2020 Price Levels

1.4 Study Participants and Coordination

The Norfolk District Engineer is responsible for conducting the overall study in cooperation with the Executive Committee comprised of representatives of Programs and Project Management Division, Planning Branch, and the City Manager of the City of Chesapeake. An Advisory Committee was also formed comprised of field-level representatives from the City of Chesapeake, the City of Virginia Beach and applicable state agencies. The following agencies are the cooperating agencies: the U.S. Navy (USN), the U.S. Coast Guard (USCG), and the U.S. Environmental Protection Agency (USEPA).

1.5 Prior Studies and Reports

Several relevant reports have been prepared by USACE concerning the AIWW and bridges. They include:

House Document No. 391, 62nd Congress, 2nd Session. Congress. 1912.

The Intracoastal Waterway – Boston Massachusetts, to Beaufort, North Carolina report was printed as House Document No. 391, 62nd Congress, 2nd Session, and enacted into law 25 July 1912, authorized construction of a continuous waterway, inland where practicable, from Boston, MA, to Beaufort, NC. It also provided for construction and maintenance of bridges or ferries

where the waterway crossed existing roads. Subsequent River and Harbor Acts of 1917, 1918, and 1933 authorized further improvements and provisions for the waterway.

Study of Vertical Clearance Requirements, The Atlantic Intracoastal Waterway. *1960. Jacksonville District.*

The "Study of Vertical Clearance Requirements, The Atlantic Intracoastal Waterway," dated March 1960, was prepared by the Jacksonville District and established the minimum vertical bridge clearance requirement to be 65 feet over the AIWW.

Interim Report on Replacement of Federal Highway Bridges in North Carolina*.1970. Wilmington District.*

The "Interim Report on Replacement of Federal Highway Bridges in North Carolina" was completed in 1970 by the Wilmington District in response to identical Senate and House Resolutions adopted on 30 September 1968 and 11 December 1969. It recommended the replacement of five of six existing federally owned, U.S. Army Corps of Engineers operated bridges over the AIWW in North Carolina. Replacement of these five bridges was authorized by Section 101 of the River and Harbor Act of 1970 (Public Law 91-611). The Wilmington District originally recommended a 75/25 Federal/non-Federal cost-sharing plan to replace the five obsolete low-level bridges with five two-lane high level, fixed span bridges. The State of North Carolina agreed to assume responsibility for the replacement bridges. The Water Resources Development Act of 1976 (Public Law 94-587) modified the original authorization to provide for total Federal funding of the two of the five bridges. The Water Resources Development Act of 1986 (Public Law 99-662) modified the original authorization to provide for 100 percent Federal funding of the remaining three bridges.

Replacement of Federal Highway Bridges in Virginia and North Carolina. *1977. Norfolk District.*

In January 1977, the Norfolk District completed a feasibility report entitled "Replacement of Federal Highway Bridges in Virginia and North Carolina." It was submitted in compliance with the same resolutions cited in the previous paragraph. The report considered replacing the four U.S. Army Corps of Engineers owned and operated low-level bridges crossing the AIWW within Norfolk District's jurisdiction. These four bridges were located at Deep Creek, Great Bridge and North Landing in Virginia and South Mills in North Carolina. The intent of the report was to determine the feasibility of constructing new bridges and turning them over to local interests for OMRR&R. The report recommended that only the bridge at Deep Creek be replaced. The proposed bridge was a 4-lane, 65 foot clearance, fixed-span structure with an alignment north of the existing bridge.

However, the Board of Engineers for Rivers and Harbors recommended against replacing the bridge. The Board stated that the DSC was an alternate route for the AIWW that carried very little commercial freight traffic and a limited amount of recreational boat traffic; therefore, operation of the existing bridge did not cause undue delays to navigation traffic. The Board also stated that the existing bridge was in good physical condition, and although it did not meet current width and design loading standards, it was projected that the traffic capacity would not be reached until the early 1980s. Consequently, the Board believed that it had not been demonstrated that traffic congestion caused by the bridge justified the difference in the cost

between continuing to operate and maintain the existing bridge and the recommended plan. The last reason for the decision by the Board was that the plans of the Commonwealth to improve the section of U.S. Route 17 in the Deep Creek area were indefinite with respect to the year of initiation of construction.

AIWW Bridge Replacement at Great Bridge, Chesapeake, VA*. 1994. Norfolk District.*

In January 1994, the Norfolk District completed a Section 216 feasibility phase study entitled "AIWW Bridge Replacement at Great Bridge, Chesapeake, VA." The report evaluated alternative plans to replace the existing bridge. The NED Plan consisted of a 4-lane, 6-foot vertical clearance, double-leaf rolling-lift bascule approximately 125 feet west of the existing bridge. The recommended Locally Preferred Plan (LPP) was similar to the NED Plan, except that the bridge would provide five lanes and be located approximately 100 feet east of the existing bridge. Additionally, a culvert bridge widening is associated with the LPP as a part of the authorized plan. The local sponsor would pay all costs incremental to the NED Plan and upon completion of the project, the local sponsor, the City of Chesapeake, assumed responsibility for all operation, maintenance, repair, replacement and rehabilitation.

1.6 Existing Water Projects

1.6.1 Atlantic Intracoastal Waterway

The route of the AIWW extends from Massachusetts to Florida. It is a naturally protected navigation route which generally parallels the Atlantic coast for its entire length. The waterway's route intersects existing highways at a number of points, a factor which generated the need for bridge construction. Since their construction, the bridges and associated OMRR&R have been a responsibility of the USACE.

In Virginia, the AIWW passes down the Chesapeake Bay, through the Hampton Roads harbor, and down the Southern Branch of the Elizabeth River. Hampton Roads is a natural roadstead of 25 square miles formed by the confluence of the James, Nansemond, and Elizabeth Rivers. The harbor in Hampton Roads is recognized as one of the largest and finest natural harbors in the world. The Elizabeth River has three branches: the Western, Eastern, and Southern.

The Norfolk District portion of the AIWW south of Norfolk, including the provision of any necessary bridges, was authorized by the Congress in accordance with the River and Harbor Acts of 1910, 1912, 1917, 1918, and 1933. It consists of two inland water routes. Route A, locally known as the "Albemarle and Chesapeake Canal (ACC) Route," is shown on Figure 1-1. It extends between a point on the Southern Branch of the Elizabeth River, 2,500 feet south of the Norfolk and Western Railway Bridge, and the Virginia-North Carolina State line on the North Landing River, a distance of 27.2 miles. The existing project for this route was originally authorized by the Rivers and Harbors Act of 25 July 1912. The project provides for channels 12 feet deep and from 90 to 250 feet wide following the Southern Branch of the Elizabeth River, 5.2 miles; the Virginia Cut (ACC) 8.3 miles; and North Landing River, 13.7 miles; construction of a tidal guard lock at Great Bridge, Virginia; and protection of Government property in the vicinity of the lock, with dikes and appurtenant structures, against flooding by storm tides. The protection works have not been constructed.

Route B, locally known as the “Dismal Swamp Canal Route” (DSC), is located between the mouth of the Pasquotank River in North Carolina and its juncture with the Southern Branch of the Elizabeth River in Chesapeake, Virginia. The route covers a distance of 64.6 miles. The existing project for this route, adopted by the River and Harbor Act of 3 March 1899, provides for a channel 10 feet deep and 50 to 100 feet in width. The dimensions have since been modified to 10 feet deep and 100 feet wide in Deep Creek and Pasquotank River, 9 feet deep and 50 feet wide in Dismal Swamp, and 10 feet deep and 80 feet wide in Turners Cut. However, only a 6-foot deep channel is being maintained since using traffic does not justify the maintenance of anything deeper.

The lock and highway bridge on the ACC Route are operated 24 hours per day, 7days per week. The two locks and two highway bridges on the DSC Route are operated 8 hours per day, 7 days per week. The DSC locks and bridges are opened only at 8:30 a.m., 11:00 a.m., 1:30 p.m., and 3:30 p.m.

1.6.2 Atlantic Intracoastal Waterway Bridges

The Norfolk District operates three bridges crossing the two waterways. One of these bridges crosses the ACC at North Landing, Virginia. The other two bridges cross the DSC at Deep Creek, Virginia and South Mills, North Carolina. All three are operated for the Norfolk District by a contractor.

The North Landing Bridge is a double-swing span two-lane bridge constructed in 1951. It has a length of 238 feet, a width of 28 feet, vertical clearance of 6.5 feet, and a horizontal channel clearance of 80 feet. It has a weight limit of 13 tons.

The Deep Creek Bridge was recently funded for replacement with construction scheduled to begin in 2020. The original 1934 bridge was a two-lane bascule bridge that carried the George Washington Highway / Route 17 across the DSC in Chesapeake, VA. The Deep Creek Bridge underwent major repair in Fiscal Year 1996 to upgrade its capacity from 13 tons to 20 tons. The new bridge was upgraded to a five-lane, dual leaf bascule bridge with sidewalks on both sides. The load capacity of the bridge was unchanged at 20 tons. Horizontal clearance between the fenders is 60 feet when the bridge is open. When the bridge is closed the vertical clearance is 4 feet.

The bridge at South Mills also spans the DSC. Opened for traffic on 23 June 1934, the South Mills Bridge underwent major repair in Fiscal Year (FY) 1996 to upgrade its capacity from 13 tons to 20 tons. The state of North Carolina constructed two parallel, high level, fixed span bridges (one for northbound traffic and one for southbound traffic) about 1.5 miles north of the existing bridge. They were constructed from 1980 to 1982. They both are about 2,100 feet long and have a roadway width of 38 feet. At the AIWW itself, there is a vertical clearance of 65 feet with no horizontal restriction for vessels.

In addition to the bridges discussed above, there are two bridges that cross the ACC in the vicinity of Great Bridge. The first, which is part of Route 168, is a five-lane, fast acting bascule bridge which was constructed by the Norfolk District with partial assistance from the City of Chesapeake. The bridge is 200 feet long, has a 100 foot horizontal clearance between fenders, and is approximately 90 feet wide. It was opened for traffic in 2004 and is now owned and

maintained by the City of Chesapeake. Slightly less than one mile to the east of this bridge is a four-lane, high level, fixed span bridge which crosses the ACC as part of the Route 168 Bypass, completed in 2001. This bridge was constructed by the Commonwealth of Virginia and is about 3,000 feet long with a roadway width of 75 feet. It has a vertical clearance of at least 65 feet with no horizontal restriction for vessels.

Other bridges that cross the AIWW are the Centerville Turnpike Bridge, which is a single swing span, two-lane bridge east of Great Bridge in Chesapeake, and the Pungo Ferry Bridge, a high level, fixed span structure in Virginia Beach spanning the North Landing River and the AIWW with a vertical clearance of 65 feet. The Jordan Bridge at Highway 337 is a fixed bridge with 145 feet of vertical clearance and the Gilmerton Bridge at Highway 13/460 which is a lift span bridge with 35 feet of vertical clearance in the closed position. The Veterans Bridge at Dominion Boulevard replaces the former Steel Bridge bascule design with a 95 foot clearance fixed span bridge.

1.7 NEPA Scoping and Public, Resource Agency, and Tribal Coordination

1.7.1 NEPA Scoping

On January 16, 2018, the USACE held a National Environmental Policy Act (NEPA) open-house-style, public scoping meeting at the Hampton Roads Transportation Planning Organization (HRTPO) building. Staff from USACE were on-hand with storyboards to show the areas of the city to be addressed, to describe the potential measures, to answer questions, and to obtain public comments. Approximately 23 people attended, and eight comments were submitted during and after the meeting. The comments that were received are addressed in the Environmental Correspondence section of the Environmental Appendix, Appendix C. None of the public comments identified potential effects that would be highly controversial or highly uncertain.

1.7.2 Resource Agencies

Interagency coordination began with a kick-off stakeholder meeting on December 4, 2017. Federal, state, and local government officials, resource agencies, academics, and nonprofit organization members were invited to the workshop, with the goal of focusing the Norfolk Landing Bridge Replacement Study objectives and identifying solutions. Personnel from the Coast Guard, the U.S. Navy, the HRTPO, the Virginia Marine Resources Commission (VMRC), and USACE were in attendance. During the workshop, initial comments were obtained.

In addition, the following were invited to be cooperating agencies: U.S. Environmental Protection Agency (USEPA), U.S. Coast Guard (USCG), U.S. Navy, National Oceanic and Atmospheric Administration's (NOAA) National Marine Fisheries Service (NMFS), and the U.S. Fish and Wildlife Service (USFWS). The USEPA, the U.S. Navy, and the Coast Guard accepted the invitation. A cooperating agency meeting was held on June 7, 2018, and attendees included personnel from the USEPA, U.S. Navy, the Coast Guard, the Cities of Virginia Beach and Chesapeake, and the USACE. Follow-up coordination also occurred via email.

Coordination under the U.S. Fish and Wildlife Coordination Act (FWCA) with the USFWS was completed, and a Planning Aid Report was completed by USFWS in June 2019. Coordination under Section 7 of the Endangered Species Act (ESA) was completed and a Biological Assessment (BA) was prepared and is provided in the Environmental Appendix, Appendix C.

The project would be exempt from the incidental take prohibitions as addressed in the USFWS Programmatic Biological Opinion on Final 4(d) Rule for the Northern Long-Eared Bat and Activities Excepted from Take Prohibitions. There is no Essential Fish Habitat (EFH) in the Study Area; therefore, neither an EFH assessment nor coordination under the NMFS under the Magnuson-Stevens Fishery Conservation and Management Act is required. Coordination as required per Section 106 the National Historic Preservation Act (NHPA) is ongoing. A Programmatic Agreement (PA) has been prepared, and is included in the Environmental Appendix.

1.7.3 Tribal Coordination

Letters inviting tribal nations to consult on the project were sent to the Catawba Indian Nation, the Delaware Nation, the Nansemond Indian Nation, and the Pamunkey Indian Tribe. The Delaware Nation and the Nansemond Indian Nation accepted the invitation to consult. The Catawba Indian Nation asked to be notified of any Native American archaeological finds, and the Pamunkey Indian Tribe has not responded.

1.7.4 Cultural Resources

Discussions with the Virginia Department of Historic Resources of the need for a Programmatic Agreement (PA) took place. The Historic Preservation Commissions of the City of Chesapeake and the City of Virginia Beach were invited to consult on the project, and both accepted. As stated above, a PA has been finalized.

1.7.5. Draft Report/EA Coordination

On March 29, 2019, a Draft EA/Draft Finding of No Significant Impact was released was released to the public for a 30-day comment period. It was available on USACE project website for download and review. It was also available in selected public libraries. Comments were solicited through a public notice, indicating that they could be submitted by mail or email. Another open-house style public meeting was held on April 10, 2019, at North Landing Elementary School in Virginia Beach, to allow citizens to view storyboards and submit comments. Thirty-three people attended and 9 public comments were submitted. They are addressed in the Environmental Correspondence section of the Environmental Appendix, Appendix C. None of the public comments identified potential effects that would be highly controversial or highly uncertain.

Comments on the Draft EA were received from all three cooperating agencies. The USCG indicated that the Draft EA was sufficient and that it did not have any additional comments, other than to indicate the requirement for a bridge permit. The Navy stated its concern about any impacts on a fuel line owned by NuStar Energy, LP, and any limitations on fuel supply via the fuel line and/or in navigating the AIWW. The Navy indicated that NuStar may need the fuel line relocated, and recommended coordination with NuStar. This is discussed further in the Hazardous Toxic Radioactive Waste Section (Section 7.14) and the Utilities Section (Section 7.16) of this document. The USEPA provided comments relating to temporary and permanent wetland impacts, wetland mitigation, wildlife, and air quality. These are addressed in the appropriate sections of this document; specifically, in Section 7 and in the Environmental Appendix, Appendix C.

This report serves as the USACE decision support document for the recommended navigation improvements and as the EA to meet NEPA requirements for the proposed action. It is also formatted to facilitate review and processing by the Assistant Secretary of the Army (ASA) for Civil Works (CW) to provide a report with recommendations to Congress. The remainder of the report is organized as follows.

Section 2: Existing Economic and Navigation Feature Conditions
Section 3: Affected Environment
Section 4: Future without Project Condition
Section 5: Plan Formulation
Section 6: Recommended Plan / Proposed Action
Section 7: Environmental Consequences of the Alternatives
Section 8: Summary of Best Management Practices / Mitigation Measures
Section 9: Environmental Compliance
Section 10: Agencies and Persons Consulted
Section 11: Recommendations
Section 12: Finding of No Significant Impact
Section 13: References

Appendices
Appendix A: Engineering Appendix
Appendix B: Economics Appendix
Appendix C: Environmental Appendix
Appendix D: Real Estate Appendix

2 Existing Economic and Navigation Concerns

2.1 Condition of Existing Federal Bridge

The North Landing Bridge is owned and operated by the Norfolk District, USACE, as a part of the Atlantic Intracoastal Waterway project. The bridge spans the ACC portion of the AIWW and connects the cities of Chesapeake and Virginia Beach, Virginia.

The current weight limit of 13 tons/26,000 pounds is below current VDOT roadway standards, preventing certain emergency vehicles and trucks from crossing the bridge. The current daily traffic on the bridge is approximately 11,000 vehicles per day (2017) and is well in excess of its original design capacity of 8,000 vehicles per day and currently it is carrying almost 1.37 times its theoretical maximum. Traffic loads are projected to steadily increase as Chesapeake and Virginia Beach develop. The bridge is in a growing suburban area and its two-lane capacity (10-foot lanes) is often the cause of traffic problems. Traffic problems also occur when the bridge is opened for navigational traffic (Figure 2-1).

Figure 2-1. Picture of North Landing Bridge in 1976.

2.1.1 Bridge Criteria and Standards

As reported in the 2012 Initial Appraisal, the North Landing Bridge does not meet VDOT standards as it does not conform to either existing traffic level of service (LOS) standards or current design vehicle load limits for traffic volumes. The bridge has been determined to be structurally deficient and functionally obsolete based on this assessment. Table 2-1 below compares the existing bridge design with the VDOT standards.

Table 2-1. Bridge Criteria

Item	Recommended Criteria	Existing Bridge
Clear Roadway Width	40 feet[1]	24 feet
Design Load	HS2)-44	H15

[1] Based on a rural collector road system VDOT manual of the structure and bridge division measured between curbs.

The bridge also has high OMRR&R costs at approximately $608,000 per year. The bridge has frequently had to close for repairs due to malfunction and/or allisions. These problems create the following risks and impacts:

1. Current and future increasing costs to navigation commerce due to vessel delays.
2. Current and future increasing costs to road commerce due to traffic delays and forced detours.
3. Future increasing risk to U.S. Navy readiness by delaying fuel deliveries to NAS Oceana, in the case of a bridge shutdown in the closed position.

The bridge underwent a major repair in 2010. The repair work was funded by the American Recovery and Reinvestment Act (ARRA) 2009, and was performed in two phases. The cost of repairs was $146,000 for phase 1 and $1.78M for phase 2. The phases were as follows:

1. Phase 1: Bridge house repairs, which included additional security at the bridge house and upgrading the energy-efficiency of the bridge house with improved windows, doors, roofing, air conditioning and heat.
2. Phase 2: Removal and replacement of the existing bridge surface, steel grid replacement and concrete fill, repairs to the underwater support piling and concrete abutments, and replacement of traffic control lights and poles and traffic control gates.

The repair work did not affect or change the load limits, vessel clearance, capacity or width of the bridge and did not bring the bridge up to current Virginia standards.

2.1.2 Current Opening Times

The North Landing Bridge opens on the hour and half-hour from 6 a.m. to 7 p.m on all days. The bridge opens on demand from 7.p.m. to 6 a.m. on all days (Code of Federal Regulations, Title 33, § 117.1021). The height of the bridge above water is 6 feet above mean water.

2.1.3 Mechanical Bridge Breakdowns

During the past 18 years, the bridge has been closed to navigation traffic on seventeen separate occasions due to various problems. These problems include (but are not limited to) mechanical failure, storm damage, heat related failure, main circuit breaker failure, jammed wedges, gear box failure, and high water.

North Landing Bridge has been shut down because of electrical issues and wedge issues 57 times over the past twenty years. Table 2-2 lists bridge closure examples beginning in 1999.

Table 2-2. Record of Major Facility Downtime

Year	Occurrences of Shut Downs	Description of Breakdowns
1999	4 times	North span stopped half open; Both spans stuck in middle, shut both spans and opened Chesapeake span ok; South span wouldn't close, Brake on V.B. span broken
2000	6 times	Wedge bars broken, south span would not open, north span would not open, north span only gear box, replaced gear box, limit switches frozen
2001	4 times	Bridge stuck due to heat; Removing wrecked car and debris; One span stuck due to heat; Bridge stuck due to heat
2003	7 times	Span motor wiring & resistor bank; Wedge motor jammed; Bridge stuck due to heat; Wedge motor brake not releasing; Wedges on Virginia Beach span would not pull; N.E. traffic gate
2004	3 times	Bridge stuck due to heat; Lost power to console; Traffic gate
2005	4 times	South span power failure; South span power failure; Wedges on Virginia Beach span would not pull; Replaced brake coils on wedge motor & faulty coupling
2006	6 times – one shut down lasted five days	Wedges on Virginia Beach span would not pull, coupling problem; High water in electrical boxes; Limit switch on Virginia Beach span; High water in electrical boxes; Air buffer spring broke; Amperage problem Virginia Beach span
2008	5 times	Bad three phase relay; Wedge motor failure; Bridge would not close due to excessive heat; Broken pin on wedges; Wedge motor failure
2009	4 times	Bridge would not close – unknown failure; Wedge failure; Storm damage – trees down across road; Heat related failure. Reconfigured water cooling system
2010	4 times	Local power outages twice. Main circuit breaker failure; South wedge failure
2011	1 time	Wedge motor failure
2012	2 times	Virginia Beach wedge failure; Virginia Beach span gear box failure
2013	2 times	Virginia Beach wedge failure; Chesapeake wedge failure
2015	2 times	Virginia Beach wedge failure; Gate failure, going up and down
2016	1 time	Virginia Beach wedge failure
2017	1 time	All wedges would not drive

2018	3 times	Virginia Beach wedge fell off, 2 shut downs due to navigation for high water
2019	4 times	2 shut downs to navigation for high water, 2 breakdowns due to electrical/mechanical issues
*(Occurrences of shut downs per year each were a time span between 1 and 8 hours unless otherwise noted)		

2.1.4 Allisions

An allision is defined as the striking of a marine vessel with a fixed object. There are instances of allisions with the bridge which have caused the bridge to shut down. Since 2016 there have been four allisions. Two allisions in which a tug and barge combination allided with the bridge on June 5, 2016 and March 1, 2016 caused the bridge to be temporarily inoperable. The bridge closure caused delays to commercial and military fuel shipments and caused an estimated $500,000 in damages. On January 17, 2019, an allision caused damage to fender system and the navigation light of the boat that allided with the bridge and the cost estimate for the repairs was less than $4,000. On February 2, 2018, another boat allided with the bridge and there was damage to its fender system, less than $250.00.

2.2 Adjoining Waterways / Study Area

The existing North Landing Bridge spans the ACC section of the AIWW. The AIWW bisects the study area, and the navigation use of this waterway is made by the way of two routes--the DSC route and the ACC route. The ACC serves as a primary transportation link for the AIWW system. Navigation traffic on the ACC is characterized by various amounts of commercial (including Naval fuel barges) and recreational activity, although pleasure boats are by far the predominant user.

Two watersheds contribute flows to the project area, the Chesapeake Canal watershed and the Upper North Landing River watershed. The North Landing River feeds into the AIWW. The project site is located within a floodplain. The drainage area upstream of the bridge is 28,000 acres. The project disturbs less than 20 acres, which is less than 1% of the upstream drainage area, and drains directly to the AIWW. The AIWW is a human-made channel and will be treated as a human-made conveyance system for the purposes of compliance with water quality regulations.

An overview of the study area climate and topography can be found in Chapter 3.

2.3 Navigation Conditions

Currently navigation statistics show approximately 8,868 vessels passing through the Great Bridge Guard Lock (#11) in fiscal year (FY) 2017. The ledger of vessels for the Great Bridge Lock is used as a proxy for estimating the number of vessels passing through the North Landing Bridge. Table 2-3 shows the breakdown of vessel types.

Table 2-3. Estimated Vessels Passing Through the Project Area

FISCAL YEAR	GREAT BRIDGE GUARD LOCK (#11)						
2017	Government Vessels	Passenger Boat or Ferry	Recreation Vessels	Towboats w/Barges	Towboats wo/Barges	*Tonnage*	Lockings
1ST QUARTER	27	6	2,425	195	104	195,838	1,023
2ND QUARTER	16	4	275	239	90	283,095	532
3RD QUARTER	40	9	3,117	234	138	295,240	1,437
4TH QUARTER	47	3	1,528	244	127	278,291	1,209
GRAND TOTAL	130	22	7,345	912	459	1,052,464	4,201

Vessels are forced to slow down under the bridge because the channel under the bridge constricts to 80 feet from 100 feet west of the bridge and 120 feet east of the bridge. In order to navigate through the channel at the bridge commercial vessels need to slow down such that there is a 5 minute delay during opening. A 15-20 minute delay for recreational users is estimated based on the need for these users to wait for a bridge opening. Without delay, the North Landing Bridge opens on the hour and half-hour from 6 a.m. to 7 p.m. on all days.

The Waterways Limited Cost Estimator for Navigation (WLCEN) model, in coordination with the Inland Navigation Planning Center of Expertise (PCX), was used to calculate the benefits for navigation with a bridge replacement. Variables such as fuel cost, wages, and other costs associated with vessel operation and maintenance were used to estimate the benefits associated with decreased delays and allisions with a bridge replacement.

Reported trips in the study area are reported to and published by the Institute for Water Resources, USACE. Table 2-4 details vessel activity from the last ten years. It is noted that a predominant number of bridge openings are for single vessel passage.

Table 2-4. Vessel Reports

Year	No. of Gov't Vessels	No. of Passenger Boat or Ferry Vessels	No. of Recreational Vessels	No. of Towboats w/Barge	No of Towboats w/o Barge	Tonnage
2009	113	44	7278	780	425	680,900
2010	135	31	7485	835	430	828,590
2011	191	19	6874	863	789	856,815
2012	130	27	6460	971	514	1,081,800
2013	120	20	6136	890	364	1,001,620
2014	120	18	5913	869	324	909,188
2015	105	10	6205	859	400	961,323
2016	109	12	6598	913	489	989,267
2017	130	22	7345	912	459	1,052,464
2018	142	13	6650	984	362	1,088,966
Average	**129.5**	**21.6**	**6694.4**	**887.6**	**455.6**	**1,001,620**

Source: USACE, 2019

Commercial and recreation vessels travel the AIWW in lieu of the Atlantic Ocean. Over 8,000 vessels passed in FY17. A limited amount of commercial traffic transits the North Landing Bridge, principally serving northeastern North Carolina and the Hampton Roads, Virginia area. Principal commerce consists of sand, gravel, and wood products, as well as fuel delivered to a nearby storage facility serving NAS Oceana. The Waterborne Commerce of the United States Report (fiscal year 2018) indicates that approximately 1,088,966 short tons of commerce traveled the ACC Route in FY18. One of the main commerce types passing the bridge and of strategic significance is U.S. Navy jet fuel from Portsmouth, Virginia to Virginia Beach. Additional tonnage data from the last ten years can be seen in Table 2-4 above.

Recreational activity has grown significantly over recent years as a direct result of the growth in population and the increase in leisure time devoted to water-based bi-directional activities. The North Landing Bridge services both locally based recreation traffic and intracoastal traffic in route to destinations along the Atlantic and Gulf coastlines. Over the most recent 10-year period of record, recreational vessels made 82% of all vessel trips. Following the ten year trend, recreation vessels accounted for 83% of all vessels in 2017 (Figure 2-2). Typically, recreation vessels are the majority users of the canal. Vessel activity is slow during the period from November to March.

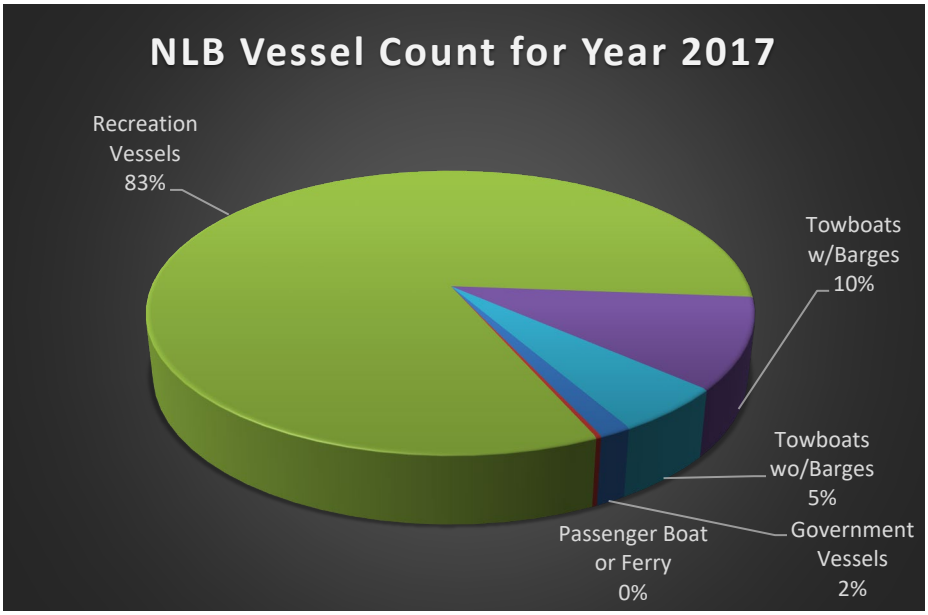


Figure 2-2. NLB Vessel Count for Year 2017

2.4 Transportation Conditions

VA Route 165, which is named Mt. Pleasant Route in Chesapeake and North Landing Road in Virginia Beach, provides a connection from the City of Chesapeake's Civic Center in Great Bridge, where it intersects with VA Route 168 (Battlefield Boulevard), to the Municipal Center in Virginia Beach, which is located at the intersection of Princess Anne Road and North Landing Road. Route 165 runs in an east-west direction and crosses the AIWW at the North Landing Bridge. The VDOT has classified Route 165 as Urban Minor Arterial. Table 2-5 details the historical average daily vehicle counts for the North Landing Bridge.

Table 2-5. Average Daily Vehicle Counts

Year	Location A[1]	Location B[2]
2017	11,000	12,000
2016	11,000	11,000
2015	11,000	11,000
2014	11,000	10,000
2013	7,800	11,000
2012	7,700	11,000
2011	7,900	12,000
2010	11,000	12,000
2009	10,000	12,000
2008	9,900	12,000

Source: Virginia Department of Transportation
[1] Location A: Between Fentress Airfield Road and Chesapeake City Limit
[2] Location B: Between North Landing Road and Indian River Road

North Landing Bridge is located within the Hampton Roads area. A HRTPO study showed that traffic is expected to increase in the Hampton Roads area (Figure 2-3). A detailed traffic study was completed by an independent contractor, WSP USA, Inc. (WSP). WSP is a transportation consulting company familiar with the VDOT data. Their report can be viewed in Appendix A. The study was conducted using the preexisting Hampton Roads Traffic Demand Model. The traffic study estimated existing demand and forecasted future demand, as well as vehicle miles traveled (VMT) and vehicles hours traveled (VHT), for the with and without project conditions in the study area. These estimates were used to calculate benefits for vehicle traffic with a bridge replacement.

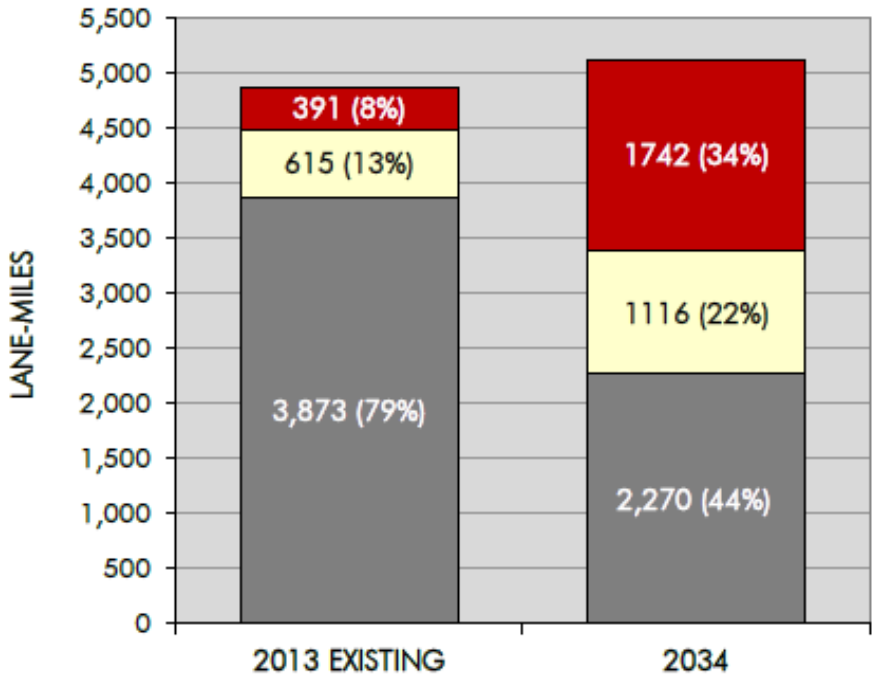


Figure 2-3. Existing (2013) and 2034 Congestion Levels by Lane-Mile for the CMP Roadway Network (PM Peak) in the Hampton Roads Area. Red: Severe Congestion, Yellow: Moderate

3 Affected Environment

3.1 Land Use

Land use comprises the natural conditions and/or human-modified activities occurring at a particular location. Human-modified land use categories include residential, commercial, industrial, military, transportation, communications and utilities, agricultural, institutional, recreational, and other developed use areas. Federal laws, state laws, management plans, and zoning regulations determine the type and extent of land use allowable in specific areas and often intend to protect specially designated uses and/or environmentally sensitive areas. Zoning requirements are regulations developed by the locality to control potential future development. Comprehensive plans evaluate long-term demographic trends to identify how the region of analysis should be developed. Where zoning focuses on immediate trends in development, comprehensive plans are generally less regulatory in nature and often serve as guidance when the current planning department is evaluating applications for development.

The Cities of Chesapeake and Virginia Beach have comprehensive plans that include long-range plans, goals, and considerations for land use. The comprehensive plan for the City of Chesapeake is called, “Moving Forward, Chesapeake 2035,” and was adopted on February 25, 2014, and amended on November 15, 2016. The comprehensive plan for the City of Virginia Beach is called, “City of Virginia Beach Comprehensive Plan—It’s Our Future—A Choice City,” dated May 17, 2016. Both also have various Local Zoning Ordinances that address various land uses and resources within the cities. In addition to these plans, each city has planning documents that focus more specifically on particular areas within their cities.

The Region of Influence (ROI) for land use is all existing and proposed future land uses throughout the Study Area. This includes the limits of physical disturbance caused by construction and maintenance of the project features, including temporary and permanent fill and structures, all temporary or permanently cleared areas, and all areas otherwise converted to another use, or that will result in an altered or limited land use, as a consequence of the construction of the measures. Also the ROI would include a 500-foot buffer around all temporarily and permanently impacted areas, to capture the extent of potential noise impacts as they pertain to land use. (The noise impact assessment is included in a separate section of this document).

3.1.1 Existing Conditions

Three U.S. Navy interests occur within the ROI: the NALF Fentress, a fuel line, and a fuel depot. Therefore, the USACE extended an invitation to the U.S. Navy to be a Cooperating Agency. The U.S. Navy accepted and has been participating as such, including review of the conceptual designs of the alternatives.

Naval Auxiliary Landing Field (NALF) Fentress. An overarching land use consideration within the ROI is the proximity of NALF Fentress in the City of Chesapeake to the North Landing Bridge (Figure 3-1). In fact, nearly all of the land on the west side of Mount Pleasant Road leading up to the bridge and within the ROI in Chesapeake is within NAFL Fentress’ military installation boundary. This 2,560-acre military facility was commissioned in 1943 and is located in the rural eastern portion of the City of Chesapeake. NALF Fentress serves as an auxiliary field to the larger NAS Oceana located approximately 7 miles to the northeast, in Virginia Beach; the two facilities are home to some of the U.S. Navy’s best high-performance planes.

NALF Fentress' one operational runway, known as Runway 23, went through a major refurbishment in 2012 (City of Chesapeake 2035). Surrounding NAFL Fentress's 2,560-acre facility, it also holds restrictive easements on another 9,418 acres (U.S. Navy 2014).

Figure 3-1. Naval Auxiliary Landing Field Fentress property boundary. (Source: U.S. Navy 2014).

Both NALF Fentress and NAS Oceana require numerous practice flights during the day and night. As such, the use of airspace over and surrounding military installations is controlled by the Federal Aviation Administration (FAA). According to measurements taken on aerials, the center of the existing North Landing Bridge is approximately 9,620 feet northeast of the edge of Fentress's Runway 23. The majority of the flight operations at NALF Fentress are Field Carrier Landing Practice (FCLP) operations (U.S. Navy 2014).

The Department of Defense (DOD), recognizing the need to balance military aircraft operations with community concerns over aircraft noise and accident potential, developed the Air Installation Compatible Use Zone (AICUZ) program in the 1970s. Today the AICUZ program is considered an important tool that is used by all branches of the military to communicate with neighboring counties, communities, municipalities, and individuals to inform them of the importance of preventing incompatible land use near military installations, and to promote compatible development between the air installation and its neighbors (U.S. Navy 2014).

The AICUZ Program recommends that noise contours, accident potential zones (APZs), height and obstruction requirements, and associated land use recommendations be incorporated into local community planning. The U.S. Navy establishes APZs based on historical data for aircraft mishaps near military airfields. The U.S. Navy indicates that "APZs identify probable impact areas if an accident were to occur; however, APZs do not predict the probability of an accident occurring" (U.S. Navy 2014).

The three types of APZ designations are Clear Zone, APZ 1, and APZ 2. Clear zones are typically trapezoidal-shaped zones immediately at ends of the runways, are the zones where accidents are most likely, and should remain undeveloped. APZ 1s lie beyond Clear Zones, and APZ 2s lie beyond APZ 1s. Of the three, APZ 2s are where accidents are considered least likely, and some limited low density development is considered compatible (U.S. Navy, 2014).

In consideration of the AICUZ program, the U.S. Navy and the Cities of Chesapeake, Norfolk, and Virginia Beach entered into a 2005 Joint Land Use Study (JLUS). Areas of the APZ and noise zones for NALF Fentress in conjunction with current zoning are depicted in Figure 3-2 below. As can be seen below, the ROI in both Virginia Beach and Chesapeake, including the bridge itself, is partially within APZ 2 (U.S. Navy 2014).

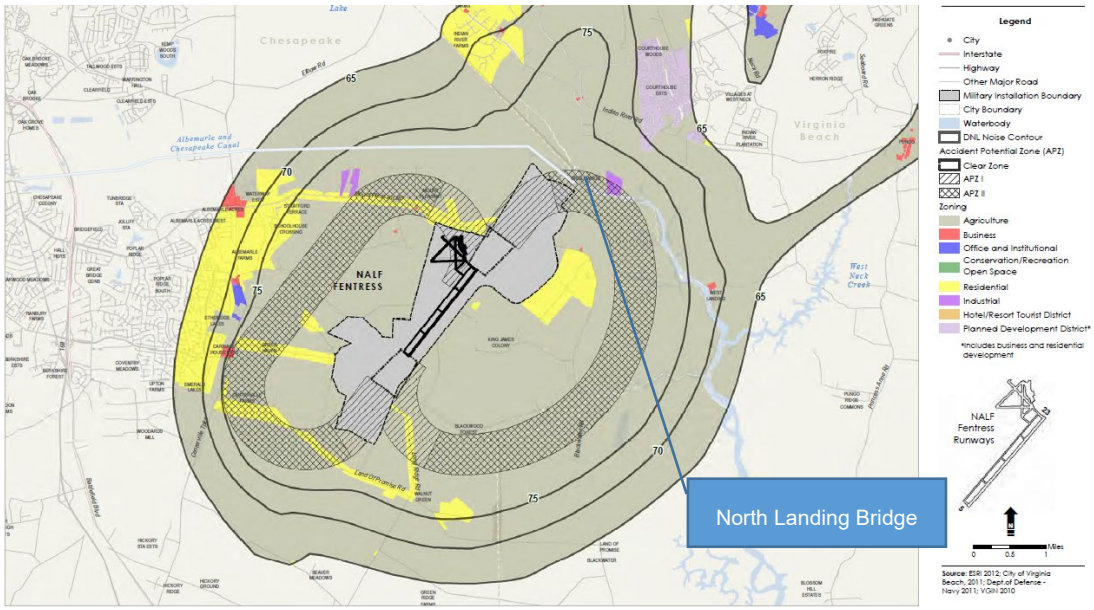


Figure 3-2. Chesapeake and Virginia Beach Zoning Districts within the AICUZ footprint. (Source: U.S. Navy 2014).

3.1.2 U.S. Navy Fuel Line and Fuel Depot

Along the northern bank of the AIWW, downstream of the bridge, there is a fuel depot that supplies fuel for the Navy (shown in purple on Figure 3-2) where fuel is offloaded. The fuel is transported offsite by fuel line. Both are owned by NuStar Energy, LP, a private petroleum fuel line and terminal company. This will be discussed more in the Navigation and Utilities sections of this chapter.

3.1.3 Zoning and Comprehensive Plans

As shown in Figure 3-2 above, the ROI is located in a section of both cities that is relatively rural. All of the land in the ROI in both cities is zoned Agriculture 1 (AG1) or Agriculture 2 (AG2); however none of it is in agricultural production. An AG1 or AG2 allows some residential use as well, but in a less dense manner. Residential development prior to the zoning designations is grandfathered (City of Virginia Beach and Chesapeake, 2016).

None of the land in the ROI on the Chesapeake side is developed, nor is it suitable. There is only a small clearing along the bank of the AIWW on privately owned land that appears to be used as a small campsite or other passive use; otherwise, the land appears to be unused. In addition to being within either U.S. Navy property or its Accident Potential Zone (APZ) 2, the entire ROI on the Chesapeake side is low-lying and forested; almost all of it is permanently inundated wetlands underlain by organic soils and subject to overbank flooding from the AIWW. (Wetlands will be discussed later in this chapter). The Nature Conservancy also owns a 692-acre parcel, a portion of which is within the ROI. The parcel was purchased to preserve natural wetland habitat. The USACE also owns a parcel of land within the ROI, bordering and including the AIWW itself.

Within the ROI on the Virginia Beach side of the AIWW and North Landing River, the predominant land use is sparse single family residential housing along North Landing Road. Other than clearings for the homes, much of the land is currently forested. There are approximately 15 homes near the road, within the ROI, at least one of those is uninhabitable and unoccupied. One large home is situated along the AIWW, adjacent to the bridge. Many of these residents attended the NEPA Scoping meeting in January 2018, and some provided comments, which are further discussed in the Environmental Consequences chapter and are addressed in the Environmental Appendix, Appendix C, of this document.

According to the current Virginia Beach comprehensive plan (2016), North Landing Road within the ROI is the dividing line between two different designated planning areas of development: the “Princess Anne Commons and Transition Area” to the west and “Rural Area” to the east, within the City of Virginia Beach. The Princess Anne Commons and Transition Area includes a subarea known as the “Interfacility Traffic area,” which borders the west side of North Landing Road and is within the ROI. The ITA is described as “generally overlapping areas that are impacted by AICUZ day-night noise levels of greater than 65 dB,” and accordingly the plan states that this is subarea is subject to “certain development restrictions due to jet noise restrictions and must be carefully planned to create a coherent and compatible land use pattern.” It is further indicated that of the land within this ITA, less than half is developable due to “wetlands, waterways, existing development, or other constraints”(Virginia Beach, 2016).

To the east of North Landing Road is the designated “Rural Area.” The City of Virginia Beach regards this area as generally low-lying, with a high water table; sparsely populated; and largely

dominated by agricultural use, open space, State and Federal Wildlife Refuges, and other natural areas. The intent is for land use to preserve this character; very limited development is envisioned, and City infrastructure will generally not be extended into areas that are not already served. Virginia Beach also adheres to a "Southern Watershed Ordinance" by which it intends to protect, restore, or enhance the quality of the waters that include the North Landing River, AIWW, and other waterways (Virginia Beach, 2016).

The ROI lies within area covered under the Green Sea Blueway and Greenway Management Plan. This plan was a regional collaborative plan among the Cities of Virginia Beach and Chesapeake, and the County of Currituck. Its stated purpose is "to develop long-term management strategy that protects, conserves, and manages a unique system of natural resources, open space areas, and selectively-chosen recreational uses, activities, and facilities that are sustainable." The plan further explains that its goals are "to establish and cultivate the long-term stewardship of the Green Sea area's natural, cultural, and recreational resources through ongoing outreach and education, protection of the area's ecological integrity, and the provision of passive recreational uses and activities that can coexist with the area's tremendous array of natural resources and amenities to protect and manage a system of upland, wetland, and waterway resources." The areas covered under this plan include the southern watersheds of Virginia Beach and Chesapeake, Virginia, and northeastern watershed in Currituck County, North Carolina. (City of Chesapeake, City of Virginia Beach, and the County of Currituck, 2015).

3.1.4 Coastal Zone Management Act (CZMA)

In addition to the above considerations, the ROI lies within Virginia's Coastal Zone, as defined by the Virginia Coastal Zone Management Plan (CZMP) which oversees and implements guidance and regulation in accordance with the Federal Coastal Zone Management Act (CZMA), 16 U.S.C. 1451 et seq. Federal activities that are likely to affect any land or water use, or natural resources of Virginia's designated coastal management area must be consistent with the enforceable policies of the Virginia CZM Program. To this end, the federal agency provided a federal consistency determination to the state.

The Virginia CZMA Program is networked with several agencies administering the enforceable policies. The Chesapeake Bay Preservation Act (CBPA) is one of the enforceable policies of the Virginia CZMA Program. The CBPA's purpose is to improve water quality in the Chesapeake Bay; it requires the use of conservation planning and pollution prevention practices when developing sensitive coastal lands. Within the Chesapeake Bay watershed, there are two types of resource areas: Resource Management Areas (RMAs) and Resource Protection Areas (RPAs). However, the ROI for this project drains south to the Albemarle Sound in North Carolina, rather than to the Chesapeake Bay. Based on existing and proposed mapping, there are no designated RPAs or RMAs within the ROI, and no CBPA authorization is required.

Virginia also has several advisory policies which were established to serve as a discretionary guide during project planning. The Virginia Department of Environmental Quality (VDEQ), through its Office of Environmental Impact Review (OEIR) is responsible for administering the federal Coastal Zone Management Program (CZMP). The OEIR coordinates the Commonwealth's review of federal consistency determinations and certifications with cooperating agencies and responds to the appropriate federal agency or applicant.

A Federal Coastal Consistency Determination for conformance with the enforceable policies under the state and federal programs was submitted to the OEIR upon release of the Draft EA. The OEIR's Federal Consistency Determination Concurrence was received on May 17, 2019. Both documents are provided in the Environmental Appendix, Appendix C. The Best Management Practices section of this report has also been updated accordingly.

3.2 Transportation and Navigation

3.2.1 Transportation

"Transportation" refers to the operational characteristics of the land transportation network, including the network's capacity to accommodate existing and projected future travel demand. Networks may encompass many different types of facilities that serve a variety of transportation modes, such as vehicular traffic, public transit, and non-motorized travel.

U.S. Department of Transportation (USDOT) and Virginia Department of Transportation (VDOT) laws and regulations require a continuing, comprehensive, and intermodal statewide transportation planning process, including a statewide transportation plan and transportation improvement program that facilitates the efficient, economic movement of people and goods in all areas of the state. In accordance with 23 CFR 450, the Hampton Roads Transportation Planning Organization (HRTPO) produces a financially constrained Regional Long-Range Transportation Plan every four years that addresses a planning horizon of 20 years. The purpose of these plans is to guide transportation investments to projects designed to meet the transportation goals of the HRTPO--economic vitality, safety, mobility, and environmental protection. These regulations also address the content of metropolitan plans. Both the City of Chesapeake and the City of Virginia Beach participate in the federally mandated, regionally based long-range transportation planning process for urbanized areas, which is coordinated through the HRTPO. The HRTPO's long-range transportation plans cover several modes of transportation, including personal vehicle, public transportation bicycling, and walking." (HRTPO website, 2017).

USDOT and VDOT regulations also emphasize safety standards in the design and construction of roadways. The American Association of State Highway Transportation Officials (AASHTO) is a nonprofit association that represents highway and transportation departments across the U.S., and serves as a liaison between federal and state transportation officials. One of its missions is to set design and installation standards (USDOT, 2019). The VDOT Road Design Manual has adopted the design and safety standards of AASHTO Green Book (VDOT 2005).

The ROI for transportation includes the entire bridge and roadway corridor that would be temporarily or permanently, directly or indirectly, affected by any type of construction relating to this project.

3.2.2 Navigation

"Navigation" refers to the use of waterways, either primarily for transportation or recreational purposes, by any type of vessel. Vessels include ships, barges, ferries, boats, sailboats, small craft, and the like.

Under the U.S. Rivers and Harbors Act 1899 (33 USC 403), authorization is required for any alteration or modification of any course, location, condition or capacity of any port, haven,

harbor, canal, or other navigable waterway. The U.S. Coast Guard administers Section 9 and issues permits for construction of crossings over navigable waters. This law and its implementing regulations allows the U.S. Coast Guard to require necessary lighting and aids to navigation, and to approve any temporary or permanent closures or restrictions of navigation channels. The Act also authorizes the U.S. Coast Guard to impose requirements for navigational safety, and for establishment of anchorage grounds for vessels in navigable waters of the U.S. whenever it is apparent that these are required by the maritime or commercial interests of the United States for safe navigation.

The ROI for navigation includes the AIWW and the North Landing River waterways surrounding and within the Study Area limits that can be used by any type of vessel, and that would be temporarily or permanently, directly or indirectly, affected by any type of construction relating to this project.

3.2.3 Existing Conditions

Transportation

The existing conditions are described in detail in Chapter 2 and summarized herein, for purposes of NEPA. The existing corridor is a two-lane rural minor arterial roadway with a speed limit of 45 mph. The roadway width from curb-to-curb is 24 feet, with two 12-foot wide traffic lanes with no shoulders. As previously described, the corridor and bridge do not meet AASHTO safety standards for roadways for roadway width or capacity. The bridge is weight-restricted to 13 tons, eliminating the legal use by heavy vehicle such as emergency response and tractor trailers. However, overweight vehicles still use the bridge.

The existing crossing is a vital link in the transportation system, as well as for the residents immediately bordering the ROI. The HRPTO estimated an average of 11,000 vehicles per day (vpd) traveled over the North Landing Bridge in 2013. This value is considered the current condition traffic volume. The VDOT Functional Classification map in Figure 3-3 outlines the types of transportation corridors around the project area.

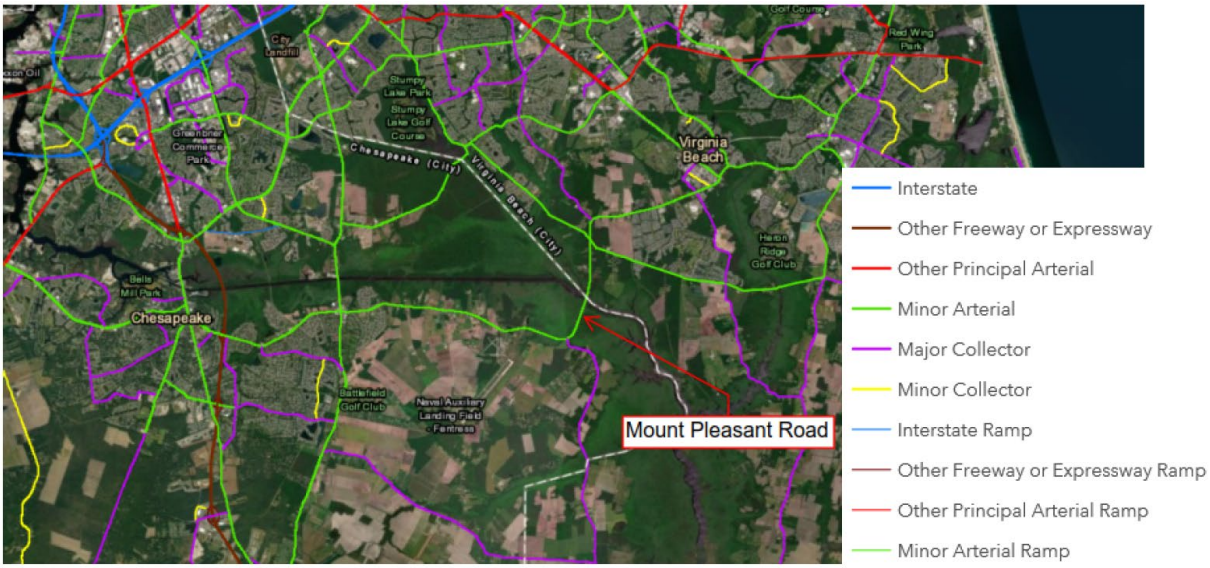


Figure 3-3. VDOT Functional Classification map (Source: VDOT 2019).

Navigation

The existing navigation conditions are described in detail in Chapter 2 and summarized herein, for purposes of NEPA. As described earlier, the AIWW is nationally and regionally important link in the inland navigation channel system reaching from Maine to Florida. Within Southside Hampton Roads, the AIWW and the Southern Branch of the Elizabeth River are the major waterways for commercial traffic in Chesapeake. Within Chesapeake, the navigational use of the AIWW is made by way of two routes—the Albemarle and Chesapeake Canal (ACC) route, and the Dismal Swamp Canal (DSC) route (See Chapter 1, Figure 1). The ACC serves as a primary transportation link for the AIWW system. The DSC, is maintained only to a depth of 6 feet, because its traffic does not justify a deeper channel. The ACC of the AIWW bisects the study area, joins the North Landing River, then passes south into North Carolina. The two AIWW routes rejoin in the Albemarle Sound, North Carolina.

Navigational traffic on the ACC is characterized by various amounts of commercial (including Naval fuel barges) and recreational activity, although pleasure boats are by far the predominate user. Vessel activity is slow between November and March. The vessel usage report was provided in Chapter 2.

Within the ROI, the horizontal channel clearance of the AIWW's ACC at the current bridge is 80 feet wide. This is a constriction from the 100-foot and 125-foot approach channels. In order to navigate through the channel at the bridge, commercial vessels must slow down such that there is a 5 minute delay. The bridge operates in accordance with 33 CFR 117.1021, which requires openings on the hour and half hour from 0600 to 1900 and on demand from 1900 to 0600. A 15-20 minute delay for recreational users is estimated based on the need for these users to wait for a bridge opening. The bridge opens on demand at all times for commercial vessel traffic.

3.3 Geology, Topography, and Soils

This geology, topography, and soils information was established through review of the U.S. Department of Agriculture (USDA) soil survey, U.S Geological Survey (USGS) topographic maps, preliminary construction plans, a preliminary geotechnical data report, and limited site inspection data. It also includes a preliminary discussion of geotechnical conditions.

The ROI includes all areas temporarily and permanently disturbed by construction. This includes all fill, pilings, footings, bridge fenders and other attendant feature footprints; all areas to be spanned by the new bridge; all areas to be temporarily used for construction access, and all existing roadbeds within the Study Area. It includes any areas directly or indirectly impacted during construction.

3.3.1 Existing Conditions

Geology

The ROI is located within the lowland subprovince of the Virginia Coastal Plain Physiographic Province. The Coastal Plain extends from the Fall Zone eastward to the Atlantic Ocean. The "Fall Line" or "Fall Zone" marks the transitional zone where the softer, less consolidated sedimentary rock of the Atlantic Coastal Plain to the east intersects the harder, more resilient metamorphic rock to the west, forming an area of ridges, waterfalls and rapids. The topography of the Coastal Plain is a terraced landscape that stair-steps down to the coast and to major rivers (Figure 3-4). This landscape was formed over the last few million years, during the Quaternary period, as sea level rose and fell in response to the repeated melting and growth of large continental glaciers and as the Coastal Plain slowly uplifted (Frye, 1986).

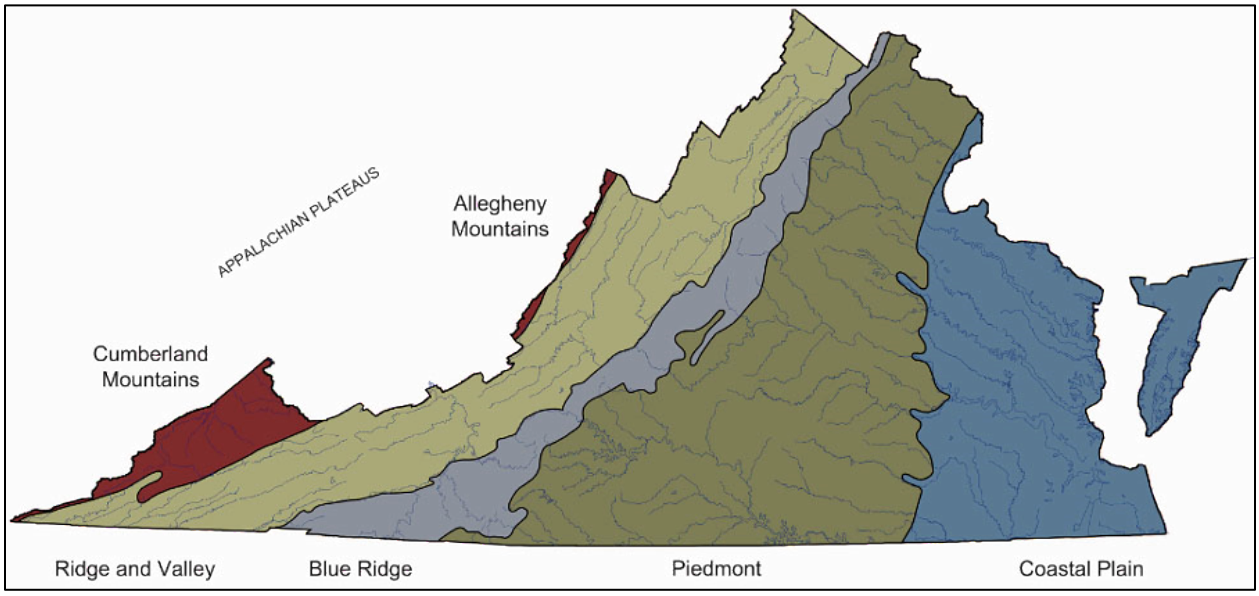


Figure 3-4. Physiographic Map of Virginia. Physiographic Provinces of Virginia (Virginia Department of Conservation and Recreation 2016).

The geologic map for the Study Area was obtained from the Virginia Department of Mines, Minerals, and Energy (DMME). The geologic units underlying the Study Area are shown and described below in Figure 3-5.

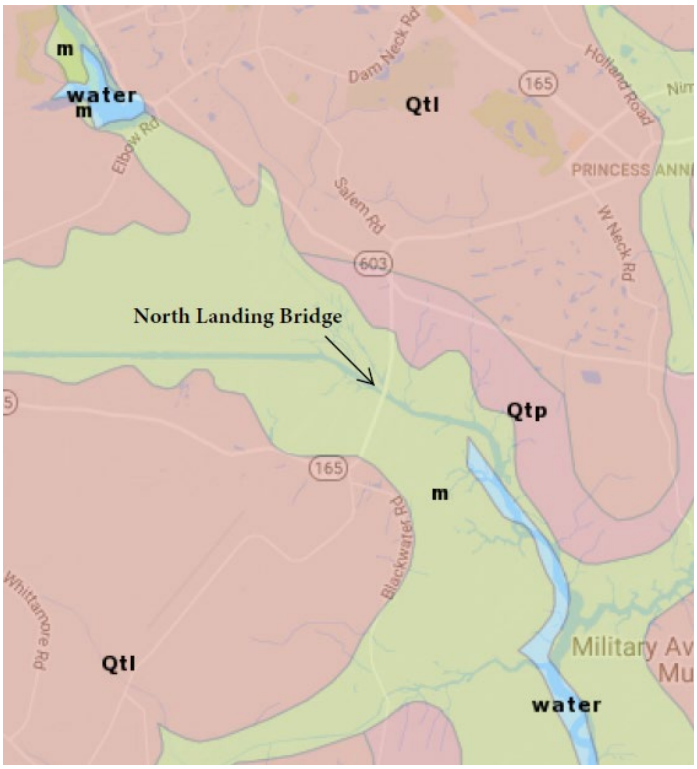


Figure 3-5. Geologic map of the Study Area. (Source: Department of Mines, Minerals, and Energy).

The map designations in Figure 3-5 are as follows:

M: Quaternary Holocene marsh and intertidal mud deposits
Qtp: Tabb Formation. Poquoson member. Quaternary age gravelly sand grading upward into clayey fine sand and silt
Qtl: Tabb Formation. Lynnhaven member. Quaternary age gravelly and cobbly fine to coarse gray sand which grades upward into clayey and silty fine sand and sandy silt. Locally, at base of unit, medium to coarse cross-bedded sand and clayey silt containing abundant plant material fill channels cut into underlying stratigraphic units (DMME 2019).

Topography

The Study Area is very low-lying. The Chesapeake portion of the Study Area lies below the 5-foot contour, and except for subtle, hummocky areas throughout the wetlands, it is almost uniformly flat. It is low-lying enough to receive some overbank flooding from the North Landing River, especially during high water or rainfall events. The topography on the Virginia Beach portion of the Study Area is only slightly higher--between the 0-foot and 8-foot contours--according to the USGS map and preliminary engineering drawings. It is also relatively flat.

The AIWW waterway is approximately 155 feet wide from bank to bank, and its navigation channel is approximately 15 feet deep in the center. The adjacent North Landing River, is approximately 80 feet wide, measured from bank to bank.

Soils

According to the U.S. Department of Agriculture's National Resource Conservation Service soil survey report (USDA 2018), which is included in the Environmental Appendix, Appendix C, of this report, the Study Area contains six different soil mapping units: Dorovan-Bellhaven complex; Psamments soils; Udorthents loamy; Chapaonoke silt loam; Dorovan mucky peat; and Acredale silt loam. Their map codes for purposes of viewing Figure 3-6 below are given in parentheses.

Nearly the entire Chesapeake section of the Study Area is mapped as Dorovan-Bellhaven complex (18). Dorovan soils are described as, "0-2% slopes, frequently flooded, and very poorly drained, with a typical profile of 0-3" mucky peat, and 3-79" muck." Bellhaven soils are described as, "0-1% slopes, very poorly drained, with a typical profile of 0-26" muck, and 26-79" fine sandy loam. The parent material for this soil complex is herbaceous and woody organic material. These are hydric histosols found on densely forested floodplains and hardwood swamps (USDA 2018).

Along the banks of the AIWW and the peninsula between the AIWW and the North Landing River, there are narrow bands of Psamments soils (35), which are described as occurring on "0-10% slopes, and are well drained, with a profile description of "0-6" fine sand, and 6-60" sand," and occur on marine terraces. These are relatively young, nonhydric soils (USDA 2018).

On the Virginia Beach section of the Study Area, there is a smaller area near the existing bridge, mapped as Udorthents, loamy (40). These are described as moderately well drained to excessively drained; however permeability is variable. These are an urban complex of cut and fill land (USDA 2018).

Areas of Chapanoke silt loam (8) are also mapped within the Study Area in Virginia Beach. These are somewhat poorly drained hydric soils with a profile of 0-7" silt loam, 7-53" silty clay loam, and 53-72" fine sandy loam. Their parent material is described as "loamy fluviomarine deposits" that were formed on marine terraces (USDA 2018).

Much of the wetter forested area within the Study Area in Virginia Beach is mapped as Dorovan mucky peat (12). These are very poorly drained hydric histosols with a profile description of 0-4" mucky peat, 4-78" muck, and 78-80" silt (USDA 2018).

The remainder of northernmost end of the Study Area in Virginia Beach is mapped as Acredale silt loam (1). These are poorly drained hydric mineral soils, with a typical profile consisting of 0-7" silt loam, 7-15" silt loam, 15-43 silty clay loam, and 43-66" fine sandy loam. Like Chapanoke silt loams, these soils' parent material is described as "loamy fluviomarine deposits" that were formed on marine terraces (USDA 2018).

In short, all soils within the Study Area are mapped as hydric soils, with the exception of the Psammets (35) and Udorthents (40), which make up a very small portion of the Study Area

(Figure 3-6). Parts of the areas mapped as these soils are likely made up of old spoils from when the AIWW was originally dredged.

It is important to note that geotechnical borings have not been done for this project yet. The soil survey is only intended to provide general information; and descriptions herein are not complete. In particular, the histosol soils (Dorovan, and Dorovan-Bellhaven complex soils) may contain organic muck or mucky peat layers that are much deeper than indicated herein. It is very clear that the information from geotechnical borings will be very critical to the design and construction of the project.

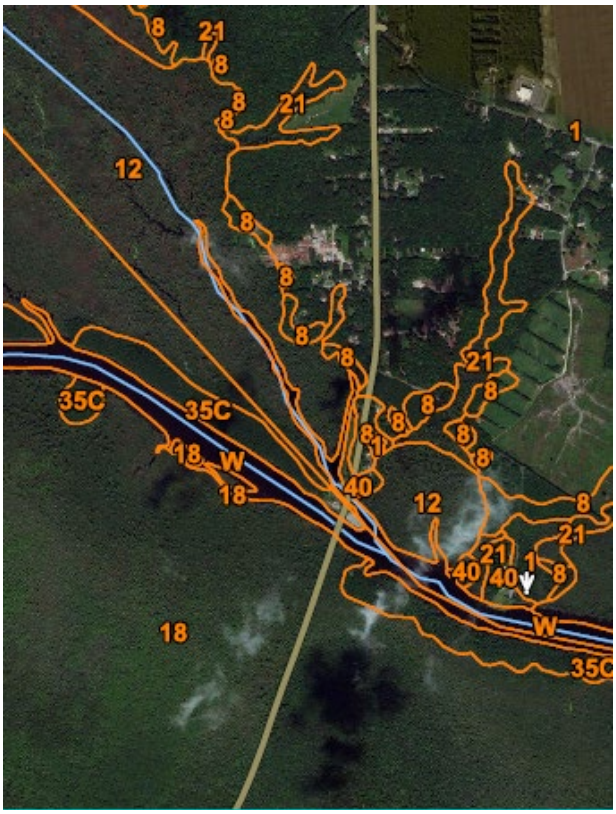


Figure 3-6. Soil survey map of the Study Area (Source: NRCS).

There is no prime important farmland in the Study Area.

Geologic hazards

The area around the southern Chesapeake Bay, including the Cities of Chesapeake and Virginia Beach, are undergoing subsidence. The Virginia Institute of Marine Science (VIMS) estimates that the general land subsidence rate in the Chesapeake Bay area is approximately -0.0131 feet per year, which is 1.3 feet over the next 100 years (USACE 2018).

Because the Study Area does not lie within a seismically active area, regulations and policies that relate to geologic hazards and seismic safety do not apply.

3.4 Water Resources and Water Quality

Water quality can be defined as the ability of the water to support life, as well as human activities such as recreation. Water quality describes the chemical and physical composition of water as affected by natural conditions and human activities. This section addresses surface waters other than wetlands, waterways, groundwater, and stormwater. Although wetlands are an aquatic resource and directly related to water quality, they are discussed in detail in a separate section.

The ROI includes all surface waters, public water supply, groundwater, and other aquatic areas within the limits of all physical disturbance caused by construction and maintenance of the project features. This includes temporary and permanent fill and structures, any dredging, all temporary or permanently cleared areas, water discharges including stormwater, and all areas otherwise converted to another use, or that will result in an altered or limited use, as a consequence of the construction of the measures. Alterations that would affect water quality and water resources include shifts in circulation patterns, turbidity, temperature, and nutrient fluctuations.

The following analysis of water resources identifies applicable regulatory requirements, and describes existing conditions within the ROI and vicinity.

3.4.1 Federal

The Clean Water Act (CWA) of 1972, as amended (33 USC § 1251 et seq.), is the primary federal law that protects the nation's waters, including lakes, rivers, streams, wetlands, and other surface waters. The CWA prohibits all unpermitted discharge of any pollutant into any jurisdictional waters of the U.S. The U.S. Environmental Protection Agency (USEPA) is responsible for administering the water quality requirements of the CWA. Section 303(d) of the CWA requires all states to identify waters that do not meet, or are not expected to meet, applicable water quality standards. States must develop a total maximum daily load (TMDL) for each pollutant that contributes to the impairment of a listed water body. The Virginia Department of Environmental Quality (VDEQ) is responsible for ensuring that TMDLs are developed for impaired surface waters in Virginia. In addition to the discharge restrictions, the CWA Section 404 requires a USACE issued permit for the dredging and/or filling of jurisdictional waters of the U.S., including wetlands. Areas meeting the "waters of the U.S." definition are under the jurisdiction of the USACE. "Waters of the U.S.," which includes wetlands, are defined by USACE Regulations 33 CFR 328, and generally include most waters that have a downstream connection to interstate waters and/or a nexus to interstate commerce. Anyone proposing to conduct a project that requires a federal permit or involves dredge or fill activities that may result in a discharge to U.S. surface waters and/or waters of the U.S. is also required to obtain a CWA Section 401 Water Quality Certification from the VDEQ, verifying that project activities will comply with water quality standards.

Section 10 of the Rivers and Harbors Act of 1899 (as amended; 33 USC § 403) regulates structures or work that would affect navigable waters of the U.S. Structures include any work includes dredging, filling, excavation, or other modifications to navigable waters of the U.S. The USACE issues permits for work or structures in navigable waters of the U.S. The U.S. Coast Guard also has authority to regulate the placement of structures within navigable waters; this is discussed in the Transportation and Navigation section of this chapter.

3.4.2 State

The State Water Control Law mandates the protection of existing high-quality state waters and provides for the restoration of all other state waters so they will permit reasonable public uses and will support the growth of aquatic life. The adoption of water quality standards under Section 62.1-44.15(3a) of the law is one of the State Water Control Board's methods of accomplishing the law's purpose. Water quality standards consist of statements that describe water quality requirements. They also contain numeric limits for specific physical, chemical, biological or radiological characteristics of water. These statements and numeric limits describe water quality necessary to meet and maintain uses such as swimming and other water-based recreation, public water supply, and the propagation and growth of aquatic life.

Virginia manages water quality of its streams, lakes, reservoirs and tidal waters though a continuing planning process modeled after Section 303 of the Clean Water Act. A Virginia Water Quality Assessment 305(b)/303(d) Integrated Report summarizes findings and makes recommendations for a list of impaired waters by VDEQ. Every two years, a List of Impaired Waters is developed to describe segments of streams, lakes, and estuaries within the state that exhibit violations of water quality standards. In order to maintain the water quality standard, VDEQ creates TMDLs (Total Maximum Daily Loads) on a tributary level that indicate the total pollutants that a water body can assimilate and still meet water quality standards.

The determination of whether the Commonwealth’s waters support their applicable designated uses as mandated by Section 305(b) of the Clean Water Act is made by VDEQ and reported annually to EPA based on monitoring data. Virginia’s water quality standards define the water quality needed to support each of these uses by establishing the numeric criteria for comparison of physical and chemical data. If a waterbody contains more of a pollutant than is allowed by the water quality standards, it will not support one or more of its designated uses.

Water quality standards designate uses for waters. There are six designated uses for surface waters in Virginia: aquatic life, fish consumption, public water supplies (reservoirs only), recreation (swimming), shellfish harvest, and wildlife use. If a waterbody contains more contamination than allowed by water quality standards, it will not support one or more of its designated uses. Such waters have "impaired" water quality. In most cases, a cleanup plan (called a "total maximum daily load") must be developed and implemented to restore impaired waters. A TMDL is defined, for each pollutant, as “the set limit on the total amount of that pollutant that particular waterbody can tolerate and still maintain water quality standards.” Once a TMDL is developed, it must be approved by EPA, and measures must be taken to reduce pollution levels in the waterway. In Virginia, the most common cause of impaired waters is bacterial contamination, followed by contaminated sediments, low dissolved oxygen (DO), and polychlorinated biphenols (PCBs), once commonly used in industry but proven to be highly toxic and long-lived once accidentally released into the environment (VDEQ, 2014).

The VDEQ regulates stormwater discharge associated with industrial activities through its Virginia Pollutant Discharge Elimination System (VDPES) program, and stormwater discharges from construction sites and from municipal separate storm sewer systems (MS4s) through its Virginia Stormwater Management Program (VSMP). The operator or owner of a construction activity involving land disturbance of equal to or greater than 1 acre is required to register for coverage under the General VPDES Permit for Discharges of Stormwater from Construction Activities and develop a project specific stormwater pollution prevention plan (SWPPP). The

SWPPP must be prepared prior to submission of the registration statement for coverage under the General Permit, and it must address water quality and quantity in accordance with the Virginia Stormwater Management Program Regulations. As part of the SWPPP, an erosion and sediment control (ESC) plan is required to ensure compliance with state law and regulations. (VDEQ 2014).

3.4.3 Existing Conditions

Surface Waters and Waterways

The ROI is located within Hydrologic Unit Code (HUC) 03020205, or the Back Bay, North Landing River, and Pocaty River sub basin. This watershed is part of the Chowan River basin watershed that drains south to the Albemarle Sound in North Carolina.

The major surface waters within the ROI are the North Landing River and the AIWW. At the bridge location, the AIWW is approximately 200 feet wide, and the North Landing River is approximately 85 feet wide. They come to a confluence within the ROI, are freshwater, and are wind-tidal from the south. There are roadside ditches along the Virginia Beach section of the ROI that drain into the North Landing River. On the Chesapeake section, nearly all of the ROI consists of permanently inundated wetlands that are also subject to wind-tidal overbank flooding from the AIWW, during high water events.

The North Landing River watershed was listed on the 303(d) list in 2006 as being impaired due to violated bacteria standards, which do not supporting recreational/swimming. Virginia's current bacterial standard uses *E. coli* and enterococci as bacterial indicators. Sources of *E. coli* include humans, livestock, wildlife, pets, and the rate of failure of septic systems. These were identified as nonpoint sources of bacteria loads (VDEQ 2014).

One residential point-source permitted for fecal bacteria control has been authorized by VDEQ in this watershed and ROI. The U.S. Navy Fentress NALF, also within the vicinity of the ROI, holds non-point source discharge permit. The wastewater from Fentress NALF is stored in aerated lagoons and then used for irrigation of crop land. Application is on a rotating basis among five fields, where only field is used per month. However, there is no discharge of any wastewater to the North Landing River from Fentress NALF.

Public water supply

The scoping comments provided by the Virginia Department of Environmental Quality's Office of Environmental Impact Review included review by the Virginia Department of Public Health, Office of Drinking Water. The Office of Drinking Water indicated that there are no public surface water intakes within the watershed, and no public groundwater wells within one mile of the ROI.

Groundwater

It is important to note that geotechnical borings and a groundwater assessment has not been conducted on the site. However, with the land within the ROI being so low-lying, it is clear that much of the ROI is at, or just above, the water table. The Chesapeake section of the ROI consists of permanently inundated wetlands to either side of the existing roadway. In the Virginia Beach section of the ROI, with topography ranging from 0-8 feet above mean sea level, the water table is relatively high. There is no public water supply infrastructure within the ROI;

therefore, the residents living along the ROI on North Landing Road (the Virginia Beach side), utilize groundwater from private wells for their drinking water.

Stormwater

The construction of the existing roadway and bridge pre-dated any requirements for stormwater abatement or point- or non-point-discharge permits. There are no existing stormwater facilities within the ROI. Currently, stormwater runs off the roadways into the roadside ditches, and/or existing wetlands; and stormwater from the bridge runs into the North Landing River/AIWW.

3.5 Floodplains

For the purpose of the following discussion, floodplains are defined as any land area susceptible to being inundated by floodwaters from any source.

Executive Order 11988 – Floodplain Management

Through Executive Order (EO) 11988, Federal agencies are required to evaluate all proposed actions within the 1% annual chance floodplain or Base Floodplain as defined by FEMA. Actions include any Federal activity involving 1) acquiring, managing, and disposing of Federal land and facilities, 2) providing Federally undertaken, financed, or assisted construction and improvements, and 3) conducting Federal activities and programs affecting land use, including but not limited to water and related land resources planning, and licensing activities. In addition, the FEMA 0.2% annual chance floodplain should be evaluated for critical actions or facilities, such as storage of hazardous materials or construction of a hospital.

USACE Engineering Regulation 1165-2-26 – Implementation of Executive Order 11988 on Floodplain Management

This regulation sets forth general policy and guidance for USACE implementation of EO 11988 as it pertains to the planning, design, and construction of Civil Works projects and activities under the Operation and Maintenance and Real Estate Programs. As shown in ER 1165-2-26 and in accordance with EO 11988, USACE uses an eight step process as part of the decision-making for projects that have potential impacts to or are within the Base Floodplain. The eight steps and project-specific responses for EO 11988 are discussed further in Chapter 9.

The ROI includes all areas upstream and downstream of the North Landing Bridge that may be impacted by flooding.

3.5.1 Existing Conditions

Downstream of the North Landing Bridge, the North Landing River watershed is essentially rural. Upstream of the Bridge and east of the Great Bridge Lock located in the City of Chesapeake, the AIWW's ACC and Upper North Landing River watersheds are both rural and developed, where the cities of Chesapeake and Virginia Beach have residential development within the upland areas. Figure 3-7 below shows the North Landing Bridge/Route 165 and Great Bridge locations. Figure 3-8, at the same scale as Figure 3-7, provides a current look at land use, where residential subdivisions can be seen.

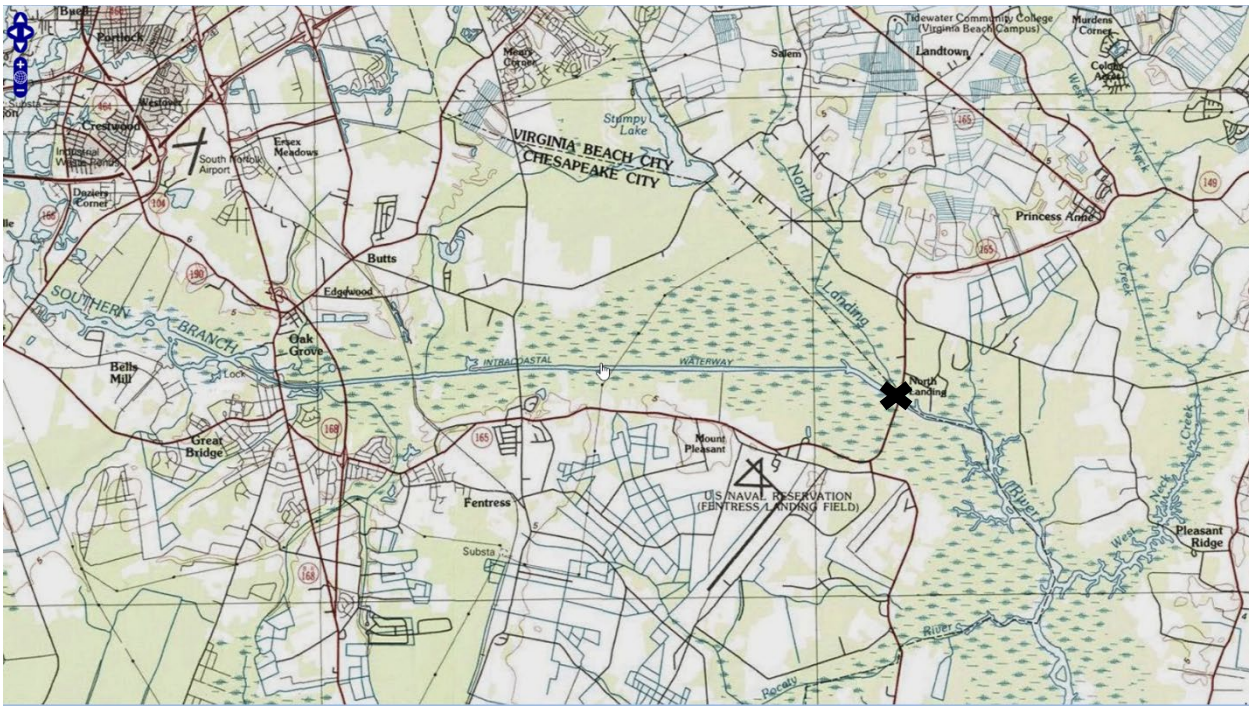


Figure 3-7. Vicinity Map.

Figure 3-8. Vicinity Map – Aerial Imagery.

The Study Area is within a Special Flood Hazard Area on the communities' flood insurance rate maps. The project area is located in AE Zones with determined base flood elevations, which means it is considered to be within a high risk flood area. Typically, these areas include areas near water bodies.

As coastal communities, the Cities are prone to tidal flooding, such as from tropical systems and nor'easters; however, the study area has not experienced a major tidal storm event. Past storms have mainly been from nor'easters, tropical storms, or weak Category 1 hurricanes. The ACC and the North Landing River drain into the Currituck and Albemarle Sounds, and eventually exit approximately 73 miles from the North Landing Bridge into the Atlantic Ocean through the Oregon Inlet in North Carolina. At the North Landing Bridge location, being inland and somewhat protected, the area is generally not impacted by tidal influence, but mostly by wind tides. Persistent winds from the south can elevate water levels, and likewise, winds from the north can drain the waterways. The storm surge model is typically used for hurricane evacuation planning and decision-making, the National Oceanic Atmospheric Administration's Sea, Lake, and Overland Surges from Hurricanes (SLOSH) model does show that if given the right storm direction, track, forward speed, and intensity, the North Landing Bridge location could be impacted by storm tide from tropical systems (NOAA, 2014). Model results from the over 16,000 hypothetical storms evaluated, show a Category 1, 2, 3, or 4 intensity hurricane could possibly cause a maximum stillwater storm tide elevation of approximately 4, 7, 10, and 15 feet, referenced to the North American Vertical Datum of 1988 (NAVD88), respectively.

Tropical systems, nor'easters, and thunderstorms can also produce large amounts of rainfall. Events such as Nor'Ida (2009) and Hurricanes Irene (2011), Sandy (2012), and Mathew (2016) produced approximately 10 inches or more of rainfall for the area. Given the channel width at approximately 300 feet or more and a depth of 15 feet and wide floodplain areas at approximately 0.5 mile or more, the ACC and North Landing River have not experienced significant elevated water levels from past heavy rainfall events. The vast amount of wetlands also help to serve as hydraulic storage areas and buffers against development.

Figures 3-9, 3-10, and 3-11 below show floodwater from the 2009 Nor'Ida event overtopping the east gates at the Great Bridge Lock, looking west towards the Southern Branch of the Elizabeth River; floodwater overtopping Battlefield Boulevard/Route 168, looking north from the Great Bridge Bridge; and then the floodwater crossing Route 186 eventually flowing into the ACC, looking east from the from the bridge, respectively. The top of the lock wall is 6.3 feet, NAVD88 and the top of the lock gate is 4.3 feet, NAVD88. At the Money Point NOAA tide gage, located approximately six river miles west of the Great Bridge Lock along the Southern Branch of the Elizabeth River, the storm tide was measured at 6.76 feet, NAVD88.

Figure 3-9. Great Bridge Lock – 2009 Nor'Ida Event.

Figure 3-10. Great Bridge Bridge – 2009 Nor'Ida Event.

Figure 3-11. ACC - 2009 Nor'Ida Event

Historically, generally looking at available USACE gage records from 1969 to present at the North Landing Bridge, it appears maximum water levels, from storm surge, wind tides, and/or rainfall events, have never been greater than 3 feet, NAVD88. It appears the highest recorded water level was 2.84 feet, NAVD88 on October 1, 2010. Also, water levels have been recorded greater than 1.94 feet, NAVD88 nine times, which is the elevation at which the North Landing Bridge closes for navigation. At this elevation, water can enter the two bridge support pedestals that contain mechanical gears and electrical components. Five of those events occurred in the last five years: September 2016, May 2017, May 2018, July 2018, and September 2018.

The current effective Federal Emergency Management Agency (FEMA) Flood Insurance Study (FIS) and Flood Insurance Rate Maps (FIRM) are dated December 16, 2014 for the City of Chesapeake and January 16, 2015 for the City of Virginia Beach; the engineering was completed in 2012 (FEMA, 2014, 2015). From the FISs and FIRMs, the FEMA 1% and 0.2% annual chance stillwater flood elevations at the North Landing Bridge are 3.0 and 4.0 feet, NAVD88, respectively, based on storm surge modeling using the Advanced Circulation Model for Oceanic, Coastal and Estuarine Waters (ADCIRC). As shown in Figure 3-12 below, using FEMA's National Flood Hazard Layer, the 1% (blue shading, rounded elevations in black) and 0.2% (orange shading) annual chance floodplains have extensive coverage. For scale, the 1% annual chance floodplain width is approximately one mile in length across the North Landing

Bridge and roadway. As shown, most of the right overbank roadway approach in Chesapeake is inundated by the 1% annual chance flood, where most of the roadway is at a general elevation of 2.5 feet, NAVD88. At the bridge crossing, the top of road and low chord elevations are the same at 5.6 feet, NAVD88. As shown from west to east, once past the Great Bridge Lock, 1% annual chance water levels gradually drop. With the roadway approach wide in distance and low in elevation and the high bridge deck, the bridge and roadway generally do not act as a major obstruction to flow.

Figure 3-12. FEMA 1% and 0.2% Annual Chance Floodplains.

For comparison, the North Atlantic Coast Comprehensive Study (NACCS) 1% and 0.2% annual chance flood elevations used in this study are 5.6 and 7.0 feet, NAVD88, respectively, based on stillwater conditions. The engineering for the NACCS was completed in 2015.

There are some residential structures within the immediate vicinity of the North Landing Bridge and roadway approaches. One structure located within Chesapeake, immediately upstream or west of the bridge and adjacent to the ACC on the left overbank, is located within the FEMA 1% annual chance floodplain. Using two foot topographic contour elevation data from Virginia Beach's Geographic Information System (GIS) website, the ground elevation around the structure is approximately 3 feet, NAVD88 or less. There are other structures located within Virginia Beach, along both sides of the roadway. Based on the City's GIS building footprint data, it appears all structures are located beyond the limits of the FEMA 1% annual chance floodplain and one is located within the 0.2% annual chance floodplain. A Navy Fuel Depot, located approximately 2,000 feet downstream along the north bank, has buildings within the FEMA 1% annual chance floodplain and storage tanks and a portion of the loading dock are located within the 0.2% annual chance floodplain. It is noted, an Elevation Certificate would determine the true flood hazard potential for all structures.

For the most part, structures located just downstream and upstream of the bridge are not located within the FEMA 1% annual chance floodplain. As you go upstream approaching the

Great Bridge Lock and the FEMA 1% annual chance elevations increase, some structures are shown in the floodplain.

3.6 Wetlands

Wetlands are a subclass of “waters of the United States," and are defined by the Clean Water Act regulations as, “those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas” (40 CFR 230). The two major categories of wetlands are tidal (subject to the ebb and flow of tide), and nontidal (freshwater). Wetlands may be forested, scrub/shrub, or emergent.

Wetlands and waters of the U.S. are regulated under Sections 401 and 404 of the Clean Water Act (33 U.S.C 1251 *et seq*). “Waters of the U.S.,” per USACE Regulations 33 CFR 328, generally include most waters and/or wetlands that have a downstream connection to interstate waters and/or a nexus to interstate commerce. Section 404 is USACE’s regulatory authority to require permits for the discharge of dredged or fill material into jurisdictional waters of the U.S, including wetlands. Section 401 requires a state water quality certification for discharges into waters of the U.S., including wetlands. In addition, the Virginia Department of Environmental (VDEQ) regulates activities in waters of the U.S., including wetlands, under State Water Control Law (Code of Virginia Title 62.1), and Virginia Administrative Code Regulations.

Section 10 of the Rivers and Harbors Act of 1899, as amended (33 USC Section 403) regulates structures and work that would affect navigable waters of the U.S. Structures and work include bridge and attendant feature construction, dredging, filling, excavation, or other modifications to navigable waters of the U.S. All wetlands subject to the ebb and flow of tide, and/or permanently inundated wetlands connected to traditionally navigable waters are by definition navigable waters (33 CFR 328).

Executive Order 11990, Protection of Wetlands, requires federal agencies to minimize the destruction, loss, or degradation of wetlands resulting from their actions. In addition, the 404(B)(1) Guidelines require USACE to implement the Least Environmentally Damaging Practicable Alternative (LEDPA) as the Proposed Action. If a more environmentally impactive alternative is chosen, then the 404(b)(1) analysis must clearly explain why the less impactive alternative was not practicable.

Wetlands are delineated pursuant to the 1987 USACE Wetland Delineation Manual, along with the appropriate regional supplement manual. The ROI falls under the Atlantic and Gulf Coast Plain Region Regional Supplement to the Corps of Engineers Wetland Delineation Manual: (Version 2.0).

The ROI includes all wetlands within the limits of all physical disturbance caused by construction and maintenance of the project features. This includes any direct and indirect, temporary and permanent wetland impacts by fill, structures, dredging, shading, an altered hydrologic regime such as draining or water discharges including stormwater; all temporary or permanently cleared areas; and all wetland areas otherwise converted to another use, as a consequence of the construction of the measures.

3.6.1 Existing Conditions

The U.S. Geologic Service (USGS) topographic maps (Figure 3-13), Google Image aerial photography, and U.S. Fish and Wildlife Service's National Wetland Inventory (NWI 2018) (Figure 3-14) maps all indicate the predominance of wetlands within the ROI. NWI maps data delineate the approximate aerial extent of wetlands and surface waters utilizing a wetland classification system as defined by Cowardin et al. (1979), to map the presence, hydrologic regime, and vegetative community type. In addition to these, the Natural Resource Conservation Service (NRCS) has mapped most of the soils in the ROI as hydric soils (see Geology, Topography, and Soils section of this chapter). However, it is acknowledged that due to the map scale, the primary intended use of these is regional, watershed, and agricultural data display and analysis, rather than for specific project data analysis.

Figure 3-13. U.S. Geologic Service topographic map of Region of Influence.

Figure 3-14. Preliminary Wetland Delineation and National Wetland Inventory mapping (USFWS) and Field Data.

As of this writing, real estate right of entry access agreements have not been received for all of the parcels in the ROI. In June 2018, USACE Planning and Regulatory staff visited the areas that were publically accessible or where right of entry was granted were examined. The ROI

was partially delineated by USACE, for the presence of jurisdictional waters and wetlands using the three criteria espoused by the USACE – hydric soils, vegetation, and hydrology. For those areas that were inaccessible, USGS, NWI, aerial mapping was closely examined to obtain an estimate. We developed a map of the combination of the partial delineation and the NWI mapping data.

City of Chesapeake section of the ROI

This area is mapped on the NWI maps as PFO1R and PFO4R (palustrine, forested, broad leaved deciduous or narrow leaved evergreen, seasonally flooded, freshwater tidal). During the site visit, these areas were examined from the roadsides, without entering the properties. Inundation to the surface was clearly visible in most areas to either side of the roadway. Dominant species were mostly typical of a very wet community: bald cypress (*Taxodium distichum*), water tupelo (*Nyssa aquatica*), swamp tupelo (*Nyssa biflora*), black willow (*Salix nigra*), netted chain fern (*Woodwardia aerolata*), royal fern (*Osmunda regalis*), lizard tail (*Saurus cernuus*). Nondominant species included red maple (*Acer rubrum*), green ash (*Fraxinus pennsylvanica*), sweet gum (*Liquidambar styraciflua*), wild blueberry (*Vaccinium corumbosum*), fetterbush (*Leucothoe racemosa*), laurel greenbriar (*Smilax laurifolia*), Carex spp, and cattails (*Typha latifolia*). In areas that appeared to be less inundated but still saturated, there were species such as sweet gum, bayberry (*Morella pensylvanica*), swamp rose (*Rosa palustris*), and poison ivy (*Toxidendron radicans*).

By definition, “facultative species” are those that statistically occur at least 50% of the time in wetlands. All species that are facultative or wetter are by definition hydrophytic species. All of the species observed were hydrophytic, with most being either facultative wet (statistically occurring in wetlands at least 66% of the time), or obligate wetland species (statistically occurring in wetlands at least 99% of the time). Some of the trees, particularly the red maples and sweet gums, appeared to be stressed or dying; perhaps because they are not as tolerant of inundated conditions. Figure 3-15 and Figure 3-16 depict photographs of species within the project area taken during a site visit.

Both sides of the road in Chesapeake had similar communities. NRCS mapped these areas as “Dorovan” or Dorovan-Bellhaven complex”, which are hydric histosols (organic soils). All areas visible from the roadway were clearly jurisdictional forested bottomland wetland community. There may be a narrow upland ridge along the bank of the AIWW as suggested by aerial photography, NWI maps, and soil maps; however this would need to be verified in the field. Overall the wetlands had very little disturbance and appeared to be of high quality.

Figure 3-15. Wetlands on Chesapeake side of ROI (USACE Photo, June 2018).

Figure 3-16. Wetlands on Chesapeake side of ROI (USACE Photo, June 2018).

City of Virginia Beach section of the ROI

The Virginia Beach side of the ROI is roughly 5-8 feet higher in elevation. The areas immediately bordering the roadway are primarily older homesites, lawns, and forested areas. However, the east side of the road contains a large tract of forested wetlands that border the North Landing River and the AIWW (Figure 3-17).

USACE Planning and Regulatory staff were able to visit this parcel. Although there also appear to be large acreages of bottomland forested wetlands on that parcel, the forested wetlands within the ROI there are more disturbed, with a drier hydrologic regime than those in Chesapeake. The forested wetlands in the ROI are dominated by red maple, green ash, sweet gum, bayberry, Virginia creeper (*Parthenocissus quinquefolia*), but also included some invasive species such as Chinese privet (*Ligustrum sinese*), trumpet creeper (*Campsis radicans*), and gill-over-the-ground (*Glechoma hederacea*). In some areas of these forested wetlands, there was evidence of past disturbance such as old spoil piles, shallow ditches, and old dirt roadbeds. There was some evidence of surface hydrology, but was more of a saturated system. There were also areas that contained many of these same species but did not appear to have any hydrologic indicators.

On the west side of the corridor, there is an expansive, densely vegetated, freshwater emergent marsh. It contains species such as fox sedge (*Carex vulpinoidea*), bristly sedge (*Carex comosa*), partridge pea, *Rumex* spp, soft rush (*Juncus effuses*), arrow arum (*Peltandra virginica*),

Figure 3-17. Freshwater emergent wetland on the west side of the road on the Virginia Beach section of the ROI (USACE Photo, June 2018).

The invasive common reed grass (*Phragmites australis*) was found along a few sections on peninsula of land between the AIWW and the North Landing River. This species is usually found in freshwater areas or above mean high water (MHW) in brackish waters, and is often associated with topographic or other disturbances such as the placement of fill material, plant die-back, or surface erosion. It propagates through not only seeds but also a network of underground rhizomes.

A full wetland delineation will be completed during or before the Preconstruction, Engineering, and Design (PED) Phase.

3.7 Fish and Fishery Resources

The Magnuson-Stevens Fishery Conservation and Management Act of 1994 (MSA), as amended October 11, 1996, applies to federally managed species, and requires federal agencies to identify and describe an Essential Fish Habitat (EFH) for fisheries that may be impacted by a potential project. EFH is defined as “those waters and substrates necessary to fish for spawning, breeding, feeding, or growing to maturity.” The MSA applies to federally managed species under the management of regional fishery management councils. Under the MSA, fishery management plans must identify and describe EFH for the fishery, minimize adverse effects from fishing on the fishery and sustainably manage the resource. “Adverse effect” includes “any impact which reduces quality and/or quantity of EFH, through direct impacts (e.g. contamination or disruption), indirect impacts (e.g. loss of prey, reduction in fecundity), or individual, cumulative, or synergistic impacts.

The Anadromous Fish Conservation Act of 1965 authorizes the Secretaries of the Interior and Commerce to enter into cooperative agreements with the States and other non-Federal interests for conservation, development, and enhancement of anadromous fish. In Virginia, anadromous fish regulations and requirements also fall under the authority of Virginia Department of Game and Inland Fisheries (VDGIF) and the Virginia Marine Resources Commission (VMRC).

The Fish and Wildlife Coordination Act of 1958 (FWCA) requires the USACE to coordinate with the USFWS and NOAA Fisheries on water resources related projects to obtain their views toward presentation of fish and wildlife resources and mitigation of unavoidable impacts.

The ROI includes any affected fish and fishery resources in the direct fill footprint of all instream structures and structures in wetlands, within the North Landing River and the AIWW. The ROI includes all aquatic areas where a structure or fill is being placed for the bridge, the fender system, onsite mitigation, stormwater, or other activities associated with the project, including all aquatic areas that are filled, dredged, or otherwise converted to another use as a result of implementation of project construction. With implementation of the project, direct effects to fish and fishery resources would include noise disturbances, turbidity plumes, potential entrainment, or any restriction of fish passage. The ROI includes aquatic areas that are either temporarily or permanently altered by implementation of an action alternative. Alterations that would affect fish and fishery resources include shifts in circulation patterns, turbidity, temperature, and nutrient fluctuations.

3.7.1 Existing Conditions

At the location of the Action Area, the AIWW and the North Landing River are located in a freshwater wind tidal waterway. Upstream of the Study Area, the USACE-operated Great Bridge

Locks adjacent to Virginia Route 168 cut off the tidal exchange of brackish water and aquatic species passage to the downstream on the AIWW. Therefore, at the Study Area, the AIWW is freshwater and occasionally wind-tidal by virtue of winds from the south.

Currently, the channel is approximately 15 feet deep and approximately 50 feet wide at its deepest. The current horizontal channel clearance between the fenders is 80 feet. According to a current Hydraulics and Hydrology analysis prepared by USACE's consultant, an as-built survey conducted at the time the bridge was constructed indicated that the channel bottom materials consisted of organic silt, fine sand, and silt, with an average particle size ranging from 0.05-0.3 mm. The left overbank materials (north side) consisted of small gravel and fine sand, with an average particle size ranging from 0.1-0.4 mm. The right overbank materials (south side) consisted of organic silt, fine sand, and peat, with an average particle size of 0.01-0.1 mm (WSP unpublished, 2018).

NOAA Fisheries has confirmed in an email dated May 24, 2018, that there is no EFH within the Study Area; therefore, no EFH Assessment was required. That email is in the Environmental Appendix, Appendix C.

The VDGIF Fish and Wildlife Information Service online tool also does not report any anadromous fish species at this location. However, the NOAA Fisheries Protected Resource Division Mapper Tool indicated that the Action Area may be near the upstream limits of habitat for the Atlantic sturgeon (*Acipenser oxyrinchus*) and the shortnose sturgeon (*Acipenser brevirostrum*). Those species are discussed under the Special Status Species section of this report.

Although the waterway is not likely used by EFH species or protected species, it would be habitat for common fish species, such as largemouth bass , *Micropterus salmoides* bluegill (*Lepomis macrochirus*), pumpkinseed **(***Lepomis gibbosus)*, yellow perch (*Perca flavescens*), white perch (*Morone americana*), and white catfish **(***Ameiurus catus***)**. Although the waterway is on the 303(d) list, it is used by some for recreational fishing.

The USACE coordinated with the USFWS and NOAA Fisheries with respect to the Fish and Wildlife Coordination Act to obtain a Coordination Act Report. A Planning Aid Report was submitted by the USFWS in June 2019. It is located in the Environmental Appendix, Appendix C. The report reiterated that there are not likely any anadromous fish within a 3-mile radius of the ROI, and that it did not contain EFH.

3.8 Special Status Species

Animals listed as endangered or threatened are protected under the Endangered Species Act of 1973, as amended (ESA). According to the ESA, "endangered species" is defined as any animal in danger of extinction throughout all or a substantial portion of its range. A "threatened species" is any species likely to become an endangered species in the foreseeable future throughout all or a substantial part of its range. "Proposed species" are species for which the U.S. Fish and Wildlife Service (USFWS) and National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NMFS) have sufficient information on their biological status and threats to propose them as endangered or threatened under the ESA. "Candidate species" are species for which the USFWS has sufficient information on their biological status and threats to

propose them as endangered or threatened, but for which development of a proposed listing regulation is precluded by other higher priority listing activities.

Per 50 CFR 402.2, the Action Area is defined as "all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action." For purposes of the ESA, the Action Area is synonymous with the ROI. It includes the limits of physical disturbance of the habitat caused by construction and maintenance of the project features as well as the extent of hydraulic and water quality impacts that would have the potential to impact threatened and endangered species and their habitat. For the extent of the physical, hydraulic, and water quality impacts, all areas within 100 feet upstream and downstream of the bridge will be included. The Action Area will include all areas to be temporarily and permanently cleared or filled, as well as a 150-foot buffer around all such areas. The Action Area is also defined by the extent of noise impacts as they pertain to threatened and endangered species.

This section provides a summary of the federally listed species that have the potential to occur in the Action Area. The following references were consulted for inclusion of applicable information into this section:

- National Oceanic and Atmospheric Administration Greater Atlantic Regional Fisheries Office (GARFO), Section 7 online Mapper (NOAA 2019);
- Information, Planning, and Consultation System (IPaC) database search (USFWS 2018);
- Virginia Aquarium's Virginia Sea Turtle and Marine Mammal Stranding Network Reports (Swingle et al. 2017-2010);
- Virginia Fish and Wildlife Information Service (VaFWIS) database search within a three mile radius of the Study Area (Virginia Department of Game and Inland Fisheries 2017);
- Virginia Natural Heritage Database Search (Virginia Department of Conservation and Recreation 2017);
- USFWS Planning Aid Report (USFWS June 2019).

3.8.1 Existing Conditions

Based on these, species under the jurisdiction of both the NOAA Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (USFWS) were identified (Table 3-1).

Table 3-1. Federally listed species under the jurisdiction of the USFWS and the NMFS known or with the potential to occur in the Action Area

Taxonomic Category/Common Name	Scientific Name	Status	Critical Habitat
USFWS Jurisdiction Species			
Mammals			
Northern Long-eared Bat	*Myotis septenrionalis*	T	N
NMFS Jurisdiction Species			
Fish			
Atlantic sturgeon (all DPSs)	*Acipenser oxyrinchus*	T	Y*
Shortnose sturgeon	*Acipenser brevirostrum*	E	N

DPS = Distinct Population Segment; T = Threatened; E = Endangered; Y = Yes; N = No; P = Proposed; ^Species status is reported as it pertains to the DPS/Action Area; *Critical Habitat not located in Action Area

Source: (NOAA Fisheries Section 7 Mapper Tool 2019; USFWS 2018; Virginia Department of Conservation and Recreation 2017; Virginia.)

Northern Long-Eared Bat

The USFWS listed the northern long-eared bat threatened in 2015, with no designated critical habitat. The most severe threat attributed to the substantial population decline of the northern long-eared bat and other insectivorous bats has been the widespread spread of the White-Nose Syndrome (WNS) that is caused by the fungal infection *Pd* (*Pseudogymnoascus destructans*). Since the disease was first observed in New York in 2007, WNS has spread rapidly in bat populations from the East to the Midwest and South. The U.S. Fish and Wildlife Service expects further declines as the disease continues to spread across the species' range. The Action Area is located within the managed White-Nose Syndrome Buffer Zone as defined by the USFWS. Populations in Virginia are thought to have declined by 96% and are anticipated to decline with the continued spread of the White-Nose Syndrome (USFWS 2016).

The northern long-eared bat is dark brown on its back with lighter coloration underneath with a wingspan of approximately nine to 10 inches and is approximately three to four inches in body length (USFWS 2015a). This bat is distinguished from other similar bat species in its genus by the length of its ears that extend past its nose when folded. During the winter, northern long-eared bats hibernate in caves and mines called hibernacula. During the summer, this species roosts beneath bark and in cavities of both live and dead trees (snags). They will also roost in human-made structures such as culverts, barns, and sheds. Females give birth to one young during the summer. Maternity colonies of females and young generally have 30 to 60 bats at the beginning of the summer, although larger maternity colonies have also been seen. Most bats

within a maternity colony give birth around the same time, which may occur from late May or early June to late July, depending on where the colony is located within the species' range.

According to the Virginia Department of Game and Inland Fisheries (VDGIF) website and Northern long-eared bat roosting and hibernacula location map (Figure 3-18), there are six documented maternal roosting trees near the Action Area. These are all located within the City of Chesapeake on the south side of the AIWW and to the west of the existing roadway, within existing forested wetland and upland habitat. There are no known hibernacula in the vicinity of the Action Area. The map below in Figure 3-18 shows the locations of the known roosting trees in red.

A Biological Assessment was prepared for the northern long-eared bat and coordinated with USFWS.

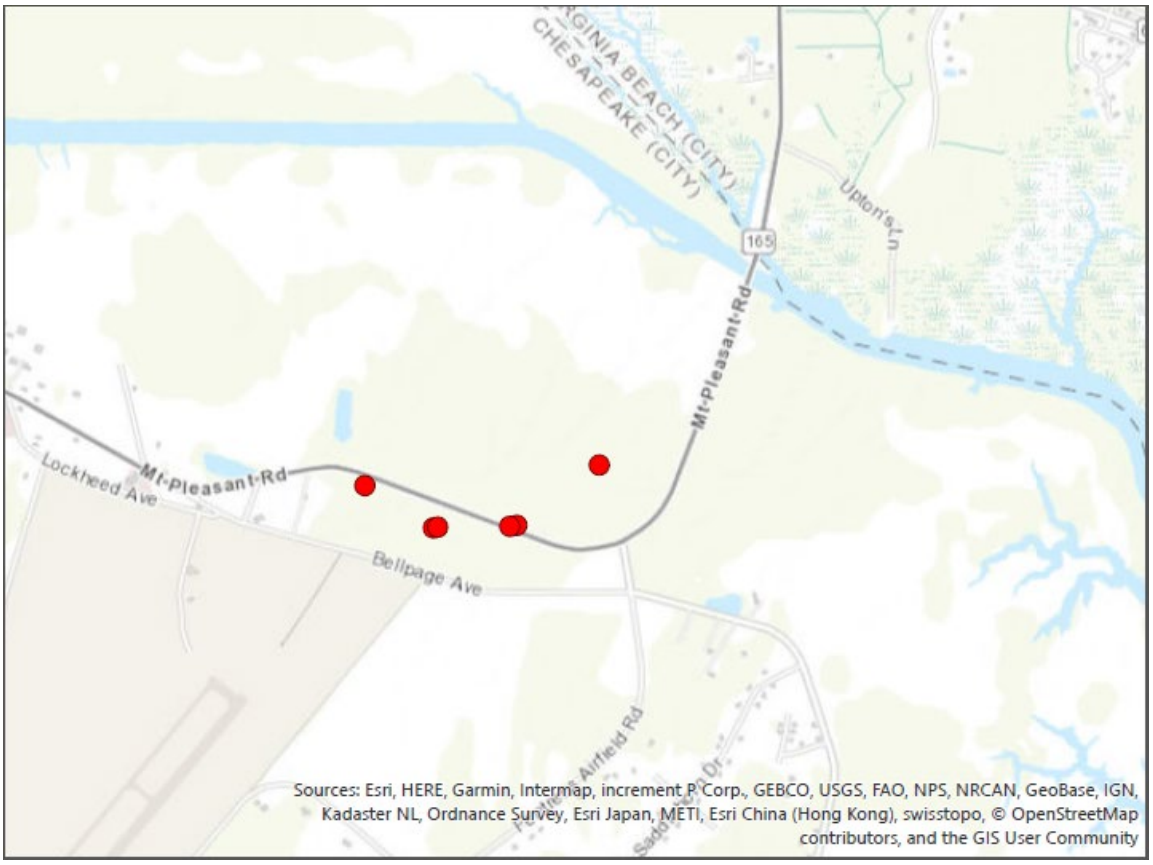


Figure 3-18. Locations of known Northern long-eared bat roosting trees (Source: VDGIF, 2019).

Atlantic sturgeon (all DPSs) and Shortnose sturgeon

According to the NMFS Section 7 online Mapper Tool, the Action Area is also within the upstream limits of the Atlantic sturgeon and the shortnose sturgeon (Figure 3-19). Locally, the Atlantic sturgeon also is known to occur in the Chesapeake Bay and its tributaries, such as the Elizabeth, James, and York Rivers; however the Great Bridge Locks adjacent to Route 168 and along the AIWW in Chesapeake, upstream and to the west of the Action Area, prevents sturgeon migration from those waterways southward to the Action Area.

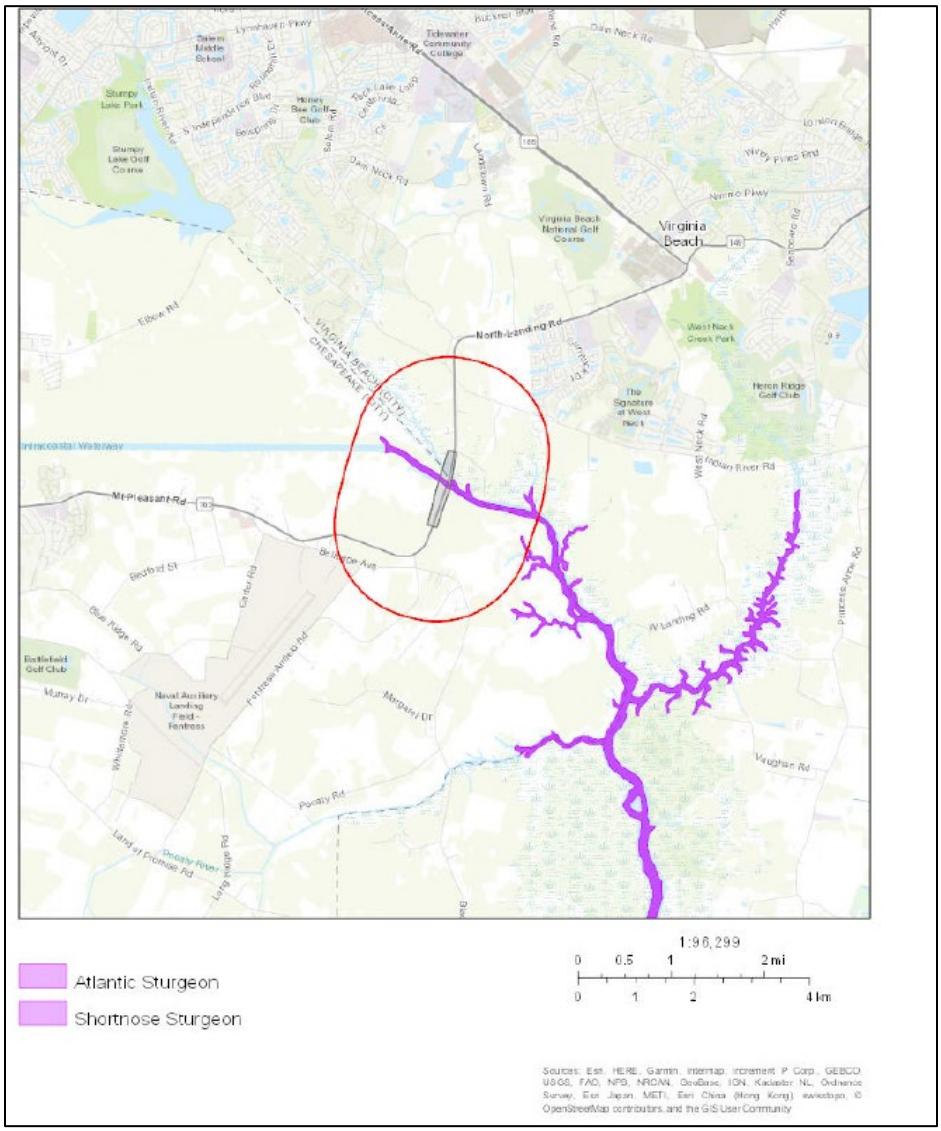


Figure 3-19. NOAA Fisheries Service Section 7 Mapper Tool showing the range of the Atlantic Sturgeon and the Shortnose Sturgeon. The Action Area is located within the red circle (Source: NOAA 2019).

Atlantic sturgeon are an anadromous bony fish that are distinguishable from other fish by five rows of bony scutes along the length of their body, a protrusible mouth, and heterocercal tail. They are slow growing and late maturing, and have been recorded to reach up to 16 feet in length and 60 years of age. They are bottom feeders that suck food into a ventrally located protruding mouth. The diet of adult and subadult includes mollusks, gastropods, amphipods, annelids, decapods, isopods, and fish (NMFS 2012).

In 2017 NMFS designated Critical Habitat locations for the Atlantic sturgeon in the Federal Register. These locations are in Maine, New York, New Jersey, Pennsylvania, Maryland, and Virginia. The locations in Virginia include the Potomac, Rappahannock, York, James and Elizabeth Rivers, out to their confluence with the Chesapeake Bay.

Male sturgeon begin upstream spawning migrations when waters reach approximately 6°C (43°F), and remain on spawning grounds through the spawning season. Females begin spawning migrations when temperatures are closer to 12°C to 13°C (54-55°F), make rapid spawning migrations upstream, and quickly depart following spawning. Spawning is believed to occur in flowing water between the salt front of the estuaries and the fall line of large rivers, when and where optimal flows are 46-76 cm/s and depths are three to 27 meters. Sturgeon eggs are deposited on hard bottom substrate such as cobble, coarse sand, and bedrock. At temperatures of 20°C and 18°C, hatching occurs approximately 94 and 140 hours, respectively, after egg deposition. Larval Atlantic sturgeon are assumed to inhabit the same riverine or estuarine areas where they were spawned. Studies show that egg and larvae through age two sturgeon occur in low salinity waters. However, older fish are more salt tolerant and occur in higher salinity waters as well as low salinity waters. Atlantic sturgeon may remain in the natal estuary, as juveniles, for months to years before migrating to open ocean as subadults (NMFS 2012).

Shortnose sturgeon are also large anadromous fish, with lengths of up to 4.5 feet. They are similar in appearance to Atlantic sturgeon, but are smaller, with a larger mouth, a smaller snout shape, and scutes. They live in rivers and coastal waters from Canada to Florida. They are benthic omnivores but have also been observed feeding off plants surfaces. Juveniles randomly vacuum the bottom while adults are more selective feeders. They feed on crustaceans, insect larvae, worms, and mollusks (NMFS 1998).

Shortnose sturgeon hatch in the freshwater of rivers and spend most of their time in the estuaries of these rivers. In the spring, adults move far upstream and away from saltwater to spawn. After spawning, the adults move rapidly back downstream to the estuaries, where they feed, rest, and spend most of their time. Male shortnose sturgeon usually spawn every 1 to 2 years once the mature, while females typically spawn every 3 to 5 years. The number of eggs females can produce is appears to be correlated with age and body size and ranges from 30,000 to 200,000. Spawning habitats that have been recorded range from gravel/rubble/boulder substrate in the Connecticut River to gravel/sand/log substrate in the Savannah River, and typically when water temperatures increase to 8-9 degree C (NMFS 1998).

The NOAA Section 7 Mapper Tool (NMFS 2019a) states that Atlantic sturgeon adults and subadults “could utilize the Action Area for foraging and migrating, at any time of the year.” It further indicates that more recent research suggests that shortnose sturgeon leave their natal estuaries, undergo coastal migrations, and use other river systems to a greater extent than previously thought. It states that NOAA expects shortnose sturgeon to overwinter in the rivers, “so the time of year for coastal migrations would be roughly from April 1 to November 30.”

However, the onsite conditions indicate that the Action Area may not contain suitable habitat for either species. The bottom materials, being soft organic and fine silts, lack the cobble, hard bottom, or coarse sand to which the species normally attaches eggs following spawning. Also, although the Action Area is a low salinity waterway, it is far upstream of any known records of

species occurrence or spawning. As a wind-tidal system, it also is relatively stagnant and lacks the flowing water between the salt front of the estuaries and the fall line of large rivers that is typically associated with spawning. Furthermore, at a maximum depth of 15 feet and a waterway that is approximately 80 feet wide at its deepest, its dimensions are narrower and shallower than most of the waters where the species is believed to occur (10-88 feet deep). Nevertheless, a Biological Assessment was prepared for these sturgeon species and coordinated with NMFS.

Critical Habitat

There is no designated Critical Habitat under the jurisdiction of the USFWS or NMFS in the Action Area.

Bald Eagle

Once federally listed as endangered, the bald eagle (*Haliaeetus leucocephalus*) has made a remarkable comeback. It is currently protected under the American Bald and Golden Eagle Act, and the Migratory Bird Treaty Act; and under Virginia law pursuant to VDGIF regulations. Bald Eagles breed throughout much of Canada and Alaska, in addition to scattered sites across the lower 48 states, from California to the southeastern U.S. coast and Florida. Wintering covers most of the contiguous U.S., with some year-round distribution in the northwest.

A large raptor, the bald eagle has a wingspread of about seven feet. Adults have a dark brown body and wings, white head and tail, and a yellow beak. Juveniles are mostly brown with white mottling on the body, tail, and undersides of wings. Bald Eagles typically breed and winter in forested areas adjacent to large bodies of water. However, such areas must have an adequate food base, perching areas, and nesting sites. Throughout its range, it selects large, super-canopy roost trees that are open and accessible. Nests are constructed from an array of sticks placed in an interwoven pattern. Other materials added as fillers may include grasses, mosses, even corn stalks.

The large area of forested wetland habitat and waterway within the Action Area and beyond likely provides good foraging area for bald eagles; and they likely occur and/or pass through the Action Area. However, according to the nesting data provided by The Center for Conservation Biology (CCB, 2019), there are no documented nests within the Action Area (Figure 3-20).

Figure 3-20. Locations of known bald eagle nesting sites (yellow dots). (Source: The Center for Conservation Biology CCB, 2019).

3.8.2 Migratory birds

Migratory birds are defined as those described by the USFWS in the 50 CFR 10.13 and consists of species that that belongs to a family or group of species in the United States as well as Canada, Japan, Mexico, or Russia. Most birds native (naturally occurring in the U.S.) to the U.S. belong to a protect family and are protected by the Migratory Bird Treaty Act.

The USFWS IPAC database and the USFWS Planning Aid Report has identified the following 11 migratory birds that may occur in or near the Action Area during part of the year: American kestral (*Falco sparverius paulus*), bald eagle, dunlin (*Calidris alpine articola*), king rail (*Rallus elegans*), least tern (*Sterna antillarum*), prarie warbler (*Dendroica discolor*), prothonotary warbler (*Protonaria citrea*), red-headed woodpecker (*Melanerpes erythrocephalus*), red-throated loon (*Gavia stellata*), rusty blackbird (*Euphagus carolinus*), and wood thrush (*Hylocichla mustelina*).

3.9 Wildlife

For the purpose of the following discussion, wildlife includes invertebrates, amphibians, reptiles, birds, and mammals. Protected species and more information on migratory bird species are discussed in the Special Status Species Section; and fish are discussed in the Fish and Fisheries Resources section.

The Fish and Wildlife Coordination Act requires the USACE to coordinate with the USFWS and NOAA Fisheries on water resources related projects to obtain their views toward preservation of fish and wildlife resources and migration of unavoidable impact. As indicated earlier, the USFWS's Planning Aid Report dated June 2019 was considered for this report, and it is found in the Environmental Appendix, Appendix C. In addition, USACE coordinates with state agencies such as the Virginia Department of Game and Inland Fisheries (VDGIF) and the Virginia Department of Conservation and Recreation (VDCR) to consider impacts on state listed, rare, and other species.

The ROI for wildlife includes the limits of physical disturbance of the habitat caused by construction and maintenance of the project features as well as the extent of hydraulic and water quality impacts that would have the potential to impact wildlife species or habitat areas within 100 feet upstream and downstream of the bridge. The ROI includes all areas to be temporarily and permanently cleared and/or filled. It also includes areas indirectly adversely affected by the project, by means such as erosion, alteration of wildlife passage corridors, or changes in community type, and the extent of noise impacts as they pertain to wildlife.

3.9.1 Existing Conditions

The ROI is well-recognized as including highly valuable wetland communities and habitat. The VDCR indicated in its scoping comment letter that the ROI is located within the "North Landing River Conservation Site." The VDCR's letter explains that Conservation Sites are given a biodiversity significance ranking based on the occurrence of rare or protected species, and the rarity and quality of the natural heritage and natural communities that they possess. The VDCR has ranked the Study Area "B1", which signifies "Outstanding Significance" (VDCR 2019a). The North Landing River watershed is among the most pristine and least disturbed wetland and upland habitats in southeast Virginia. VDCR's website further indicates that that area "serves as a buffer for the North Landing River from the rapidly growing nearby cities. Rare species, and communities are found here as well. Protection of these areas benefits the entire riparian system" (VDCR 2019b). The USFWS Planning Aid Report reiterated these comments. Private organizations such as the Nature Conservancy also recognize the high quality and importance of aquatic and terrestrial habitat along much of the AIWW and the North Landing River; therefore, it has made it a priority to acquire wetland parcels in these areas. The Nature Conservancy owns one parcel within the ROI in Chesapeake.

The VDGIF's species listing of listed, rare, and common species within a 3-mile radius indicated many species that are generally only found in tidal brackish waters; however, it also included many species that utilize nontidal wetlands and may occur within the ROI. These are the state-listed canebrake rattlesnake, tricolored bat, Rafinesque's eastern big-eared bat, eastern glass lizard, Eastern chicken turtle, and the barking treefrog. The VDCR indicated in their scoping comments that the Duke's skipper (*Euphyes dukesi*) is a rare species that may be present on the site or in the vicinity. The Duke's skipper is a small orange-brown and yellow butterfly that is found in coastal areas in southeastern Virginia, and prefer swamps and wet marshy areas. Specifically, it prefers to lay its eggs on the undersides of shoreline sedges (*Carex hyalinolepis*).

Many more common species of toads, frogs, snakes, lizards, turtles, as well as deer, opossum, raccoon, squirrels are also likely to utilize the habitat within and near the ROI. Numerous species of songbirds and nesting birds, and birds of prey such as falcons, eagles, and owls are

likely pass through the ROI. Eleven species of migratory birds that may occur within the ROI were listed in the Special Status Species section.

Regionally, the wetland habitat along the AIWW and North Landing River watershed is part of a very large acreage of uninterrupted, undisturbed habitat. Most of the wetland habitat within the ROI, particularly on the Chesapeake side, is also undisturbed and largely pristine; there is no development along the corridor other than a small gated access road. The existing roadway corridor itself is the largest impact in this section of the ROI; it is a raised solid fill causeway. It may act as an interruption to the wildlife corridor, particularly for smaller and flightless species. However, most species can likely cross the corridor, which also puts them at risk for vehicle strikes.

The Virginia Beach side is much more developed and disturbed along the stretch of approximately one-half mile of the existing corridor, within the ROI. There are approximately 15-20 single family home or outbuilding sites, including some cleared areas and lawns, and a large gravel parking area adjacent to the AIWW. There are also forested wetlands to the east side of the road, bordering the waterway, and a large section of freshwater emergent wetlands to the west. These areas may be utilized or frequented by many of the same species discussed earlier, but likely to a lesser extent.

3.10 Cultural Resources

Several federal laws and regulations have been established to manage cultural resources, including the National Historic Preservation Act (NHPA) of 1966, the Archeological and Historic Preservation Act of 1974, the American Indian Religious Freedom Act of 1978, the Archeological Resource Protection Act of 1979, and the Native American Graves Protection and Repatriation Act of 1990. In addition, DoDI 4710.02, *Department of Defense Interactions with Federally-Recognized Tribes* (2006), governs DoD interactions with federally recognized tribes and EO 13175, *Consultation and Coordination with Indian Governments* (2000), charges federal departments and agencies with regular and meaningful consultation with Native American tribal officials in the development of policies that have tribal implications. In order for a cultural resource to be considered significant, it must meet one or more of the following criteria for inclusion on the National Register of Historic Places (NRHP):

“The quality of significance in American history, architecture, archeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association and (a) that are associated with events that have made a significant contribution to the broad patterns of our history; or (b) that are associated with the lives of persons significant in our past; or (c) that embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or (d) that have yielded, or may be likely to yield, information important in prehistory or history.” (36 CFR 60.4).

3.10.1 Existing Conditions

Regional Archeological Setting

Earliest human inhabitation of the Americas remains one of the most debated issues in archaeology, but it is well evidenced that Native Americans began to inhabit the Chesapeake Bay region over 12,000 years ago. Many of the sites left by the 'Paleo-Indians' of this period may now be submerged on the bottom of the bay, its tributaries and the Atlantic continental shelf; sea-levels during the Wisconsin Glaciation of the Pleistocene epoch, or Ice Age, were some 400 feet below contemporary levels (Bratton et al. 2002).

During the Archaic Period, 8000–1200 Before Common Era (BCE), populations were evidently low, but grew considerably. The Archaic Period is divided into Early (8000-6500 BCE), Middle (6500 to 3000 BCE) and Late (3000 to 1200 BCE) Archaic Periods. Along with increasing population, there is evidence of an increased diversity in resources hunted and gathered for food, with a particularly notable expansion in fishing and shellfish gathering (Thompson and Worth 2011).

Around 1200 BCE, people in the region began making and using pottery. This marks the beginning of the Woodland Period, also divided into Early (1200-500 BCE), Middle (500 BCE to CE 900), and Late (CE 900-1600) Woodland Periods. Through the Woodland Period populations increased with the expansion of agriculture, as did political hierarchy. The settlement pattern consisted of a series of hamlets strung along the shores of the major estuaries with a larger, often palisaded, chief's village central to them. This was the state of native culture in the Chesapeake Bay region during the Protohistoric Period to 1600-1650 CE (Turner 1992). John Smith's map (Figure 3-21), based on observations made in 1608, shows the native settlements in the vicinity of the project area of Nansemond and Chesapeake.

3-21. Section of Smith's map, red circle indicates the approximate location of the project area.

3.10.2 Historic Period

After landing in 1607, English settlers struggled for survival for several years at Jamestown before expanding into settlements along the James River. By the middle of the 17th century European settlement had expanded to the Elizabeth River and its branches, and by the end of the 17th century settlement had occurred in what would become North Carolina in the Albemarle Sound area, and such backwaters as the North River. The earliest mapping of North Landing is recorded in a 1781 map made by a British officer. During the Revolutionary War small battles had occurred at Kempsville, a few miles north of the project area, at Great Bridge just to the west, and again at Great Bridge in 1781.

Waterways were the highways of early America. North Landing was essentially the head of navigation of the North River, where overland passage would be needed to link transport from waters linked to the North Carolina sounds to those linked to the Chesapeake Bay. The idea of a canal linking the two regions was suggested by George Washington in 1763, and work was finally begun in 1793. After twelve years of arduous hand labor the Dismal Swamp Canal opened in 1805. As steam powered vessels were developed the need for a deeper, wider canal prompted the construction of the ACC, dug by steam shovel in 1856-1859. A lock was built at Great Bridge to prevent flow through the system from the Elizabeth River to the Carolina Sounds, rather than raise vessels to different water levels as with most canal locks. At the time

the canal was considered an engineering marvel. By the late 19th century the development of an extensive network of railroads in the region left the Dismal Swamp Canal little used and reduced the traffic on the ACC rendering them unprofitable for their private owners and leading to poor maintenance. In 1913 the federal government bought the ACC, and then the DSC in 1929. Both of these have been operated by USACE since acquisition.

3.10.3 Architectural Resources

The original bridge over the ACC at North Landing was built by the Albemarle & Chesapeake Canal Company in 1868. This was replaced by the USACE in 1916, and that bridge was replaced by the current bridge in 1951. In 2003 The ACC was listed in the National Register of Historic Places (NRHP) as a historic district. The current North Landing Bridge is a contributing element along with most of the buildings at the USACE reservation, and the lock, at Great Bridge. The house at 3001 Mount Pleasant Road, across the road from the bridge operator's shack, was included in the evaluation. Although built in 1919 it was non-contributing in the NRHP nomination, and has since been extensively modified. There are six other houses potentially affected by this project. They will be evaluated as a part of a Phase I cultural resources survey. There is a small cemetery on the east side of the road, north of the canal. Four graves marked with head stones indicate at least seven burials.

3.10.4 Archaeological Resources

No archaeological surveys have been conducted in the project area, or immediately adjacent to it, and no sites have been recorded. A number of sites have been recorded within two miles of the project area, and are listed in Table 3-2. As with other areas around the Dismal Swamp, well drained landforms bordering the swamp were favored by prehistoric Native Americans for hunting camps, and sites are frequently found in these places. For historic sites, the landing would have had associated sites, possibly domiciles. Maps from the early and mid-20th century show several houses no longer extant, and these are the earliest maps in this area with that level of detail. Rights of entry for a Phase I archaeological survey were obtained for only about half of the parcels. Survey was undertaken on those areas where rights of entry had been granted by landowners in March 2019. No archaeological sites were identified, but observations were made on the cemetery mentioned above and it has been added to the Virginia Department of Historic Resources database for architectural resources.

Table 3-2. Virginia Department of Historic Resources (DHR) Recorded Archaeological Sites within Two Miles of the Project Area.

DHR ID	Site Types	Time Periods	Evaluation Status
44CS0006	null	null	null
44CS0009	Camp	Prehistoric/Unknown (15000 B.C. - 1606 A.D.)	null
44CS0010	null	Prehistoric/Unknown (15000 B.C. - 1606 A.D.)	null

44CS0011	null	Prehistoric/Unknown (15000 B.C. - 1606 A.D.)	null
44CS0012	null	Prehistoric/Unknown (15000 B.C. - 1606 A.D.)	null
44CS0013	null	null	null
44CS0014	null	Archaic (8500 - 1201 B.C.)	null
44CS0156	null	18th Century (1700 - 1799), 20th Century (1900 - 1999)	null
44CS0157	Camp, Cemetery, Trash scatter	Prehistoric/Unknown (15000 B.C. - 1606 A.D.), 18th Century (1700 - 1799), 19th Century (1800 - 1899), 20th Century (1900 - 1999)	null
44CS0158	Farmstead	Historic/Unknown	null
44CS0159	Farmstead, Trash scatter	19th Century: 4th quarter (1875 - 1899), 20th Century (1900 - 1999)	null
44CS0160	Trash scatter	Historic/Unknown, Woodland (1200 B.C. - 1606 A.D.)	null
44CS0165	Trash scatter	19th Century: 4th quarter (1875 - 1899), 20th Century (1900 - 1999)	null
44CS0168	Cemetery	Historic/Unknown	null
44CS0183	Trash scatter	Historic/Unknown	null
44VB0258	Camp, base	Middle Woodland (300 - 999 A.D.)	DHR Staff: Not Eligible

44VB0259	Camp, temporary	Early Archaic (8500 - 6501 B.C.)	DHR Staff: Not Eligible
44VB0260	Camp	Woodland (1200 B.C. - 1606 A.D.)	DHR Staff: Not Eligible
44VB0261	Camp	Woodland (1200 B.C. - 1606 A.D.)	DHR Staff: Not Eligible
44VB0267	Trash scatter	19th Century: 2nd half (1850 - 1899), 20th Century: 1st half (1900 - 1949)	DHR Staff: Potentially Eligible
44VB0268	null	Historic/Unknown, Early Archaic (8500 - 6501 B.C.)	DHR Staff: Not Eligible
44VB0276	Farmstead	null	DHR Staff: Potentially Eligible
44VB0277	Camp	Woodland (1200 B.C. - 1606 A.D.)	DHR Staff: Potentially Eligible
44VB0278	Farmstead	Prehistoric/Unknown (15000 B.C. - 1606 A.D.), 18th Century: 2nd half (1750 - 1799), 19th Century: 1st half (1800 - 1849)	DHR Staff: Potentially Eligible
44VB0279	Camp	Woodland (1200 B.C. - 1606 A.D.)	DHR Staff: Not Eligible
44VB0280	Cemetery	19th Century: 4th quarter (1875 - 1899)	DHR Staff: Not Eligible
44VB0290	Camp	Late Archaic (3000 - 1201 B.C.)	null
44VB0306	Canal	19th Century (1800 - 1899), 20th Century (1900 - 1999)	DHR Staff: Not Eligible (not ACC)

3.11 Socioeconomics

Socioeconomics is defined as the basic attributes and resources associated with the human environment, particularly population, demographics, and economic development. Demographics entail population characteristics and include data pertaining to race, gender, income, housing, poverty status, and educational attainment. Economic development or activity typically includes employment, wages, business patterns, an area's industrial base, and its economic growth. Impacts on these fundamental socioeconomic components can also influence other issues such as housing availability.

The USEPA describes environmental justice as the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies (USEPA 2016). Fair treatment means that no group of people, including racial, ethnic, or socioeconomic, should bear a disproportionate share of the negative environmental consequences resulting from the execution of federal, state, local, and tribal programs and policies. The goal of fair treatment is not to shift risks among populations but to identify potential disproportionately high and adverse effects and identify alternatives that may mitigate these effects. Federal agencies must provide minority and low-income communities with access to information on matters relating to human health or the environment and opportunities for input in the NEPA process, including input on potential effects and mitigation measures. The demographic information, including age, race and income of the populace, is vital to framing both a socioeconomic analysis and an analysis of environmental justice conditions.

The CEQ regulations implementing NEPA state that when economic or social effects and natural or physical environmental effects are interrelated, the NEPA document will discuss these effects on the human environment (40 CFR 1508.14). The CEQ regulations further state that the "human environment shall be interpreted comprehensively to include the natural and physical environment and the relationship of people with that environment." Following from these CEQ regulations, the socioeconomic analysis evaluates how elements of the human environment such as population, employment, education, and housing might be affected by the Proposed Action.

In 1994, EO 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low- Income Populations, was issued to focus the attention of federal agencies on human health and environmental conditions in minority and low-income communities. In addition, EO 12898 aims to ensure that the environmental effects of federal actions do not fall disproportionately on low-income and minority populations. To support an evaluation of environmental justice issues, this section includes data related to the existence of minority and low-income populations in the vicinity of the Proposed Action that could potentially be disproportionately affected. For an analysis of impacts to minority, low-income, and child populations, refer to Chapter 6, Other Considerations Required by NEPA.

EO 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, tasks "each federal agency [to] make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high adverse human health and environmental effects of its programs, policies, and activities on minority

populations and low-income populations." EO 12898, dated February 11, 1994, aims to: (1) focus the attention of federal agencies on the environmental and human health conditions in minority communities and low-income communities with the goal of achieving environmental justice; (2) foster non-discrimination in federal programs that substantially affect human health or the environment; and (3) give minority communities and low-income communities greater opportunities for public participation in, and access to public information on, matters relating to human health and the environment.

Because children may suffer disproportionately from environmental health risks and safety risks, EO 13045, Protection of Children from Environmental Health Risks and Safety Risks, was issued on April 21, 1997 to help ensure that federal agencies' policies, programs, activities, and standards address environmental health and safety risks to children. EO 13045 requires all federal agencies to make it a high priority to identify and assess environmental health risks and safety risks that may disproportionately affect children and ensure that its policies, programs, activities, and standards address disproportionate risks to children that may result from environmental health risks or safety risks.

The ROI for socioeconomic factors has two levels. First, the ROI includes residents within the roadway and bridge corridor who may be displaced, have their property devalued by use for the temporary construction and/or permanent structure of a replacement bridge, or have their highway access altered. Second, the ROI includes motorists using North Landing Road/Mount Pleasant Road, especially residents of eastern Chesapeake and western Virginia Beach west of the North River who may rely on this route to commute to work.

3.11.1 Existing Conditions

Existing demographic and economic information was drawn from the U.S. Census Bureau, Bureau of Labor Statistics, Virginia Employment Commission, and local planning agencies. The impacts of implementing proposed project measures to various segments of the population is considered, especially with regard to the geographic distribution of these population elements and the impacts of the project measures in these areas. U.S. Environmental Protection Agency guidance (USEPA 2016) on environmental justice was considered in evaluating these impacts.

Demographics

The project area straddles the city line between Chesapeake and Virginia Beach, although the existing bridge is entirely within Chesapeake. Chesapeake and Virginia Beach are within the Norfolk-Virginia Beach, NC-VA Metropolitan Statistical Area (MSA). The MSA also includes the cities of Norfolk, Portsmouth, Newport News, Hampton, Poquoson, Williamsburg, the counties of Gloucester, James City, York, Isle of Wight, plus Gates and Currituck counties in North Carolina. The 2016 population estimate for the MSA was 1,726,907. Virginia Beach and Chesapeake are the first and third largest contributors to this total, with 2017 estimates of 405.435 and 240,397 respectively (U.S. Census Bureau, 2019a).

The ROI lies between two census tracts, 454.23 and 211.02, in Virginia Beach and Chesapeake respectively (Figure 3-22). One the Chesapeake side of the canal the area is uninhabited swamp, but there is a moderate density of dwellings along North Landing Road on the Virginia Beach side.

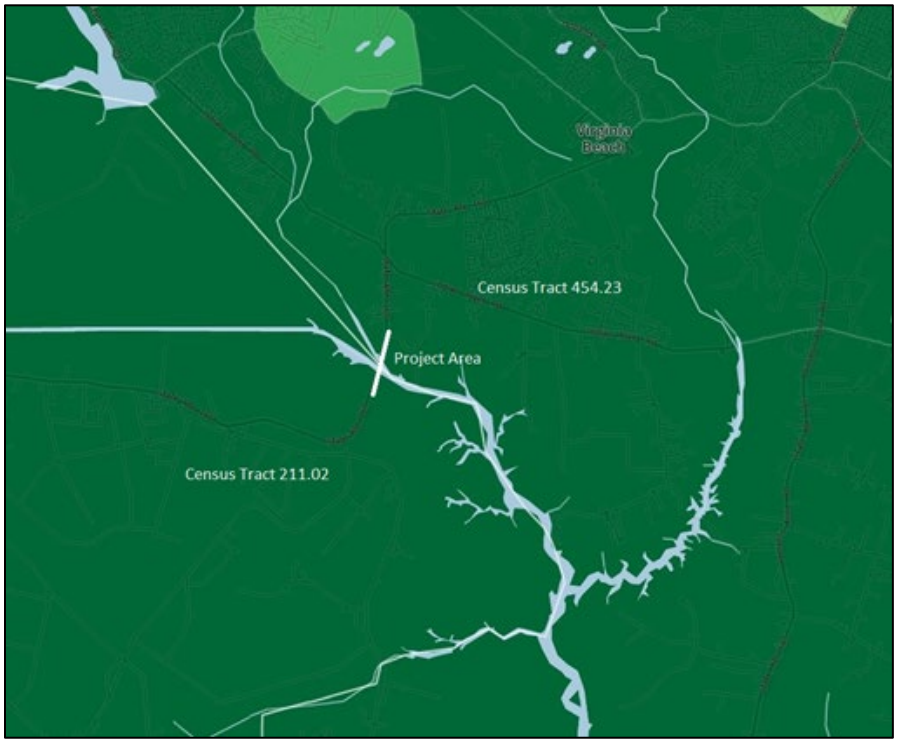


Figure 3-22 - Census Tracts in the Vicinity of the Project Area. Source: U.S. Census Bureau, 2019a

The age structure of these two census tracts straddles percentages for Virginia Beach and Chesapeake. The Virginia Beach percentage of persons over 65 is 11%, while that of Census Tract 454.23 is 16%, In Chesapeake 7.8% of the population is over 65 and in Census Tract 211.02 it is only 7.8% (U.S. Census Bureau, 2019b).

Virginia Beach had a 35.51% minority population in the 2010 census, with Census Tract 454.23 close to that at 39.37%. In Chesapeake minorities are 39.58% of the total population, but in Census Tract 211.02 minorities make up only 18.11% (U.S. Census Bureau, 2019b).

Virginia Beach had a median household income of $65,219 in the 2010 census, while Census Tract 454.23 was much higher at $99,219. Likewise, in Chesapeake the median household income was $69,743 while that of Census Tract 211.02 was $96,383 (U.S. Census Bureau, 2019b). There were only 11 African Americans living below the poverty level in Census Tract 454.23 or .15% of its population. In Census Tract 211.02 there were 24 African Americans people living below the poverty level, .22% of the population. There were much greater numbers of white people than black people living below the poverty level in these two census tracts. Census Tract 454.23 had 295 white people below the poverty level 3.41% of the population, in Census Tract 211.02 the number was 606, or 5.67% of the population (U.S. Environmental Protection Agency, 2019). Table 3-3 outlines population data for the City of Chesapeake and the City of Virginia Beach.

Table 3-3. Population Data

	1980	1990	2000	2010	2020	2030
Chesapeake	144,486	151,982	199,184	222,209	272,381	308,736
Virginia Beach	262,199	393,089	425,257	437,994	470,288	493,095
MSA	1,225,955	1,437,154	1,558,730	1,564,751	1,822,160	1,956,013

Sources: U.S. Census, Virginia Employment Commission

Employment Data

Over half the jobs in south Hampton Roads metropolitan statistical area (MSA) jurisdictions (south of the James River) are located in Chesapeake and Virginia Beach. From 1990 to 2017, Chesapeake experienced a 145.9 percent increase in employment, the largest growth rate for south Hampton Roads. For the same time period, Virginia Beach experienced an increase of 119.7 percent. Employment projections by the Hampton Roads Planning District Commission for the two cities indicate continued growth for the next 25 years but at decreasing rates. Figure 3-23 below details the projected employment rates for Hampton Roads.

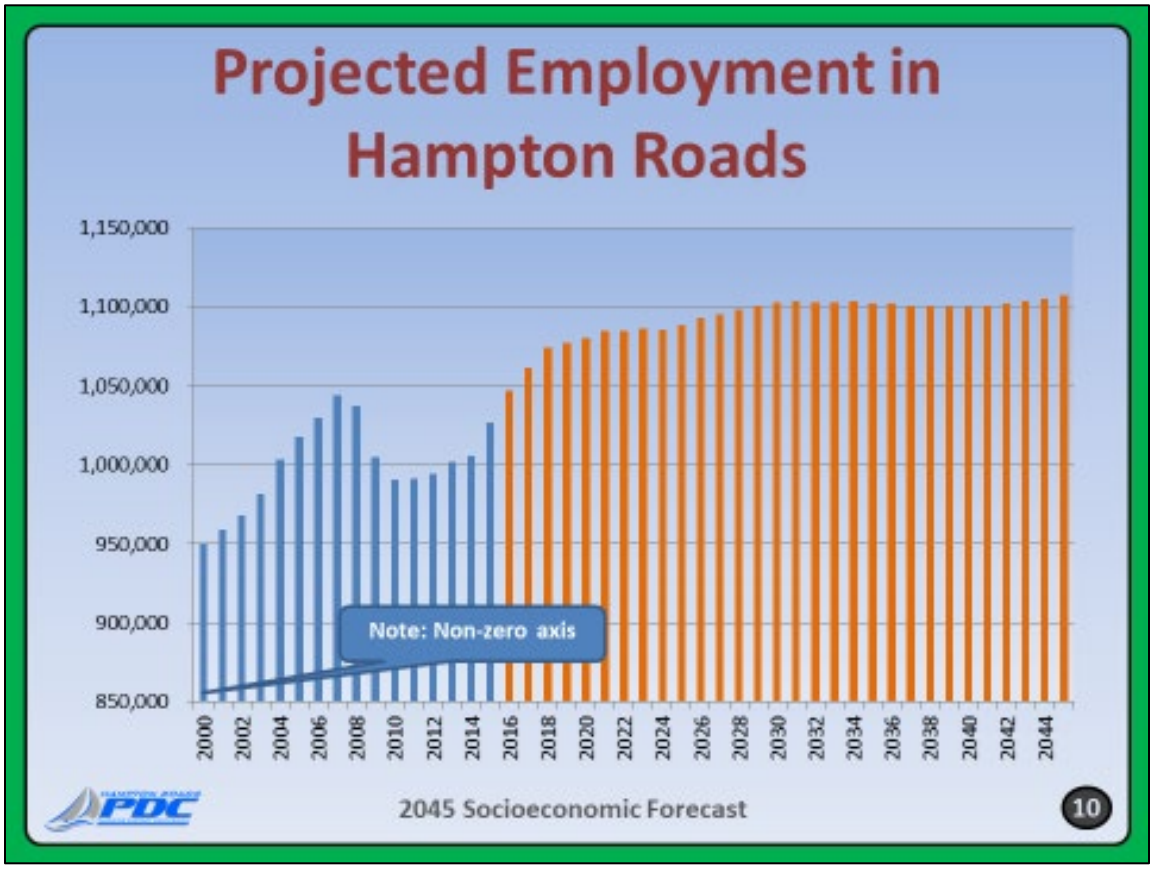
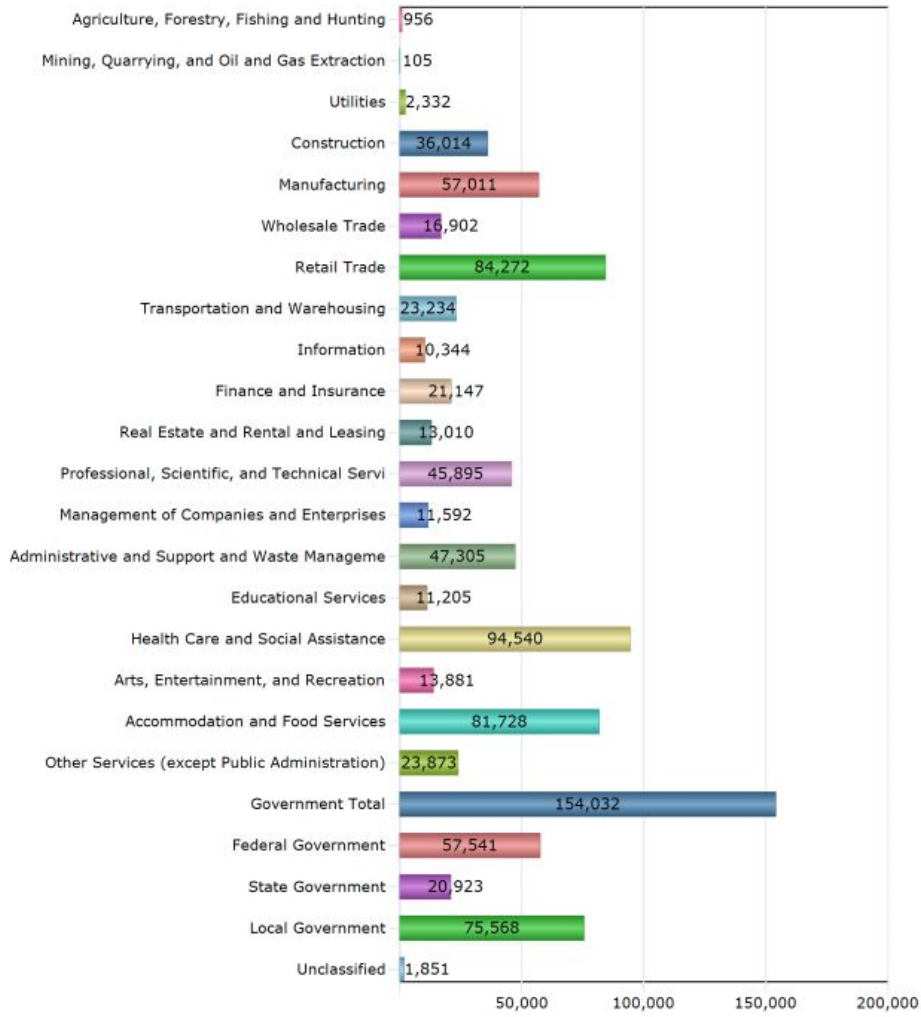


Figure 3-23. Projected Employment in Hampton Roads. Source: Hampton Roads Planning District Commission

The largest single employer in the MSA is the Department of Defense, which includes all the military installations located throughout the region (Table 3-4). Military bases located in Virginia Beach include: part of Joint Expeditionary Base Little Creek-Fort Story (Amphibious Base), and NAS Oceana, which includes Dam Neck Annex. As of 2017, there were 17,385 military and 6,363 Federal civilian jobs in the city, which together make up 9 percent of Virginia Beach's total employment (BEA). Military installations in Chesapeake include the Naval Support Activity (NSA) Hampton Roads, Northwest; and Naval Air Landing Field (NALF) Fentress (which is part of NAS Oceana); and St. Juliens Creek Annex (part of Norfolk Naval Shipyard). As of 2017, there were 1,552 military and 1,157 Federal civilian jobs in Chesapeake, which together make up 2 percent of Chesapeake's total employment.

Unemployment rates as of December 2018 for Chesapeake (2.8%) and Virginia Beach (2.6%) tended to be close to the state average (2.8%) and approximately one percentage point below the national average (3.7%), according to the Bureau of Labor Statistics. The rate for the MSA (3.0%) was slightly above the state average for the same period but below the national average.

Table 3-4. Employment by Industry



Total: 751,230

Note: Asterisk (*) indicates non-disclosable data.

Source: Virginia Employment Commission, Economic Information & Analytics, Quarterly Census of Employment and Wages (QCEW), 3rd Quarter (July, August, September) 2018.

Development and Economy

Income levels for Chesapeake and Virginia Beach tend to be comparable to those for the MSA as a whole. Per capita income figures for 2014 (U.S. Census) show $45,616 for Chesapeake, $51,161 for Virginia Beach, and $44,321 for the MSA (Tables 3-5 & 3-6)). These figures are somewhat above (Virginia Beach) and below (Chesapeake) the state average of $50,345. The median family income for the census tracts in the MSA in 2014 was about $59,679, which was somewhat below the Chesapeake average of $66,625 and Virginia Beach average of $67,676.

Environmental Justice

The statistics for these census tracts containing the project area do not suggest substantial populations of economically and socially disadvantaged people, although there is a relatively high rate of poverty among the white population. In the more directly affected population, those that might have property condemned or compromised there would be much greater effects, but this would be limited to a very few households. Although data specific to these households is unavailable, by appearances these seem to be lower-middle to middle income households from field reconnaissance.

Table 3-5. Wage and Salary Disbursements by Industry [Billions of dollars]

	2009	2010	2011	2012	2013	2014	2015	2016	2017
Wage and salary disbursements	**6,251.4**	**6,377.5**	**6,633.2**	**6,930.3**	**7,114.4**	**7,477.8**	**7,854.4**	**8,080.7**	**8,453.8**
Private industries	**5,076.3**	**5,186.4**	**5,438.4**	**5,732.0**	**5,906.8**	**6,240.5**	**6,578.7**	**6,773.0**	**7,108.1**
Goods-producing industries	1,058.0	1,053.3	1,100.8	1,155.5	1,190.1	1,260.9	1307	1328.3	1390.3
Manufacturing	661.3	674.1	706.7	734.3	746.8	780.9	807.2	814	846.4
Services-producing industries	4,018.3	4,133.1	4,337.6	4,576.5	4,716.7	4,979.7	5271.7	5444.7	5717.8
Trade, transportation, and utilities	984.6	998.9	1,044.5	1,092.6	1,118.5	1,175.5	1237	1262	1313.5
Other services-producing industries	3,033.7	3,134.2	3,293.1	3,483.9	3,598.2	3,804.2	4034.7	4182.7	4404.3
Government	**1,175.1**	**1,191.1**	**1,194.8**	**1,198.2**	**1,207.6**	**1,237.2**	**1,275.8**	**1,307.7**	**1,345.7**

Table 3-6. Hours Worked by Full-Time and Part-Time Employees by Industry (Millions of Hours)

	2010	2011	2012	2013	2014	2015	2016	2017
Hours worked by full-time and part-time employees	222053	226014	230328	233870	238476	243373	246631	249508
Domestic industries	224005	227979	232383	236137	241017	246040	249682	252730
Private industries	187284	191877	196701	200707	205562	210441	213842	216979
Agriculture, forestry, fishing, and hunting	2504	2448	2448	2530	2581	2667	2778	2679
Farms	1507	1467	1463	1499	1528	1575	1640	1584

Forestry, fishing, and related activities	997	981	985	1031	1053	1092	1138	1095
Mining	1431	1664	1822	1841	1974	1699	1368	1408
Utilities	1088	1079	1062	1073	1090	1102	1103	1102
Construction	11199	11092	11624	12196	12772	13510	14031	14502
Manufacturing	22646	23162	23703	23956	24355	24540	24548	24795
Durable goods	13872	14400	14877	15079	15387	15481	15416	15514
Nondurable goods	8774	8762	8826	8877	8968	9059	9132	9281
Wholesale trade	10089	10382	10574	10718	10831	10973	10928	11082
Retail trade	21315	21741	22066	22024	22377	22830	22869	23121
Transportation and warehousing	7413	7794	7996	8297	8580	8995	9271	9516
Information	4928	4872	4849	4880	4953	4967	5041	5084
Finance and insurance, real estate, rental, and leasing	13605	13778	14032	14164	14345	14802	14983	15242
Professional and business services2	29546	30883	31664	32795	34039	35036	35853	36323
Educational services, health care and social assistance	32814	33580	34776	35369	35766	36792	37927	38633
Arts, entertainment, recreation, accommodation, and food services	18800	19159	19975	20675	21407	21963	22528	22932
Other services, except government	9906	10243	10110	10189	10492	10565	10614	10560
Government	36721	36102	35682	35430	35455	35599	35840	35750
General government	33255	32719	32368	32201	32229	32356	32540	32425
Government enterprises	3466	3383	3314	3228	3227	3243	3300	3325
Rest of the world	-1952	-1965	-2055	-2267	-2541	-2667	-3051	-3222

3.12 Visual Resources

Visual resources are the natural and anthropogenic features that comprise the visual qualities of a given area, or "viewshed." These features form the overall impression that an observer receives of an area or its landscape character. Topography, water, vegetation, human-made features, and the degree of panoramic view available are examples of visual characteristics of an area.

Visual resources are mentioned in NEPA and CEQ regulations to implement NEPA under the heading of "Aesthetics." These regulations identify aesthetics as one of the elements or factors in the human environment that must be considered in determining the effects of a project. Visual resources can be subjective by nature, and therefore the level of the proposed project's visual impacts can be challenging to quantify. Generally, projects that create a high level of contrast to the existing visual character of a project setting are more likely to generate adverse visual impacts due to visual incompatibility. Thus, it is important to assess a project's effects relative to the existing conditions of the area. On this basis, specific project components and their effect on the visual environment are quantified and evaluated for impact assessment purposes based on factors affecting setting compatibility such as changes in visual vividness, intactness, and unity from the existing conditions.

The ROI for visual resources is defined by those parts of the areas in which temporary or permanent visual changes could occur. For the Study Area, this includes the bridge itself, the area above and the river below said bridge and any adjoining land along the roadway corridor and its immediate surroundings. The ROI includes the viewshed both along the roadway corridor and from the waterway.

3.12.1 Existing Conditions

The general visual landscape of the ROI can be described as being a rural area and thus the corridor is classified as a rural minor arterial roadway. The ROI is part of a rural stretch of two-lane road that ultimately connects two primary residential hubs in within Virginia Beach and Chesapeake.

Along the Virginia Beach section of the ROI, there are mostly scattered single-family homes dating from the 1950s and 60s. The roadway corridor is likely visible from most of the residences, as it is at ground level. Forested areas and one large freshwater emergent wetland are situated between and among some of these homesites. There are some parcels that contain abandoned outbuildings and overgrown vegetation along the ROI. There is one large home situated adjacent to the bridge along the AIWW waterfront. This home has a clear view of both the bridge and the AIWW.

Along the Chesapeake section of the ROI, there is no development. The dominant feature on both sides of the corridor in the visual landscape is the lush, freshwater bottomland forested wetland. Photographs of the wetland areas are provided in the wetland section of this chapter.

The North Landing Bridge itself is a double swing span, narrow two-lane bridge constructed in 1951 that crosses over the AIWW (Figure 3-24 and Figure 3-25). The bridge and its approaches are an at-grade crossing. The bridge itself has solid low-profile metal side walls. When open, the bridge spans swing laterally to either side.

The Virginia Department of Conservation and Recreation's Division of Natural Heritage (VDCR) stated in a letter dated January 4, 2019, that this section of the North Landing River/AIWW has been designated a Virginia Scenic River, per Virginia Code 10.1-200. VDCR recommended that USACE contact the VDCR's Division of Planning and Recreational Resources. VDCR's Division of Planning and Recreational Resources provided their recommendations in the CZMA concurrence letter dated May 17, 2019. The recommendations are also included in Section 8, "Summary of Best Management Practices/Mitigation Measures in this report.

From the AIWW and North Landing River, the setting of the area has an appearance that is almost entirely natural. Both sides of the AIWW are mostly heavily forested and the waterway has almost no development. In fact, for several miles in either direction on the waterway, the only human-made features visible from the waterway are the low-profile bridge, its wooden fender system, its operator building, a gravel parking lot, the NuStar fuel tanker depot, and the adjacent waterfront home.

Figure 3-25. Existing North Landing Bridge, facing west. (Source: USACE)

Figure 3-24. Existing North Landing Bridge, facing north. (Source: USACE)

3.13 Recreation

Recreational amenities are defined as those lands and facilities that provide for relaxation, rest, exercise, activity, enjoyment, education, or opportunities for leisure and community support that enrich the quality of life. These include, but are not limited to, parks, trails, boat ramps, piers, marinas, athletic fields, playgrounds, and community centers. Recreational areas may include any type of activity in which residents or visitors may participate. Activities include hiking, bicycling, boating, fishing, swimming, sunbathing, picnicking, playground use, or participation in sports.

Each city has a comprehensive plan that includes long-range plans, goals, and considerations for parks and recreation. The comprehensive plan for the City of Virginia Beach is called "City of Virginia Beach Comprehensive Plan—It's Our Future—A Choice City," and is dated May 17,

2016. The City of Chesapeake's comprehensive plan is called "Moving Forward, Chesapeake 2035", and was adopted on February 25, 2014, and amended on November 15, 2016.

The ROI is defined as all existing and proposed recreational lands and facilities that would be affected either directly or indirectly by the project. This includes the limits of physical disturbance caused by construction and maintenance of the project features, including temporary and permanent fill and structures, all temporary or permanently cleared areas, and all areas otherwise converted to another use, or that will result in limited recreational use, as a consequence of the construction of the measures. The ROI also includes the extent of hydraulic and water quality impacts that would have the potential to impact use of recreational areas, or all areas within 100 feet upstream and downstream of the bridge. Also the ROI would include a 500-foot buffer around all temporarily and permanently impacted areas, to capture the extent of potential noise impacts as they pertain to use of recreational areas. (The noise impact assessment is included in a separate section of this document).

The ROI lies within area covered under the Green Sea Blueway and Greenway Management Plan. This plan was a regional collaborative plan among the Cities of Virginia Beach and Chesapeake, and the County of Currituck. Its stated purpose is "to develop long-term management strategy that protects, conserves, and manages a unique system of natural resources, open space areas, and selectively-chosen recreational uses, activities, and facilities that are sustainable." The plan further explains that its goals are "to establish and cultivate the long-term stewardship of the Green Sea area's natural, cultural, and recreational resources through ongoing outreach and education, protection of the area's ecological integrity, and the provision of passive recreational uses and activities that can coexist with the area's tremendous array of natural resources and amenities to protect and manage a system of upland, wetland, and waterway resources. The areas covered under this plan include the southern watersheds of Virginia Beach and Chesapeake and northeastern watershed in Currituck County, North Carolina. (City of Chesapeake, City of Virginia Beach, and the County of Currituck, 2015).

3.13.1 Existing Conditions

The North Landing River and the AIWW are regarded as a major recreational resources that are used extensively for boating, canoeing, kayaking, bird watching, and recreational fishing. As will be discussed in greater detail later in this report, the USACE's 2017 vessel report indicates that approximately 8,868 vessels passed through the bridge opening that year; with 7,345 of them being recreational vessels. The river and its tributaries have also been designated by the state and city as a Virginia Scenic River.

City of Virginia Beach

Within the ROI in Virginia Beach, there are mostly low-density residential homes and forested land. There are currently no public parkland, canoe launches, or other designated recreational areas or facilities within the ROI (Figure 3-26). There is one old boat ramp that is in despair with broken pavement and overgrown vegetation; however, it is on private property (Figure 3-27).

Figure 3-26. Facing downstream on the AIWW (USACE Photo, June 2018).

Figure 3-27. Existing old boat ramp on the gravel parking lot peninsula (USACE Photo, June 2018).

City of Chesapeake

As previously mentioned, the ROI within the City of Chesapeake is not developed, and is nearly all forested wetlands. Currently, there are no public recreational facilities there. The Nature Conservancy, recognizing the high quality of many of the wetland areas along the AIWW and North Landing River, has been buying many forested tracts of land within the watershed to be preserved as natural habitat. The Nature Conservancy owns a tract of land approximately 692 acres in size, a portion of which is within the ROI. The tract is bisected by the Mount Pleasant Road, with the vast majority of this land lying to the east of the road. The Navy owns a large tract on the west side of the road, which was purchased to help protect the operations of it Fentress Airfield (Navy, 2014). The USACE also owns a large tract of land on the west side of the road that includes the Albemarle and Chesapeake Canal Historic District, as well as AIWW and bridge itself.

There is a privately-owned 43-acre linear tract of land on the east side of Mount Pleasant Road, bordering the AIWW. There is a gated unpaved access road from Mount Pleasant Road on this

parcel. There may be a narrow strip of well-drained soil along the shoreline of this property. Aerial photography suggests that there appears to be a small clearing near the shoreline and the parcel may be used passively for camping, hunting, or fishing.

Public Use Trails and Bicycle Facilities

Currently, there are no sidewalks, walking or bicycling trails, and little to no roadway shoulder along the entire ROI corridor--Mount Pleasant Road in Chesapeake and North Landing Road in Virginia Beach (Figure 3-28). In addition, the existing corridor is very narrow. As a result, the existing corridor currently is not conducive to walking, bicycling, or other shared use recreational activities.

Figure 3-28. The existing bridge and roadway corridor across both cities has no walking or bicycle trails.

The comprehensive plans of both cities indicate a desire for a shared use trail along the ROI corridor across the North Landing Bridge, connecting to the two cities (This shared use trail is envisioned to be part of a larger network of existing and proposed trails in both cities (City of Virginia Beach, 2016, and City of Chesapeake, 2014).

3.14 Hazardous, Radioactive, and Toxic Wastes (HRTW)

Hazardous materials include, but are not limited to, hazardous and toxic substances (biological, chemical, and/or physical) and waste, and any materials that pose a potential hazard to human health and the environment due to their quantity, concentration, or physical and chemical properties. Hazardous wastes include discarded and/or spent materials that are listed in 40 CFR 261.31-.34 and are characterized by their ignitability, corrosivity, reactivity, and toxicity. Hazardous materials and wastes, if not controlled, may either (1) cause or significantly

contribute to an increase in mortality, serious irreversible illness, or incapacitating reversible illness, or (2) pose a substantial threat to human health or the environment. Radioactive waste is the radioactive by-products from the operation of a nuclear reactor or from the reprocessing of depleted nuclear fuel.

The primary relevant federal regulations include those promulgated under the Resource Conservation and Recovery Act (RCRA) of 1974 and the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA). CERCLA, otherwise known as the Superfund program, provides a federal "Superfund" to clean up uncontrolled or abandoned hazardous waste sites as well as accidents, spills, and other emergency releases of pollutants and contaminants into the environment (EPA, 2019).

The Toxic Substances Control Act of 1976 (TSCA) provides the EPA with the authority to require reporting, record-keeping, testing requirements, and restrictions relating to chemical substances and/or mixtures. TSCA addresses the production, importation, use, and disposal of specific chemicals, including polychlorinated biphenyls (PCBs), asbestos, radon, and lead-based paint (EPA 2019).

The Virginia Department of Environmental Quality (VDEQ) Waste Division rules regarding asbestos adopt existing federal Occupational Safety and Health Administration (OSHA), and USEPA regulations and apply them to all public facilities in which activities involving the disturbance or removal of asbestos containing material (ACM) may occur. The USEPA maintains guidance on management inspection of facilities that may have lead-based paint (LBP). The state rules regarding LBP adopt existing OSHA and USEPA regulations and apply them to all public facilities in which activities involving the disturbance or removal of LBP may occur.

The ROI includes all areas temporarily and permanently disturbed by construction. This includes all fill, pilings, footings, bridge fenders and other attendant feature footprints; all areas to be spanned by the new bridge; all areas to be temporarily used for construction access, and all existing roadbeds within the Study Area. It includes any areas directly or indirectly impacted during construction.

The following analysis of hazardous materials and wastes includes a description of existing contamination and the risk of exposure to hazardous materials and waste related to the contamination and to routine use, storage, and transportation of hazardous materials. Sources for hazardous materials and wastes are available through web sites for EPA and the VDEQ.

The VDEQ Waste Division maintains records for the following information:

1) CERCLA Information System. This database lists potential hazardous release sites under the Superfund Program, a federal program to clean up the most hazardous sites.
2) Resource Conservation and Recovery Information System (RCRIS). This is an inventory of hazardous waste handlers.
3) Toxics Release Inventory (TRI). This is an information system about toxic chemicals that are being used, manufactured, treated, transported, or released into the environment.
4) Solid Waste Facilities Inventory. This is an information system about large facilities for the storage and handling of solid waste, whether transported or left in place.

5) Pollution Response Program (PREP) database lists all reports by agencies and citizens to VDEQ of anything, whether it is strictly pollution or not.

3.14.1 Existing Conditions

Superfund (CERCLA) Sites

The nearest CERCLA sites to the ROI are former industrial sites on the Southern Branch of the Elizabeth River about 15 miles to the northwest. These are Atlantic Wood, a former creosoting plant, and Peck Iron and Metal, a former scrap yard (EPA, 2019).

RCRIS Sites

These RCRIS generators include dry cleaning establishments, gasoline stations, fiberglass manufacturers and other industrial facilities. There are no registered storage tanks within the ROI. The closest are at a gas station (Hog Heaven North Landing Grocery) 1.46 miles north, a private tank (VO-TECH CENTER) 1.57 miles northeast, and at a distributor (NuStar Terminals North Landing #12) 0.39 mile east. The latter of these is a substantial storage facility which supplies fuel for the Navy. The large cylindrical above ground storage tanks along the AIWW are supplied by barge, and the facility supplies the fuel via a pipeline to the air station. The pipeline is in the ROI (Figure 3-29) (VDEQ, VEGIS Mapper 2019).

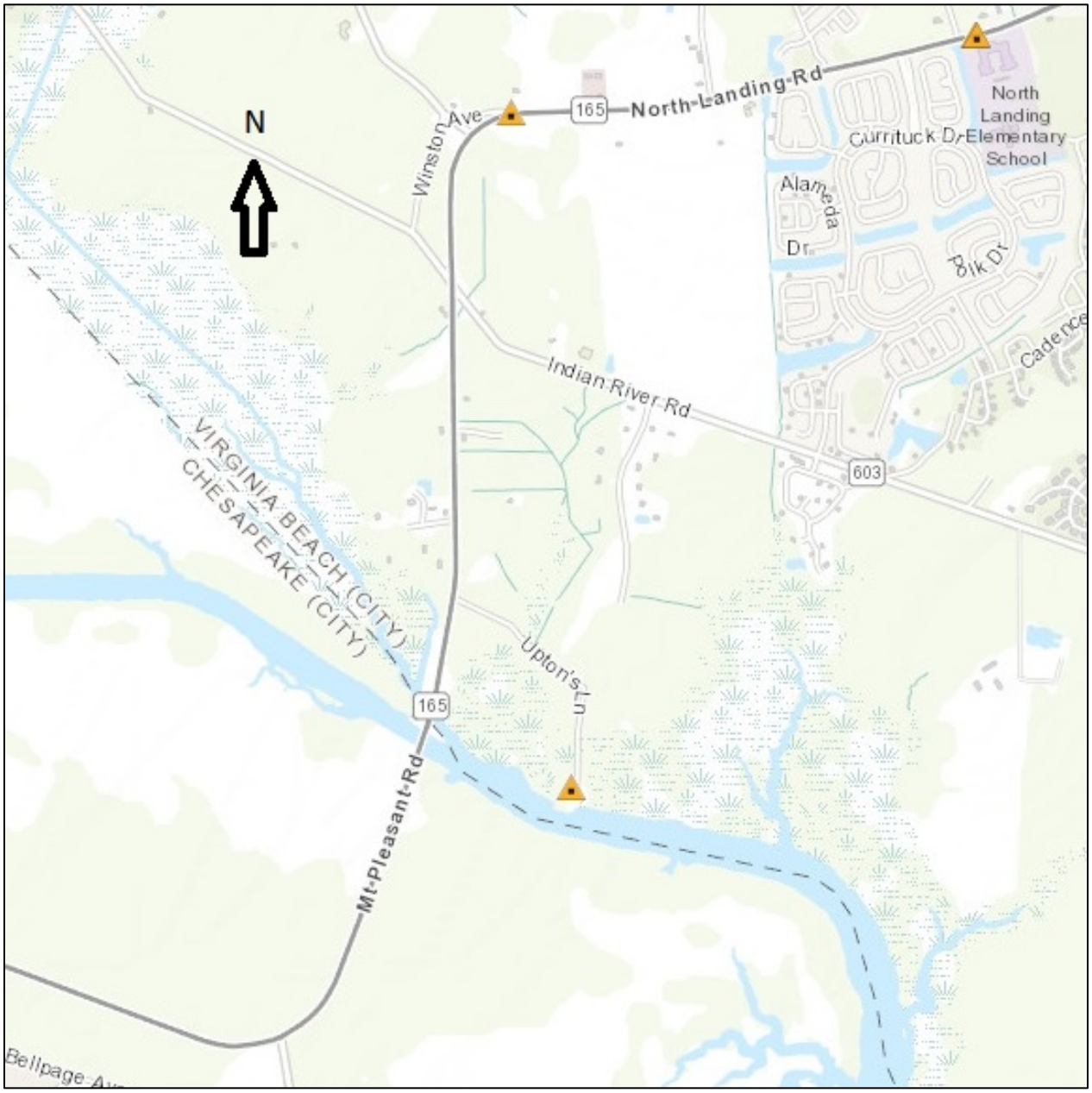


Figure 3-29. VDEQ Registered Petroleum Storage Tanks. Source: VDEQ VEGIS mapper (2019).

PREP Database

The PREP data available from VDEQ's website as of January 15, 2019 listed all calls or other notifications VDEQ received. Of these, eight are within the 4-mile perimeter of the project site or have direct drainage in to the river near the project site. Two of these calls were for sinking boats, one for a fish kill, one for wastewater, one for pipeline valve, one for sheen on water, and one for fuel spill. Another incident recorded in the data base includes a drill for responding to

hazardous materials situations. If the report proves to be consequential, it is recorded under another program, such as the Remediation/Aboveground Storage Tanks (AST) & Underground Storage Tank (UST) program, which includes geocoding the location. VDEQ's website indicates that it does not certify this data to be all inclusive or complete. This data is provided to the citizens of the Commonwealth of Virginia free of charge for informational purposes only. (VDEQ VEGIS Mapper 2019).

HTRW Sites

No significant HTRW releases to the project area have been documented. As with any active industrial area, there is the potential for HTRW contaminants to be released to the environment from a multitude of sources; however no evidence has been found to suggest that sediments have been exposed to HTRW (VDEQ VEGIS Mapper 2019).

Solid Waste Facilities

There are no solid waste facilities on the project site or within 4 miles (VDEQ VEGIS Mapper 2019).

Brownfields Sites

Brownfields is a term used in the U.S. to describe tracts of land formerly used for industrial or commercial purposes. They may contain construction debris and contaminants, but not to the degree of a Superfund site. EPA has a grant program for the rehabilitation of brownfields sites, but there are none in the project area identified under that program (VDEQ VEGIS Mapper 2019).

VDEQ - Virginia Pollutant Discharge Elimination System (VPDES)

Section 402 of the Clean Water Act established the National Pollutant Discharge Elimination System (NPDES) program to limit pollutant discharges into streams, rivers, and bays. In the Commonwealth of Virginia, VDEQ administers the program as the Virginia Pollutant Discharge Elimination System (VPDES). VDEQ issues VPDES permits for all point source discharges to surface waters, to dischargers of stormwater from Municipal Separate Storm Sewer Systems (MS4s), and to dischargers of stormwater from Industrial Activities, and Virginia Stormwater Management Program (VSMP) permits to dischargers of stormwater from Construction Activities.

There is a VPDES permit in the ROI (Figure 3-30). It is a general permit at 3001 Mount Pleasant Road. General permits cover lower impact discharges such as car wash or laundry effluents. There is one individual permit within two miles of the ROI, which is at the NuStar tank facility (VDEQ VEGIS Mapper 2019).

Figure 3-30. VPDES Permits. Source: VDEQ VEGIS Mapper (2019).

Existing site development

Currently, the site contains a solid fill paved roadway and bridge constructed in the 1950s. There is a possibility that the existing road bed may contain HTRW materials. The road was constructed on fill and there is no existing information on the contents of the fill. Due to the age of the existing road there is a possibility that the fill may not be considered clean and may require special handling and/or disposal.

The bridge tender's station building and the bridge itself, a double-swing span moveable bridge, contain electrical and mechanical machinery from that timeframe as well. There are aerial electric, telephone, and cable lines supported by large utility poles. The bridge electrical and mechanical machinery likely contain fuels, oils, and possibly PCBs. The bridge tender's station building could also contain some level of PCBs, asbestos, and/or lead paint. According to NuStar Terminals, its fuel line may contain asbestos. The utility lines and poles may also contain hazardous materials.

3.15 Safety

This analysis considers the safety conditions and/or hazards to the public within the ROI, including those relating to land use, roadway vehicular transportation and navigational transportation, and construction.

3.15.1 Highway Safety

The Federal Highway Administration (FHWA) and Virginia Department of Transportation (VDOT) regulations emphasize safety in the design and construction of roadways. The American Association of State Highway Transportation Officials (AASHTO) is a nonprofit association that represents highway and transportation departments across the U.S., and serves as a liaison between federal and state transportation officials. One of its missions is to set design and installation standards (USDOT, 2019). The VDOT Road Design Manual has adopted the design and safety standards of AASHTO Green Book (VDOT 2005).

3.15.2 Navigational Safety

The U.S. Rivers and Harbors Act 1899 (33 USC 403) prohibits the creation of any unauthorized obstruction to the navigable capacity of any of the waters of the U.S. It requires authorization for any temporary or permanent alteration or modification of any course, location, condition or capacity of any port, haven, harbor, canal, or other navigable waterway. The Act also authorizes the U.S. Coast Guard to impose requirements for navigational safety, and for establishment of anchorage grounds for vessels in navigable waters of the U.S. whenever it is apparent that these are required by the maritime or commercial interests of the United States for safe navigation. Per Virginia Code Section 29.1-744, the VDGIF has been delegated authority over various waterway safety measures, such as designated No Wake Zones and placement of navigation markers. As mentioned in the Transportation and Navigation section of this chapter, Congress delegated to the U.S. Coast Guard the permit authority over the construction of any bridge over navigable waters, unless specifically exempted by Coast Guard regulations.

3.15.3 Air Traffic Safety

As mentioned in the Land Use section of this chapter, DOD developed the Air Installation Compatible Use Zone (AICUZ) program in the 1970s, in response to the need to balance military aircraft operations with community concerns over aircraft noise and accident potential. The AICUZ Program recommends that noise contours, accident potential zones (APZs), height and obstruction requirements, and associated land use recommendations be incorporated into local community planning. The Navy establishes APZs based on historical data for aircraft mishaps near military airfields. The Navy indicates that "APZs identify probable impact areas if an accident were to occur; however, APZs do not predict the probability of an accident occurring." The three types of APZ designations are Clear Zone, APZ 1, and APZ 2. Clear

zones are typically trapezoidal-shaped zones immediately at ends of the runways, are the zones where accidents are most likely, and should remain undeveloped. APZ 1s lie beyond Clear Zones, and APZ 2s lie beyond APZ 1s. Of the three, APZ 2s are where accidents are considered least likely, and some limited low density development is considered compatible (Navy, 2014).

The Federal Aviation Administration (FAA) has the responsibility and authority under the Air Commerce Act to promote air safety and the efficient use of the navigable airspace. Under this authority, per 14 CFR 77, FAA requires proponents sponsoring any construction or alterations which may affect navigable airspace, to file a Notice of Proposed Construction or Alteration (FAA Form 7460-1) either electronically or manually with the FAA.

3.15.4 Occupational Safety

The Occupational Safety and Health Act (OSHA) of 1970 and implementing USEPA regulations created the Occupational Safety and Health Administration to require the assurance of safe and healthful working conditions for working men and women by setting and enforcing standards and by providing training, outreach, education, and assistance.

The ROI for all aspects of safety includes the limits of all physical disturbance caused by construction and maintenance of the project features, including temporary and permanent fill and structures, all temporary or permanently cleared areas, and all areas otherwise converted to another use, or that will result in an altered or limited use, as a consequence of the construction of the measures. Safety considerations with respect to transportation, navigation, and airspace are key with respect to this project, as are workers' safety before, after, and during construction. They are discussed herein, and also in more detail in the Land Use and Transportation and Navigation section of this chapter and Chapter 7. Also considered are safety practices during construction for both the public and the workers.

3.15.5 Existing Conditions

The existing bridge and its roadway corridor were constructed in the early 1950s, prior to the development of roadway safety standards. Currently the bridge measures approximately 24 feet in clear width, with no shoulders. As described in Chapter 2, it has undergone maintenance work when either damaged and/or to extend its operational life. However, the operational and maintenance work cannot bring the bridge up to modern safety standards. The bridge is also weight-restricted to 13 tons.

The bridge and roadway corridor are currently classified as a VDOT minor arterial roadway. The preliminary engineering report indicates that they are far below the current safety standard for width, weight, and capacity, which call for at least two 12-foot lanes and two 10-foot shoulders. In addition, the current weight restriction prohibits use by larger vehicles including emergency response vehicles and tractor trailers. It is known that large vehicles violate these restrictions and use the bridge regardless, however, contributing to further wear and tear and potential damage on the roadway and bridge, and potential safety hazards for other vehicles.

As described in Chapter 2, the bridge also poses a navigational restriction. Currently the AIWW navigational channel has a horizontal clearance of 125 foot feet north of the bridge, and 100 feet south of the bridge; and the channel is constricted to an 80-foot horizontal clearance between the bridge fenders. In order to navigate through the channel at the bridge safely, commercial

vessels must slow down; and there have been navigational allision accidents along the fender system of the bridge due to navigational operator error. Vertically, the bridge has a clearance of 6.5 feet, which necessitates openings for many vessels.

Whenever the bridge is closed due to malfunctions, maintenance, or emergency repair, roadway traffic must use a 15-mile detour, and the navigational channel is either further restricted or closed for safety purposes. Also, when fuel deliveries may not pass through the bridge by barge, they must be transported to the Navy by land on multiple fuel truckloads. This can burden other roadways and present travel delays.

As mentioned in the Land Use section of this chapter, the ROI is also located within the Accident Potential Zone 2 (APZ-2) per the AICUZ program, due to its proximity to Fentress NALF. This means that the ROI is within the airspace used for take-off and/or landings.

3.16 Utilities

The Underground Utility Damage Prevention Act regulates the notification, reporting, and management of excavation activities in the Commonwealth of Virginia. All utilities, meaning any item of public or private property which is buried or placed below ground or submerged for use in connection with the storage or conveyance of water, sewage, telecommunications, electric energy, cable television, oil, petroleum products, gas, or other substances, and includes but is not limited to pipes, sewers, combination storm/sanitary sewer systems, conduits, cables, valves, lines, wires, manholes, attachments, and those portions of poles below ground. Effects on existing or proposed aboveground municipal, commercial, or private utilities are also considered.

This section focuses on all utilities within the ROI. The ROI includes any existing or proposed utility services and infrastructure to be impacted temporarily or permanently, directly or indirectly. This would include all existing roadbeds and shoulders, all proposed roadway footprints and areas to be spanned by the new bridge, all construction access areas.

3.16.1 Existing Conditions

A fuel line and facility operated by a private company, NuStar, serves the Navy, and is located within the ROI, on the Virginia Beach side of the AIWW. The fuel facility is located along the AIWW waterway, and the fuel line runs adjacent to Upton Lane and North Landing Road. According to NuStar, part of the original fuel line was abandoned and remains in place right next to the current one. In addition, the land adjacent to the fuel facility is experiencing erosion (personal communication with NuStar).

The only known public utilities in the Study Area are aboveground telecommunications cables (telephone, television, cable, or fiber optic) and electrical transmission lines along the existing roadway corridor. These are operated by privately owned companies that provide service to the Cities of Chesapeake and Virginia Beach. Both cities have verified that there are no municipal water, wastewater, or stormwater infrastructure lines serving the Study Area; it is presumed that the residents are served by well water and septic. Information on gas lines is proprietary so discussion on gas lines will be limited. There were no utilities identified as attached to the existing structures.

3.17 Air Quality

Air quality can be defined as the degree to which the ambient air concentration is contaminated with any one or more pollutant that has been scientifically proven to be a health concern. To protect the overall health and well-being of the public and to prevent further damage to the environment, Congress established the Clean Air Act of 1970 (amended 1990).

Under the Clean Air Act, EPA sets specific limits on certain outdoor air pollutants at the thresholds that have been established at levels that are known to be safe. The EPA sets and implements the National Ambient Air Quality Standards (NAAQS) for six criteria pollutants known to cause detrimental health effects. Those pollutants are: ozone, particulate matter, nitrogen dioxide, sulfur dioxide, carbon monoxide and lead. The EPA is also required to designate areas as either meeting (attainment) or not meeting (nonattainment) the NAAQS.

It is necessary that the states develop a general plan to attain and maintain the NAAQS in all areas of the country, and a specific state implementation plan (SIP) to re-attain the standards for each area designated nonattainment for a NAAQS. According to the plans that are outlined in the SIP, states and local agencies are given delegated authority to implement the regulations in order to control emissions sources of criteria pollutants. Established under the Clean Air Act (section 176(c)(4)), the General Conformity rule ensures that the actions taken by federal agencies, do not interfere with a state's plans to attain and maintain national standards for air quality. ("Clean Air Act Overview | USEPA", 2019)

According to 40 CFR 93.153(b), for Federal actions not subject to Federal Highway Administration (FHWA) regulations or the Federal Transit Act (FTA), a conformity determination is required for each criteria pollutant or precursor where the total of direct and indirect emissions of the criteria pollutant or precursor in a nonattainment or maintenance area caused by a Federal action would equal or exceed any of the established rates for each of the following pollutants.

3.17.1 Criteria Pollutants

Ozone

Ozone (O_3) builds up near the ground through a series of complex chemical reactions involving VOCs and NOx (Volatile Organic Compounds, oxides of nitrogen; respectively) in the presence of sunlight. Ozone concentrations vary depending on the weather conditions but is more readily formed on warm, sunny days when the air is stagnant, primarily from March through October. An ozone exceedance day is counted if the measured eight-hour average ozone concentration exceeds the standards making ozone levels unhealthy and causing breathing difficulties. Conversely, ozone production is more limited when it is cloudy, cool, rainy, or windy. ("Ground-level Ozone Pollution | USEPA", 2019) ("Air Quality in Virginia", 2019)

Carbon Monoxide

Carbon monoxide (CO) is a colorless, odorless, poisonous gas produced by the incomplete combustion of fossil fuels. Carbon monoxide is produced primarily by motor vehicles. It can reduce a person's ability to think clearly and causes visual impairment and headaches or death if high enough concentrations are experienced for a long period of time. ("Carbon Monoxide (CO) Pollution in Outdoor Air | USEPA", 2019)

Nitrogen Dioxide

Nitrogen dioxide (NO_2) is a primary component of nitrogen oxides (NO_x), and is produced when fuel is burned in motor vehicles, power plants, industrial boilers and other sources. Nitrogen dioxide can place a strain on the heart and respiratory system and can increase a person's susceptibility to respiratory infections. ("Nitrogen Dioxide (NO2) Pollution | USEPA", 2019)

Sulfur Dioxide

Sulfur dioxide (SO_2) is produced by power plants and industries that burn fossil fuels containing sulfur, such as coal and oil, and by the phosphate industry through its production of sulfuric acid. Sulfur dioxide is irritating to the lungs and can result in a higher incidence of respiratory disease. ("Sulfur Dioxide (SO2) Pollution | USEPA", 2019)

Particulate Matter

Particle pollution, also known as particulate matter, is the general term used for a mixture of solid particles and liquid droplets found in the air and is made up of a number of components, including acids (such as sulfates and nitrates), organic chemicals, metals, soil or dust particles, and allergens (such as fragments of pollen or mold spores).

$PM_{2.5}$ describes the small or fine particles that are 2.5 micrometers in diameter or less in size (such as those found in smoke and haze) and pose the greatest health threat. PM_{10} or coarse particles describe particles that are greater than 2.5, but less than or equal to 10 micrometers in diameter.

Fine particles can result directly from emissions of fuel combustion from motor vehicles, power generation and industrial facilities, as well as from residential fireplaces and wood stoves. Coarse particles are generally emitted from sources such as vehicles traveling on unpaved roads, materials handling, crushing and grinding operations, and windblown dust. Their chemical and physical compositions vary depending on location, time of year, and weather.

The USEPA has established two health-based air quality standards for particle pollution, one for $PM_{2.5}$and the other for PM_{10}. The Virginia Department of Environmental Quality, in cooperation with several city and county air pollution control agencies, monitors for particle pollution air quality throughout the state. ("VDEQ - Ozone and PM2.5 Regional Planning Activities", 2019).

Lead

(Pb) Sources of lead emissions include pipes, fuel, and paint, however, with the phasing-out of leaded fuel and paints for their safer unleaded counterparts in the past two decades lead emissions have dropped to an all-time low. ("Lead Air Pollution | USEPA", 2019)

The Clean Air Act also establishes a national goal of preventing degradation or impairment in any federally designated Class I area. Class I areas are defined as all national parks over 6,000 acres and all wilderness areas and memorial parks over 5,000 acres. In Class I areas, visibility impairment is defined as a reduction in visual range and atmospheric discoloration. In the context of the Prevention of Significant Deterioration (PSD) for air quality permitting, an applicant must provide a separate analysis of air quality impacts in any Class I area that may be impacted by the new or modified facility. The Hampton Roads area of Virginia is not within 250 kilometers of at least one Class I area. Therefore, new PSD applications are not required to

include a Class I air quality impact analysis. ("Prevention of Significant Deterioration Basic Information | USEPA", 2019).

The ROI for the North Landing Bridge Project with respect to air quality is defined by the USEPA's Section 3 Regulatory Boundary as being that of the Hampton Roads Area, which comprises the cities of Chesapeake, Hampton, Newport News, Norfolk, Poquoson, Portsmouth, Suffolk, Virginia Beach, and Williamsburg, and the counties of Gloucester, Isle of Wright, James City, and York, Virginia.

3.17.2 Existing Conditions

The North Landing Bridge Project is located in Hampton Roads, which is located at the eastern edge of the Chesapeake Bay Airshed, an area that is over four times larger than its watershed and covers much of the Ohio valley and the mid-Atlantic region. According to USEPA's Greenbook, the Hampton Roads Area is currently in attainment for all criteria pollutants. ("Green Book | USEPA", 2019). VDEQ Air Division verified this in its CZMA concurrence determination comments, specifying that the airshed is in attainment for the latest standards for ozone. Therefore, a general conformity determination is not required. However, VDEQ Air Division notes in its CZMA concurrence determination comments that the Hampton Roads Area is in an emission control area for NO_x and volatile organic compounds (VOCs).

3.18 Noise and Vibration

Sound is a physical phenomenon consisting of minute vibrations that travel through a medium, such as air, and are sensed by the human ear as well as most fauna. Noise is generally defined as unwanted sound that is typically associated with human activity and that interferes with or disrupts normal activities of humans and wildlife. The human environment is generally characterized by a certain consistent noise level that varies by area. This is called ambient, or background, noise. Although exposure to high noise levels has been demonstrated to cause hearing loss, the principal human response to environmental noise is annoyance. The response of individuals to similar noise events is diverse and influenced by the type of noise; perceived importance of the noise and its appropriateness in the setting; time of day and type of activity during which the noise occurs; and sensitivity of the individual.

Section 4(b) of the Noise Control Act (NCA) of 1972 (42 USC §§ 4901-4918) directs federal agencies to comply with applicable federal, state and local noise requirements with respect to the control and abatement of environmental noise. Congress defined environmental noise in the NCA of 1972 to include the intensity, duration, and character of sounds from all sources. In addition, both cities have Noise Ordinances, which contain time restrictions on specific types of noise producing activities, such as construction, and aims to protect citizens from offensively loud noise and vibration. Examples of which are use of power tools, including lawn mowers, music, vehicles and their associated noise, pets, and others. They do not cover aircraft, which are regulated under applicable federal laws and regulations.

3.18.1 Existing Conditions

The three main sources of noise within the Study Area to be considered in this report are airfield noise, traffic noise, and construction noise (Table 3-7). Each are very different types of noise in terms of intensity, frequency, and duration. Airfield noise is an existing condition within the ROI, due to the proximity of NALF Fentress and NAS Oceana, and would not be in any way

attributable to the bridge project. However, it is a relevant consideration as ambient noise and as a cumulative effect, so it is discussed herein. Traffic noise is the noise generated by roadway vehicles using the existing roadway and that are projected to use the proposed roadway. Construction noise is the temporary noise associated with any mobilization, clearing, establishment of construction access, removal of the existing roadway and bridge, construction of the new roadway and bridge, and demobilization. As noted earlier, the existing and proposed roadway alignments pass through a residential area within the ROI on the Virginia Beach side.

Traffic noise and construction noise are the noise sources attributable to Proposed Action and evaluated in this document. For federally funded roadways to be constructed on either new horizontal or vertical alignment, the Virginia Department of Transportation (VDOT) generally uses a noise analysis range of up to 500 feet in either direction of a proposed roadway alignment (VDOT 2018). Therefore, the USACE is using an ROI for noise analysis consisting of a buffer area of 500 feet in either direction of all roadway alignment alternatives.

The normal human ear can detect sounds that range in frequency from about 20 Hz to 20,000 Hz. However, all sounds in this wide range of frequencies are not heard equally well by the human ear, which is most sensitive to frequencies in the range of 1,000 Hz to 4,000 Hz. This frequency dependence can be taken into account by applying a correction to each frequency range to approximate the human ear's sensitivity within each range. This is called A-weighting and is commonly used in measurements of community environmental noise. The A-weighted sound pressure level (abbreviated as dBA) is the sound level with the "A-weighting" frequency correction (Navy 2014).

Table 3-7. Common Sounds and Their Levels.

Outdoor	Sound level (dBA)	Equivalent
Jet Plane (at ramp)	120	Rock Concert
Snowmobile	100	Subway train
Tractor	90	Garbage disposal
Noisy restaurant	85	Blender
Downtown (large city)	80	Ringing telephone
Freeway traffic	70	TV audio
Normal conversation	60	Sewing machine
Rainfall	50	Refrigerator
Quiet residential area	40	Library

Source: Center for Hearing and Communication (2019).

Airfield Noise

The Navy indicates that the main sources of noise at NALF Fentress are flight operations. The Navy has collected data from this source of noise, and that has been incorporated into NOISEMAP, the DOD-approved computer model that projects noise impacts around military airfields, to develop a map depiction of noise exposure. As mentioned in the Land Use section, the AICUZ program establishes both APZ zones and noise zones. Noise zones are determined for AICUZ purposes by using the day-night average sound level (DNL) noise unit of measure. The DNLs are depicted as a noise contours, for planning purposes (Navy 2014).

The Navy explains in its AICUZ publication that DNL averages the sound energy from aircraft operations at a location for a 24-hour time period. DNL also adds an additional 10 dBA to events occurring between 10:00 pm to 7:00 am. This 10 dBA “penalty” factors in the added intrusiveness of sound to account for the increased sensitivity during sleeping hours and because ambient sound levels at night are normally lower than during the daytime. By combining factors relating to noise: maximum noise levels, duration, the number of events over a 24-hour period, and nighttime events, the DNL produces a single measure of overall noise impact. The Navy indicates that studies have been done to reflect that DNL correlates well to, and therefore is an appropriate measure of, community noise annoyance. Although the DNL provides a single measure of overall noise impact, it does not provide specific information on the *number* of noise events or the *individual sound levels* that occur during the 24-hour period. For example, a DNL of 65 dBA could result from a few noisy events or a large number of quieter events (Navy 2014).

The resulting noise contour map developed for areas surrounding NALF Fentress is shown in Figure 3-31. It shows that the entire ROI outside of the military installation boundary is within the 75 dBA DNL noise contour, which is the highest level.

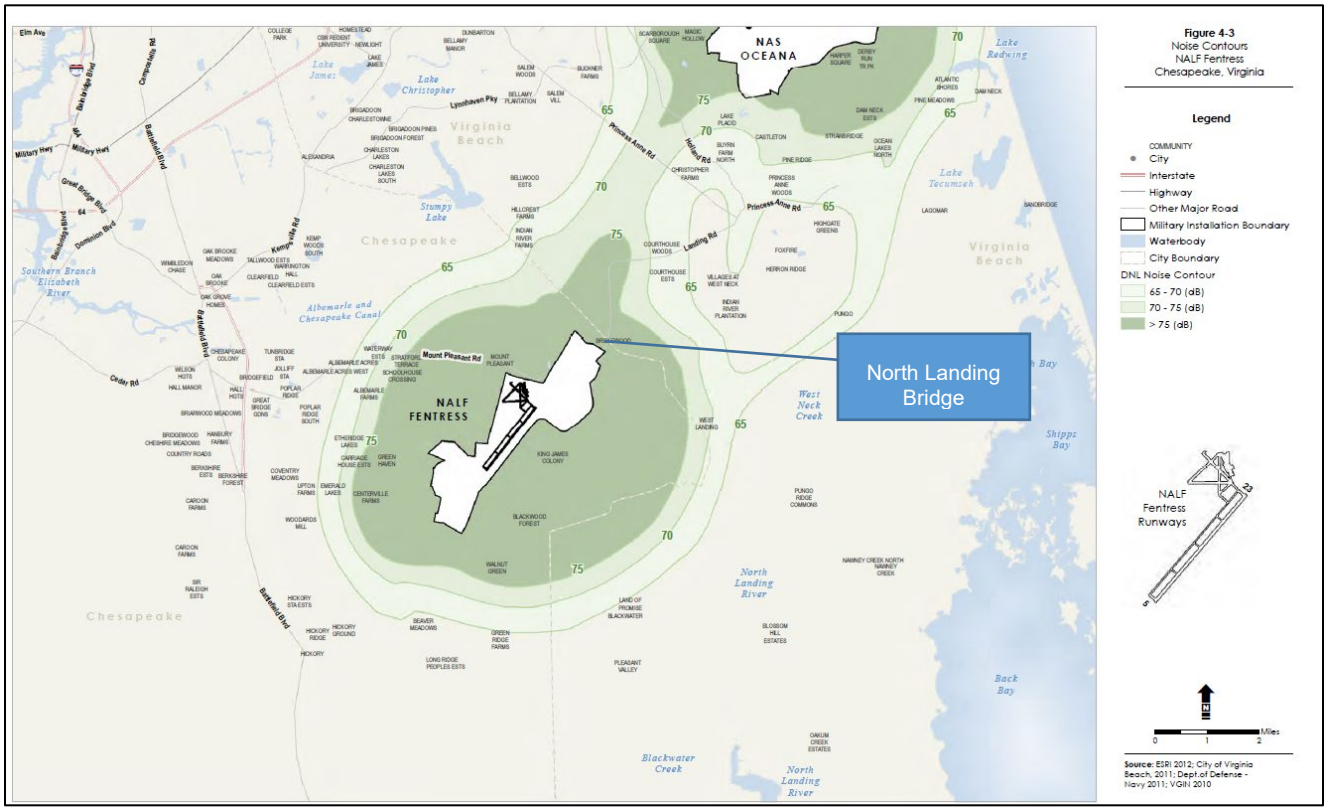


Figure 3-31. U.S. Navy noise contour map developed for NALF Fentress (Navy 2014).

Traffic Noise

The USACE does not have a noise analysis or model specifically designed to determine effects caused by traffic noise. Although we may consider the Navy's noise contour map, it was focused on broadly determining effects of its flight operations, rather than on site-specific ambient roadway corridor noise or other sources of noise within its Study Area.

The Federal Highway Administration (FHWA) and VDOT are required by 23 CFR 771, a U.S. Department of Transportation regulation, to conduct noise analysis studies on federally funded roadway projects on new horizontal or vertical alignment. Although this regulation does not apply to the USACE, and recognizing that the ROI is already a noise-impacted area, we are conducting a limited ambient traffic noise study. The monitoring is based on existing conditions at noise sensitive receptors, to obtain a worst noise hour (loudest hour of the day) reading. Noise sensitive receptors are buildings or parks where quiet forms a basic element of their purpose; residences and buildings where people normally sleep (e.g., homes, hotels, hospitals), where nighttime noise is most annoying; and institutional land uses (e.g., schools, libraries, parks, churches) with primarily daytime and evening use. Because noise levels at sensitive receptors are reduced by obstructions (such as sound walls) lying between them and the noise source, special emphasis is placed on sensitive receptors having a direct line of sight to the Proposed Action construction sites and facilities.

The existing bridge has a weight restriction due to its age and condition; however, USACE is aware that some overweight vehicles do use it. It was notable by USACE staff during a site visit

that the bridge's metal deck is rather noisy and makes a banging sound when a larger, heavy vehicles cross it. This would be an existing condition noise impact within the ROI, and would be mostly impact the adjacent home that is situated along the AIWW.

Construction Noise

Currently there is no ongoing construction activity within the ROI.

3.19 Climate Change

Global climate change is a transformation in the average weather of the Earth, which is measured by changes in temperature, wind patterns, and precipitation. Emissions of greenhouse gases above natural levels are considered to be a significant contributor to global climate change. Greenhouse gases are known to trap heat in the atmosphere and regulate the Earth's temperature. These gases include water vapor, carbon dioxide, methane, nitrous oxide, ground-level ozone, and fluorinated gases such as chlorofluorocarbons, and hydrochlorofluorocarbons.

The ROI for the North Landing Bridge Project with respect to air quality is defined by the EPA's Section 3 Regulatory Boundary as being that of the Hampton Roads Area, which comprises the cities of Chesapeake, Hampton, Newport News, Norfolk, Poquoson, Portsmouth, Suffolk, Virginia Beach, and Williamsburg, and the counties of Gloucester, Isle of Wright, James City, and York, Virginia. It also includes all areas within the limits of disturbance for the project.

Executive Order 13834, Efficient Federal Operations, was signed on May 22, 2018, is intended to eliminate unnecessary use of resources, and protect the environment. It further directs agencies to achieve and maintain annual reductions in building energy use and implement energy efficiency measures that reduce costs; and meet statutory requirements relating to the consumption of renewable energy and electricity.

3.19.1 Existing Conditions

The Earth's average temperature has increased by more than one degree Fahrenheit over the last century and many scientists, but not all, have attributed this temperature rise to the burning of fossil fuels and the resulting release of carbon dioxide into the atmosphere (Intergovernmental Panel on Climate Change 2013, referenced in Strauss et al. 2014). Global sea level rise has resulted from this warming with a cascading effect of melting glaciers and ice sheets. Scientists estimate sea level has risen approximately two times faster in the last two decades as compared to the 20th century (Strauss et al. 2014). Along the East Coast, coastal flooding is anticipated to increase with sea level rise, as higher sea level increases the potential for more severe storm surge (Sallenger et al. 2012), the nearest tide gauge to the city of Norfolk, the Sewells Point gauge, shows that in recent decades the rate of sea level rise has been accelerating, with the present rate being 4.65 mm/yr, while earlier in the 20th century the rate was 4.0 mm/yr, and this rate is expected to continue to increase into the future (Boon 2012).

Climate change and related sea level rise is anticipated to be accelerated along the eastern coastal portions of the United States. A recent sea level rise study for Virginia predicts that record-breaking coastal flooding is likely to occur under mid-to-high range projections within the next 20 to 30 years (depending on location within Virginia) (Strauss et al. 2014). Using

scenarios from a NOAA-led technical report to the National Climate Assessment (Parris et al. 2012, referenced in Strauss et al. 2014), the Strauss et al. (2014) study estimated mid-range or "intermediate high" local sea level rise projections for different locations in Virginia of roughly 1.2-1.5 feet by mid-century, and 4.0 to 4.8 feet by 2100 (using 2012 as the baseline). Hampton Roads is one of the most vulnerable areas to storm surge flooding, and this will worsen with sea level rise (Kleinowsky et al. 2007).

Land subsidence, sea level rise, flat and low tidewater topography and intensive coastal real estate and infrastructure development puts southeastern Virginia, namely Virginia Beach/Norfolk/Hampton Roads region, at extreme risk from storm surges. Hurricanes also, are becoming more intense with climate change as they generate power from warm, moist air over warm ocean waters (Robert Repetto, 2012).

The area around the southern Chesapeake Bay, including the Cities of Chesapeake and Virginia Beach, are undergoing subsidence. The Virginia Institute of Marine Science (VIMS) estimates that general land subsidence in the Chesapeake Bay area is approximately -0.0131 feet per year, which is 1.3 feet over the next 100 years.

The entire ROI is 8 feet or less in elevation above mean sea level. The entire Chesapeake section of the ROI and much of the wetlands bordering the North Landing River in the Virginia Beach section, with their wind-tidally influenced wetlands, are roughly at sea level. These wetlands as well as the gravel parking lot on the peninsula adjacent to the bridge tender building are very low-lying and act as a large floodplain for absorbing high water events and sea level rise.

Carbon dioxide emissions from roadway vehicles and to a lesser extent, navigational vessels, are a leading greenhouse gas. Currently, approximately 11,000 vehicles per day utilize the roadway corridor, and roughly 8,000 vessels per year pass through the bridge. During bridge openings and closures, they must idle as they wait to pass through the crossing.

4 Future Without Project Condition

The future without project (FWOP) condition is defined as the situation likely to occur under existing improvements, laws, and policies. It can be viewed as the most important step in the planning process since it is the foundation for evaluating potentials for alleviating the problems and realizing the opportunities. It sets the consistent base upon which alternative plans are formulated, from which all benefits are measured, against which all impacts are assessed, and thus (given the estimated benefits and impact assessments) for plan comparison and selection.

In the case of the North Landing Bridge, the without project condition is a continuation of maintenance and repair of the existing structure in its present alignment until such time as the existing bridge is replaced with a structure under the existing USACE OMRR&R program. Since the bridge is owned and maintained by USACE, these costs would be totally borne by the Federal Government, as would all succeeding life cycle replacements.

4.1 Problems and Needs

Vehicular traffic is projected to more than double the design capacity volume within a 50-year planning horizon for North Landing Bridge. About 11,000 vehicles cross the bridge per day, which is in excess of the bridge's design capacity of 8,000 vehicles per day. Traffic volume is projected to increase. With the current bridge design, traffic will continue to be impeded by the bridge opening schedule. An increase in traffic volume affected by bridge openings could continue to increase traffic delays. With the current opening schedule, navigation will continue to be adversely constrained by the limited number of scheduled bridge openings. Outage of the bridge due to accident or equipment failure can affect both vehicular traffic and vessel traffic.

When the bridge cannot open for vehicle traffic, the detour route is an almost 15 miles (Figure 4-1). Further indication of the bridge's degraded condition is a downgraded weight limit of 13 tons, versus the current standard for this type of roadway of 26 tons. Certain ladder trucks, tankers and other emergency vehicles are not allowed to use the bridge and must detour. Figure 4-1 below shows the shortest possible detour, which involves traveling west to the bridge at Centerville Turnpike.

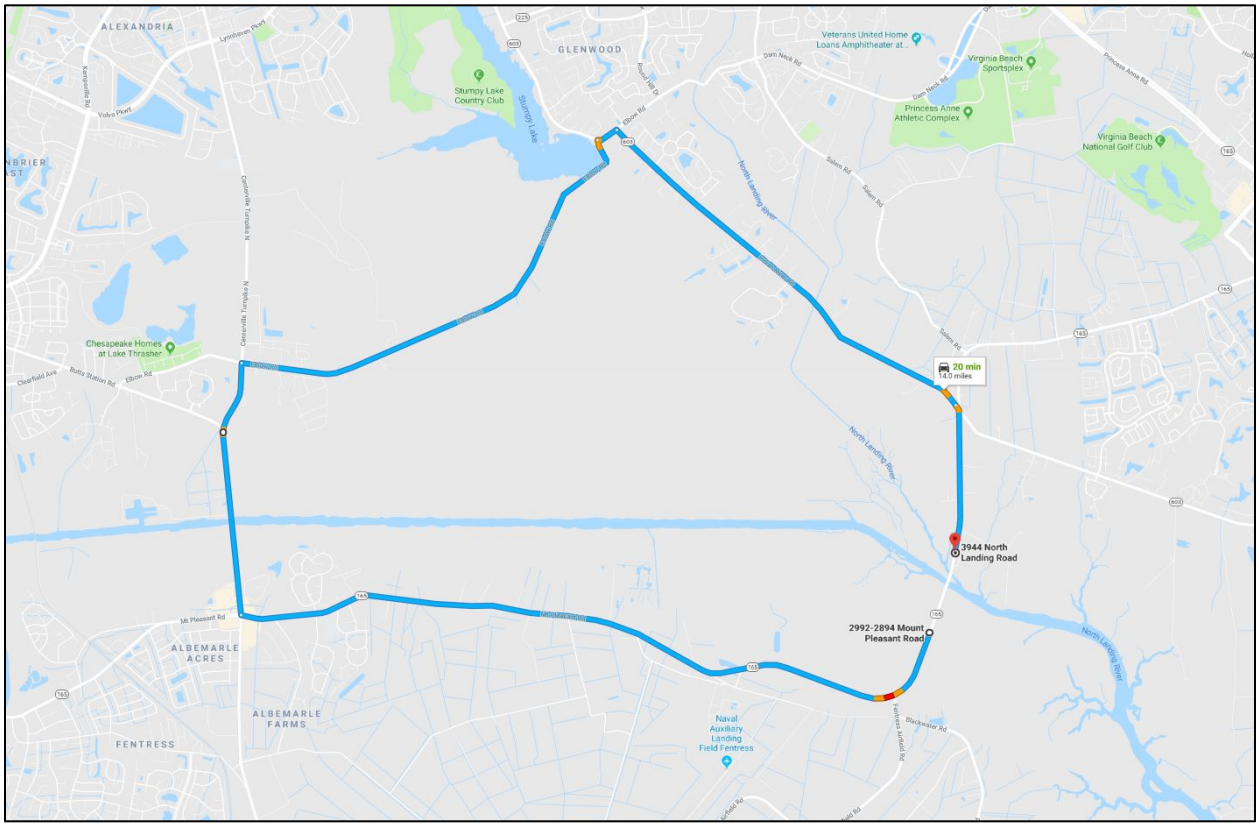


Figure 4-1. Example of North Landing Bridge detour route. Source: Google Maps

4.2 Future without Project Condition

Under current conditions, it is illegal for vehicles over 13 tons to cross the bridge. Despite this, it is a common occurrence. Certain emergency service vehicles, such as fire trucks, exceed the rated bridge load, but take the risk of crossing rather than detouring. In the future, it is expected that illegal overloads from trucks will continue, which presents a safety concern and a threat to the structural integrity of the bridge. It is possible that there could be additional OMRR&R costs if the bridge continues to deteriorate beyond what has been projected. It is not likely that the bridge will collapse or fail completely with the current maintenance schedule.

Additionally, the bridge break downs, described in Chapter 2, Section 2.1, Condition of the Existing Federal Bridge, are projected to continue and likely increase in frequency.

From an economic standpoint, the without project condition is defined as a continuation of maintenance and repair of the existing structure in its present alignment until such time as the existing bridge undergoes a major rehabilitation in 2028. Subsequent to the rehabilitation, operation and maintenance cost will continue. Table 4-1 details the expected operation and maintenance costs under the without project condition.

Table 4-1. Timeline of Operations and Maintenance.

Year	Action and Cost
2026-Forward	Maintain existing bridge @ $608,000/yr
2028	Major rehabilitation @ $8,608,000/yr
2038-Forward	Painting, localized steel repair @ $1,000,000/10 yr
2058	Deck Replacement @ $3,000,000

Since the bridge is owned and maintained by USACE, the operation and maintenance costs are, and will continue to be, totally borne by the Federal Government, as would all succeeding life cycle replacements. A true replacement bridge in-kind was not considered because such a bridge would not meet current standards and regulations as defined by the American Association of State Highway and Transportation Officials (AASHTO) and the United States and Virginia Departments of Transportation. A bridge replacement that adheres to current guidelines would differ so significantly in design and structure that it could not be reasonably defined as "in kind."

4.2.1 Navigation and User Traffic Data

Based on a trend line analysis utilizing historical data provided by the Norfolk District Operations Branch, it is projected that the number of bridge openings will remain relatively stable. This result is based on a linear trend analysis using 20 years of historical data. The average delay time per cycle has been estimated at 4.5 minutes based on an analysis of current bridge opening/operating conditions. Table 4-2 details the bridge openings and project assumptions for bridge openings. Without project assumptions for bridge openings includes an assumed 4,529 bridge openings in 2027 per five year trend and by 2076 there would be an assumed 4,714 bridge openings per five year trend. This data was sourced from Lock and Bridge Traffic data. Vessel traffic through the AIWW is roughly between 7,000 – 8,000 vessels per year, but is expected to increase in the next couple years to numbers above 8,000.

Recreation vessels are, by far, the largest percentage of AIWW users in the study area at 83%. However, the next largest percentage of vessels was towboats with barges at 10%. In 2016 alone, there were two allisions involving towboats with barges. Therefore, a FWOP condition could assume that future allisions will continue to occur with the current bridge geometry.

Table 4-2. Bridge Openings

Fiscal Year	Number of Openings	Vessel Traffic	Yearly change in Openings
Historical 1999-2008 Average	5106	7,040	-84
2018	5326	7158	491
2027	4529	7749	-85
2076	4714	7893	-12

4.2.2 Highway User Traffic Data

Virginia Route 165, which is named Mt. Pleasant Route in Chesapeake and North Landing Road in Virginia Beach, provides a connection from Chesapeake's Civic Center in Great Bridge, where it intersects with Virginia Route 168 (Battlefield Boulevard), to the Municipal Center in Virginia Beach, which is located at the intersection of Princess Anne Road and North Landing Road. Route 165 runs in an east-west direction and crosses the AIWW at the North Landing Bridge. Figure 4-2 shows a detailed aerial view of the study area. The starred pins mark the nearest intersection on either side of the bridge. Virginia Beach is located north of the river, while Chesapeake is south of the river.

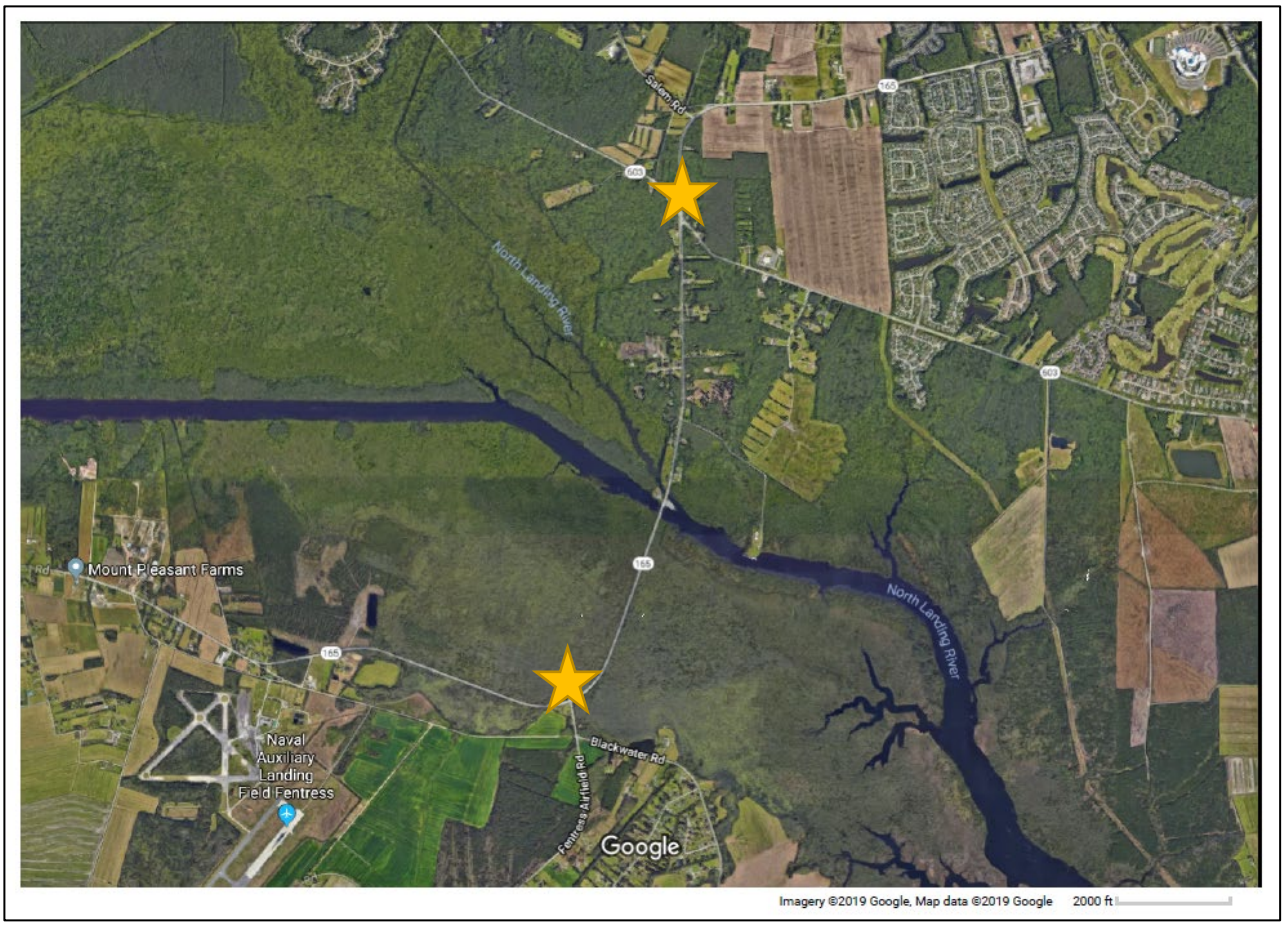


Figure 4-2. Satellite View of Study Area.

The without project highway user traffic estimates were provided by the contractor, WSP USA, Inc. (WSP) and results can be seen in Appendix A: Engineering Appendix. WSP is a transportation consulting company familiar with VDOT data. In their analysis, WSP used 2009 and 2040 as the base year and future year, respectively. The study was conducted using the preexisting Hampton Roads Traffic Demand Model. The traffic study estimated existing demand and forecasted future demand, as well as vehicle miles traveled (VMT) and vehicles hours traveled (VHT), for the with and without project conditions in the study area. These estimates were used to calculate benefits for vehicle traffic with a bridge replacement.

The delays to vehicular traffic desiring to cross the bridge have traditionally been a function of the number of bridge openings and the amount of time that the bridge stays open during each opening cycle. Consistent with historical methods of operation, it is assumed that navigation traffic will continue to be given priority over highway traffic relative to the timing of bridge openings. Between 2007 and 2017, the ten year average of registered passenger cars was 133,207,580 per year over the bridge. Between 2007 and 2017, the ten year average for registered light trucks was 114,682,168 per year over the bridge. Out of the total amount of vehicle traffic over the bridge, 53.74 percent was passenger car traffic and 46.26 percent was light truck traffic.

Table 4-3 presents the percent change from 2009 to 2040 (FWOP Condition). In 2040, the volume of cars is projected to increase 66.2% with the current bridge. If a high bridge is built, the volume will increase 71.3%. This increase in volume can be explained by a perceived and/or actual reduction in VHT, due to the completion of a new, fixed, high bridge.

Table 4-3. Average Daily Traffic (ADT) Forecast.

Scenario	NLB Volume	Volume Change %
Base Year (2009)	10,108	NA
No Build	16,798	66.2%
High Bridge	17,310	71.30%

Source: WSP, USA, Inc.

WSP also provided data comparing VHT and VMT under current and future with/without project conditions. However, it must be noted that this was a regional analysis approach. Therefore, some changes in VHT and VMT that are shown in the results are not necessarily caused by the proposed project. Given the location of this bridge and its limited impact on changing overall regional traffic patterns, it is not unexpected for some of the VHT and VMT comparisons to portray only small differences.

4.2.3 Sea Level Rise

When there are flood events, parts of North Landing Bridge and its equipment flood during high water events. Flooding of the electrical box would continue as sea level rise is projected to increase. Sea Level rise is detailed in Chapter 3, Section 3.18.1 Existing Conditions and in Chapter 7, Section 7.18.1 No Action/FWOP. Flooding conditions at North Landing Bridge are detailed in Chapter 3, Section 3.5 Floodplains.

4.3 Potential City of Virginia Beach Park

The City of Virginia Beach has proposed a park adjacent to North Landing Road (Figure 4-3). It was envisioned to be a passive use park, with a canoe launch. If built, the park could increase traffic marginally on the North Landing Bridge. The park would be in close enough proximity that the bridge would be necessary for park access if visitors are entering from the City of Chesapeake. However, it should be noted that the park is only a draft proposal, and may not go forward.

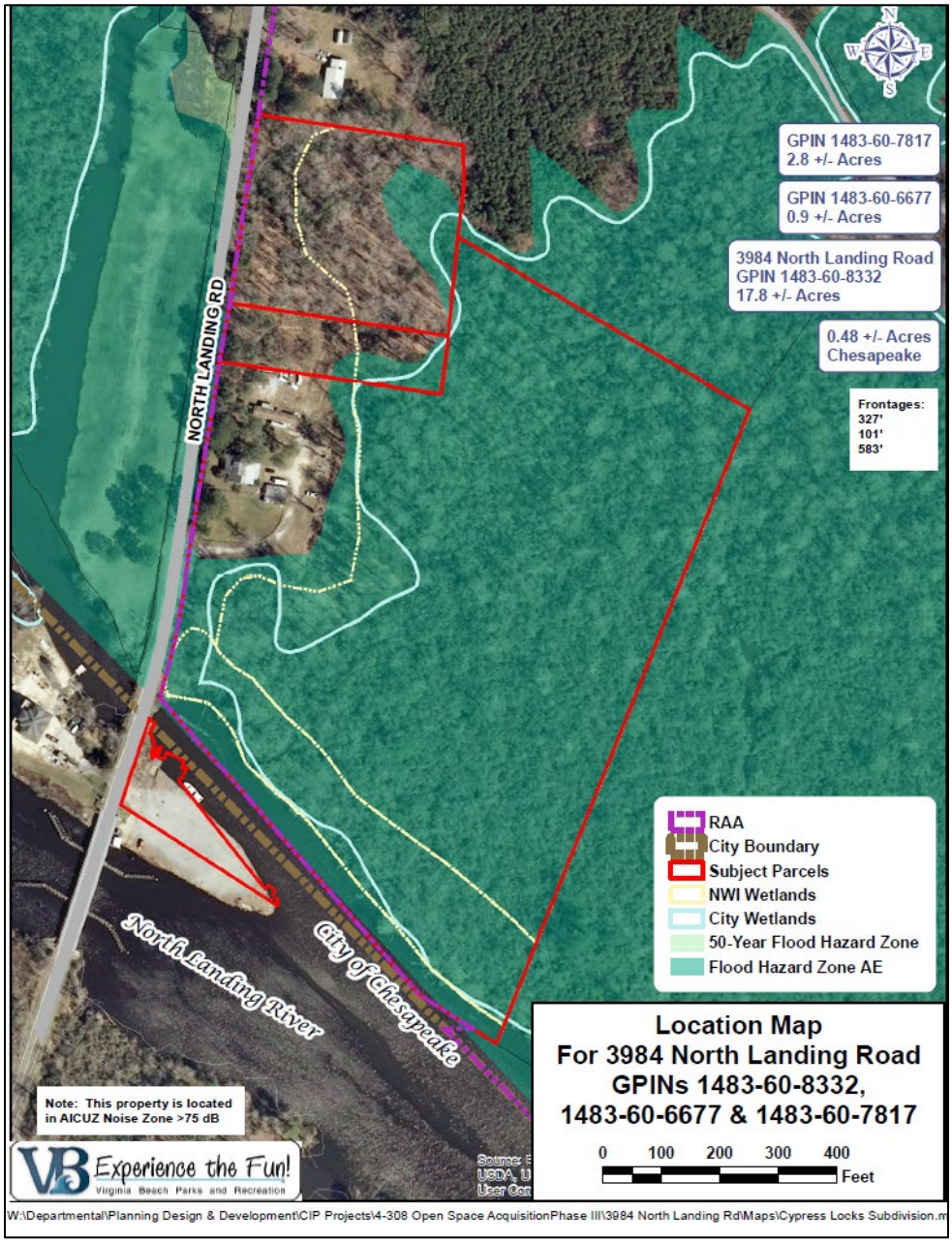


Figure 4-3. Proposed Cypress Locks Park. Source: Virginia Beach Plans and Recreation.

4.4 Replacement Options and OMRR&R

There are no plans to replace the bridge in the next 50 years. However, there is a projected maintenance schedule of maintenance every ten years. The total annual cost of OMRR&R for the bridge is $608,000, with 25% being for operation and 75% being for maintenance. Rehabilitation of the bridge is projected to be needed every 10 years after 2018 at an estimated cost of $8 million. Painting and maintenance of the steel superstructure is projected for every 10

years at a maintenance cost of $1 million. The maintenance costs for the fixed spans were estimated using the criteria from VDOT's Volume V Part 32 for determining life cycle costs. These costs include tasks such as mill & overlay, deck patching, and substructure concrete repair. The quantity and frequency of each repair suggested by VDOT was used for calculating the costs for maintenance of the fixed spans over a 50 year period.

5 Plan Formulation

In general, the plan formulation process follows six major steps, as listed and summarized below. This procedure is in accordance with the USACE Principles and Guidelines (P&G) and related regulations. The six steps are:

- Step 1: Identification of problems and opportunities;
- Step 2: Inventory of forecasting conditions;
- Step 3: Formulation of alternative plans;
- Step 4: Evaluation of alternative plans;
- Step 5: Comparison of alternative plans; and
- Step 6: Selection of a plan.

Preliminary plans were formulated by combining management measures. Each plan was formulated in consideration of the following four criteria described in the P&G:

- Completeness: Extent to which the plan provides and accounts for all necessary investments or actions to ensure realization of the planning objectives;
- Effectiveness: Extent to which the plan contributes to achieving the planning objectives;
- Efficiency: Extent to which the plan is the most cost-effective means of addressing the specified problems and realizing the specified opportunities, consistent with protecting the nation's environment; and
- Acceptability: Workability and viability of the alternative plan with respect to acceptance by Federal and non-federal entities and the public, and compatibility with existing laws, regulations, and public policies.

Plan Formulation Rationale

The underlying rational of the Planning Process is described in ER 1105-2-100 as "Formulation of Alternative Plans."

- Alternative plans are formulated to identify ways of achieving planning objectives within the project constraints, in order to solve the problems and realize the opportunities listed in Step 1 of the Planning Process, which is to "Identify Problems and Opportunities."
- Structural and nonstructural management measures are identified and combined to form alternative plans.
- Planners will keep focus on complete plan(s) while doing individual tasks, to ensure their plans address the problems of the planning area.
- Section 904 of the Water Resources Development Act (WRDA) of 1986 requires USACE to address the following during the formulation and evaluation of alternative plans:
  - Enhancing national economic development (NED) - including benefits to particular regions that are not transfers from other regions
  - Protecting and restoring the quality of the total environment
  - The wellbeing of the people of the United States
  - Preservation of cultural as well as historical values
- Nonstructural measures must be considered in the plan formulation process as means to address problems and opportunities.
- Revised costs of mitigation will be included in the final cost/benefit analysis.

Plan formulation was conducted with a focus on achieving the federal objective of water and related land resources project planning, which is to contribute to NED consistent with protecting the Nation's environment, pursuant to national environmental statutes, applicable executive orders, and other federal planning requirements. Alternative plan development considered study area problems, opportunities, and constraints.

Alternative plan evaluation includes all effects, beneficial or adverse, to each of the four evaluation accounts identified in the Principles and Guidelines (1983), which are National Economic Development, Environmental Quality, Regional Economic Development, and Other Social Effects.

5.1 Management Measures, Screening, and Alternatives

The management measures identified were developed with information gathered during discussions and interviews with Norfolk District operations and management personnel, the City of Chesapeake, the City of Virginia Beach, US Coast Guard, Defense Logistics Agency, US Fish and Wildlife, and the State of Virginia. The PDT compiled a list of measures for this study during a planning charrette held on December 13, 2017.

Three structural measures, fixed bridge, movable bridge, and major rehabilitation/ replacement in-place, advanced through the screening process to be used in the development of alternatives. Management measure identification and screening is presented below.

5.1.1 Structural Measures

Structural measures identified as potential improvements to North Landing Bridge included:

- New fixed bridge
- New movable bridge
- Major rehabilitation/replacement in-place
- Tunnel
- Ferry

Fixed bridge

A fixed bridge would potentially allow for less lifetime maintenance costs and less delays to vehicle and vessel traffic. The evaluation of roadway approaches to the north and south were considered and carefully planned because any deviation from the current alignment would result in impacts to wetlands. Two alignments (one to the west of the current bridge and one to the east of the current bridge) were considered for the fixed bridge measure. Two alignments were chosen because wetland impacts will differ depending on the alignment chosen. This measure was implemented for the I-64 Southside – High rise Bridge replacement on the ACC to the west of the project area. This measure was carried forward.

Movable bridge

With a movable bridge, the construction costs would be less than with the fixed bridge. However, the maintenance costs would be higher with a movable bridge. The movable bridge would be designed to accommodate current and projected future vehicle traffic conditions in terms of loading weight limits and vehicles per day. Two alignments (one to the west of the current bridge and one to the east of the current bridge) were considered for the movable bridge

measure. Two alignments were chosen because wetland impacts will differ depending on the alignment chosen. This measure was used for the Deep Creek bridge replacement along the ACC, west of both Great Bridge and the project area. This measure was also carried forward.

Major rehabilitation/ replacement in-place

A rehabilitation or replacement in-place would maintain the existing bridge alignment. Keeping the alignment the same will have the least impact on environmental resources and surrounding wetlands. The measure will likely require the bridge and route to be shut down for an extended period of time while the existing design is rehabilitated, or a major bridge replacement with a new design is constructed. This measure was carried forward.

Tunnel

The construction and maintenance costs for a tunnel would be too high and unable to compete for future funding on the basis of financial efficiency. Additionally, the impacts to wetlands, cultural resources, and private real estate would be extremely difficult to coordinate for project implementation. Therefore, this measure was not carried forward.

Ferry

A ferry would not effectively alleviate the vehicle traffic congestion and would likely exacerbate the problem. It would also add congestion to the waterway and likely require a different alignment than the existing bridge in order to construct anchorages at either side of the canal. For these reasons, this measure was not carried forward.

5.1.2 Non-structural Measures

Non-structural measures identified as potential improvements to North Landing Bridge include:

- Reduce vessel speed in the channel to prevent allisions with bumpers;
- Establish vessel traffic system to improve scheduling and timing of transits.

Reduce vessel speed in the channel

Maintaining safe vessel speeds while transiting the channel is already a standard practice. Vessels are required to move under no wake conditions. Therefore, reducing vessel speed in the channel does not meet the planning objectives, and was not carried forward.

Establish vessel traffic system

Implementation of a Vessel Traffic System (VTS) could potentially reduce navigation delays, however, problems stem from bridge downtime and inoperability, not imperfect communication between vessels and bridge operations staff. Vessel Traffic Systems are also typically only used at the busiest waterways and harbors to synchronize complex vessel schedules and de-conflict ship meetings. Problems of this magnitude do not exist in this project area. Therefore, implementing a VTS does not meet the planning objectives, and was not carried forward.

5.1.3 Screening of Measures

The study constraints and planning objectives were used to screen the range of measures as discussed above. Table 5-1 shows all of the measures considered for this study and the results of initial measures screening.

Table 5-1. North Landing Bridge Formulated Array of Measures Summary

Measure	Notes	Considered in Alternatives
Reduce vessel speed	Already a standard practice	No
Establish vessel traffic system	Doesn't address study problems	No
Ferry	Not effective	No
Tunnel	Not efficient	No
Major rehabilitation/ replacement in-place	Existing alignment with route closure	Yes
Movable bridge	Lower construction costs, higher maintenance costs, Substantially more permanent wetland impacts than the fixed bridge alternative	Yes
Fixed bridge	Higher construction costs, lower maintenance costs	Yes

5.1.4 Measures Carried Forward

The measures carried forward for consideration in the development of alternatives are shown in Table 5-2. These measures were later used in conjunction with the plan formulation strategy developed by the PDT to form a focused array of alternatives.

Table 5-2. North Landing Bridge Alternative Plan Measures

Measure	Description
Fixed bridge	New construction, fixed span bridge
Movable bridge	New construction, double-swing span, bascule, or vertical lift bridge
Major rehab/ replacement in-place	Simple rehab of existing design or major replacement to new construction standards

5.2 Focused Array of Alternatives (Formulation of Alternatives)

Once measures were established, a screening meeting was held on December 13, 2017 to develop a plan formulation strategy. This strategy was used to combine the different measures under consideration into alternatives. Based on the relationships between the bridge, the channel, vehicle and vessel traffic, and the safety concerns with each, an issue-based,

interrelated decision approach was established as the best plan formulation strategy. The key considerations driving this approach were:

- The bridge state (open or closed) determines traffic-ability of both the vehicle roadway and navigation channel.
- Bridge design (movable or fixed) determines under-bridge height and width clearances that affect navigation safety concerns.

The plan formulation strategy for this study included an Objectives-Measures analysis that, when executed, resulted in a focused array of alternatives. By ensuring each alternative plan included a management measure addressing each objective, the focused array of alternatives was able to include all possible solutions that met the four P&G criteria of completeness, effectiveness, efficiency, and acceptability. Each measure, in and of itself, was effective at addressing each specific objective. Table 5-3 shows the Objectives-Measures matrix, linking measures to specific objectives they address. All of the measures addressed every objective. However, some measures addressed the objectives more adequately than others. The number 1 was attributed to the measure if it addressed the objective and the number 2 was attributed to the measure if the measure satisfied the objective to a higher standard. For instance**,** the movable bridge and the rehab/replacement have traffic delays greater than a fixed bridge because of bridge openings for vessels. Therefore, a 2 was given to the Fixed Bridge measure for satisfying the objective more adequately than the other two measures which were given 1's for satisfying the objective but at a lower standard.

Table 5-3. Objectives-Measures Matrix

Measure	OBJ1, OMRR&R	OBJ2, Delays	OBJ3, Safety
Fixed Bridge	2	2	2
Movable Bridge	1	1	1
Rehab/Replacement	1	1	1

Continuing with the plan formulation strategy (Table 5-4), the measures under consideration were reformulated and organized into a focused array of alternative plans. The focused array of alternative plans is shown in Table 5-4.

Table 5-4. North Landing Bridge Focused Array of Alternatives

Alternative Plan	Components
Alt 1	No Action
Alt 2	Major Rehabilitation/Replacement In-Place
Alt 3	East Movable Bridge
Alt 4	East Fixed Bridge
Alt 5	West Movable Bridge
Alt 6	West Fixed Bridge

Alternative 1: No Action

The No Action Alternative plan proposes USACE will not implement any of the proposed actions identified in the study. This plan is considered the project baseline, also known as the FWOP scenario, which is used to compare all other proposed alternatives.

Alternative 2: Major Rehabilitation/ Replacement In-Place

Alternative 2 assumes a major bridge rehabilitation will take place on the current bridge. The alignment of the bridge will remain the same. This alternative could range from a simple rehab of the existing design to a major bridge replacement with a new moveable bridge design. Anchorages are needed to provide safe waiting areas between bridge openings. The existing bridge will be removed in this alternative, if replaced vs. rehabbed.

Alternative 3: East Movable Bridge

Alternative 3 assumed that a new bridge will be constructed to the east of the existing bridge alignment. The new design will be a moveable bridge design. New roadway approaches to the south and north will need to be incorporated into the plan. Anchorages are needed to provide safe waiting areas between bridge openings. The existing bridge will be removed in this alternative.

Alternative 4: East Fixed Bridge

Alternative 4 assumed a new bridge will be constructed to the east of the existing bridge alignment. The new design will be a fixed bridge design. New roadway approaches to the south and north will need to be incorporated into the plan. The new fixed bridge will need to be a minimum of 65 feet in height in order to abide by Coast Guard regulations. Typical maximum grade for roadways is 4%. Using this maximum grade the approaches to the bridge will need to be over 1,600 feet long. The existing bridge will be removed in this alternative.

Alternative 5: West Movable Bridge

Alternative 5 assumes a new bridge will be constructed to the west of the existing bridge alignment. The new design will be a moveable bridge design. New roadway approaches to the south and north will need to be incorporated into the plan. The existing bridge will be removed in this alternative. Anchorages are needed to provide safe waiting areas between bridge openings.

Alternative 6: West Fixed Bridge

Alternative 6 assumes a new bridge will be constructed to the west of the existing bridge alignment. The new design will be a fixed bridge design. New roadway approaches to the south and north will need to be incorporated into the plan. The new fixed bridge will need to be a minimum of 65 feet in height in order to abide by Coast Guard regulations. Typical maximum grade for roadways is 4%. Using this maximum grade the approaches to the bridge will need to be over 1,600 feet long. The existing bridge will be removed in this alternative.

Figure 5-1 shows the concept layout of the east and west alignment locations (in orange) with Alternative 2 simply falling where the existing bridge is shown on the aerial image.

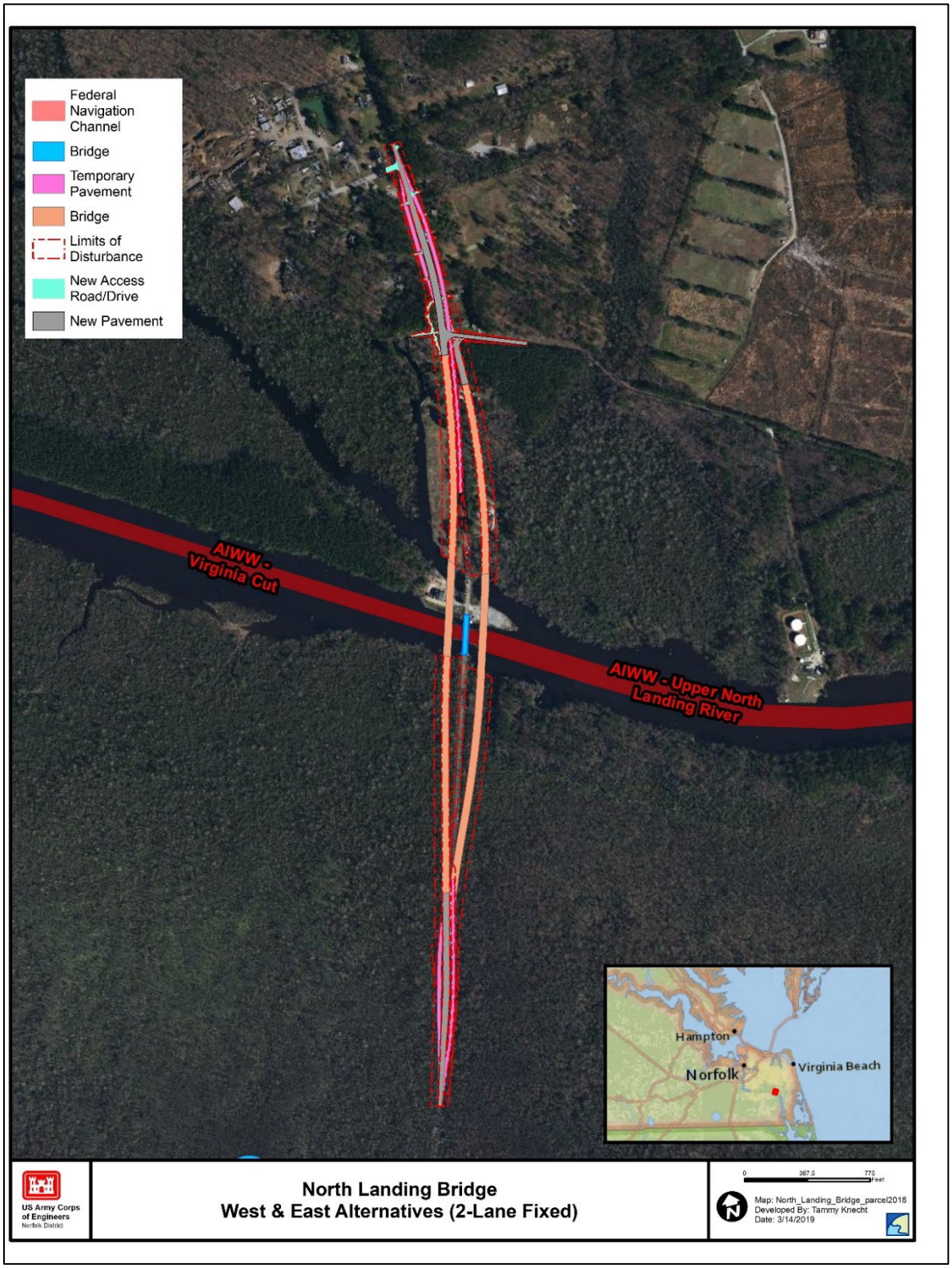


Figure 5-1. Proposed Alignments (in orange) of the Alternatives.

Evaluation criteria were developed based on the planning objectives and constraints. Selection criteria was based on NED costs and benefits for navigation and vehicle traffic. Vehicle traffic benefits and navigation benefits were calculated separately. Net benefits were used as selection criteria and were calculated as a combination of navigation and vehicle benefits. Evaluation of alternatives also took into consideration the upgrades necessary to adhere to current USACE and VDOT design guidelines.

5.3 Screening of Alternatives

An alternatives screening workshop was held on June 20, 2018 to screen out alternative plans early in the formulation and analysis phase. This alternatives screening workshop adhered to best planning practices and coincides with the iterative nature of the 6-Step USACE Planning Process. During the meeting, a set of evaluation criteria were used to screen each alternative including aspects of economics, environmental, cultural resources, real estate, flood plain management, engineering, and plan formulation. Examples of criteria discussed were: operations and maintenances costs over the lifetime of the project, vessel benefits, wetland loss, cultural resource impacts, navy fuel line impacts, complicated engineering designs surrounding bridge piers and foundations, vehicle traffic service disruptions, contributions to planning objectives, and the extent to which these plans avoided planning constraints. The red cells in Table 5-5 show where each plan did not meet the screening criteria. Each negative criteria amounted to a point. The amount of negative tabulations against each alternative is summarized in Table 5-6. The details of each negative tabulation (in red) is detailed in Table 5-6. The PDT ranked all of the alternatives according to the criteria relative to each other and the alternative with the highest point value was screened out.

Table 5-5. Alternative Evaluation Details

Plan Name	Alt. 1 - No Action	Alt. 2 - Replacement In-Place	Alt. 3 - East Movable	Alt. 4 - East Fixed	Alt. 5 - West Movable	Alt. 6 - West Fixed
1. Plan Description	Without Project Condition, baseline	Current alignment, new movable design	New eastward alignment, new movable design	New eastward alignment, new fixed design	New westward alignment, new movable design	New westward alignment, fixed design
2. Impact Assessment						
A. Criteria (Units)						
(1) Project Construction Costs (USD) Rough Order of Magnitude Cost Estimates	$0- Ranks 1st	$33,701,625- Ranks 2nd	$40,516,863- Ranks 4th	$52,030,672- Ranks 6th	$39,762,705- Ranks 3rd	$51,906,267- Ranks 5th
(2) Traffic Benefits (USD)	$0 (6th)	Traffic benefits were not yet estimated.				
(3) Vessel Benefits (USD)	$0 (6th)	$78k/year	$78k/year	$388k/year	$78k/year	$388k/year
(4) Advanced Bridge Replacement Savings (USD)	$0 (6th)	$0 (5th)	$391k/year	$391k/year	$391k/year	$391k/year
(5) Functional Wetland Loss (Acres)	0 Acres (1st)	0 Acres (2nd)	Considerably More Wetlands Loss (5th)	Less Wetlands Loss (3rd)	Considerably More Wetlands Loss (5th)	Less Wetlands Loss (4th)
(6) T&E Species Impacts (Acres of tree removal & Proximity to Roosting Sites)	No difference across array of alternatives. Roosting survey not required per USFWS. Construction limits of disturbance are all >150 feet from closest known roosting site. Tree removal is not a significant factor affecting the Northern Long-eared Bat.					
(7) Cultural Resource Impacts (Acres to survey/ Phase I Survey Cost Estimate)	0 Acres, 0 Survey Costs (1st)	0 Acres, 0 Survey Costs (1st)	12.56 Acres, $35,886 (5th)	12.56 Acres, $38,508 (6th)	5.76 Acres, $27,344 (3rd)	8.67 Acres, $30,973 (4th)
(8) Real Estate Acquisition (LERRD, availability, Parcels, acreage)	$0	$121,870	$854,565	$708,519	$882,055	$1,000,729
(9) Flood Plain Impacts (flood elevation, flow)	Modeling shows flood elevations upstream of the bridge will generally be equal to or lower than existing conditions.					
(10) Soil Suitability/ Foundation Design Optimization (USD)	Existing foundation is in very poor condition.	Most complicated. Involves removing existing foundation.	Bridge foundation (in-water) more complicated design than fixed.	Simpler design than moveable.	Bridge foundation (in-water) more complicated design than fixed.	Simpler design than moveable.
(11) Alignment vs. Construction Schedule, Vehicle Service Disruption (Days)	Intermittent Vehicle/Vessel disruption <10%/year or up to 36 days	Complete Vehicle disruption for 36 months; 22 mile detour	Some Vehicle disruption; <10%duration, or up to 109 days	Some Vehicle disruption; <10%duration, or up to 109 days	Some Vehicle disruption; <10%duration, or up to 109 days	Some Vehicle disruption; <10%duration, or up to 109 days
(12) Alignment vs. Material Delivery, Impacts to Vehicle Services (Days)	No impact	N/A, complete disruption	Some impact, up to 5% of construction duration	Some impact, up to 5% of construction duration	No impact	No impact

(13) Navy Fuel Delivery, schedule disruptions (Days)	No impact	No impact	No impact	No impact	No impact	No impact
(14) Airspace Impacts/ Constraints (Feet) [NOTE: all plans are within APZ II]	Current elevation, no impact (1st)	17' closed, 166' open (4th)	17' closed, 166' open (4th)	78' safety rail, 103' lighting (2nd)	17' closed, 166' open (4th)	78' safety rail, 103' lighting (2nd)
B. Contribution to Planning Objectives						
(1) Reduce Bridge OMRR&R	No effect (6th)	Somewhat reduces maintenance and repair (3rd)	Somewhat reduces maintenance and repair (3rd)	Significantly reduces OMRR&R (1st)	Somewhat reduces maintenance and repair (3rd)	Significantly reduces OMRR&R (1st)
(2) Reduce or eliminate delays to navigation and vehicle traffic	No effect (6th)	Reduces (3rd)	Reduces (3rd)	Eliminates (1st)	Reduces (3rd)	Eliminates (1st)
(3) Reduce safety hazards to vessels and vehicles	No effect (6th)	Yes	Yes	Yes	Yes	Yes
C. Avoidance of Planning Constraints						
(1) Qualitative Assessment	Yes	No - significant route closure during construction	doesn't minimize impacts to wetlands	Yes	doesn't minimize impacts to wetlands	Yes
D. Other Social Effects (OSE)						
(1) Life, Health, and Safety	Doesn’t address current safety problems	Complete emergency services access disruption for 36 Mo.	Adequately addresses life, health and safety	Adequately addresses life, health and safety	Adequately addresses life, health and safety	Adequately addresses life, health and safety
(2) Community Cohesion (displacement of people & businesses)	No displacement	0	2	1	1	1
(3) Recreation	Not evaluated	Not evaluated	Not evaluated	Not evaluated	Not evaluated	Not evaluated
E. P&G Formulation Criteria						
(1) Completeness (Extent to which plan accounts for all necessary investments)	No	Doesn't account for anchorages	Doesn't account for anchorages	Yes	Doesn't account for anchorages	Yes
(2) Effectiveness (Extent to which plan contributes to planning OBJs)	(-) (-) (-)	(+) (+) (+)	(+) (+) (+)	(+) (+) (+)	(+) (+) (+)	(+) (+) (+)
(3) Efficiency (Extent to which the plan is cost-effective)	Doesn't address problems / constraints	TBD	TBD	TBD	TBD	TBD
(4) Acceptability (Viability with respect to F/non-F entities, public, law, regulations, and policy)	Yes	Yes	Yes	Yes	Yes	Yes

Table 5-6. Alternative Evaluation Results

Plan Name	Alt. 2-Replace In-Kind	Alt. 3-East Movable	Alt. 4-East Fixed	Alt. 5-West Movable	Alt. 6-West Fixed
Count of negative attributes	8	7	2	5	1

Based on the results summarized in Table 5-6, the PDT unanimously decided to screen-out Alternative 2 – Replace In- Kind. Alternative 2 was screened out because it included high operations and maintenance costs over the lifetime of the project and had lower vessel benefits associated with replacing the bridge. In terms of soil suitability, it was the most complicated alternative and would involve removing the existing foundation which is a complicated process, and would require new design & construction to possibly avoid the existing foundation. There would be significant road closures during construction, a disruption of emergency vehicle service access during construction and only somewhat reduces operations and maintenance costs.

The remaining alternatives that completed the focus array were Alterative 1 – No Action, Alternative 3 – East Moveable Bridge, Alternative 4 – East Fixed Bridge, Alternative 5 – West Movable Bridge and Alternative 6 – West Fixed Bridge as shown in Table 5-7.

Only two-lane bridges were considered for this study because a four lane road approach is not planned in the City of Virginia Beach's long range plans and the City of Chesapeake does not have a plan to fund a four lane approach. Therefore, a four-lane bridge was not considered feasible and not included in any alternative.

Table 5-7. North Landing Bridge Feasibility Study – Final Array of Alternatives

Alternative Plan Name	Description
Alternative 1	No Action
Alternative 3	East Moveable Bridge
Alternative 4	East Fixed Bridge
Alternative 5	West Movable Bridge
Alternative 6	West Fixed Bridge

5.4 Comparison of the Final Array of Alternatives

Utilizing the evaluation criteria, a comparison of the remaining alternatives was needed to help in the evaluation of each of the selected alternatives carried forward from the final array. NED benefits, Other Social Effects (OSE), effects to the environment, and decision criteria are included and outlined in more detail in Section 5.7 System of Accounts.

Project costs were developed for each of the alternatives utilizing projected traffic and vessel volumes and associated history of construction costs. This study utilized a traffic study and vessel study. The traffic study that was utilized was the Hampton Roads Traffic Demand Model, which was also used on the Deep Creek Bridge Replacement study. The traffic model estimated the existing and future demand of traffic over the bridge. Navigation benefits were calculated using the Waterways Limited Cost Estimator for Navigation (WLCEN). The WLCEN model was

developed by the inland Navigation PCX and was used by the Galveston District as well. USACE received a onetime use certification.

The environmental quality account considers non-monetary effects on ecological, cultural, and aesthetic resources. The preferred plan should avoid or minimize environmental impacts and maximize environmental quality in the project area. Consideration of environmental impacts are incorporated as part of this study and the environmental consequences of the alternatives are described in Chapter 7 of this document.

Finally, it was determined that each of the actionable alternatives would contribute to the Federal objectives. Each of the actionable alternatives would reduce delays to commercial and military fuel shipments, reduce detour trips for emergency vehicles, increase the load limit for the bridge, adhere to current engineering and design requirements, and meet VDOT roadway standards. Additional information is also available in Appendix A, the Engineering Appendix.

5.5 Alternative Plan Costs

An Abbreviated Risk Analysis (ARA) was performed to evaluate uncertainties associated with each major construction cost item or feature in coordination with input with other members of the PDT. The ARA was developed via Cost Planning Center of Expertise guidelines. The ARA was used to update the costs into a complete Cost Schedule Risk Analysis (CSRA). The CSRA was developed via Cost Planning Center of Expertise guidelines. Costs are presented in Table 5-8. When comparing the costs for each alternative, both initial construction costs as well as operation and maintenance costs were considered. For the movable bridge alternatives, it is important to consider operation and maintenance cost in conjunction with the initial construction costs. The OMRR&R costs are included for a 50 year life cycle. Table 5-8 shows a summary of the construction cost, including 29% contingency and escalation, OMRR&R cost, and total project cost.

Construction Costs

A summary of construction costs (including contingencies) associated with bridges and roadways for the different alternatives across the AIWW at North Landing Bridge is shown in Table 5-8. The costs were itemized for the bridge, approach roadway work, relocations, cultural resource preservation, lands and damages, planning, engineering, and design, and construction management. Cost estimates were based on FY20 price levels. A detailed construction cost estimate (Micro-Computer Aided Cost Estimating System) for the West Fixed Bridge and East Fixed Bridge options are located in Appendix A: Engineering.

Table 5-8. Cost Breakdown Structure of Alternatives

	West Alignment		East Alignment	
Cost Item[1]	**Fixed**	**Moveable**	**Fixed**	**Moveable**
Civil Works Breakdown Structure[2]				
Roads and Bridges	$80,983,475	$61,885,304	$75,809,000	$72,938,64
Relocations	$386,446	$1,265,839	$1,555,000	$2,274,638
Cultural Resource Preservation	$772,978	$808,879	$558,000	$1,221,398
Lands and Damages	$1,854,937	$937,288	$2,790,000	$908,075
Planning, Engineering, and Design	$14,708,962	$10,944,715	$11,595,000	$12,992,87
Construction Management	$5,767,630	$4,291,606	$6,187,000	$5,094,709
Subtotal First Cost	$104,474,48	$80,133,631	$98,494,000	$95,430,31
Subtotal First Cost (Rounded)	$104,474,00	$80,134,000	$98,494,000	$95,430,00
Interest During Construction (Total Amount)	$3,502,126	$2,686,212	$3,909,887	$3,788,257
Annualized Investment Cost	$4,218,309	$3,192,437	$3,999,385	$3,823,638
Annualized OMRR&R Cost	$184,578	$796,434	$184,578	$796,434
Total Annualized Cost	$4,402,886	$3,988,870	$4,183,963	$4,620,072
Total Annualized Cost (Rounded)	$4,403,000	$3,989,000	$4,184,000	$4,620,000

(1) Interest Rate = 2.75% (FY 20 Price Levels)

(2) Includes Contingency 27.9%

Note: Prices are in FY20 Price Levels and AAB for Vehicle Traffic includes Advance Bridge Replacement.

5.5.1 Construction Assumptions

Construction assumptions are feasibility level assumptions that are the basis for project cost estimates and environmental impact assessments.

Construction assumptions included:

- The statement of probable cost does not include undercut of existing soils. Geotechnical exploration is still ongoing to determine the condition of the existing soils.

- Mechanically Stabilized Earth (MSE) walls are assumed to have a maximum height of approximately 15 feet. MSE wall height and bridge length can be optimized based upon the geotechnical exploration as the design process continues.
- Pavement section is assumed to include 2” of surface mix asphalt, 2” of intermediate mix asphalt, 4” of base mix asphalt, and 12” of NO. 21 stone.
- Statement of probable cost does not include traffic signals.
- The project assumes that roadway traffic and water traffic must be maintained at all times.
- Temporary work trestles will be utilized during construction in organic muck or peat soils.

5.5.2 Without Project Maintenance Assumptions

Without project maintenance is projected to be approximately $608,000 every year in operations and maintenance cost. Of those costs, 75% is projected to be in operations cost and 25% is projected to be in maintenance costs. A major rehabilitation is expected to occur every 10 years after 2018 at an estimated cost of $8M. Painting and localized steel repair also has a projected maintenance cost of $1M every ten years.

5.5.3 With Project Initial Assumptions

With Project initial assumptions assume that the selected design will be required to provide a stormwater management design that complies with Virginia Stormwater Management Program (VSMP) regulations (9VAC25- 870). Land disturbance area for the proposed bridge alternatives varies from 15 to 22 acres, including the disturbed portions of the AIWW and North Landing River.

5.5.4 Construction Assumptions Summary on Focused Array

The projected construction for the alternatives is expected to take up to 30 months (the actual construction schedule for the alternatives is located in the Engineering Appendix).

5.5.5 Construction and Investment Costs

Construction costs were developed based on the latest condition surveys.

5.6 Economic Alternative Analysis

The economic analysis was based on both vessel traffic and vehicle traffic benefits.

The vehicle traffic analysis was completed based on the North Landing Bridge Vehicle Traffic (NLB-VT) Model. Traffic Economics Model. This model has been used in previous USACE studies and modified for this study. Specifically, the model was used to calculate the economic benefits and costs of the alternatives for the North Landing Bridge. The estimated net NED benefits are consistent with the 1983 Principles and Guidelines and associated planning guidance and the ER-1105-2-100 USACE Planning Guidance Notebook.

The Inland Navigation Spreadsheet model, or WLCEN, was used to calculate user demand and cost savings for navigation vessels. The general theory underlying the model is that, due to the

nature of service disruptions and the lack of available alternate overland modes, the vast majority of existing condition traffic delay or disruption impacts and thus the degree to which an alternative can reduce these impacts (benefits) can be closely approximated by computing the total cost of vessel delays in the existing and alternative conditions and taking the difference. The benefits of a given alternative can be defined as the reduction in total vessel delay in hours multiplied by the hourly operating cost. The model is designed to estimate this total vessel delay.

5.6.1 NED Benefits (National Economic Development)

NED benefits are changes in the economic value of the national output of goods and services. Figure 5-2 below details the various benefits considered in this study.

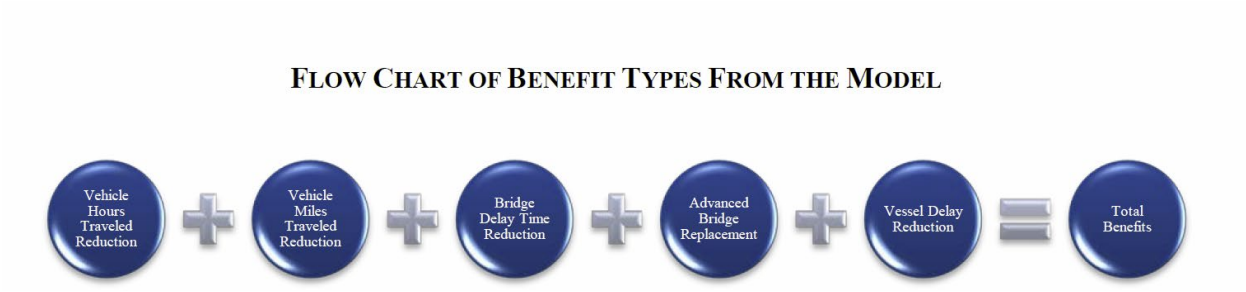


Figure 5-2. NED Benefits Considered.

Table 5-9 summarizes the benefits for vehicle and vessel traffic. As can be seen, benefits are significantly higher for the fixed bridge. Vehicle traffic benefits comprise the majority of all benefits.

Table 5-9. NED Benefits for Final Array

Cost Item	West Alignment		East Alignment	
	Fixed	Moveable	Fixed	Moveable
Average Annual Benefits (Vehicle Traffic)	$11,320,863	$1,009,863	$11,320,863	$1,009,863
Average Annual Benefits (Vessel Traffic)	$414,780	$51,420	$414,780	$51,420
Total Average Annual Benefits	$11,735,643	$1,061,283	$11,735,643	$1,061,283
Total Average Annual Benefits (Rounded)	$11,736,000	$1,061,000	$11,736,000	$1,061,000

Note: Interest rate = 2. 75% (FY 20 Price Levels)

5.7 NED Plan

The NED plan is defined as the plan with the greatest net economic benefits consistent with protection of the nation's environment. In this study, the NED plan, which is also the Recommended Plan and Preferred Alternative, must include the roadway design criteria detailed in Table 5-10. Both the East 2-Lane Fixed alignment and the West 2-Lane Fixed alignment were considered the preferred plan in earlier stages of the feasibility study because they had similar net annual benefits. Table 5-11 below compiles costs and benefits to determine the NED. Once costs were refined, the East Alignment became the NED plan as detailed in Table 5-11.

Table 5-10. Roadway Design Criteria

Roadway Design Criteria	
Roadway Classification	Rural Minor Arterial
VDOT Classification	GS-2
Design Speed	55 MPH
Posted Speed	45 MPH
Minimum Horizontal Radius	964 feet
Maximum Super Elevation (TC-5.11	8%
Minimum Lane Width	12 feet
Minimum Shoulder Width	10 feet (Minimum 8 feet paved)
Maximum Vertical Grade	4%
Minimum Stopping Sight Distance	500 feet
Side Slope Standards	3:1
Average Daily Traffic (VDOT 2017)	11,000
Minimum Clear Zone	26 Feet

Table 5-11. Summary of Project Economics

Cost Item[1]	West Alignment		East Alignment	
	Fixed	Moveable	Fixed	Moveable
Civil Works Breakdown Structure[2]				
Roads and Bridges	$80,983,475	$61,885,304	$75,809,000	$72,938,684
Relocations	$386,446	$1,265,839	$1,555,000	$2,274,638
Cultural Resource Preservation	$772,978	$808,879	$558,000	$1,221,398
Lands and Damages	$1,854,937	$937,288	$2,790,000	$908,075
Planning, Engineering, and Design	$14,708,962	$10,944,715	$11,595,000	$12,992,837
Construction Management	$5,767,630	$4,291,606	$6,187,000	$5,094,709
Subtotal First Cost	$104,474,428	$80,133,631	$98,494,000	$95,430,341
Subtotal First Cost (Rounded)	$104,474,000	$80,134,000	$98,494,000	$95,430,000
Interest During Construction (Total Amount)	$3,502,126	$2,686,212	$3,909,887	$3,788,257
Annualized Investment Cost	$4,218,309	$3,192,437	$3,999,385	$3,823,638
Annualized O&M Cost	$184,578	$796,434	$184,578	$796,434
Total Average Annualized Cost	$4,402,886	$3,988,870	$4,183,963	$4,620,072
Total Average Annualized Cost (Rounded)	$4,403,000	$3,989,000	$4,184,000	$4,620,000
Average Annual Benefits (Vehicle Traffic)	$11,320,863	$1,009,863	$11,320,863	$1,009,863
Average Annual Benefits (Mariner Traffic)	$414,780	$51,420	$414,780	$51,420
Total Average Annual Benefits	$11,735,643	$1,061,283	$11,735,643	$1,061,283
Total Average Annual Benefits (Rounded)	$11,736,000	$1,061,000	$11,736,000	$1,061,000
Benefit Cost Ratio	**2.67**	**0.27**	**2.80**	**0.23**
Net Benefits	**$7,333,000**	**-$2,928,000**	**$7,552,000**	**-$3,559,000**

(1) Interest Rate = 2.75% (FY 20 Price levels)

(2) Includes Contingency 27.9%

Note: Prices are in FY20 Price Levels and AAB for Vehicle Traffic includes Advance Bridge Replacement.

Contributions to NED are increases in the net value of the national output of goods and services, expressed in monetary units. For this study, the contributions to NED are the direct net benefits that accrue in the planning area and the rest of the nation. Specifically, the benefits are primarily based on decreased delays in vessel traffic as decreased delays in vehicle traffic. A large majority of the average annual benefits from this plan were derived from vehicle traffic benefits.

The Recommended Plan results in a BCR of 2.80 and net NED benefits of approximately $7,552,000 in AAEQ terms at FY20 price levels and using a discount rate of 2.75%. Costs for the Recommended Plan were provided by USACE Norfolk District Cost Engineering and the AE serving on the study. Interest During Construction (IDC) was calculated for an approximately 30-month PED period (see the Economics Appendix for IDC calculations).

5.7.1 Deviations from the NED Plan

There are no planned deviations from the NED plan. For this study the NED is the Recommended Plan/ Preferred Alternative. There is no Locally Preferred Plan. The City of Chesapeake expressed that they are in agreement with the Fixed Bridge alternative and they have no preference regarding the west or east alignment.

5.8 System of Accounts

Per ER 1105-2-100, Section 2-3 d(4), alternatives in the final array must be evaluated using three other accounts in addition to NED, including Regional Economic Development (RED), Environmental Quality (EQ), and Other Social Effects (OSE). However, in this study, all of the plans in the final array of alternatives are similar and there are not significant differences in the four accounts for these plans.

These four accounts including NED were established to facilitate evaluation and display of the effects of alternative plans. They encompass all significant effects of a plan on the human environment as required by the National Environmental Policy Act of 1969 (NEPA) (42 U.S.C. 4321 et seq.). They also encompass social well-being as required by Section 122 of the Flood Control Act of 1970 (Public Law 91-611, 84 Stat. 1823). The EQ account shows the significant effects on ecological resources that cannot be measured in monetary terms. The OSE account shows urban and community impacts and effects on life, health and safety. The NED account, which is the only required account under Principles and Guidelines, shows effects on the national economy and, as such, establishes Federal interest. The RED account shows the regional incidence of NED effects, income transfers, and employment effects. NED benefits have already been discussed in this report and the RED, EQ, and OSE evaluations for the selected plan are discussed below.

5.8.1 Regional Economic Development

The USACE Institute for Water Resources, Louis Berger, and Michigan State University have developed a regional economic impact modeling tool, Regional ECONomic System (RECONS), that provides estimates of jobs and other economic measures such as labor income, value added, and sales that are supported by USACE programs, projects, and activities. This

modeling tool automates calculations and generates estimates of jobs, labor income, value added, and sales through the use of IMPLAN®'s multipliers and ratios, customized impact areas for USACE project locations, and customized spending profiles for USACE projects, business lines, and work activities. RECONS allows the USACE to evaluate the regional economic impact and contribution associated with USACE expenditures, activities, and infrastructure.

The expenditures associated with All Work Activities, with Ability to Customize Impact Area and Work Activity at Virginia Beach-Norfolk-Newport News, VA-NC are estimated to be $84,381,067. Of this total expenditure, $81,265,000 will be captured within the local impact area. The remainder of the expenditures will be captured within the state impact area and the nation. These direct expenditures generate additional economic activity, often called secondary or multiplier effects. The direct and secondary impacts are measured in output, jobs, labor income, and gross regional product (value added) as summarized in the following tables. The regional economic effects are shown for the local, state, and national impact areas. In summary, the expenditures $84,381,067 support a total of 747.1 full-time equivalent jobs, $43,409,000 in labor income, $64,510,000 in the gross regional product, and $129,715,000 in economic output in the local impact area. More broadly, these expenditures support 1,191.0 full-time equivalent jobs, $78,672,000 in labor income, $119,906,000 in the gross regional product, and $235,771,000 in economic output in the nation. All costs are in 2019 price levels. Table 5-12 below shows the major spending categories for this project and estimate of the funding expenditure percentages.

Table 5-12. Spending Profile

Spending Category	Percentage (%)
Construction of new highway, streets, and bridges	86%
Environmental Planning and Compliance	1%
USACE Labor -- Construction Management, Project Management, and Planning	9%
USACE Overhead	4%

Table 5-13 below details the value added to various impact areas—local, state, and U.S.

Table 5-13. Direct Impact Summary

Area	Local Capture ($)	Output ($)	Jobs*	Labor Income ($)	Value Added ($)
Local	$81,625	$81,625	453	$28,101	$37,183
State	$84,228	$84,228	489	$30,756	$40,060
U.S.	$84,381	$84,381	491	$33,127	$41,351

* Jobs are presented in full-time equivalence (FTE)

5.8.2 Environmental Quality

The effects of the Recommended Plan were considered in terms of probable environmental, social well-being, and economic factors. The environmental analysis is based on anticipated effects of either the Eastern or the Western Action Alternative. The project will include both

temporary and permanent impacts to forested and emergent wetlands regulated under the Clean Water Act. A full wetland delineation and further design will be needed to ascertain the final wetland impacts. However, a preliminary determination has found that Alternative 4 will entail approximately 0.94 acres of permanent direct fill wetland impacts; and Alternative 6 will entail approximately 1.0 acres of permanent direct fill impacts of wetland impacts. All permanent fill and span wetland impacts will be mitigated in-kind, utilizing wetland mitigation bank or in-lieu-fee credits offsite. The preliminary wetland mitigation requirements, according to the Uniform Mitigation Assessment Methodology (UMAM), are approximately 6.93 to 7.96 wetland mitigation credits, within the service area for this project. Temporary work trestles will be utilized for construction access in wetland areas underlain by organic peat and muck soils, in order to minimize impacts. All temporarily disturbed wetlands will be restored to preexisting conditions and planted with native tree species.

Informal consultation under Section 7 of the Endangered Species Act was conducted with the USFWS for the northern long-eared bat, and with the NMFS for the Atlantic and shortnose sturgeon. The USFWS determined that the project is not likely to affect the northern long-eared bat, per the Programmatic Biological Opinion on the Final 4(d) Rule for the Northern Long-Eared Bat and Activities Excepted from Take Prohibitions (PBO). NMFS concurred that there would be no effect on the Atlantic and shortnose sturgeon. Best Management Practices and standard USACE protocols will be implemented to avoid and minimize impacts on wetlands, and for the protection of the northern long-eared bat, to reduce any potential negative impacts of the project. Environmental quality account information is contained within Section 7 of this integrated report and summarized in the FONSI within Section 10.

5.8.3 Other Social Effects

Other Social Effects Matrix

The PDT reviewed the remaining alternative plans based on OSE metrics. The rating scheme that was used to rank the plans were based on the Institute for Water Resources' handbook for Applying Other Social Effects in Alternatives Analysis (2013). This method uses a -3 to 3 scale with -3 representing significant negative effects and 3 representing significant beneficial effects. Zero is negligible effects or no impact. The one and two scores are for minor and moderate effects in either the negative or positive direction. All metrics were scored for each alternative with consideration as to how that particular alternative would impact the metric in the future. Alternative plans can then be compared against each other based on the scoring results. Table 5-14 below shows the OSE matrix comparing the remaining alternatives.

Table 5-14. Other Social Effects Summary of Alternatives and Factors

Factor	Metric	No Action	West Fixed	West Moveable	East Fixed	East Moveable
1. Health and Safety	Emergency Services	0	3	1	3	1
2. Economic Vitality	Tax Revenue	0	-1	-1	-1	-1
3. Regional / National / Global Impact	Traffic	0	3	1	3	1
	Commerce	0	3	1	3	1
4. Local Community Support		0	2	2	2	2
5. Historic Structures/ Districts	Historic Structures	0	0	0	-1	-1
	Archeological Sites	0	-1	-1	-2	-2
6. Socially Vulnerable Populations		0	0	0	0	0
7. Displacement		0	-1	-1	-2	-2
8. Energy Conservation		0	3	-1	3	-1
	Total	0	11	1	8	-2

The scoring justification for each alternative for each factor is in Table 5-15 below.

Table 5-15. Scoring Justification for Other Social Effects

Factor	Scoring Justification
1. Health and Safety	Emergency preparedness was factored into the alternatives. Some fire equipment is restricted from using the current structure because of load restrictions. A bridge structure that adheres to current standards would increase emergency preparedness by allowing for all types of emergency vehicles to pass thereby reducing response time.
2. Economic Vitality	While acquiring structures can, temporarily, reduce tax revenue for both communities. The long ranch plans for both communities shows increased development within the region which would necessitate a better bridge.
3. Regional / National / Global Impact	Due to the relatively small size of the project, the national economic impact is not expected to be significant. However, the regional impact of the project will reduce traffic delays and vessel delays.
4. Local Community Support	Community support was a factor in the formulation of the Recommended Plan. The City of Chesapeake and the City of Virginia Beach have expressed support. However, the project will impact properties adjacent to the chosen alignment. Negative reactions to the project can be expected from those who are negatively impacted.
5. Historic Structures	Historic structures and archaeological sites were researched. The project will have an adverse effect on the Albemarle and Chesapeake Canal District and the North Landing Bridge, which is a contributing element. A full assessment will be completed later in the study. Additional cultural resource information is included in Chapter 3, Section 3.9 Cultural Resources.
6. Socially Vulnerable Populations	There were no socially vulnerable populations in the study area.
7. Displacement	Displacements may be necessary based upon the chosen alignment. Please see the Real State Appendix for more details.
8. Energy Conservation	There will be possible energy savings in the reduction in fuel consumption associated with delays of the bridge opening.

Other Social Effects Summary

There will be positive effects from the bridge regarding emergency preparedness. The bridge is a route for emergency vehicles so a fully functioning bridge will complement emergency preparedness. Some fire equipment is restricted from using the current bridge.

There will be beneficial effects on vessel operator safety with a high rise fixed bridge. A high rise fixed bridge will reduce allisions with the bridge. Without improvements, vessels could potentially allide with the current 6-foot clearance when the bridge is closed. There will be beneficial vehicle traffic safety benefits because under current conditions there is no shoulder on the bridge. Any accident on the bridge could delay traffic and bridge openings. Additionally, there are currently illegal overloads from trucks cross the bridge. A new bridge built under the current bridge standards would increase truck traffic across the bridge and reduce additional time spent driving due to detours. There will be energy savings with a fixed bridge alternative because barges won't have to wait for the lock to open and vehicle traffic will not have to detour when the bridge is open. An increase in the amount of vehicle traffic and vessel traffic is expected to occur with or without bridge improvements. A fixed bridge will improve overall time for vehicles and vessels not delayed by openings/waiting for openings. This might enhance increases in volume as well. There will be energy savings due to the reduction in fuel consumption associated with delays of the bridge opening. Consequently, long term productivity effects include a reduction in delays from bridge openings.

Within the study, one of the adverse effects of the bridge is that property owners will most likely be displaced with either alignment. There will be impacts to private property ownership but as the study progresses, additional discussions will occur with adjacent landowners. The plan aims to mitigate displacement as much as possible.

The existing North Landing Bridge is cited as a contributing element of the Albemarle and Chesapeake Canal Historic District; therefore, its demolition would be an adverse effect to the district. Mitigation will be provided for this adverse effect. In regards to the City of Virginia Beach's proposed park adjacent to North Landing Road, a structurally efficient bridge will ensure continuous access to the park and could possibly affect the Recommended Plan / Proposed Action.

6 Recommended Plan / Proposed Action

6.1 Description of the Recommended Plan (RP)

The Recommended Plan is currently defined as the NED plan. The Recommended Plan is a high rise, two-lane, fixed bridge to the east of the current bridge (Figure 6-1). The high rise bridge will not have to close for navigation traffic and includes a two-lane approach. The Recommended Plan includes upgrades that are necessary per current USACE and VDOT design guidelines. Prior to the Recommended Plan selection, it was clear that a high rise, two-lane fixed bridge was the NED plan but two alignments for the high rise, fixed-bridge (to the west of the current bridge and to the east of the current bridge) were close in benefits. As the project costs were refined throughout the study, the alternative to the east of the current bridge became the plan that maximizes net NED benefits and the Recommended Plan.

6.1.1 Basis for Selection

A fixed bridge alternative was selected over any moveable bridge option primarily because all of the vessel benefits come from the fixed bridge alternatives. Additionally, most of the vehicle traffic benefits come from a fixed bridge as well. Table 6-1 details the cost summary for the Recommended Plan.

Table 6-1. Recommended Plan Cost Summary

Cost Item	East Fixed
Total Project First Cost (Rounded)	$98,494,000
Interest During Construction	$3,909,887
Annualized Investment Cost	$3,999,385
Annualized OMRR&R Cost	$184,578
Total Average Annual Cost (Rounded)	**$4,184,000**
Average Annual Benefits (Vehicle Traffic)	$11,320,863
Average Annual Benefits (Mariner Traffic)	$414,780
Total Average Annual Benefits (Rounded)	**$11,736,000**
Benefit Cost Ratio	**2.8**
Net Benefits	**$7,552,000**

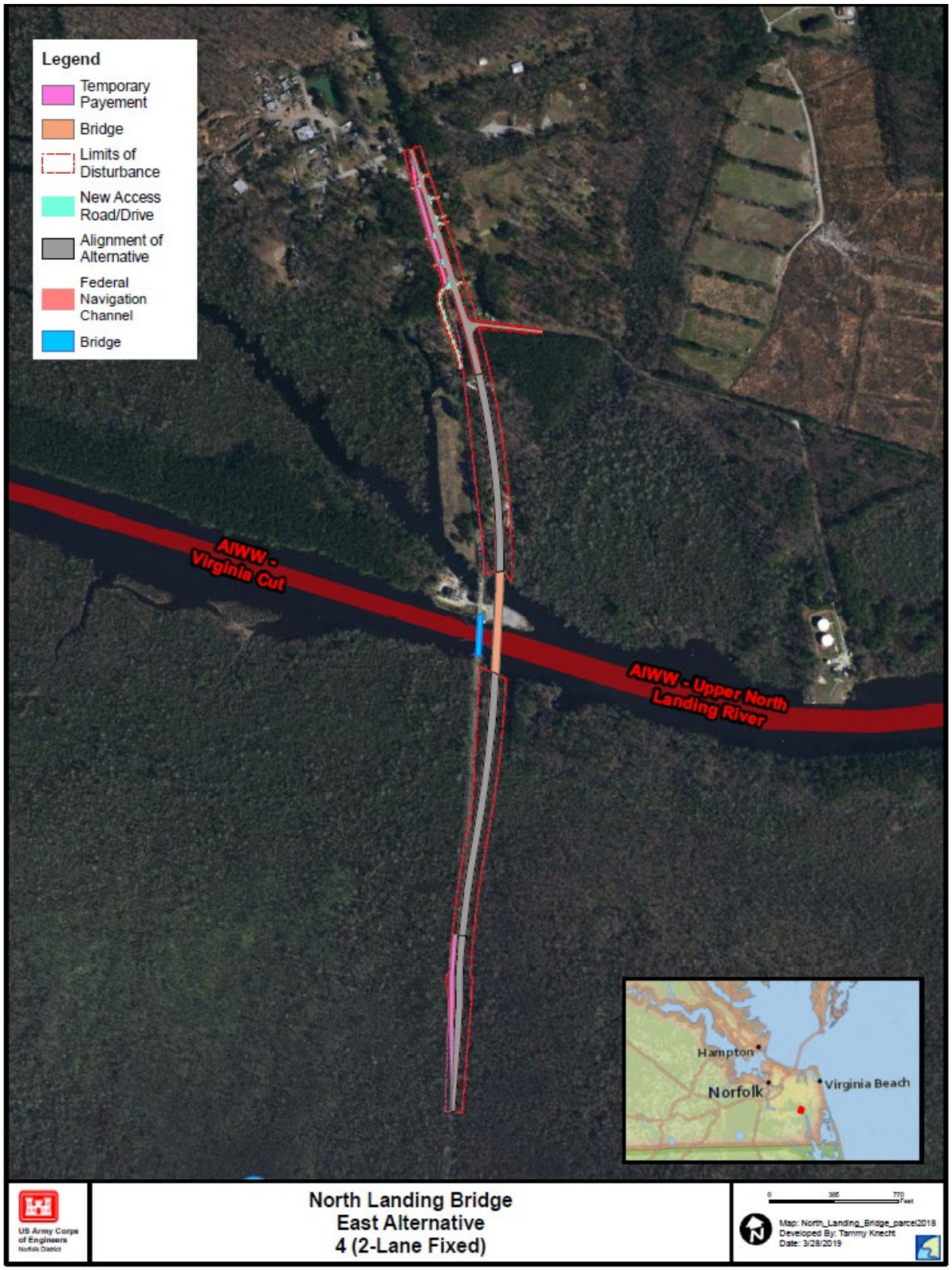


Figure 6-1. North Landing Bridge East Fixed Recommended Plan.

6.1.2 Roadway Approach

The roadway approach is designed to accommodate maximum efficiency and is tied into the existing road. All of the proposed alignments included a shoulder taper to tie into the existing roadway. Taper lengths are based on VDOT design standards (Length = Speed * Width). Existing driveways will also need to be extended to proposed alignments to provide access to the adjacent properties.

6.1.3 Utility Relocations

The current design analysis does not consider impacts to public and private utilities other than the NuStar fuel line. As the design process continues, utility impacts will be determined, but they have been considered. Any relocated utility will need to be placed inside of a utility easement. It is highly possible that there could be a relocation of the NuStar fuel pipeline along the East Fixed alignment. NuStar has agreed to relocate the fuel line before construction begins so it will not be impacted by construction.

The NuStar fuel station to the east of the existing bridge regularly receives shipments of jet fuel deliveries by barge. A discussion of the relocation costs for the pipeline are included in the Cost Appendix. Deliveries of fuel from the AIWW will not be significantly impacted by construction; however, the underground distribution line will be impacted by this project. Fixed bridge alternatives will increase the height of the intersection at North Landing Road and Upton's Lane significantly, requiring Upton Lane to be reconstructed to meet the proposed height of North Landing Road. For alignments to the east of the existing roadway, NuStar will require the existing line be relocated outside of the roadway travel lanes to allow access to the line for maintenance.

6.1.4 Bridge Dimensions

The fixed span bridge will have a minimum vertical clearance of 65 feet above the mean high water (MHW) elevation, as required by the USCG, 75 years post-construction in the year 2102. Tables 6-2 and 6-3 provide a summary of the proposed bridge design and dimensions, based on the 10% project design with a 50-year project life. It is acknowledged that the bridge is likely to have at least a 75 year life cycle so the bridge was also analyzed using a 75 year life cycle. See more information in Chapter 6.7, Sea Level Change and Navigation Structures. For the 10% design, a sea level rise of 1.45 feet was calculated for the 50-year period using the intermediate curve for the NOAA Sewells Point tide gauge station. To account for sea level rise increase in the bridge design, 1.45 feet was added to the current FEMA 1% annual chance stillwater storm tide flood elevation of 3.0 feet, NAVD88. Thus, the low chord elevation within the navigation channel was designed to 69.45 feet, NAVD88. As is discussed in Chapter 6.7, this design does meet the clearance required for the intermediate projection for SLC for a 75 year life cycle. The design will continue to be evaluated with incorporation of SLC for the 75 year life cycle as the project moves into PED.

Table 6-2. Summary of the Design at a 10% Level of Design

Alignment	Lanes	Min. Vertical Clearance (ft)	Bridge Begin Station	Bridge End Station
East Fixed	2	65	5+80.00	39+40.00

Table 6-3. Bridge Dimensions at a 10% Level of Design

Alignment	Length	Bridge (width) ft	Low Chord Elevation (ft, NAVD88)	Structure Depth (ft)	Maximum Top of Roadway Elevation (ft, NAVD88)
East Fixed	3360'-0"	46'-4"	69.45	8'-0"	78.00

An example of the bridge roadway for the two-lane alternative is shown in Figure 6-2, looking down on aerial imagery of the east alignment and looking upstream at the roadway profile and existing ground, the maximum top of road elevation = 78.0 feet, NAVD88 and low chord elevation = 69.45 feet, NAVD88 within the navigation channel. Although not shown, the proposed fixed bridge spans will be supported by hammerhead piers.

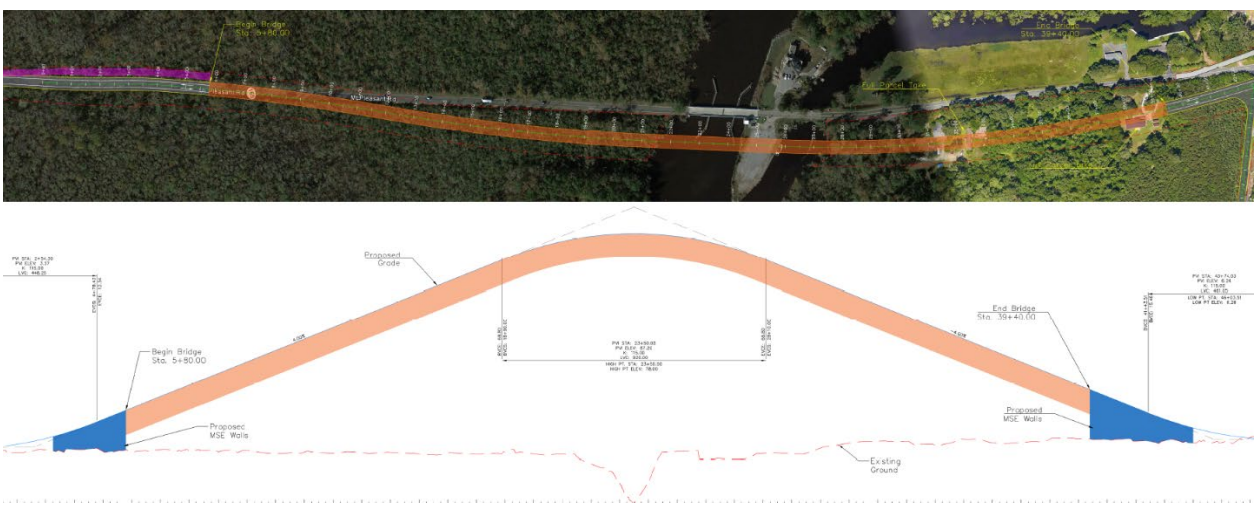


Figure 6-2. East Alignment Fixed Span Bridge

6.1.5 Material Management

The bridge will have components made of concrete and reinforcing steel. Precast prestressed concrete bulb-T (PCBT)'s were proposed for all fixed spans. Steel was not considered as an option for either alternative because it is unfavorable for this location due to the high corrosive environment. Precast concrete is a more economical option and better for long term durability in

the corrosive marine environment. The final compressive strength assumed for the precast beams was 10,000 psi and the compressive strength of the concrete at release was assumed to be 8,000 psi with 0.6" diameter Grade 270 low-relaxation strands. Each span has five beams spaced at 10'-1" with a 3'-0" overhang. The overhang dimensions meet the requirements of VDOT's Vol. V Part 2 for the cantilever design of the deck slab and does not require yield line analysis. Table 6-4 provides the material properties for the proposed superstructure and substructures of the bridge.

There are several aspects to consider for material management:

- There is currently a 20% steel tariff burden is applied as a running percent of select costs to material costs; i.e. structural steel, and rebar.
- 6% sales tax for the City of Chesapeake is applied to select costs (all materials and equipment costs).
- Pavement section is assumed to include 2" of surface mix asphalt, 2" of intermediate mix asphalt, 4" of base mix asphalt, and 12" of NO. 21 stone.
- Geotechnical exploration must be completed to determine the condition of the existing soils and will most likely be started during PED.

Table 6-4. Material Properties.

Bridge Component	**Concrete Class**	Reinforcing Steel	Prestressing Strands
Superstructure			
Deck	A4 (fc': 4 ksi)	CRR Class II	-
Barriers	A4 (fc': 4 ksi)	CRR Class II	-
Approach Slab	A4 (fc': 4 ksi)	Black	-
Pre-stressed Beams	A5 (fc': 10 ksi)	CRR Class I	Carbon Steel
Diaphragms	A4 (fc': 4 ksi)	CRR Class II	-
Substructure			
Abutment Network	A3 (fc': 3 ksi)	CRR Class II	-
Abutment Footing	A3 (fc': 3 ksi)	CRR Class I	-
Pre-stressed Piles (within waterline)	A5 (fc': 5 ksi)	CRR Class I	Stainless Steel
Pre-stressed Piles (outside waterline)	A5 (fc': 5 ksi)	Black	Carbon Steel

6.2 Environmental Mitigation

The project will temporarily and permanently impact forested and emergent wetlands regulated under the Clean Water Act, Section 404. All permanently impacted wetlands will require compensatory wetland mitigation. All wetlands temporarily impacted must be restored to pre-existing contours and planted with wetland species in the existing wetlands. If these wetlands cannot be restored, they will also require compensatory mitigation.

A full wetland delineation and further design will be needed to ascertain the final wetland impacts. However, a preliminary determination has found that the Recommended Plan, East Alignment, Alternative 4 will entail approximately 0.94 acres of permanent direct fill wetland impacts. All permanent wetland impacts will be mitigated in-kind, utilizing wetland mitigation bank or in-lieu-fee credits offsite. The preliminary wetland mitigation requirements, according to

the Uniform Mitigation Assessment Methodology (UMAM), are approximately 6.93 to 7.94 wetland mitigation credits, purchased from a mitigation bank within the service area for this project. The Recommended Plan will entail approximately 5.46 acres of temporary wetland impacts. All temporarily disturbed wetlands will be restored to preexisting conditions and planted with native tree species.

Compensatory mitigation requirements will be determined using the Uniform Mitigation Assessment Methodology (UMAM), as well as mitigation requirements of the VDEQ. This compensatory mitigation for permanent wetland impacts and restoration of temporary impacts will be necessary to prevent significant wetland impacts. Please see Section 7 of this report and the Environmental Mitigation Plan in the Environmental Appendix, Appendix C, for further detail.

In addition, mitigation for stormwater impacts will be required, per the Clean Water Act, Section 402, and the Virginia Stormwater Management Act. A project-specific stormwater pollution prevention plan, including stormwater mitigation, is required for projects involving land-disturbing activities greater than one acre in size. These mitigation requirements are dependent on the total acreage of new impervious area; therefore, they will be determined during the Preconstruction, Engineering, and Design (PED) phase of the project. As part of this requirement, where land-disturbing activities result in a net increase of impervious cover, the total phosphorus (TP) load of the increased impervious area is limited to 0.41 pounds per acre per year. A General Construction Permit, which serves as a Virginia Pollution Discharge Elimination System (VPDES) permit, will be required from the VDEQ.

Based on preliminary calculations, approximately 11.00 pounds per year of TP load reduction would be required. On the Virginia Beach side of the bridge, wet swales are being considered to provide initial treatment. The wet swales would discharge into a constructed wetland or other stormwater facility. On the Chesapeake side, roadway runoff would sheet flow to conserved open space after roadside pretreatment. Bridge runoff would be piped to conserved open space. Incorporating these BMPs, it is estimated that this phosphorus load reduction requirement could be met.

The VDEQ generally requires stormwater management to be constructed in uplands to limit the amount of wetland impacts; therefore the current wetland impact assessment assumes no wetland impacts due to stormwater treatment. Total take parcels may provide stormwater management opportunities. However, if it is determined after the final wetland delineation is completed that there is not enough upland space, then offsite alternatives for stormwater treatment may be preferable. For more information on the preliminary stormwater plan, please see the Engineering Appendix, Appendix A.

For a summary of avoidance and minimization measures to reduce any potential impacts to environmental resources, please see Chapter 8, Summary of Best Management Practices.

Operations and Maintenance Considerations

Operation and maintenance of the recommended plan will be a continuation of existing operation and maintenance practices. Current operations and maintenance is the responsibility of USACE. However, upon completion of the construction of the new bridge, the non-federal sponsor understands that the intent of the project is to turn the bridge over to the city. Maintenance of the bridge should occur as needed to adhere to safety and road standards.

Operations and Maintenance costs for the Recommended Plan are projected to be $184,578 per year for a 50-year life cycle.

6.3 Real Estate Considerations

The East High Rise Bridge alternative requires the acquisition of real property interests across thirteen privately owned parcels on the East side of North Landing Road; including nine private landowners on the north side of the North Landing River and two private landowners on the south side of the river. The road realignment footprint would be supported by perpetual road easements, and the bridge structure, including both approaches, would be supported with a fee simple real property interest (absolute ownership by USACE). Temporary Work Area Easements, serving as a construction buffer, will provide sufficient area on either side of the road/bridge construction footprint for construction equipment to maneuver without impeding traffic on North Landing Road during the period of construction. The currently proposed East side road realignment design shows two parcels on the East side of North Landing Road where the primary residential structures are directly impacted by the acquisition of the footprint required for the bridge and bridge approach structural footprints. The resulting displacement of the residents/landowners of both parcels would require buy-outs; and the affected landowners would qualify for relocation benefits. In addition, the proposed road realignment for the East side alternative impacts the NuStar fuel line right-of-way. A relocation of the fuel line is likely and there have been preliminary discussions with NuStar. NuStar is in favor of relocating the line.

A geographic information system (GIS) was employed to assist in the identification of Real Estate parcels affected for the alternative and the cost to acquire them. The real estate parcels and their attribute data were registered to a digitized base map and then a digitized construction “footprint” was registered to the base map. The database was then queried to determine the number of parcels affected, areas, costs, usage, etc. GIS was also utilized to estimate wetland and utility relocation impacts for each alternative.

6.4 Implementation Requirements

6.4.1 Cost Sharing

The construction of the bridge is 100% Federally funded. However, the City of Chesapeake has expressed interest in taking ownership of the bridge after construction is complete.

6.5 View of the Non-Federal Sponsor

At the Tentatively Selected Plan meeting held on January 25, 2019, the City of Chesapeake supported the fixed bridge alternative and didn’t have any preference for either the east or west alignment. The City agreed to move forward with the fixed bridge alternative. The City also stated very positively that this bridge replacement and turn-over by USACE to the City is the third such agreement between the two agencies. The other two projects included the Great Bridge Bridge ten years ago and the current Deep Creek Bridge project. The City of Chesapeake is aware that it would be responsible for long term maintenance.

At the Agency Decision Milestone (ADM) Meeting held on July 9th, 2019, the City of Chesapeake affirmed that they are willing and ready to take over the bridge responsibilities after the project is complete. The City of Virginia Beach also supported the project and course of action outlined in the feasibility report. At the time of the ADM meeting, an alignment was not yet

chosen, but both stakeholders were amenable to either the west or east alignment and were supportive of the decisions made throughout the project.

On December 13, 2019, the City of Chesapeake sent a letter to the Norfolk District Commander reaffirming their support of the Project. The City affirmed that upon completion of the new bridge, it is proposed that the existing bridge be demolished and the new bridge be turned over to the City of Chesapeake for future operation, maintenance, repair, replacement and rehabilitation. The City is going to seek the City Council's approval for the City to serve as the Non-Federal Sponsor of the Project, provide the necessary items of local cooperation, including the acceptance of ownership of the new bridge and the assumption of responsibility for future operation, maintenance, repair, replacement and rehabilitation of the new bridge, and enter into a Project Partnership Agreement with the federal government at the appropriate time prior to the start of construction. The City anticipates seeking Council's approval at a meeting in January 2020.

Additionally, there has been a decade of interest between the cities of Chesapeake and Virginia Beach that requested the need for a feasibility assessment of North Landing Bridge. The cities of Chesapeake and Virginia Beach provided letters dated 10 October 2008 and 12 June 2009, respectively which requested that the Norfolk District consider the need for and feasibility of modifying or replacing the AIWW North Landing Bridge in conjunction with city and Commonwealth plans to improve the road system in this area. The letters stated that, based on the outcome of the feasibility study, the cities would consider serving as the local cost-sharing sponsor, including the possibility of assuming ownership of a replacement bridge. Coordination has been conducted with the cities of Chesapeake and Virginia Beach and VDOT.

6.6 Risk and Uncertainty

Risk and uncertainty exists in the potential fluctuation of the Federal interest rate, changes in mitigation costs, and deviations from vessel or traffic forecasts. Interest rates, forecasts, and vessel and traffic volumes are discussed further in the Appendix B (Economics). Cost contingencies, incremental costs, and estimates for the bridge construction costs are discussed in Appendix A (Engineering).

There is a risk associated with the estimated temporary and permanent impacts to high-functioning, sensitive, bottomland forested wetlands. A completed wetland delineation and further design detail will be required to ascertain wetland impacts. This risk will be minimized as much as practicable through avoidance, minimization, and mitigation of temporary and permanent wetland impacts. However, there remains a risk that the estimated cost of wetland mitigation would increase if impacts increase.

There is minimal risk associated with the relocation of the NuStar fuel line along the eastern alignment. Possible risks include disruptions to the fuel line, possible spills and relocation costs. However, a new line would be fully constructed before switching the fuel to the new line to mitigate any disruption to fuel transport. There have been ongoing talks with NuStar and the Army Corps to discuss relocation and to minimize any risk. NuStar is in favor of the relocation of the line.

The main implementation risks identified in the risk register are related to geotechnical and engineering uncertainty. There is not a difference in risk regarding the east and west alignment.

There is a risk to defer the geotechnical exploration of the project site to PED because there could possibly be the discovery of subsurface conditions that vary from those assumed from existing information that could negatively impact construction cost and schedule. Another implementation risk is using the 10% level of design because the project costs for implementation are rough order of magnitude estimates, and costs determined during PED could be much different as a result of unfavorable conditions that remain unknown during the feasibility phase. The team is using all available existing data to make the best informed assumptions about the project area to mitigate risk. There is some implementation risk associated with the acquisition of private property and/or establishing rights-of-way. Most alternatives will require property owner to be agreeable and partner with USACE so there is risk and uncertainty involved in acquisition. Project implementation will require acquisition of multiple parcels of property. USACE is working on early communication with the community and property owners by holding public meetings to make sure landowners are aware of the alternatives.

6.7 Sea Level Change and Navigation Structures

The potential impacts of future local relative sea level change (SLC) on navigation structures and the possible adaptations that can be developed to counteract these impacts must be considered in all USACE studies and projects located in tidally influenced waters. Current USACE guidance (ER 1100-2-8162 and EP 1100-2-1) requires planning studies to consider SLC in the development and assessment of planning alternatives. EP 1100-2-1 recommends that analyses assess the effects of SLC on the project at three future time periods post-construction, including 20 years, 50 years, and 100 years (Figure 6-3). Since the rate of future SLC (i.e. feet per century) is uncertain, the guidance specifies that the evaluation should consider the three different SLC curves (low, intermediate, and high) included in the USACE's online SLC calculator.

As previously mentioned, the 10% design was originally based on the minimum required vertical clearance of 65 feet, a project life of 50 years, the effective FEMA 1% annual chance stillwater storm tide flood elevation of 3 feet, NAVD88, and a computed sea level rise of 1.45 feet for the 50-year period using the USACE intermediate curve. Upon further consideration of the local conditions, and because the proposed bridge is fixed, non-adaptable infrastructure, an analysis was completed to ensure that the proposed design would meet the necessary navigation requirements for a 75 year life cycle, based on AASHTO and VDOT guidelines (Table 6-5). It was determined that this analysis would be appropriate based on mean sea level, versus the original design assumption of the effective FEMA 1% annual chance stillwater storm tide flood elevation of 3 feet. Multiple factors contributed to the assumptions in this analysis, outlined below:

1. It is not necessary to design the bridge based on the 1% annual chance Stillwater storm tide flood elevation of 3 feet, because the navigation clearance necessary would not be relevant during a 100 year storm event. This is an infrequent event, and navigation would not be occurring in the AIWW during these conditions. All navigation looking for safe harbor would occur prior to flood events occurring.
2. The intermediate projection is used for other Norfolk District studies in this area, and the bridge is not especially susceptible to SLC other than the navigation clearance issue.
3. There are other bridges along this waterway that are fixed and have existing 65 foot clearances. These include a relatively new high rise bridge along the Chesapeake Expressway (168) that would be anticipated lifespan similar to the proposed bridge.

These existing clearance constraints will effectively limit the height of vessels along this waterway.

4. The majority of vessels using the waterway need a much lower vertical clearance than 65 feet. Only a tall sailboat is likely to need that level of clearance, which is a recreation craft (not commercial) and only a small percentage of the vessels using the waterway. In addition, the Navy Fuel barge, which is the vessel that has national security implications, is a very low vessel which would not need anywhere near this level of clearance. All other vessels could use alternate routes if the constraint became an issue.

Given the factors above, the low chord elevation within the navigation channel of 69.45 feet, NAVD88, is highly likely to meet all future navigation needs for the 75 year life of the project. It will in fact continue to provide this clearance 100 years after construction using the intermediate projection. It is possible that the bridge may not maintain the minimum 65 ft vertical clearance during normal, non-flood conditions as early as 2087 depending on the extent of sea level rise. However, any amount of SLC at the other, relatively new fixed bridges along the waterway will reduce clearance below the minimum and limit passage of the largest vessels. Thus, the proposed design will not be the limiting height for vessel passage in any SLC scenario. It's also notable that while USACE considers the High sea level scenario to be the upper limit of reasonably plausible future conditions, other entities including NOAA and various state governments are now using a higher scenario as their upper bounds.

Table 6-5: Fixed Span Bridge Low Chord Elevation Based on Mean Sea Level, Feet Relative to NAVD88

Year	**Significance**	**Low Chord Elevation of 10% Fixed Span Bridge Alternative (ft NAVD88)**	**Low Chord Elevation (ft NAVD88)**		
			Low Projection	*Intermediate Projection*	*High Projection*
2102	End of 75-year life cycle	69.45	66.34	67.42	70.83
2127	100 years after construction		66.71	68.33	73.46

Clearance at MSL

Year	Significance	Minimum Vert Clearance above MSL	Low	Med	High
2102	End of 75-year life cycle	66.2	68.11	67.03	63.62
2127	100 years after construction		67.74	66.12	60.99

Clearance at MHW (Sewell's Point, MHW = 1.2 ft NAVD88)

Year		Minimum Vert Clearance above MHW	Low	Med	High
2102	End of 75-year life cycle	65	66.91	65.83	62.42
2127	100 years after construction		66.54	64.92	59.79

7 Environmental Consequences

7.1 Land Use

7.1.1 Alternative 1, No Action/Future without Project

Alternative 1, the No Action/FWOP Alternative, would involve no action from USACE to replace the existing bridge and roadway. All of the existing infrastructure including the bridge and approaches would remain in place and in use.

Based on the comprehensive plans and ordinances of both cities, land use within the Region of Influence (ROI) is expected to remain largely as it is today. The Accident Potential Zone (APZ)-2 designation due to the proximity of NALF Fentress is also expected to remain in place.

On the Virginia Beach side of the ROI, the existing land use that is mostly rural residential is also expected to remain. The main change within the ROI is a proposed park by the City of Virginia Beach. If developed, the park would be on approximately 21 acres of land on the east side of the road, adjacent to the North Landing River. Plans have not been developed yet, but the proposed park is envisioned mostly for passive use, as most of this 21 acres consists of forested wetlands. The southernmost section of this parcel of land, which is actually within the City of Chesapeake, includes the eastern portion of the peninsula that is located between the AIWW and the North Landing River. The gravel parking lot and old boat ramp on the peninsula of land could be used as a parking lot and new boat launch area. However, it is important to note that the park is only conceptual; it may not ever be constructed.

No land use changes are expected to occur within the Chesapeake side of the ROI; it would remain forested wetlands. There is no public recreational land use; however the privately-owned parcel along the AIWW may be used for private passive use recreation. The waterway is actively used for recreation, however.

The No Action alternative would have no direct temporary or permanent, adverse or beneficial impacts on land use. However, potential temporary, indirect, minor adverse effects could result due to the continued maintenance work and occasional closures that the bridge requires. Permanent, indirect, minor adverse effects could occur if the bridge reaches a point where it can no longer be repaired and must be closed. These indirect effects on land use would be adverse because they would require detours and make residential access more difficult.

7.1.2 Alternative 4, East Alignment Fixed Bridge

A key land use consideration within the ROI, based on the proximity of NALF Fentress in the City of Chesapeake to the North Landing Bridge, is the APZ-2 designation. The U.S. Navy, as a Cooperating Agency, has reviewed the conceptual fixed bridge vertical elevation design and indicated that it will not interfere with the Navy's operations at NALF Fentress facility. However, due to the project's proximity to the facility, a completed FAA Form 7460-1, Notice of Proposed Construction or Alteration is required to be submitted for an FAA obstruction evaluation prior to construction, so that vertical elevations of construction equipment may be considered and documented.

Although the entire corridor is zoned "Agriculture 1 and 2", none of the corridor is used for agriculture. Therefore, there will be no impacts on prime farmland or conversion of farm land to

another use. The predominant land use in the ROI is sparse single family residential housing along North Landing Road; therefore, the largest impact on land use would be residential. A few of the residents who live along the ROI and other local citizens attended the NEPA Scoping meeting in January 2018. Eight attendees provided comments, three of which related to land use. These commenters stated that they thought the eastern alignment would have less land use impacts. Land use comments are addressed herein and in the comment matrix and response in the Environmental Appendix, Appendix C of this document.

This alternative would require the acquisition of real property interests across thirteen privately-owned parcels on North Landing Road; i.e., including nine private landowners on the north side of the North Landing River; and two private landowners and one governmental landowner (i.e., Navy) on the south side of the river. The currently proposed east side road realignment design shows two parcels on the east side of North Landing Road where the primary residential structures are directly impacted by the footprint required for the bridge and bridge approach structural footprints. The resulting displacement of the residents/landowners of both parcels would require buy-outs; and the affected landowners would qualify for relocation benefits. In addition, the proposed road realignment for the east side alternative would encroach upon the Navy's fuel line right-of-way. This is discussed more in the Utilities section.

This alternative would affect public lands; a small section of Navy property (NALF Fentress) will be impacted during construction. Currently, there are no public park lands affected by this alternative in the ROI. However, this alternative would also bisect the future location of the proposed local park land, if it were to be developed. The alignment would pass through approximately 400-500 feet of the property, including the higher, developable ground on the property. As a result, it is unclear whether or not the plans for the park could still move forward. Assuming the park would be viable, this section of the park would be permanently underneath the bridge span and would experience shading and a view of the underside of the bridge. There would also be bridge support pilings spaced across the property. There would need to be a construction easement and a permanent maintenance easement across the land, which would affect where any buildings and/or amenities could be constructed as well as the use and visual appeal of the park land. Other than this potential conflict, this alternative is consistent with State, area wide, and local plans and programs. This would be a temporary and permanent, direct and indirect, moderate adverse effect on public land use.

With the high rise bridge in place, permanent at-grade roadway access would need to be maintained for all residential properties to remain, and for the park if it is still developed. The existing at-grade roadbed would need to remain in place, and the access road would require short connection segments or ramps from the properties to connect with the new project corridor.

On the Chesapeake side, there is no public recreational use; however the privately-owned parcel along the AIWW may be used for passive use recreation. If so, the existing at-grade roadbed access to this parcel would likely have to be retained unless this parcel was acquired for the project. The Nature Conservancy-owned parcel is intended for wetland habitat preservation and is not intended for recreational or other land use.

It is important to note that exact footprints for temporary and permanent impacts will be determined during the Preconstruction, Engineering, and Design (PED) phase. Impacts on private property are avoided to the extent practicable. All land required for the project's

permanent footprint will be acquired by the government. Temporary construction easements will be acquired for all construction areas, and no disturbance will occur outside of the limits of construction. All residents will be compensated by the government as appropriate, with respect to the temporary and permanent impacts on their properties.

During construction, construction equipment and structures associated with roadway and bridge construction would be present along the corridor, including on the bridge, in some areas to the sides of the roadway, and near the waterway. For safety reasons, these work areas would need to be closed off to public and/or private use for portions of the three-year construction time-frame. However, for all residential properties to remain, access to and use of those properties would be preserved. There could be temporary minor inconveniences for residents due to the presence of the equipment in or near yards, closer to houses, etc. The construction schedules for the bridge and the proposed park are not clear at this time, but would have to be coordinated to avoid conflicts. Construction will have temporary, direct and indirect, minor impacts on land use.

A completed FAA Form 7460-1, Notice of Proposed Construction or Alteration will be submitted for an FAA obstruction evaluation prior to construction, so that vertical elevations of construction equipment may be considered and documented with respect to airspace usage

This would be a temporary, minor, adverse effect on land use of the waterway during construction.

Based on the foregoing, this alternative would have temporary, direct and indirect, minor adverse effects; and permanent direct and indirect minor to moderate adverse effects on public and private land use.

7.1.3 Alternative 6, West Alignment Fixed Bridge

This alternative would have similar effects described for Alternative 4, except that it will require the acquisition of real property interests from eleven individual landowners on the west side of North Landing Road; i.e., including nine private landowners on the north side of the North Landing River, and two private landowners, and one Government landowner (i.e., Navy) on the south side of the river. It will also impact existing USACE-owned land west of the bridge. The road realignment footprint will require perpetual road easements to the remaining properties. Direct access to residential parcels adjacent to the road realignment and bridge approach footprints on the north side of the river will be addressed in the next project phase. Ensuring direct access to the rural residential parcels on the west side of North Landing Road will be required to avoid cutting off reasonable access to those parcels, which could result in a Total Taking that would require acquisition of the entire affected parcel(s) and the provision of relocation benefits to the displaced residential landowner. Therefore, providing alternate routes of access for affected parcels, such as additional access ramps and segments, will be accomplished in the next project phase.

Another difference between this alternative and Alternative 4 is that this alternative would not pass through or cause a permanent conflict with the potential City of Virginia Beach park land.

On the Chesapeake side, there is no public recreational use; however the privately-owned parcel along the AIWW may be used for passive use recreation. If so, the existing at-grade

roadbed access to this parcel would likely have to be retained. The Nature Conservancy-owned parcel is intended for wetland habitat preservation and is not intended for recreational or other land use.

It is important to note that exact footprints for temporary and permanent impacts will be determined during the PED phase. Impacts on private property are avoided to the extent practicable. All land required for the project's permanent footprint will be acquired by the government. Temporary construction easements will be acquired for all construction areas, and no disturbance will occur outside of the limits of construction. All residents will be compensated as appropriate, with respect to the temporary and permanent impacts on their properties.

During construction, construction equipment and structures associated with roadway and bridge construction would be present along parts of the corridor, including on the bridge, in some cases to the sides of the roadway, and near the waterway. For safety reasons, these work areas would need to be closed off to public and/or private use for portions of the three-year construction time-frame. However, for all residential properties to remain, access to and use of those properties would be preserved. There could be temporary minor inconveniences for residents due to the presence of the equipment in or near yards, closer to houses, etc. The construction schedules for the bridge and the proposed park are not clear at this time, but would have to be coordinated to avoid conflicts. Construction will have temporary, direct and indirect, minor impacts on land use.

This would be a temporary, minor, adverse effect on land use of the waterway during construction.

Based on the foregoing, this alternative would have temporary, direct and indirect, minor adverse effects; and permanent direct, minor to moderate adverse effects on land use.

7.1.4 Cumulative Effects

The past, present, and reasonably foreseeable effects of any alternative must be considered, and the effects on land use described herein include consideration of those. As indicated earlier, no other major changes in land use are expected in the ROI, other than described herein. Sea level rise is expected to occur over time due to climate change, and may cause increased flooding frequencies in particularly the lowest-lying areas within the ROI. Under the medium USACE sea level estimate, approximately 1.4 feet of sea level rise would occur over a 50-year period. Flooding as a result of sea level rise would mostly occur in the lowest-lying wetland areas. However, implementation of the No Build, Alternative 4, or Alternative 6 is not predicted to substantially cumulatively or synergistically interact with climate change and/or other effects to land use.

7.2 Transportation and Navigation

7.2.1 Alternative 1, No Action/Future without Project

Transportation. Alternative 1, the No Action/FWOP Alternative, would involve no action from USACE to replace the existing bridge and roadway. All of the existing infrastructure including the bridge and approaches, which do not meet AASHTO safety standards for width, weight, or capacity, would remain in place and in use. Roadway traffic would still be delayed briefly by regular bridge openings. The bridge will continue to be used by overweight vehicles. Also, occasional bridge closures due to malfunctions and/or maintenance, and temporary detours of

at least 15 miles for roadway traffic for a few days at a time would be expected to continue. This could contribute temporarily to additional traffic congestion elsewhere, possibly delaying emergency vehicles along the detour.

Improvements to the existing corridor (North Landing Road in Virginia Beach and Mount Pleasant Road in Chesapeake) are not included in the HRTPO's 2040 Long-Range Transportation Plan: Regional Priority Projects (HRTPO 2016). Each city has a master transportation plan of its own. The master plan for City of Virginia Beach maintains its corridor (North Landing Road) as a two-lane road. The most recent City of Chesapeake transportation master plan, adopted in 2016 as part of the City's comprehensive plan, recommends a four-lane roadway by 2050 for the stretch of Mount Pleasant Road that approaches the North Landing Bridge from the City of Chesapeake; however no funding has been allocated (City of Chesapeake, 2016). Therefore, no widening of either corridor is anticipated.

According to the traffic study completed by the USACE and its engineering firm, for the No Build/FWOP Alternative, the average daily traffic volumes are expected to increase by approximately 66%, from a base year of 2009 and its volume of 10,108 vehicles, through the year 2040 and its projected volume of 16,798 vehicles. This is considered to be a substantial change. According to the traffic study, a volume of 16,000 vehicles per day on a two-lane rural road is considered to be at capacity; therefore, this alternative would be at capacity prior to the end of the 50-year planning period of analysis. The traffic model indicated that approximately 85% of the traffic that uses the bridge is coming from within a 5-mile radius; and this trend would be expected to continue (WSP, unpublished data).

Eventually, the bridge will become too old and/or damaged to maintain or repair. At that point, if it is not replaced, it would have to be closed for safety reasons; at that point, over 11,000 vehicles per day roadway would permanently endure a 15-mile detour. If that occurs, it would be a direct, permanent, moderate adverse effect on roadway transportation.

Navigation. The USACE would continue to own the AIWW federal navigation channel and to maintain it as needed. The existing vessel counts are provided in Chapter 2, and future estimates of vessel counts are not known at this phase of the study. It is assumed that vessel counts over the period of analysis will remain similar to what they are currently.

Because the navigation channel would remain constricted at the bridge location, vessels would continue to have to slow down to pass through the bridge. There would likely still be occasional allision accidents along the bridge and bridge fender system. Also, recreational vessels would still have to wait for hourly openings.

Eventually, the bridge will become too old and/or damaged to maintain or repair. At that point, if it is not replaced, it would have to be closed for safety reasons, and its swing span permanently removed so that navigation is not impeded.

Based on the foregoing, the No-Build/FWOP Alternative would have direct, temporary and permanent, minor to moderate adverse impacts on transportation and navigation.

7.2.2 Alternative 4, East Alignment Fixed Bridge

Transportation. For this alternative, the new bridge would meet all current safety standards for width, weight, and capacity. According to the traffic study, for either Alternative 4 or 6, the average daily traffic volumes are expected to increase by approximately 71%, from a base year of 2009 and its volume of 10,108 vehicles, through the year 2040 and its projected volume of 17,310 vehicles. This is a 5% increase over the projected volume of 16,798 vehicles through the year 2040 for the No-Build/FWOP Alternative. The fact that the new bridge will have no weight restriction and no navigation delays may account for the slight increase in traffic for either Alternative 4 or 6.

According to the traffic study, all build scenarios were projected to have only marginal impacts on the Vehicle Miles Traveled (VMT) and the Vehicle Hours traveled (VHT). Around the North Landing Bridge area, traffic models had mixed projections, with mostly increased VMT and VHTs, suggesting that more traffic might be drawn into the bridge subarea. VDOT noted during the Draft EA comment period that it could not determine whether or not the roadway could adequately support the traffic volumes. According to our traffic study, a volume of 16,000 vehicles per day on a two-lane rural road is considered to be at capacity, and therefore either Alternative 4 or 6 would be at capacity prior to the end of the 50-year planning period of analysis. However, as mentioned earlier, there are no funded roadway widening projects for the connecting roadways in either city at this location in the long-range transportation plans.

Roadway access to existing properties would have to be retained. The existing at-grade roadbed will need to be left in place to access those; and small connector roads will need to be constructed to connect to the new roadway corridor.

Because this roadway corridor is planned by both cities to remain open in the future; and this alternative both upgrades safety standards and allows enough space for future shared use path if desired, it is consistent with State, area-wide, and local transportation plans and programs.

Navigation. After the old bridge fenders are removed and replaced, the current navigational constriction at the bridge will be reduced or eliminated. The 80-foot horizontal clearance underneath the bridge will be widened to a 100-foot clearance, and will connect the 125-foot channel to the west with the 100-foot channel to the east.

The U.S. Coast Guard (USCG) submitted comments during the Draft EA comment period. The USCG stated that the Draft EA was sufficient. The USCG reiterated that it must review and approve the final bridge and fender system clearance construction plan, which must meet current navigational safety standards, during the bridge permit application process, which occurs during the PED phase. It is noted that the vertical clearances upstream and downstream of the Study Area (Route 168 bypass and Pungo Ferry Bridge) both have a 65-foot vertical clearance.

One navigation-related concern was raised by NuStar, the fuel line company, during the August 8, 2019 meeting with USACE staff. NuStar provided verbal comments regarding an existing erosion problem near its tank area, along the bank of the AIWW. NuStar has plans to construct bank stabilization in the near future; but is also concerned that the wider channel at the bridge fender system would invite navigation traffic to travel at higher speeds, exacerbating erosion. Also, that might cause wake that snaps barge lines during the offload of fuel to the tanks. The

USACE suggested that NuStar can apply for a designated “No Wake Zone” in the vicinity of the bridge. In Virginia, the authority to grant these has been delegated to the VDGIF.

Without the need for bridge closures and openings, there would be less idling of either roadway or navigational traffic within the ROI, so both modes of traffic would flow more freely. The bridge and roadway approaches would be less vulnerable to coastal flooding, both nuisance and storm-induced. Because there will be less maintenance required for a new fixed bridge, and less expected flooding along the ROI due to high water events, there would rarely if ever be a need to close the bridge and detour traffic during the 50-year planning period of analysis.

Both roadway and waterway traffic will be maintained during construction. The Occupational Health and Safety Act (OSHA) requirements will be in place for all construction workers during construction. During construction, construction equipment and structures associated with roadway and bridge construction would be present along the corridor, including on the bridge, in some areas to the sides of the roadway, and near the waterway. Safe roadway travel as well as safety for workers will likely require temporary travel lane closures and/or restrictions at the tie-in points at either end of the project limits. Speed limits will also need to be reduced in work zones while work is ongoing, and this could cause slight increases in congestion levels. Similarly, there may be a need to restrict navigational traffic for safety reasons while some instream bridge and fender work is done. Any navigational restrictions will require USCG approval.

Based on the foregoing, this alternative would have direct, permanent, minor beneficial effects on both transportation and navigation. During construction, it will have direct and indirect, temporary, adverse effects that are negligible to minor, on roadway and navigational traffic.

7.2.3 Alternative 6, West Alignment Fixed Bridge

This alternative would have the same effects as Alternative 4.

7.2.4 Cumulative Effects

The past, present, and reasonably foreseeable effects of any alternative must be considered. As mentioned earlier, the traffic model seems to indicate, based on the VHT and VMT results, that the project could draw more traffic to the area. However, based on the vehicle counts as described for the No Build/FWOP and those for either Alternative 4 or 6, there is not a significant difference in traffic volumes, and thus in cumulative effects on transportation.

VDOT noted during the Draft EA comment period that it does not foresee any transportation projects in the Hampton Roads Long Range Transportation Plan having an impact to the transportation network surrounding the Study Area. However, VDOT noted that prior to the beginning of construction, USACE should coordinate with both cities to ensure all applicable standards are met (VDOT correspondence, May 2019). We have added this to Section 8, Summary of Best Management Practices.

It is known that improvements of other roads outside of and connecting to the ROI are planned in the future, namely Indian River Road improvements in Virginia Beach. Since this roadway could be used as a detour route, USACE concurs with VDOT that it will be important for the team to coordinate construction schedules with both cities’ transportation departments in order to minimize temporary cumulative impacts, during the PED phase. Other than this factor,

implementation of the No Build, Alternative 4, or Alternative 6 is not predicted to substantially cumulatively or synergistically interact with climate change and/or other effects to transportation and navigation. The overall cumulative effect within the ROI for either Alternative 4 or 6 would be a minor beneficial for transportation and navigation.

7.3 Geology, Topography, and Soils

7.3.1 Alternative 1, No Action/Future without Project

Alternative 1, the No Action/FWOP Alternative would involve no action from USACE to replace the existing bridge and roadway. All of the existing infrastructure including the bridge and approaches would remain in place and in use. Only occasional maintenance and repair work on the bridge would be conducted; and if the bridge became too old and unsafe for traffic, it would be closed and removed.

This alternative would have no temporary or permanent, indirect or direct, adverse impacts on geology, soils, or topography.

7.3.2 Alternative 4, East Alignment Fixed Bridge

According to the geologic map, the ROI is located within the Coastal Plain and is mostly underlain by Quaternary (Holocene) marsh and intertidal mud deposits. This geologic layer roughly coincides with the current wetland boundary in the ROI, and provides evidence that there could be deep and geologically aged layers of the organic material, muck, and mud, particularly in the forested wetlands in the Chesapeake section of the ROI. The U.S Department of Agriculture's Natural Resource Conservation Service (NRCS) soil survey further corroborates this fact in its mapping of the bottomland hardwood swamp as "Dorovan" or "Dorovan-Bellhaven" soils, which are both histosols that contain surface layer depths of muck at least 2 – 6 feet deep. Soils such as these are seasonally inundated, very unstable, soupy, and highly prone to subsidence and compaction.

It is important to note that geologic and soil survey data are intended as general guides, and the depth of muck, mucky peat, and/or very fine sedimentary soil layers has not been determined. It could be much greater than indicated. Geotechnical borings throughout the entire roadway alignment will be critical to the success of this bridge and roadway construction project, particularly across the bottomland hardwood forested wetlands on the Chesapeake side, and any other areas mapped as Dorovan or Dorovan-Bellhaven. Further engineering and design will take place in the PED phase, but it may be that these areas cannot be filled practicably with permanent solid fill, and would instead need to be completely pile-supported, extending the length of the bridge structure. In addition, permanent infrastructure supports may need to be sunk very deep to reach a soil layer that can serve as a stable foundation. There could also be a substantial amount of poor substrate material that would need to be removed in order to install concrete infrastructure. It is recommended that methods such as "top-down" bridge construction and/or ground improvement should be considered for easier construction access, and to reduce temporary and permanent impacts on soils and wetlands. However, it is understood that such construction techniques can be cost-prohibitive.

At least half of the area to be traversed by this alternative may be underlain by wetland histosol soils of this nature (all of the Chesapeake section). Therefore, minimizing not only permanent wetland and soil impacts, but also temporary logging and construction impacts, will be critical to

ensuring that this alternative does not have significant impacts on soils. Virginia's Erosion and Sediment Control Law and any VDEQ water quality permits require soil-disturbing projects to be designed to reduce soil erosion, and construction must adhere to strict erosion and sediment control measures. In addition, it should be noted that the compensatory wetland mitigation for all temporarily disturbed areas would include removal of all temporary construction disturbance, restoration of the area to pre-existing contours, and sprigging of the cleared areas with tree saplings of (see Environmental Mitigation Plan). This assumes that the temporary impacts to soils may be adequately restored to pre-existing contours and will not be too compacted to convert back to forested wetlands. If these areas cannot be fully restored, however, then full compensatory wetland mitigation will be required for these areas as well, and the mitigation plan will need to be expanded, and the impacts could rise to being significant. However, with the existing mitigation plan in place, and if the temporarily impacts are restored and replanted, then the impacts would not rise to a level of significance.

Tree-clearing for permanent fill and/or construction access should be limited as much as possible. According to the EPA's National Management Measures to Control Nonpoint Source Pollution from Forestry (2005), conventional logging or tree-clearing practices are not recommended in muck and/or peat soils such as these. Specialized equipment, such as low-pressure or high floatation tires, or dual-tired skidders, may be necessary (EPA, 2005). Walking logging equipment might also be able reduce soil impacts when clearing trees.

In addition, temporary fill for either logging or construction should not be placed in any areas verified by geotechnical borings as consisting of muck or peat soils. If "top-down" bridge construction is not practicable, then these areas will need to be accessed by temporary structures such as work trestles. The latter is the current plan. Stockpiling temporarily in wetlands would need to be avoided and minimized, and permanent disposal would need to be offsite.

To avoid long-term impacts that cannot be restored, a tree-clearing and temporary construction plan will need to be developed and coordinated with USACE biologist, who will coordinate with the EPA and/or the U.S Department of Forestry, during the PED phase.

Unlike the aforementioned areas, the soils in wetlands and uplands on the Virginia Beach side of the ROI should be much more stable, although geotechnical borings would be needed to verify for all areas. As always, temporary and permanent wetland soil fills and disturbance should be minimized to the extent practicable, however temporary construction impacts to soils are much less of a concern in areas that are underlain by mineral flats as opposed to histosols that have a deep muck or mucky peat layer. In mineral flat wetland areas, use of geomatting could reduce compaction impacts and be easier to restore.

At least two large concrete instream bridge piers and footings will need to be installed in the AIWW waterway. The new wooden fender system most likely would be installed using a pile driver. Temporary cofferdams would need to be used during construction if filling and/or excavation needs to occur for the installations and/or removals, to contain any construction debris and soils. Once construction is completed, all temporary structures and/or fill would be removed in its entirety, and the area restored.

Topographically, Alternative 4 would not alter the landscape to a large degree. The northern and southern limits of the roadway within the ROI would begin at grade, and ascend toward the

center; however the existing North Landing Road roadbed on the Virginia Beach side will remain at its current elevation. As discussed in the Water Quality section of this chapter, stormwater treatment onsite is going to be difficult because of the lack of topographic relief for drainage and the high water table. Drainage from the project will have to be addressed carefully.

Based on the foregoing, this alternative would have temporary and permanent, direct and indirect, adverse effects on soils. Utilizing best management practices for logging and construction, the adverse effects can be reduced to minor to moderate.

7.3.3 Alternative 6, West Alignment Fixed Bridge

As described above, the areas with the greatest potential for impacts are the bottomland hardwood swamp areas. Alternative 6 would have similar temporary and permanent wetland footprint impacts to Alternative 4; therefore, the effects on geology, soils, and topography would be the same.

7.3.4 Cumulative Effects

The past, present, and reasonably foreseeable effects of any alternative must be considered. The ROI soils of most concern, the histosols, have had very little disturbance in the past, other than for the construction of the original roadbed. Other than the proposed bridge construction, little if any disturbance in these areas is anticipated in the future. If the City of Chesapeake decides to raise the elevation of the bridge approaches, additional fill for the roadway prism slope may encroach onto the existing soils. Sea level rise is expected to occur over time due to climate change, and may cause increased flooding frequencies in particularly the low-lying areas of the ROI. As a result, many of the wetlands and soils in the ROI may become saturated and/or inundated for longer periods of time. However, implementation of the No build, Alternative 4, or Alternative 6 is not predicted to substantially cumulatively or synergistically interact with climate change and/or other effects to geology, soils, or topography.

7.4 Water Quality and Water Resources

As indicated earlier, this section is intended to cover surface waters, public water supply, groundwater, and other aquatic areas, with the exception of wetlands. Wetlands are covered under a separate heading.

7.4.1 Alternative 1, No Action/Future without Project

Alternative 1, the No Action/FWOP Alternative would involve no action from USACE to replace the existing bridge and roadway. All of the existing infrastructure including the bridge and approaches would remain in place and in use.

The existing conditions described in Chapter 3 would be assumed to continue. The waterway would be expected to remain on the 303(d) list for elevated bacteria levels, which do not supporting recreational/swimming. There are no known surface intakes or public groundwater wells planned within the ROI; private well use would be assumed to continue. Existing state-permitted activities for a private homeowner and for the fuel facility along the AIWW would be expected to continue. Currently, there are no stormwater facilities within the ROI, and none would be anticipated with this alternative. Runoff from the roadways would continue to flow directly into surrounding wetlands, ditches, and the AIWW.

Without implementation of an action alternative, it is expected the North Landing Bridge and its approaches will continue to be impacted by high water flooding events, resulting in occasional but continued damage/repairs to bridge motors and electrical components and associated possible release of small amounts of fuels and/or hydraulic fluids into the waterway.

This alternative would have no new temporary or permanent, indirect or direct, adverse impacts on water quality or water resources.

7.4.2 Alternative 4, East Alignment Fixed Bridge

For this alternative, the removal of the existing bridge, pilings, and fender system, and the placement of new bridge piers and fender system, will widen the channel and could improve the hydrologic flow of the waterway at this location.

This alternative would have no effect on any surface intakes or public groundwater wells, as none exist within the ROI. This alternative also would not have any adverse effects on private groundwater well use, or on existing state-permitted ongoing uses along the AIWW that would be assumed to remain in the ROI. It will not affect a sole-source aquifer.

The placement of new impervious surface and structures triggers the requirement to meet current stormwater requirements, under Sections 313 and 402 of the Clean Water Act. The Energy Independence and Security Act (EISA) Section 438 also requires federal agencies to reduce stormwater runoff to protect water resources, and encourages use of green infrastructure to meet this requirement. Stormwater requirements address both permanent stormwater treatment for the roadway, and temporary stormwater treatment during construction, and including both abatement of flow quantities and the quality of the water discharge into surface waters.

A project-specific stormwater pollution prevention plan is required for projects involving land-disturbing activities greater than one acre in size. As part of this requirement pursuant to 9VAC25-870-63, where land-disturbing activities result in a net increase of impervious cover, the total phosphorus (TP) load of the increased impervious area is limited to 0.41 pounds per acre per year. A General Construction Permit, which serves as a Virginia Pollution Discharge Elimination System (VPDES) permit, will be required from the VDEQ. The Virginia Runoff Reduction Method spreadsheets required pursuant to 9VAC25-870-65 also report the amount of nitrogen load reduction achieved with proposed best management practices; however, the permit requirements are specific to phosphorus.

At this early stage of design, onsite best management practices (BMPs) to meet water quality and quantity requirements were explored in a preliminary sense. Because so much of the project area is wooded wetlands, on-site stormwater management options will be limited to the proposed right-of-way or to adjacent non-wetlands.

Based on preliminary calculations, approximately 11.00 pounds per year of TP load reduction would be required. On the Virginia Beach side of the bridge, wet swales are being considered to provide initial treatment. The wet swales would discharge into a constructed wetland. On the Chesapeake side, roadway runoff would sheet flow to conserved open space after roadside pretreatment. Bridge runoff would be piped to conserved open space. Incorporating these BMPs, it is estimated that this phosphorus load reduction requirement could be met.

Upland stormwater management options are preferable to limit the amount of wetland impacts; therefore the current wetland impact assessment assumes no wetland impacts due to stormwater treatment. Total take land parcels may provide stormwater management opportunities. However, if it is determined after the final wetland delineation is completed that there is not enough upland space then, offsite alternatives for stormwater treatment may be preferable. For more information on the preliminary stormwater plan, please see the Engineering Appendix.

During construction, equipment and structures associated with roadway and bridge construction would be present along the entire corridor, including on the bridge, to the sides of the bridge, and near the waterway. Temporary instream construction will be necessary for removal and replacement of bridge pilings, fenders, and bridge piers. At least two large concrete instream bridge piers and footings will need to be installed. The new wooden fender system most likely would be installed using a pile driver. Temporary cofferdams would need to be used to contain sedimentation if filling and/or excavation needs to occur for the installations and/or removals. The instream removal and installation of the bridge fender system could generate a small amount of turbidity, however these would be temporary conditions. Once construction is completed, all temporary structures and/or fill would be removed in its entirety, and the area restored.

In addition to the stormwater permits described above, a water quality permit under the Clean Water Act, Section 401/Virginia Water Protection Permit (VWPP), would be required from the VDEQ for all temporary and permanent fills in surface waters, including wetlands. A permit to encroach upon state-owned bottom would also be required from the Virginia Marine Resources Commission (VMRC). All permit conditions will be met by this alternative.

Based on the foregoing, this alternative would have negligible to minor direct or indirect, temporary or permanent adverse effects on water quality and water resources. It may even have a minor beneficial effect on water quality if stormwater treatment is onsite, given that there is currently no stormwater treatment for the roadway.

7.4.3 Alternative 6, West Alignment Fixed Bridge

This alternative would have the same effects on water quality and water resources as Alternative 4.

7.4.4 Cumulative Effects

The past, present, and reasonably foreseeable effects of any alternative must be considered. Sea level rise is expected to occur over time due to climate change, and may cause increased flooding frequencies in particularly the low-lying areas of the ROI. However, implementation of the No build, Alternative 4, or Alternative 6 is not predicted to substantially cumulatively or synergistically interact with climate change and/or other effects to water quality or water resources.

7.5 Floodplains

7.5.1 Alternative 1, No Action/Future without Project

From past historical flooding, it appears the existing bridge deck and roadway do not act as a major obstruction to flow, or cause backwater flooding to upstream properties. In addition,

hydrologic and hydraulic modeling, completed by the USACE contractor evaluating hypothetical combined tidal and rainfall events - return periods ranging from 50% to 0.2% annual chance, shows similar results. The hydraulic modeling does show upstream water levels are increased by 0.2 feet only for the 0.2% annual chance combined tidal flood and rainfall scenario. For this scenario, the water is in contact with the steel guardrail.

Without implementation of an action alternative, it is expected the North Landing Bridge and its approaches will continue to be impacted by high water flooding events, resulting in continued damage/repairs to bridge motors and electrical components and temporary road and navigation closures. If the existing culvert under North Landing Road that drains the Upper North Landing River becomes blocked with debris, it appears the water will be able to overtop the adjacent land and then flow into the AIWW and North Landing River, thus it would not exacerbate upstream flooding.

Environmentally, the North Landing Bridge area is essentially rural with limited floodplain related impacts. With past storm tides, wind tides, and/or heavy rainfall, history shows the water levels do not fluctuate significantly given the large channel and wide overbanks. The vast amount of wetlands help to serve as hydraulic storage areas and buffers against development. However, long terms impacts from sea level rise, land subsidence, and climate change could cause the flooding in the low-lying areas of the ROI in particular to worsen over time.

Socially and economically, temporary road closures due to more frequent flood events in these floodplain areas may occur. From past events, the duration for bridge closure is typically four days, depending on how quickly the floodwater recedes. This effect is discussed more in the transportation and navigation section of this chapter.

The No Build/FWOP Alternative is expected to have temporary, negligible to minor adverse effects on floodplains, due to occasional high water events. It will have a negligible permanent adverse effect on floodplains.

7.5.2 Alternative 4, East Alignment Fixed Bridge

The hydrologic and hydraulic modeling shows that with the large bridge opening and low roadway approach on the right overbank, upstream flood elevations do not increase for Alternative 4.

During construction, construction equipment and structures associated with roadway and bridge construction would be present along the entire corridor, including on the bridge, to the sides of the bridge, and near the waterway. Temporary, negligible to minor adverse effects on floodplains could occur during construction due to stormwater, but all applicable laws, including the Clean Water Act Section 402 and the Virginia Stormwater Management Act would be followed. This alternative would have temporary, direct or indirect, negligible to minor effects on floodplains during construction. These would be limited to temporary fills or structure construction disturbance. No permanent adverse effects are expected to occur. There may be a very minor beneficial effect on floodplains if removal or partial removal of the existing roadbed on the Chesapeake side occurs.

7.5.3 Alternative 6, West Alignment Fixed Bridge

The hydrologic and hydraulic modeling shows that with the large bridge opening and low roadway approach on the right overbank, upstream flood elevations increase only 0.1 feet with Alternative 6 for only the 0.2% annual chance combined rainfall and tidal flood scenario. However, no floodplain mitigation would be required. As with Alternative 4, stormwater requirements would be adhered to.

The temporary effects for this alternative would be the same as Alternative 4. This alternative would have minor direct or indirect permanent adverse effects on floodplains. There also may be a very minor beneficial effect on floodplains if removal or partial removal of the existing roadbed on the Chesapeake side occurs.

7.5.4 Cumulative Impacts

For all alternatives, the hydrologic and hydraulic modeling shows the bridge and roadway do not act as a major obstruction to flow. It is unknown and uncertain, but if the City of Chesapeake were to elevate the roadway approach on the right overbank using additional road fill material, then modeling would be needed to evaluate possible impacts. Elevating the road with fill material may cause upstream water levels to increase, force more water into the bridge opening, possibly causing damage to the bridge and/or channel scouring, and could put more water on the left upstream and downstream overbanks. If that were the case, mitigation may be required of the City, not USACE. Elevating the roadway using bridge spans verses road fill would likely need to be considered and evaluated.

Currently, to account for uncertainty, the City of Chesapeake has a 1.5 feet freeboard above the FEMA 1% annual chance flood and the City of Virginia Beach at 2.0 feet for new development and substantially damaged or improved structures (Hampton Roads Planning District Commission, 2017).

With or without the project, long-term impacts from sea level rise, land subsidence, and climate change could cause the flooding in the low-lying areas of the ROI in particular to worsen over time. However, there would be no significant effects on floodplain, due to the bridge and roadway, from increased upstream future development and/or future sea level rise, subsidence, and/or climate change. Therefore, implementation of the No build, Alternative 4, or Alternative 6 is not predicted to substantially cumulatively or synergistically interact with climate change and/or other effects to floodplains.

7.6 Wetlands

7.6.1 Alternative 1, No Action/Future without Project

The existing conditions described in Chapter 3 would be assumed to continue. The predominance of palustrine permanently flooded bottomland broad-leaved and narrow-leaved forested wetlands (PFO1R/PFO4R), palustrine scrub/shrub and/or saturated forested wetlands (PSS4B/PFO1B), and palustrine emergent wetlands (PEM) would remain in the ROI.

This alternative would have no temporary or permanent, indirect or direct, adverse impacts on wetlands.

7.6.2 Alternative 4, East Alignment Fixed Bridge

For this alternative, the new bridge would be raised above grade for nearly its entire length of approximately one mile. The new bridge approaches would have solid-fill MSE walls as abutment endpoints, would be pile-supported, and would span the wetlands, other than regularly spaced pile footings.

As described in Chapter 3, a wetland delineation has not been completed for Alternative 4. Areas for which USACE staff had right-of-entry agreements, and/or were publically accessible, were visited and delineated. For all other areas, wetland limits were estimated based on National Wetland Inventory (NWI) maps. The wetland delineation will be completed once all right-of-entry agreements have been obtained from all property owners in the ROI. Based on limited fieldwork, use of, aerial photography, and preliminary engineering plans, wetland impacts are estimated in Table 7-1 as follows:

Table 7-1 Alternative 4, East Alignment Fixed Bridge

Habitat Type	Wetland ID Number	Temporary, Permanent, or Spanned (permanently under bridge)	Estimated Impact (acres)	Data Source
Palustrine Forested narrow/broad leaved, saturated wetland (PFO4/1B)	Wetland E-1	Temporary**	0.01	NWI Geospatial
Palustrine Scrub/Shrub narrow leaved saturated wetland (PSS4B)	Wetland E-2	Permanent Temporary**	0.27 0.44	NWI Geospatial
Palustrine Forested narrow/broad leaved, seasonally flooded tidal (PF04/1R) (bottomland)	Wetland E-3	Spanned* Temporary**	0.17 0.26	NWI Geospatial
Palustrine Forested broad leaved saturated wetland (PF01B)	Wetland E-4 & E-5	Spanned* Temporary**	0.22 0.44	Field
Palustrine Scrub/Shrub broad leaved saturated wetland (PSS1B)	Wetland E-6	Permanent Spanned* Temporary**	0.01 0.08 0.11	Field
Palustrine Forested narrow/broad leaved, seasonally flooded tidal (PF04/1R) (bottomland organic soils wetlands)	Wetland E-7	Permanent Spanned* Temporary**	0.66 1.35 4.2	Field

Habitat Type	Wetland ID Number	Temporary, Permanent, or Spanned (permanently under bridge)	Estimated Impact (acres)	Data Source
Total Forested Wetland Impacts		**Permanent** **Spanned*** **Temporary****	**0.66** **1.74** **4.91**	**NWI Geospatial & Field**
Total Scrub-Shrub Wetland Impacts		**Permanent** **Spanned*** **Temporary****	**0.28** **0.08** **0.55**	**NWI Geospatial**
Total Emergent wetland Impacts		**N/A**	**0**	**NWI Geospatial & Field**

*"Spanned" impact areas are all areas that will be underneath the bridge following construction; however, they will also be restored and replanted following construction.

**"Temporary" impact areas are areas impacted for construction access. These areas also will be restored and replanted following construction.

Legend	Habitat	Construction type	Acres	10% Fill	30% of Swing out Parcels SPIN: 1483631311 0000 1483607817 0000
	Open Water	Bridge > 40	0.44		
	Non-delineated, non-NWI Wetland	Bridge < 40	0.48		
	Non-delineated, non-NWI Wetland	Bridge > 40	0.49		
	Non-delineated, non-NWI Wetland	Fill	1.23	0.12	
	Non-delineated, non-NWI Wetland	Temporary Impact	5.10		
	Non-delineated, non-NWI Wetland	Permanent Impact	0.73		
	Non-delineated-within NWI PFO4/1Bd	Temporary Impact	0.01	0.00	
	Non-delineated-within NWI PFO4/1R	Bridge < 40	0.17		
	Non-delineated-within NWI PFO4/1R	Temporary Impact	0.26		
	Non-delineated-within NWI PSS4B	Fill	0.25	0.02	
	Non-delineated-within NWI PSS4B	Temporary Impact	0.44		
	PFO4R	Bridge > 40	0.26		
	PFO4R	Temporary Impact	0.59		
	Wetland - Palustrine Forested PSS1	Bridge > 40	0.08	0.01	
	Wetland - Palustrine Forested PSS1	Temporary Impact	0.11		
	PFO1/4R	Bridge < 40	0.57		
	PFO1/4R	Bridge > 40	0.52		
	PFO1/4R	Fill	0.17	0.02	
	PFO1/4R	Temporary Impact	3.61		
	PFO1/4R	Permanent Impact	0.35	0.03	0.6
	Wetland - Palustrine Forested PFO1B	Bridge < 40	0.04		
	Wetland - Palustrine Forested PFO1B	Bridge > 40	0.18		
	Wetland - Palustrine Forested PFO1B	Temporary Impact	0.44		
	Wetland - Palustrine Forested PFO1R	Permanent Impact	0.09		

Figure 7-1. Aerial Imagery of Wetland Impacts to the East Alternative.

As described in the Geology, Soils, and Topography section, at least half of the area to be traversed by this alternative (and all of the PFO1R/PFO4R sections) are mapped on the NRCS Soil Survey mapping as “Dorovan or Dorovan-Bellhaven complex,” and may be underlain by wetland histosol soils consisting of a muck or mucky peat layer that is several to many feet deep. Soils such as these are seasonally inundated, very unstable, soupy, and highly prone to subsidence and compaction. Geotechnical borings throughout the entire roadway alignment will be critical to the success of this bridge and roadway construction project, and to avoiding permanent damage to wetlands during construction.

Further engineering and design will take place in the PED phase, but it may be that these areas cannot be filled practicably with permanent solid fill, and would instead need to be completely pile-supported. In addition, permanent infrastructure supports may need to be sunk very deep to reach a soil layer that can serve as a stable foundation. There could also be a substantial amount of poor substrate material that would need to be removed in order to install concrete infrastructure. It is recommended that methods such as “top-down” bridge construction should be considered for easier construction access, and to reduce temporary and permanent impacts on soils and wetlands. However, it is understood that such construction techniques can be cost-prohibitive.

In addition, temporary fill for either logging or construction should not be placed in any areas verified by geotechnical borings as consisting of muck or peat soils. If top-down” bridge construction is not practicable, then these areas will need to be accessed by temporary structures such as work trestles. The latter is the current plan. Stockpiling temporarily in wetlands would need to be avoided and minimized, and permanent disposal would need to be offsite.

As described above and in the Affected Environment chapter, the organic soil wetlands to be impacted in particular are of very high quality. Minimizing not only permanent wetland and soil impacts, but also temporary clearing and construction impacts, will be critical to ensuring that this alternative does not have significant impacts on wetlands. Tree-clearing for permanent fill and/or construction access should be limited as much as possible. According to the EPA’s National Management Measures to Control Nonpoint Source Pollution from Forestry (2005), conventional logging or tree-clearing practices are not recommended in muck and/or peat soils such as these. Specialized equipment, such as low-pressure or high floatation tires, or dual-tired skidders, may be necessary (EPA, 2005). Walking logging equipment might also be able reduce soil impacts when clearing trees. To avoid long-term impacts to wetlands and organic soils that cannot be restored, a tree-clearing and temporary construction plan will need to be developed and coordinated with USACE biologist, who will coordinate with the EPA and/or the U.S Department of Forestry, during the PED phase.

Virginia’s Erosion and Sediment Control Law and any VDEQ water quality permits require soil-disturbing projects to be designed to reduce soil erosion, and construction must adhere to strict erosion and sediment control measures. In addition, it should be noted that the compensatory wetland mitigation plan for all temporarily disturbed areas includes removal of all temporary construction disturbance, restoration of the area to pre-existing contours, and sprigging of the cleared areas with native tree saplings (see Environmental Mitigation Plan). This assumes that the temporary impacts to soils may be adequately restored to pre-existing contours and too not compacted to convert back to forested wetlands. If these areas cannot be fully restored, however, then full compensatory wetland mitigation will be required for these areas as well, and

the mitigation plan will need to be expanded. The spanned areas include all areas that will be underneath the bridge post-construction. Due to uncertainty as to whether all of these areas will be able to be restored as forested wetlands, the areas that will be spanned at a height of 40 feet or less were counted as shading impacts; and the areas that will spanned at a height of 40 feet or greater were not counted as wetland impacts. However, all spanned areas will be restored and resprigged with native tree species.

The final wetland delineation will be completed in the PED phase of the project, once real estate access is secured and the project design is more finalized. Final wetland impact amounts also will be determined upon more complete design of the project. At this time, however, a functional assessment using the Uniform Mitigation Assessment Methodology (UMAM) was completed for the conceptual mitigation plan, based on the estimated wetland impacts. Mitigation will be done through purchase of mitigation bank or Virginia Aquatic Resources Trust Fund (VARTF) credits in the watershed. The preliminary wetland mitigation requirements, according to the Uniform Mitigation Assessment Methodology (UMAM), are approximately 6.93 wetland mitigation credits for Alternative 4. All temporarily disturbed wetlands and spanned areas will be restored to preexisting conditions and planted with native tree species. The conceptual compensatory wetland mitigation plan is provided in the Environmental Appendix, Appendix C. The plan will be finalized as wetland impacts are determined in greater detail. However, it is noted that compensatory wetland mitigation will also be required to be done in compliance with the requirements under State laws, regulations, and requirements.

As indicated in the Water Quality section, stormwater permits and a water quality permit under the Clean Water Act, Section 401/Virginia Water Protection Permit (VWPP), would be required from the VDEQ for all temporary and permanent fills in surface waters, including wetlands. A permit to encroach upon state-owned bottom would also be required from the Virginia Marine Resources Commission (VMRC). Upland stormwater management options are preferable to limit the amount of wetland impacts; therefore the current wetland impact assessment assumes no wetland impacts due to stormwater treatment. Total take land parcels may provide stormwater management opportunities. However, if it is determined after the final wetland delineation is completed that there is not enough upland space then, offsite alternatives for stormwater treatment may be preferable. All permit conditions will be met by this alternative.

Based on the foregoing, this alternative would have temporary and permanent, direct and indirect, adverse effects on wetlands. By utilizing best management practices (BMPs) for logging and construction, not using temporary fill for construction access in organic soil wetlands, and with the compensatory wetland mitigation plan that is located in the Environmental Appendix, Appendix C, the adverse effects can be mitigated such that they will not be significant, and can be reduced to moderate. The BMPs are further described in Chapter 9.

7.6.3 Alternative 6, West Alignment Fixed Bridge

This alternative would have similar general effects on wetlands as described in Alternative 4. As described above and in the Affected Environment chapter, the organic soil wetlands to be impacted in particular are of very high quality, except that the estimated wetland impacts would be slightly higher, as described below. Minimizing not only permanent wetland and soil impacts, but also temporary clearing and construction impacts, will be critical to ensuring that this alternative does not have significant impacts on wetlands.

As with Alternative 4, a wetland delineation has not been completed for Alternative 6, but will be completed once right-of-entry agreements have been obtained from all property owners in the ROI. Based on limited fieldwork, use of National Wetland Inventory (NWI) maps, aerial photography, and preliminary engineering plans, wetland impacts are estimated in Figure 7-2 and Table 7-2 as follows:

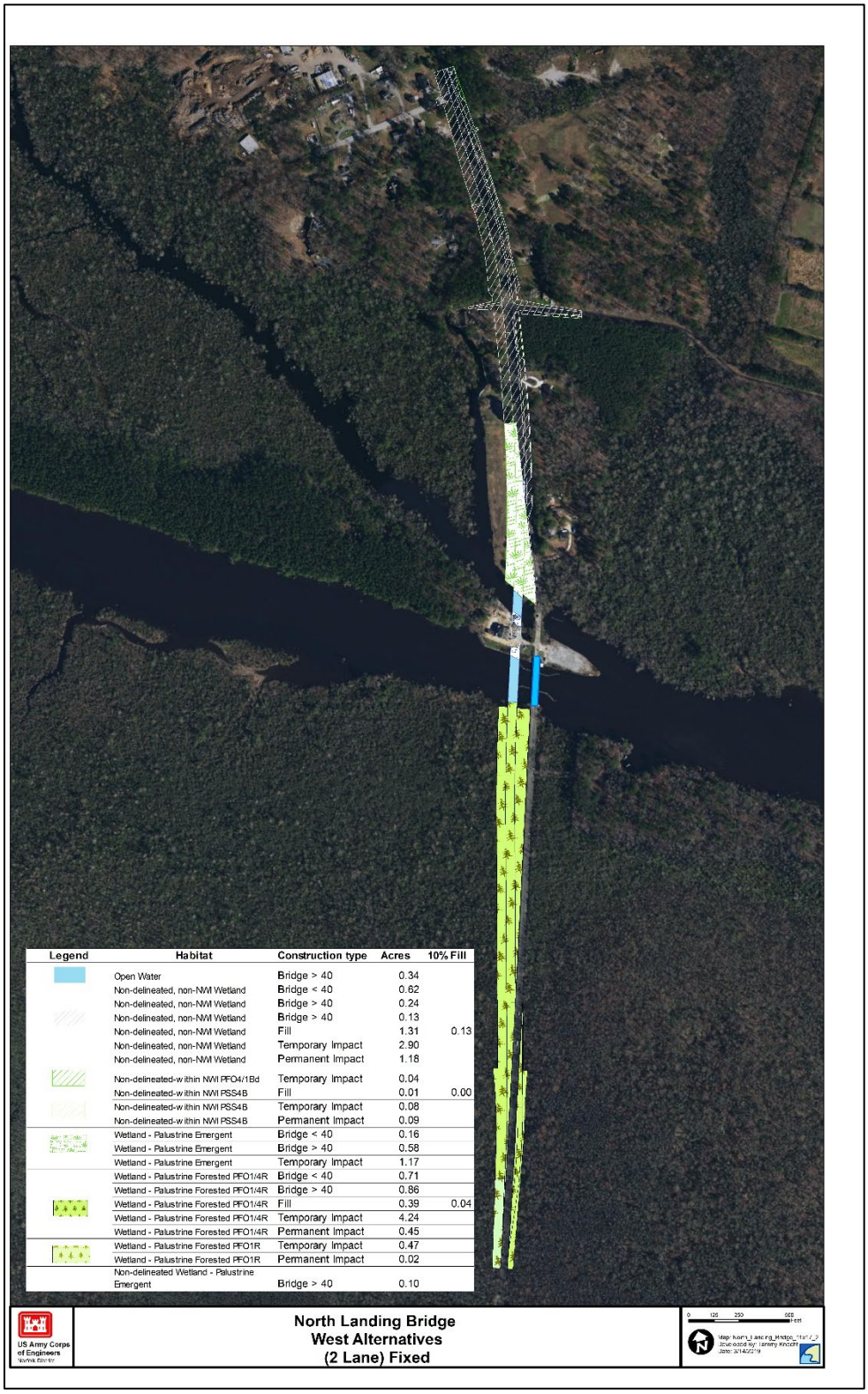


Figure 7-2. Aerial Analysis of Wetland Impacts for the West Alternative.

Table 7-2: Alternative 6, West Alignment Fixed Bridge

Habitat Type	Wetland ID Number	Temporary, Permanent, or Spanned (permanently under bridge)	Estimated Impact (acres)	Data Source
Palustrine Forested narrow/broad leaved, saturated wetland (PFO4/1B)	Wetland W-1	Temporary**	0.04	NWI Geospatial
Palustrine Scrub/Shrub narrow leaved saturated wetland (PSS4B)	Wetland W-2	Permanent Temporary**	0.1 0.08	NWI Geospatial
Palustrine Emergent Wetland (PEM)	Wetland W-3	Spanned* Temporary**	0.74 1.17	Field
Palustrine Emergent Wetland (PEM) Phragmites	Wetland W-4	Spanned*	0.1	Field estimated
Palustrine Forested narrow/broad leaved, seasonally flooded tidal (PF04/1R) (bottomland organic soil wetlands)	Wetland W-5	Permanent Spanned* Temporary**	0.9 1.57 5.15	Field
Total Forested Wetland Impacts		Permanent Spanned* Temporary**	0.9 1.57 5.19	NWI Geospatial & Field
Total Scrub-Shrub Wetland Impacts		Permanent Spanned* Temporary**	0.1 0 0.12	NWI Geospatial
Total Emergent wetland Impacts		Permanent Spanned* Temporary**	0 0.84 1.17	Field

*"Spanned" impact areas are all areas that will be underneath the bridge following construction; however, they will also be restored and replanted following construction.

**"Temporary" impact areas are areas impacted for construction access. These areas also will be restored and replanted following construction.

The preliminary wetland mitigation requirements, according to the Uniform Mitigation Assessment Methodology (UMAM), are approximately 8.22 wetland mitigation credits for Alternative 6. All avoidance and minimization requirements and mitigation procedures specified for Alternative 4 would also apply to Alternative 6.

Based on the foregoing, this alternative would have temporary and permanent, direct and indirect, adverse effects on wetlands. By utilizing best management practices for logging and construction, not using temporary fill for construction access in organic soil wetlands, and with the compensatory wetland mitigation plan that is located in the Environmental Appendix, Appendix C, the adverse effects can be mitigated such that they will not be significant and can be reduced to moderate.

7.6.4 Cumulative Effects

The past, present, and reasonably foreseeable effects of any alternative must be considered. If the City of Chesapeake decides to raise the elevation of the bridge approaches, additional fill for the roadway prism slope may encroach into wetlands to either side of the roadway. Sea level rise is expected to occur over time due to climate change, and may cause increased flooding frequencies in particularly the low-lying wetland areas of the ROI. As a result, wetland hydrologic regimes in the ROI could begin to shift wetter as time goes on. There is already some tree mortality within the ROI, and this could continue if the hydrologic regime trends toward a longer and wetter hydroperiod. The ROI could become more scrub- or emergent-dominated. However, other than the effects described herein, no other cumulative effects on wetlands associated with this project are anticipated. Implementation of the No build, Alternative 4, or Alternative 6 is not predicted to substantially cumulatively or synergistically interact with climate change and/or other effects to wetlands.

7.7 Fish and Fishery Resources

7.7.1 Alternative 1, No Action/Future without Project

This alternative would have no new temporary or permanent, indirect or direct, adverse impacts on fish and fishery resources.

7.7.2 Alternative 4, East Alignment Fixed Bridge

There is no EFH habitat in the ROI, therefore, none would be affected. The Virginia Department of Game and Inland Fisheries (VDGIF) has not indicated the presence of anadromous fish in this waterway. However, as indicated in Chapter 3, common fish species are likely present in the waterway at this location.

For this alternative, the removal of the existing bridge, pilings, and fender system with an 80-foot horizontal clearance, and the placement of new bridge piers and fender system with a 90-foot horizontal clearance, could slightly improve fish passage for any fish species that are present. However, the current conditions are not likely an impediment to species inhabiting the waterway.

During construction, equipment and structures associated with roadway and bridge construction would be present along the entire corridor, including on the bridge, to the sides of the bridge, and near the waterway. Temporary in stream construction will be necessary for removal and replacement of bridge pilings, fenders, and bridge piers. At least two large concrete in stream

bridge piers and footings will need to be installed. The new wooden fender system most likely would be installed using a pile driver. Temporary cofferdams would need to be used if filling and/or excavation needs to occur for the installations and/or removals. Instream construction will generate underwater noise and a small amount of turbidity, however these would be temporary conditions. Any fish species would likely avoid the area during construction. Once construction is completed, all temporary structures and/or fill would be removed in its entirety, and the area restored.

Based on the foregoing, this alternative would have minor direct or indirect, temporary or permanent adverse effects on fish or fishery resources.

7.7.3 Alternative 6, West Alignment Fixed Bridge

This alternative would have the same effects fish or fishery resources as Alternative 4.

7.7.4 Cumulative Effects

The past, present, and reasonably foreseeable effects of any alternative must be considered. There would be no current or cumulative impacts to EFH, since there is none in the ROI. Sea level rise is expected to occur over time due to climate change, and may cause increased flooding frequencies in particularly the low-lying areas of the ROI. Warmer waters for longer durations could induce the migration of southern fish species into the ROI in the future. However, implementation of the No build, Alternative 4, or Alternative 6 is not predicted to substantially cumulatively or synergistically interact with climate change and/or other effects to fish and fishery resources.

7.8 Special Status Species

7.8.1 Alternative 1, No Action/Future without Project

It is known that there are six northern long-eared bat (*Myotis septentrionalis*) maternity roosting trees in and near the ROI, however, bats that use those trees most likely are adapted to the conditions there, including the traffic and aircraft noise. The same would be true for bald eagles and any other species of migratory birds that utilize or pass through the ROI.

This alternative would have no or negligible, temporary or permanent, direct or indirect, adverse impacts on special status species.

7.8.2 Alternative 4, East Alignment Fixed Bridge

Northern long-eared bat. There are six known maternal roosting trees near the Action Area. Approximately 15 acres of forested habitat clearing is anticipated; however the closest roosting tree is over 1,000 feet from the limits of clearing. Figure 7-3 details the locations of bat roosting trees near the study area. The distance from limits of project to closest bat roosting tree is approximately 1,000 feet. (Source: Virginia Department of Game and Inland Fisheries website, 2019).

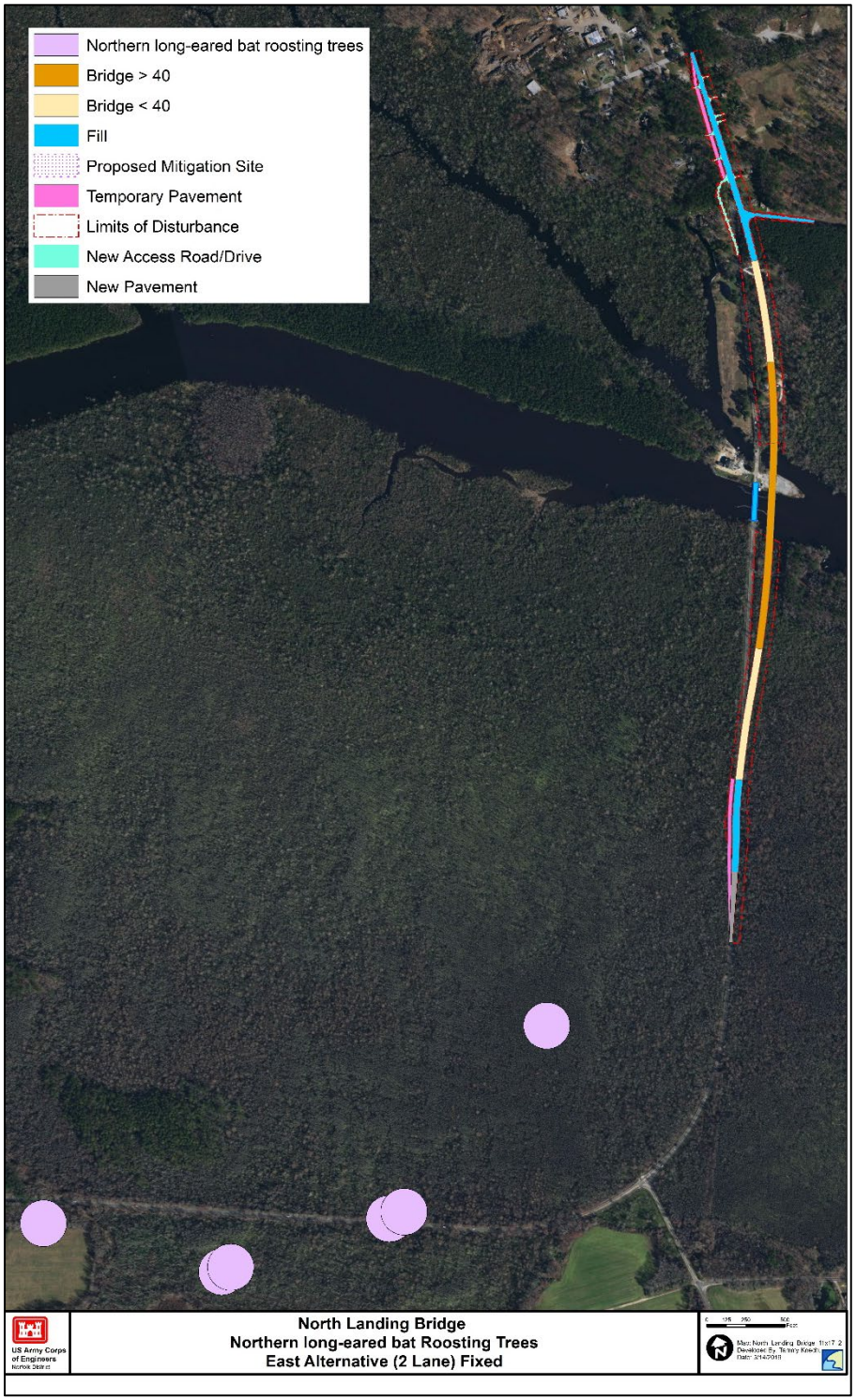


Figure 7-3. Map showing locations of known bat roosting trees near Study Area (in pink). For the Eastern Alignment Fixed Bridge. Approximate clearing limits are shown in red.

We have made the determination that implementation of either alternative *may affect, and is likely to adversely affect* the Northern long-eared bat. According to the USFWS Programmatic Biological Opinion on Final 4(d) Rule for the Northern Long-Eared Bat and Activities Excepted from Take Prohibitions (PBO), incidental take is only prohibited (and thus the PBO does not apply, and formal consultation is required) under the following circumstances:

- If it occurs within a hibernaculum.
- If it results from tree removal activities and
  - The activity occurs within 0.25 mile (0.4 km) of a known hibernaculum; or,
  - The activity cuts or destroys a known, occupied maternity roost tree or other trees within a 150-foot radius from the maternity roost tree during the pup season from June 1 through July 31.

The project will cause temporary and permanent, indirect impacts to habitat used by the Northern long-eared bat. Tree removal could result in some limited incidental take, and thus may affect and is likely to adversely affect the species. However, the PBO covers a major categories of actions, including those associated with this project, and does not require reasonable and prudent measures. Because a buffer greater than 150 feet would be preserved around the tree, either alternative would be excepted from the incidental take prohibitions specified in the PBO.

USACE is relying on the PBO and its framework as our compliance with ESA. USACE also completed the bat determination key that was developed for the northern long-eared bat and is found on the USFWS Virginia Field Office website, and included the key in our Biological Assessment (BA).

During construction, equipment and structures associated with roadway and bridge construction would be present along the entire corridor, including on the bridge, to the sides of the bridge, and near the waterway. Construction would be phased for a period of approximately three years. Construction equipment will generate noise and dust, and the temporary clearing of wooded area and use for construction access will likely cause northern long-eared bats, when present, to avoid these areas during construction. However, based on the surroundings, the ROI and vicinity contain vast acreages of wildlife habitat.

Voluntary Conservation Measures for the Northern Long-eared Bat. In addition to reliance on the 4(d) Rule and PBO, the USFWS strongly encourages all Federal agencies to carry out voluntary conservation measures. USACE intends to adhere to the following conservation measures applicable to this project, as practicable.

- Conduct tree removal activities outside of the Northern long-eared bat pup season (June 1-July 31). The USACE will attempt to time the clearing such that either:
  - all clearing is done outside of these timeframes, or
  - clearing closest to the roosting trees is done outside of these timeframes.
- Evaluate the use of outdoor lighting during the active season and seek to minimize light pollution by angling lights downward or via other light minimization measures.

In addition to these voluntary measures, USACE is preparing an Environmental Mitigation Plan for the project. It will include the following:

- All permanently impacted wetlands will be mitigated through purchase of mitigation bank credits and/or purchase of mitigation credits from the Virginia Aquatic Resources Trust Fund (VATRF) within the service area;
- Any cleared and/or temporarily disturbed wetlands will be restored to pre-existing contours and resprigged with native tree species.

Atlantic sturgeon and Shortnose sturgeon. (*Acipenser oxyrinchus* and *Acipenser brevirostrum).* The Action Area is near the northernmost limits of migration for the Atlantic sturgeon on the North Landing River, according to the NOAA Section 7 Mapper Tool. However, the benthics at the site are fine silts, muds, and organic, and therefore may not contain suitable habitat for the species, and there is no documentation of any records of the species within this watershed in Virginia.

Entrainment from installation of temporary cofferdams, pilings, footings, or fenders is not expected to affect sturgeon. Project construction and maintenance has the potential to have discountable, temporary affects to benthic habitat and forage opportunities, assuming either species is present. Noise produced from pile driving during project construction and maintenance may result in sturgeon, if present, moving out of the Action Area or not migrating this far north, and temporary, immeasurable disturbances to foraging behavior. Construction of structural, in-water features may temporarily and insignificantly increase turbidity levels. Direct and indirect vessel interactions with sturgeon are unlikely due to the slow speed of vessels (10 knots or less) and shallow draft of potential project vessels. Overall, any potential effects from the various stressors likely would be discountable. Therefore, we have made the determination that implementation of either alternative *may affect, but is not likely to adversely affect* the Atlantic sturgeon and the Shortnose sturgeon.

Bald Eagle. According to the bald eagle nesting data provided by The Center for Conservation Biology (CCB, 2019), there are no documented nests within the Action Area, including within one-quarter mile of the ROI. Therefore, no impacts on bald eagle nests are anticipated, and no permit under the American Bald and Golden Eagle Act is anticipated.

Critical Habitat. There is no Critical Habitat for any species within the Action Area, so none would be affected. Based on the foregoing, this alternative will have temporary and permanent, indirect, minor, adverse effects on Northern long-eared bat. It is expected to have no or negligible temporary or permanent adverse effects on the Atlantic sturgeon and the shortnose sturgeon.

BAs and Section 7 coordination. Two detailed BA's, one for the species under the jurisdiction of the National Marine Fisheries Service (NMFS) and one for species under the jurisdiction of the USFWS, were prepared that included these findings. Each BA also included both alternatives.

We coordinated the BA for the sturgeon species with NMFS on March 29, 2019. We received a response dated May 21, 2019, indicating that coordination was not necessary because the species will not be present or exposed to any potential effects from the project. Therefore, USACE may make a "no effect", rather than a "may affect" determination.

We coordinated the BA the northern long-eared bat with the USFWS on May 9, 2019. No response was received from USFWS within 30 days; therefore we may assume concurrence with our determination of *may affect, but not likely to adversely affect*, with reliance upon the PBO.

Therefore, Section 7 consultation is complete. Copies of both BA's are provided in the Environmental Appendix, Appendix C.

State-listed species

In its comments on the Draft EA, the Virginia Department of Conservation and Recreation (VDCR) indicated that the Duke's skipper butterfly, a state-listed species, may be present, as they prefer wet, marshy areas. VDCR recommended minimal pesticide spraying and minimizing wetland impacts.

The VDGIF also indicated that the canebrake rattlesnake, a state-listed species, may be present. VDGIF recommended providing a fact sheet for construction workers, and requested they be notified if the species is encountered. DGIF also stated that Rafinesque's Big-eared bat (*Corynorhinus rafinesqui*), a state-listed species, may be in the area, and recommended that the bridge be inspected for signs of roosting. The fact sheet for canebrake rattlesnake and notification of DGIF for the presence of the species may be implemented, and have been added to Section 8, Summary of Best Management Practices. However, the existing bridge is a metal, low-profile bridge, with little roosting potential.

7.8.3 Alternative 6, West Alignment Fixed Bridge

This alternative would have similar anticipated effects as Alternative 4 (Figure 7-4). Tree removal could result in some limited take if done when bats are active, and thus may affect and is likely to adversely affect the species. However, the clearing limits would still be over 1000 ft from the known roosting trees, and therefore, this alternative also would be excepted from the incidental take prohibitions as addressed in PBO. USACE is relying on the PBO and its framework as our compliance with ESA. In addition, we will adhere to voluntary measures as practicable.

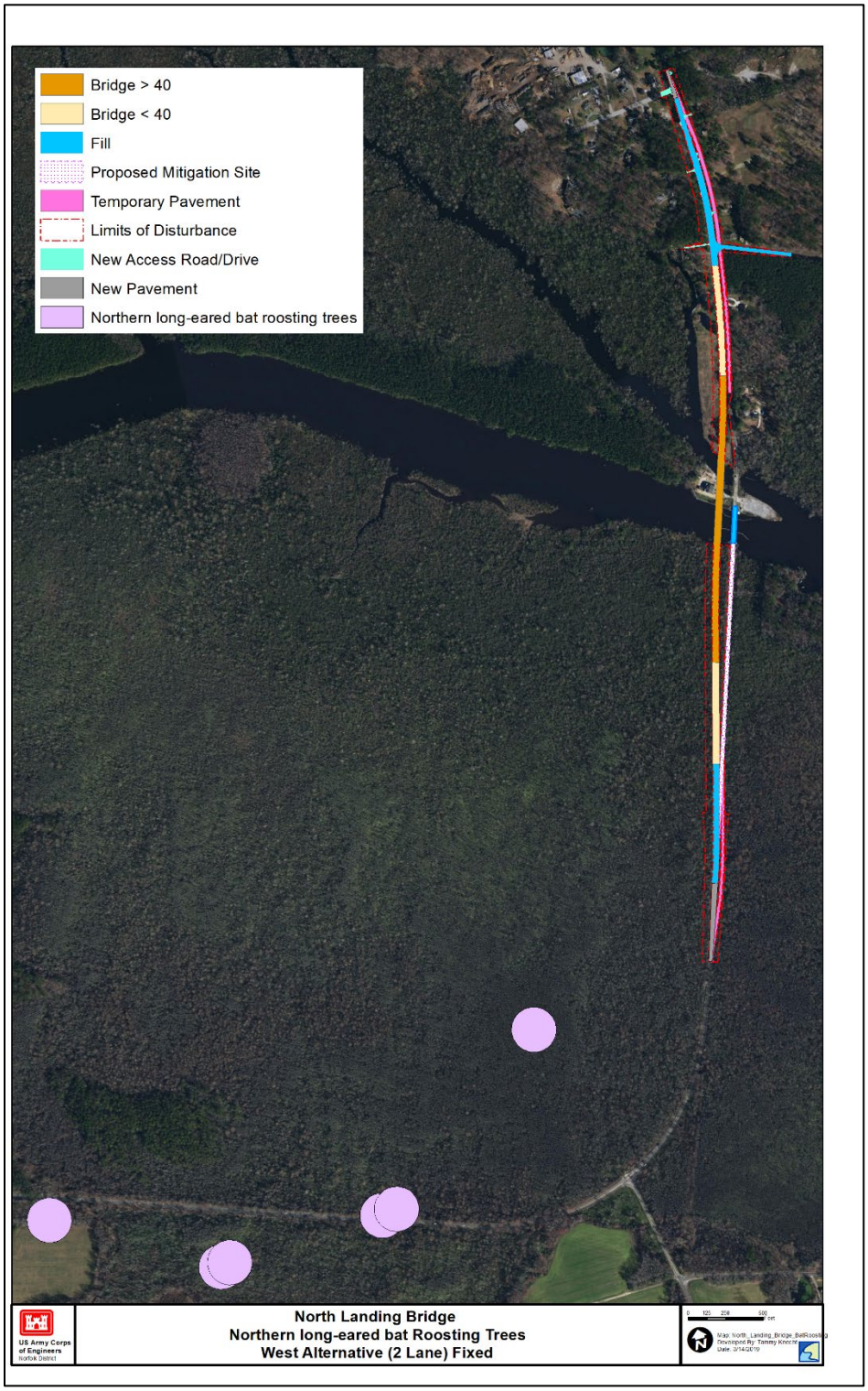


Figure 7-4. Map showing locations of known bat roosting trees near Study Area (in pink). For the Western Alignment Fixed Bridge. Approximate clearing limits are shown in red.

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BAs and Section 7 coordination. As described above, we two detailed BA's, one for the species under the jurisdiction of the National Marine Fisheries Service (NMFS) and one for species under the jurisdiction of the USFWS, were prepared. Each BA also included both alternatives, and the determinations were the same for both.

7.8.4 Cumulative Effects

The past, present, and reasonably foreseeable effects of any alternative must be considered. The ROI is within a high quality wildlife habitat, which is expected to remain in similar condition, other than the impacts described herein.

With respect to the northern long-eared bat, the USFWS expects continued declines as the disease spreads across its range. Although other manmade and natural threats exist, such as hibernacula modification, forest conversion, forest management, wind energy, climate change, contaminants, and fire, there is currently no evidence that these have separately or cumulatively contributed to significant range-wide population effects on the species prior to the onset of WNS (USFWS 2016). Also, the Northern long-eared bats that use the roosting trees in the ROI most likely are adapted to the conditions there, including the traffic and aircraft noise. The same would be true for bald eagles and any other species of migratory birds that utilize or pass through the ROI.

Sea level rise is expected to occur over time due to climate change, and may cause increased flooding frequencies in particularly the low-lying areas of the ROI. However, implementation of the No build, Alternative 4, or Alternative 6 is not predicted to substantially cumulatively or synergistically interact with climate change and/or other effects to special status species.

7.9 Wildlife

7.9.1 Alternative 1, No Action/Future without Project

The raised solid-fill roadbed approaches would continue to be a slight impediment to the passage of a few species of wildlife; however, the wildlife living in and near the ROI are likely mostly adapted to the conditions there. Similar to other such corridors, occasional vehicle strikes of wildlife attempting to cross the corridor will likely continue to occur in the ROI.

This alternative would have no new temporary or permanent, indirect or direct, adverse impacts on wildlife.

7.9.2 Alternative 4, East Alignment Fixed Bridge

The project will cause temporary and permanent, direct and indirect impacts to wetlands that are habitat for wildlife. Approximately 0.94 acre of permanent fill impacts, approximately 1.8 acres of bridge span impacts, and approximately 5.46 acres of temporary construction access impacts will occur in wetlands. These impacts are estimated in detail and by impact type in the wetlands section of this chapter; and will be finalized upon completion of a wetland delineation and design details. Also, an estimated 8.5 acres of upland area, including forests, will need to be permanently or temporarily cleared.

The partial or complete removal and abandonment of the solid-fill roadway in the Chesapeake section of the ROI would create improved connectivity and passage for wildlife species that

utilize the ROI, by allowing wildlife to pass underneath the high rise bridge, rather than crossing a busy at-grade roadway. This likely would result in fewer vehicle strikes of most species.

During construction, equipment and structures associated with roadway and bridge construction would be present along the entire corridor, including on the bridge, to the sides of the bridge, and near the waterway. Construction would be phased for a period of approximately three years. Construction equipment will generate noise and dust, and the temporary clearing of wooded area and use for construction access will likely cause wildlife to avoid these areas during construction. However, based on the surroundings, the ROI and vicinity contain vast acreages of wildlife habitat.

Once complete, all temporarily impacted areas must be seeded and/or planted with trees according to the restoration plan, and should eventually become revegetated. It is possible, however, that some wetland areas may not be able to be fully restored to their previous wetland condition and may have to be mitigated offsite.

In its comments on the Draft EA, the DGIF recommended a time-of-year restriction from March 15 to August 15, during songbird nesting season. However, this is not a requirement.

Based on the foregoing, this alternative has minor direct effects ranging from temporary to permanent, adverse to beneficial on wildlife and wildlife habitat.

7.9.3 Alternative 6, West Alignment Fixed Bridge

Although the wetland impacts are slightly higher for this alternative, it would have very similar effects on wildlife as Alternative 4.

7.9.4 Cumulative Effects

The past, present, and reasonably foreseeable effects of any alternative must be considered. The ROI is within a high quality wildlife habitat, which is expected to remain in similar condition, other than the impacts described herein. Either Alternative 4 or Alternative 6 would include a raised bridge that should improve corridors for wildlife passage. Sea level rise is expected to occur over time due to climate change, and may cause increased flooding frequencies in particularly the low-lying wetland areas of the ROI. As a result, some less saturation-tolerant plant and/or animal species could migrate elsewhere or die off. Implementation of the No build, Alternative 4, or Alternative 6 is not predicted to substantially cumulatively or synergistically interact with climate change and/or other effects to wildlife.

7.10 Cultural Resources

7.10.1 Alternative 1, No Action/Future without Project

Alternative 1 would involve no action from USACE to replace the existing bridge and roadway. All of the existing infrastructure including the bridge, bridge tender's building, existing roadbed, and existing overhead utilities would remain, and drawbridge operations would continue as at present. The existing bridge, a contributing element of the Albemarle & Chesapeake Canal Historic District would not be affected, and the landscape of the historic district would not be affected. There would be no ground disturbance, and so no impacts to archaeological sites in the area.

Alternative 1 would have no impacts to cultural resources.

7.10.2 Alternative 4, East Alignment Fixed Bridge

Alternative 4 would involve the demolition of the existing bridge, a contributing element of the Albemarle & Chesapeake Canal Historic District, and a structure that is owned by USACE, and thus considered publically and governmentally owned. It will also modify the historic character of the historic district landscape. Roadway realignment at bridge construction would disturb ground in areas with a high potential for archaeological sites, based on landform characteristics. Architectural properties other than the Albemarle & Chesapeake Canal Historic District are highly unlikely to have NRHP eligibility. This alternative will cause ground disturbance near a small cemetery near North Landing Road. If disturbance to the cemetery by construction cannot be avoided it may be necessary to relocate the seven burials there.

Due to an inability to gain access to private property during the Feasibility stage of this project, USACE is drafting a Programmatic Agreement (PA) with the Virginia State Historic Preservation Office to defer the completion of cultural resource surveys to a later stage of the project, when the government has obtained lands for a selected build alternative. The agreement would stipulate mitigation measures for impacts to the historic district, and procedures for mitigation of impacts to cultural resources, probably archaeological sites, which may be identified at a later stage in the project. Also consulting on this document are the Nansemond Indian Tribe, the Delaware Nation, the Virginia Beach Historic Preservation Commission, and the Chesapeake Historic Preservation Commission.

Alternative 4 will have significant impacts to the NRHP listed Albemarle & Chesapeake Canal Historic District, which would be mitigated through the PA. Alternative 4 also has a higher probability of impacting archaeological sites. No sites have been recorded, but some areas remain unsurveyed. Sites may be identified that are significant, i.e., NRHP eligible. Impacts would be mitigated through data recovery excavations. These impacts would be mitigated through measures stipulated to in the PA, thereby eliminating significant impacts for the purposes of NEPA.

7.10.3 Alternative 6, West Alignment

Alternative 6 would involve the demolition of the existing bridge, a contributing element of the Albemarle & Chesapeake Canal Historic District. It will also modify the historic character of the historic district landscape. Roadway realignment at bridge construction would disturb ground in areas with a moderate potential for archaeological sites, based on landform characteristics. Architectural properties other than the Albemarle & Chesapeake Canal Historic District are highly unlikely to have NRHP eligibility.

Due to an inability to gain access to private property during the Feasibility stage of this project, USACE is drafting a PA with the Virginia State Historic Preservation Office to defer the completion of cultural resource surveys to a later stage of the project, when the government has obtained lands for a selected build alternative. The agreement would stipulate mitigation measures for impacts to the historic district, and procedures for mitigation of impacts to cultural resources, probably archaeological sites, which may be identified at a later stage in the project. Also consulting on this document are the Nansemond Indian Tribe, the Delaware Nation, the Virginia Beach Historic Preservation Commission, and the Chesapeake Historic Preservation Commission.

Alternative 6 will have significant impacts to the NRHP listed Albemarle & Chesapeake Canal Historic District, which would be mitigated through the PA. Alternative 6 also has a moderate probability of impacting archaeological sites. The sites may be significant, i.e., NRHP eligible. Impacts would be mitigated through data recovery excavations. These impacts would be mitigated through measures stipulated to in the PA, thereby eliminating significant impacts for the purposes of NEPA.

7.10.4 Cumulative Effects

The build alternatives (4 & 6) would be another in a number of additions to the Albemarle & Chesapeake Canal landscape, not a part of its historic character. One was the replacement of the Great Bridge Bridge carrying Route 168 Business across the canal, another the high rise Rt. 168 bypass. Further modifications in the future might come from the replacement of other crossings, namely the Centerville Turnpike Bridge and the Norfolk Southern railroad bridge. Although impacts to archaeological sites can be mitigated through data recovery, sites impacted in this setting would be destroyed as have many others on the edges of uplands bordering the Great Dismal Swamp, mostly in the development of housing subdivisions, of which more can be expected in the future, and made more likely by an improved crossing at North Landing.

7.11 Socioeconomics

7.11.1 Alternative 1, No Action/Future without Project

Alternative 1 would involve no action from USACE to replace the existing bridge and roadway. All of the existing infrastructure including the bridge, bridge tender's building, existing roadbed, and existing overhead utilities would remain, and drawbridge operations would continue as at present.

The effect to local populations would be in the ongoing disadvantages of the drawbridge, and its aging machinery. Periodic bridge openings interrupt vehicular traffic, causing either delays or detours for commuters and those running errands. Worse, due to the advanced age of the bridge there have been frequent breakdowns closing the bridge for days at a time.

Alternative 1 would have temporary and permanent, minor adverse effect on the local population. However, if the bridge were to have to close permanently, then it would be permanent moderate adverse effect.

7.11.2 Alternative 4, East Alignment Fixed Bridge

This alternative would require the acquisition of real property interests across thirteen privately-owned parcels on the east side of North Landing Road; i.e., including nine private landowners on the north side of the North Landing River, and two private landowners on the south side of the river. The currently proposed east side road realignment design shows two parcels on the east side of North Landing Road where the primary residential structures are directly impacted by the footprint required for the bridge and bridge approach structural footprints. The resulting displacement of the residents/landowners of both parcels would require buy-outs; and the affected landowners would qualify for relocation benefits. None of the residences displaced by this project are households below the poverty level, and generally appear to be at or slightly below the median household income for Chesapeake and Virginia Beach.

A fixed bridge will improve daily life for local commuters and errand runners, and enhance the availability of emergency first responders. Minor additions to the local economy during construction are probable.

The adverse effects described above would be mitigated through purchase of the property at fair market value. There would be permanent beneficial effects to the local population as a whole, through safer roadways and time saved not waiting for bridge openings. No group of people would bear a disproportionately high share of adverse environmental consequences resulting from the proposed work; therefore, there are no environmental justice issues. This alternative would have temporary and permanent, adverse and beneficial effects that would be minor to moderate.

7.11.3 Alternative 6, West Alignment Fixed Bridge

This alternative would have similar effects described for Alternative 4, except that it will require the acquisition of real property interests from eleven individual landowners on the west side of North Landing Road; i.e., including nine private landowners on the north side of the North Landing River, and two private landowners, and one Government landowner (i.e., Navy) on the south side of the river. There would likely be one displacement of the residents/landowners of that would require a buy-out; and the affected landowners would qualify for relocation benefits. The road realignment footprint will require perpetual road easements to the remaining properties.

A fixed bridge will improve daily life for local commuters and errand runners, and enhance the availability of emergency first responders. Minor additions to the local economy during construction are probable.

The adverse effects described above would be mitigated through purchase of the property at fair market value. There would be permanent beneficial effects to the local population as a whole, through safer roadways and time saved not waiting for bridge openings. No group of people would bear a disproportionately high share of adverse environmental consequences resulting from the proposed work; therefore, there are no environmental justice issues. This alternative would have temporary and permanent, adverse and beneficial effects that would be minor to moderate.

7.11.4 Cumulative Effects

The past, present, and reasonably foreseeable effects of any alternative must be considered. Sea level rise is expected to occur over time due to climate change, and may cause increased flooding frequencies in particularly the low-lying wetland areas of the ROI. For socioeconomic factors, only Alternative 1 would add to ongoing environmental consequences, due to traffic delays posed by the drawbridge adding to delays in the metropolitan roadway system. However, implementation of the No build, Alternative 4, or Alternative 6 is not predicted to substantially cumulatively or synergistically interact with climate change and/or other effects to socioeconomics.

7.12 Visual Resources

7.12.1 Alternative 1, No Action/Future without Project

The existing bridge, with its metal deckwalls, would probably not be considered attractive to most people. It is an anthropogenic feature in a mostly rural area and across a mostly forest-dominated riparian viewshed. Being a low-profile structure, the bridge is highly visible to anyone traversing the waterway in the vicinity of the ROI. However, the bridge and roadway corridor have been in place for approximately 58 years, and the public, including residents along the corridor and waterway would be accustomed to its visual presence. The waterway is currently designated as a State scenic waterway, and it would remain as such.

Therefore, this alternative would have no new temporary or permanent, indirect or direct, adverse impacts on visual resources.

7.12.2 Alternative 4, East Alignment Fixed Bridge

The largest impact on visual resources would be for the residents to remain along the corridor in the ROI (see Figure 7-5 for the conceptual plan of the fixed bridge). For all residents to remain on the east side of the corridor, the temporary and permanent visual impacts of the roadway will be closer to their homes. The currently proposed east side road realignment design shows two parcels on the east side of North Landing Road where the primary residential structures are directly impacted by the footprint required for the bridge and bridge approach structural footprints; these structures would be removed. There will be at least another 3-6 residences to remain that will have a permanent views ranging from a 24-foot-tall bridge section with some shading effects, to a solid concrete wall. In addition, for this alternative, a 400-500-foot section of the bridge would pass directly over a proposed City of Virginia Beach passive use park property. It is unclear whether the property would still be developed into a park if this Alternative were implemented; but if so, there would be views of the underside of the bridge, and shading on the park property. All of these would be moderate permanent visual effects.

Otherwise, for the remaining residents on both sides of the corridor within the ROI (approximately 15-20 homes), the visual landscape will be altered by the slight elevation increase of the roadway and/or the slightly closer horizontal proximity of the roadway. As a result, the roadway will become a slightly more visible part of the viewshed for residents, and would cause minor permanent effects to visual resources.

Due to the height of the new bridge, it would be visible to a much larger viewshed within the region beyond the corridor than the current at-grade crossing is, both from the ground and from the waterway. However, due to the rural, sparsely populated location of the ROI, it will be visible to a relatively small number of people. Also, some sections that cross the land on both sides would be screened from the larger viewshed by existing forested areas.

This alternative will not affect any National Wild and Scenic Rivers; however, it will affect a State-designated Scenic River. However, as per VDCR comments, the North Landing River is a Virginia Scenic River. As such, VDCR requested that the bridge should be designed to be attractive.

For those using the waterway, views of the bridge will be clearer from farther distances, but probably less intrusive in the landscape, due to the elevation of the bridge above the water

surface. Boaters may pass underneath the bridge, which will now have a wider navigational opening. Only the bridge piers and fender system would be at eye-level.

During construction, construction equipment and structures associated with roadway and bridge construction would be present along the entire corridor, including on the bridge, to the sides of the bridge, and near the waterway. Approximately 25 homes along the corridor may be in the viewshed of the construction. Construction would be phased for a period of approximately three years. Once complete, all temporarily impacted areas, including spanned areas, must be seeded and/or planted with trees according to the Environmental Mitigation Plan found in the Envionmental Appendix, Appendix C. It is possible, however, that some wetland areas may not be able to be fully restored to their previous wetland condition and may have to be mitigated offsite.

Based on the foregoing, this alternative has direct effects ranging from temporary to permanent, adverse to beneficial, and negligible to moderate, on visual resources.

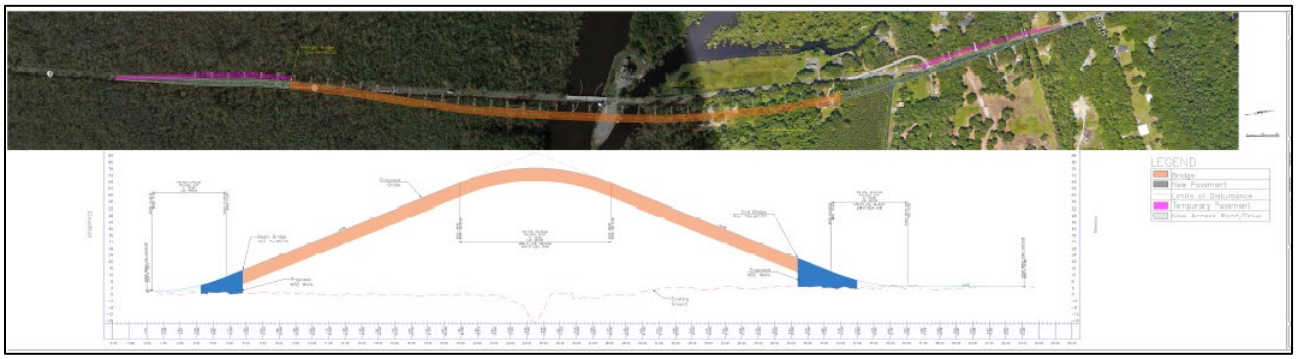

Figure 7-5. Conceptual Plan for the East Alignment Fixed Bridge.

7.12.3 Alternative 6, West Alignment Fixed Bridge

This alternative would have the same effects as Alternative 4, except the visual impacts for the residents along the corridor in the ROI will vary. The conceptual plan for the west alignment of the fixed bridge is in Figure 7-6. For all residents to remain on the west side of the corridor, the temporary and permanent visual impacts of the roadway will be closer to their homes. There are 1-2 potential total takes, one of which is a waterfront home on this side; or if the homes are able to be avoided, they would have a permanent view of the underside of a 40-60-foot tall bridge, bridge piers, and likely shading. There will be at least another 3-6 residences that will have a permanent view ranging from a 24-foot-tall bridge section with some shading effects, to a solid concrete wall. These would be moderate visual effects. Otherwise, for the remaining residents on both sides of the corridor within the ROI (approximately 15-20 homes), the visual landscape will be altered by the slight elevation increase of the roadway and/or the slightly closer horizontal proximity of the roadway. As a result, the roadway will become a more visible part of the viewshed for residents, and would cause minor effects to visual resources.

Based on the foregoing, this alternative has direct effects ranging from temporary to permanent, adverse to beneficial, and negligible to moderate, on visual resources.

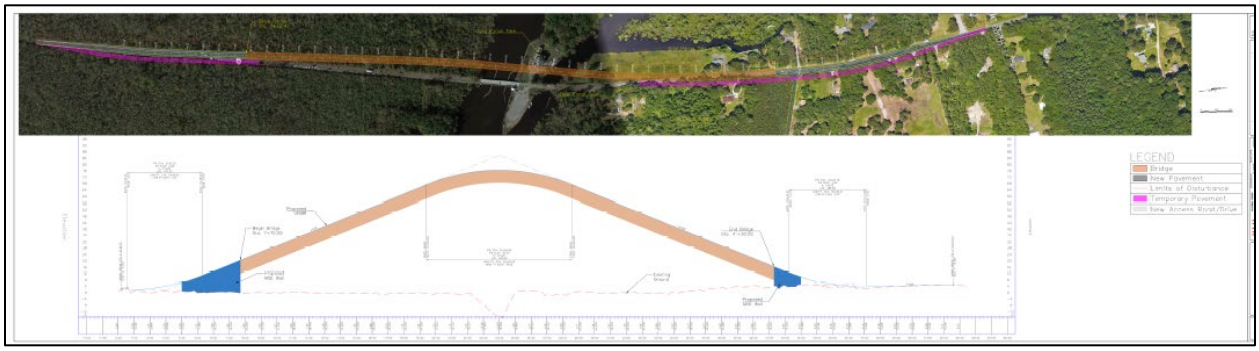

Figure 7-6. Conceptual Plan for the West Alignment Fixed Bridge.

7.12.4 Cumulative Effects

The viewshed along this corridor has been fairly constant for probably at least 30-40 years. The ROI is within a rural section of both cities, is zoned agricultural, and is already occupied by limited housing. Based on this and on both cities' comprehensive plans, these land uses will remain similar, and no major changes to the viewshed are planned here. Sea level rise is expected to occur over time due to climate change, and may cause increased flooding frequencies in particularly the low-lying areas. However, implementation of the No Build, Alternative 4, or Alternative 6 is not predicted to substantially cumulatively or synergistically interact with climate change and/or other effects to visual resources.

7.13 Recreational Resources

7.13.1 Alternative 1, No Action/Future without Project

The waterway is currently designated as a Virginia Scenic River, and it would remain as such. It is used for boating, recreational fishing, bird-watching, and other activities, and these uses would be expected to continue.

Currently, there are no public recreational lands within the ROI. There is a proposed park by the City of Virginia Beach within the ROI, on approximately 21 acres of land on the east side of the road, adjacent to the North Landing River. Plans have not been developed yet, but the proposed park is envisioned mostly for passive use, as most of this 21 acres consists of forested wetlands. The southernmost section of this parcel of land, which is actually within the City of Chesapeake, includes the peninsula that is located between the AIWW and the North Landing River. The peninsula of land with the gravel parking lot and old boat ramp might be converted into as a parking lot and new boat launch area. If constructed, this park is expected to bring more recreational usage to the ROI; however it is unclear at this time whether agreement can be reached for the purchase of the land.

The No Action alternative would have no direct temporary or permanent, adverse or beneficial impacts on recreational resources. However, potential temporary, indirect, minor adverse effects could result due to the continued maintenance work and occasional closures that the bridge requires. Permanent, indirect, minor adverse effects could occur if the bridge reaches a point where it can no longer be repaired and must be closed. These indirect effects would be adverse because they would make accessing the ROI for recreational purposes more difficult, particularly from the City of Chesapeake.

7.13.2 Alternative 4, East Alignment Fixed Bridge

For this alternative, the alignment would bisect the future location of the potential park land. It would pass through approximately 400-500 feet of the property, including the higher, developable ground on the property. The limits of disturbance would also include a small cemetery that is within the proposed park land and shown in Figure 7-7. As a result, it is unclear whether or not the plans for the park could still move forward. Assuming the park would still be viable, this section of the park would be permanently underneath the bridge span and would experience shading and a view of the underside of the bridge. This alternative will cause ground disturbance near a small cemetery near North Landing Road. If disturbance to the cemetery by construction cannot be avoided it may be necessary to relocate the seven burials there. There would also be bridge support pilings spaced across the property. There would need to be a construction easement and a permanent maintenance easement across the land, which would affect where any buildings and/or amenities could be constructed as well as the use and visual appeal of the park land. This would be a temporary and permanent, direct and indirect, minor to moderate adverse effect on recreational use.

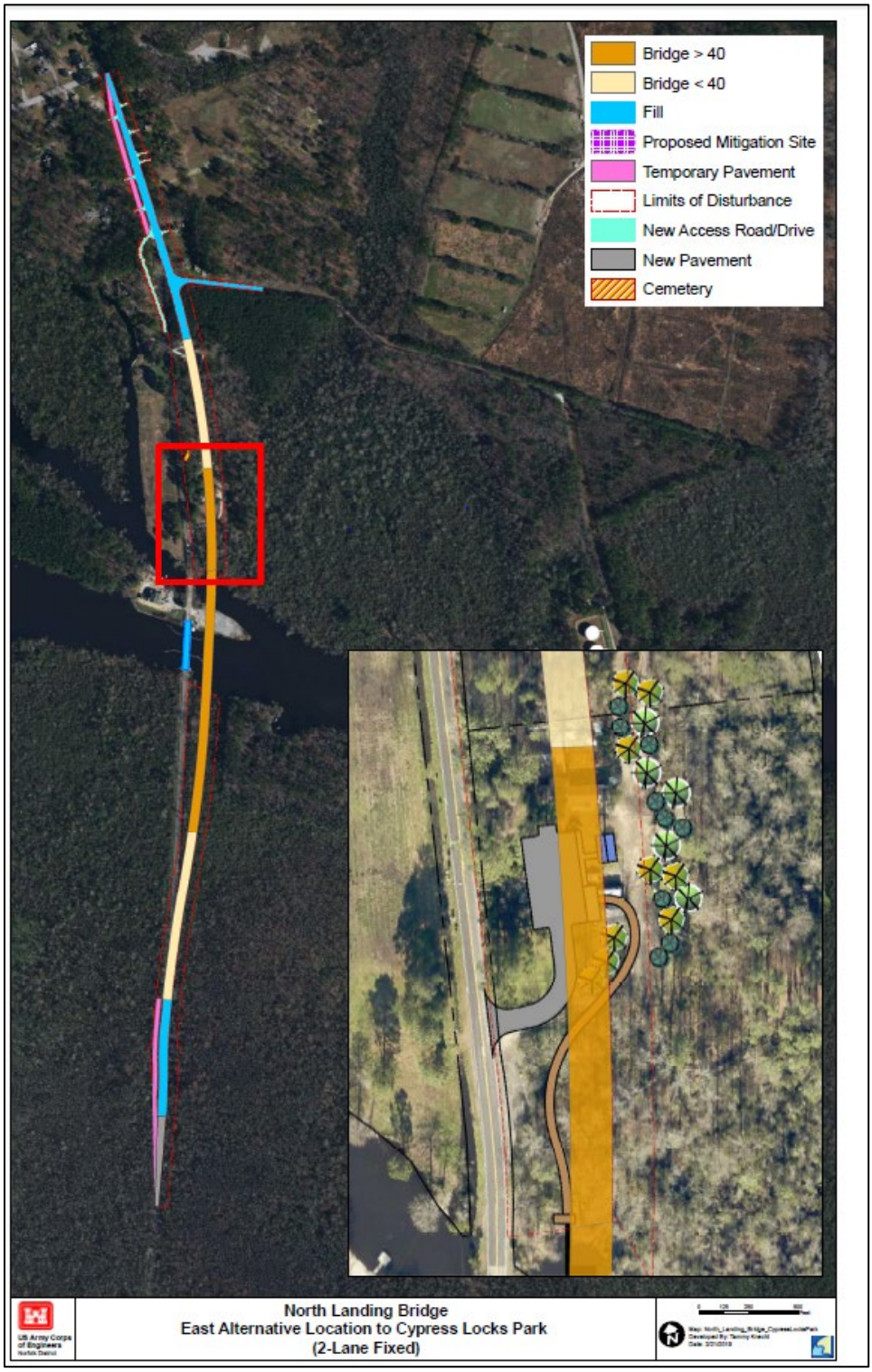

Figure 7-7. East Alignment Fixed Bridge crossing the proposed park. (NOTE: Park building configuration drawing is conceptual).

With the high rise bridge in place, permanent at-grade roadway access would need to be retained if the park is still developed. The existing at-grade roadbed would need to remain in place and would require a short connection segment or ramp near the north end of the project corridor.

On the Chesapeake side, there is no public recreational use; however the privately-owned parcel along the AIWW may be used for passive use recreation. If so, the existing at-grade roadbed access to this parcel would have to be retained unless this parcel was obtained for the project. The Nature Conservancy-owned parcel that will be impacted within the ROI is intended for wetland habitat preservation and is not open to recreational use.

Once the roadway corridor is brought up to current safety standards, it will be widened to include two wide shoulders. A beneficial effect for recreation could result from the capability to incorporate bicycle and pedestrian trails or shared use trails within one of these shoulders. If this was incorporated into the project design, it would be in keeping with the comprehensive plans of both cities. This would be a potential permanent, direct, minor to moderate beneficial effect on recreational use by bicyclists and pedestrians.

For those using the waterway for recreation, views of the bridge will be clearer from farther distances, but probably less intrusive in the landscape, due to the elevation of the bridge above the water surface. Boaters may pass underneath the bridge, which will now have a wider navigational opening, and would not have to wait for bridge openings when using the waterway. This would be a direct, permanent, minor beneficial effect on recreation.

During construction, construction equipment and structures associated with roadway and bridge construction would be present along the entire corridor, including on the bridge, to the sides of the bridge, and near the waterway. For safety reasons, these areas would need to be closed off to recreational use for portions of the three-year construction time-frame. The construction schedules for the bridge and the proposed park are not clear at this time, but would have to be coordinated to avoid conflicts. This would be a temporary, minor, adverse effect on recreational use of the waterway during construction. Any restrictions or closures of the channel for navigation would require U.S. Coast Guard approval.

Based on the foregoing, this alternative would have temporary, direct, minor adverse effects; permanent, direct and indirect, minor to moderate beneficial effects, and permanent direct and indirect minor to moderate adverse effects on recreation.

7.13.3 Alternative 6, West Alignment Fixed Bridge

This alternative would have all of the same effects described for Alternative 4, with the exception that it would not pass through or cause a permanent conflict with the proposed City of Virginia Beach park land. Another exception is that it may, however, result in the taking of one waterfront home, and private recreational use of that property and waterway.

Based on the foregoing, this alternative would have temporary, direct, minor adverse effects; permanent, direct and indirect, minor to moderate beneficial effects, and permanent direct, minor adverse effects on recreation.

7.13.4 Cumulative Effects

The past, present, and reasonably foreseeable effects of any alternative must be considered, and the effects on recreation described herein include consideration of those. Sea level rise is expected to occur over time due to climate change, and may cause increased flooding frequencies in particularly the low-lying areas within the ROI. However, implementation of the No Build, Alternative 4, or Alternative 6 is not predicted to substantially cumulatively or synergistically interact with climate change and/or other effects to recreation.

7.14 Hazardous, Toxic, Radioactive Wastes (HTRW)

7.14.1 Alternative 1, No Action/Future without Project

Alternative 1, the No Action/FWOP Alternative, would involve no action from USACE to replace the existing bridge and roadway. All of the existing infrastructure including the bridge, bridge tender's building, existing roadbed, and existing overhead utilities would remain. There would be no need for the USACE to conduct any further investigations for contamination.

There would be no permanent adverse effect on HRTW. However, currently, parts of the bridge and its equipment flood during high water events, and would continue to do so. This could result in fuels, mechanical fluids, etc. occasionally being released into the waterway. Also, considering sea level rise, this could occur more frequently in the future than presently. This would be an indirect and temporary, adverse negligible to minor effect on HTRW.

7.14.2 Alternative 4, East Alignment Fixed Bridge

For this alternative, a preliminary Phase 1 Environmental Assessment was completed and is in the Environmental Appendix, Appendix C.

The alignment of the approaches conflicts with the Nustar fuel line adjacent to the east side of the corridor. Also, Upton Lane may require a new ramp to connect to the raised bridge approach. As a result, a portion of the fuel line would have to be relocated, or the roadway infrastructure would have to be designed such that the fuel line is encased and protected.

USACE staff met with NuStar to consider its concerns relating to its fuel lines and tanks. Its comments relating to the tank facilities are discussed under the Navigation section (Section 7.2). In addition, NuStar indicated that a portion of the original fuel line was abandoned and remains buried in place right next to the current one. NuStar has indicated to USACE staff that it believes that the original fuel line, constructed in 1963, may contain asbestos. NuStar also indicated that it would prefer to relocate the active fuel line rather than have it incorporated into the roadway design.

Removal of the fuel lines would entail some risk of fuel discharge. There is a small risk of accidental rupture during construction while other construction is ongoing. In addition, although there is no known contamination in the vicinity of the fuel line, it is possible to encounter unexpected contamination during construction.

Development of an emergency plan to abate any discharges, plans to shut down the fuel line during relocation or encasement, and plans to protect the fuel line from accidental damage during construction would be required. Removal of the line containing asbestos would be done in accordance with all federal and state laws.

The bridge tender's station building and the bridge itself contain electrical and mechanical machinery aerial electric, telephone, and cable lines supported by large utility poles from that would need to be tested for HTRW prior to removal and disposal. There are a few dwellings older than 1978 that may need to be demolished as well. A Phase 2 Environmental Assessment would need to be done to determine the contents of these structures. If HTRW materials are found, they will be handled and disposed of in a lawful manner.

Removal of any part of existing road bed may also be a risk for HTRW. The road bed contains asphalt pavement, and may also contain other contaminated materials as it is dating back to the 1950's, and there is no documentation on the fill used when constructing the roadway. Further geotechnical study and testing of the materials may need to take place prior to de-construction and disposal. A plan should be developed that would provide information regarding anticipated volume and characteristic of contaminated materials identified so that appropriate plans to address the proper handling of these materials and to identify an appropriate disposal site can be developed.

With these plans in place, there could be a direct or indirect, temporary, negligible to minor adverse effect on HTRW.

7.14.3 Alternative 6, West Alignment Fixed Bridge

For this alternative, a preliminary Phase 1 Environmental Assessment was completed and is in the Environmental Appendix, Appendix C.

For this alternative, the impacts would be the same as for Alternative 4, except that the alignment should not require the relocation or encasement of the fuel line. However, Upton Lane may require a new ramp to connect to the raised bridge approach. For both alternatives, there is a small risk of accidental rupture during construction while this and other construction is ongoing. In addition, although there is no known contamination in the vicinity of the pipeline, it is possible to encounter unexpected contamination during construction.

There is less potential impact to HTRW for this alternative than for Alternative 4, due to there being less direct impact on the pipeline. However, with these plans in place, there still could be a direct or indirect, temporary, negligible to minor adverse effect on HRTW.

7.14.4 Cumulative Effects

The past, present, and reasonably foreseeable effects of any alternative must be considered. Other than those previously described and assessed, there are no other known sources of contamination or expected effects resulting from any actions in the ROI. Therefore, implementation of the No Build, Alternative 4, or Alternative 6 is not predicted to substantially cumulatively or synergistically interact with climate change and/or other effects to HRTW.

7.15 Safety

7.15.1 Alternative 1, No Action/Future without Project

Alternative 1, the No Action/FWOP Alternative, would involve no action from USACE to replace the existing bridge and roadway. All of the existing infrastructure including the bridge and approaches, which do not meet AASHTO safety standards for width, weight, or capacity, would remain in place and in use. The bridge will continue to be used by overweight vehicles. Bridge

breakdowns would continue to occur, requiring lengthy detours, contributing to additional traffic congestion elsewhere, and possibly delaying emergency vehicles along the detour.

Because the navigation channel would remain constricted at the bridge location, there would likely still be occasional allusion accidents along the bridge and bridge fender system.

Eventually, the bridge will become too old and/or damaged to maintain or repair. At that point, if it is not replaced, it would have to be closed for safety reasons, and its swing span permanently removed so that navigation is not impeded.

This alternative would have direct, temporary and permanent, adverse, minor to moderate impacts on safety.

7.15.2 Alternative 4, East Alignment Fixed Bridge

For this alternative, the new bridge would meet all current safety standards for width, weight, and capacity. After the old bridge fenders are removed and replaced, the current navigational constriction at the bridge will be reduced or eliminated. The U.S. Coast Guard must review and approve the final bridge and fender system clearance construction plan, which must meet current navigational safety standards.

During construction, equipment and structures associated with roadway and bridge construction would be present along the corridor, including on the bridge, in some areas to the sides of the road, and near the waterway. Temporary instream construction will be necessary for removal and replacement of bridge pilings, fenders, and bridge piers. Safe roadway travel as well as safety for workers will likely require temporary travel lane closures and/or restrictions at the tie-in points at either end of the project limits. Speed limits will also need to be reduced in those areas while work is ongoing, and this could cause slight increases in congestion levels. Similarly, there may be a need to restrict navigational traffic for safety reasons while some instream bridge and fender work is done. Any navigational restrictions will require U.S. Coast Guard approval.

NALF Fentress primarily supports day and night Field Carrier Landing Practice operations by U.S. Navy and U.S. Marine Corps F/A 18 Hornet, U.S. Navy F/A Super Hornet, E-2 Hawkeye, and C-2 Greyhound aircraft based in Virginia and the Carolinas (Navy 2014). During our coordination with the cooperating agencies, the U.S. Navy's Planning Liaison for NAS Oceana & Dam Neck Annex, who also covers operations at Fentress, reviewed the proposed clearance with respect to the ROI's location within the APZ-2 and Fentress NALF's flight paths. He has determined that the constructed bridge height will not present any obstructions or safety hazards for the Navy's flight operations. However, there is a requirement to coordinate with the Federal Aviation Administration (FAA) prior to construction, to obtain an obstruction evaluation. This is so that the FAA can ensure air traffic safety through awareness of new construction and heights of temporary construction cranes and other equipment.

Occupational Safety and Health Act (OSHA) requirements will be in place for all construction workers during construction.

Based on the foregoing, this alternative would have direct, permanent, beneficial effects on both roadway and waterway safety. During construction, it will have direct and indirect, temporary,

adverse effects that are negligible to minor, on roadway, waterway, workers, and air traffic safety.

7.15.3 Alternative 6, West Alignment Fixed Bridge

This alternative would have the same effects as Alternative 4.

7.15.4 Cumulative Effects

Implementation of the No Build, Alternative 4, or Alternative 6 is not predicted to substantially cumulatively or synergistically interact with climate change and/or other effects to safety. The overall cumulative effect within the ROI would be beneficial to safety.

7.16 Utilities

7.16.1 Alternative 1, No Action/Future without Project

All of the existing infrastructure including the bridge, bridge tender's building, existing roadbed, and existing overhead utilities would remain in place. There would be no permanent or temporary, direct or indirect effect on utilities.

7.16.2 Alternative 4, East Alignment Fixed Bridge

As mentioned earlier, this alternative would encroach into the current footprint occupied by the privately-owned Nustar fuel line within the ROI. The roadway alignment would require either the relocation of the fuel line, or the incorporation of the fuel line into the roadway design plan. The latter would mean that the fuel line would need some type of encasement to protect it from damage. Nustar prefers that the fuel line be relocated; otherwise, access for future maintenance and repair of the fuel line would be more difficult. It is unclear what the requirements would be logistically, legally, or cost-wise to relocate or incorporate the fuel line. If relocated, it would likely require a new easement.

The Navy stated its concern about any impacts on the NuStar fuel line, or any limitations on fuel supply via the fuel line. The Navy indicated that NuStar may need the fuel line relocated. The Navy further expressed the importance of fuel delivery and requested that all efforts be made during design and construction, including consultation with NuStar personnel, to avoid disruption of pipeline fuel support to Oceana. The Navy requested early consultation on possible interruptions.

USACE staff met with NuStar personnel on August 8, 2019, to discuss its concerns relating to utilities. NuStar personnel indicated its preference for relocation of the fuel line. Whether it is relocated or incorporated into design, it also would be in the construction zone and would need to be protected or at least temporarily relocated during construction to avoid damage and disruption. NuStar staff will also require access to the facilities for operations and maintenance. NuStar indicated that there is also an abandoned fuel line in the ground next to the active one. This is discussed further in the Hazardous Materials section (Section 7.14.2) of this document.

USACE will need to coordinate with NuStar further as design develops and also during the PED phase, as a construction plan is developed. Construction workers must be advised of the location of the fuel line and trained on safety. An emergency spill plan must be in place, should accidental damage occur during construction. Vibration monitoring would also be required during any pile driving during construction to avoid damage to the fuel line.

During construction, any disruptions to fuel line supply must be avoided to the maximum extent possible; as these would require alternate transportation of fuel supply by tanker trucks to the Navy. In its comments on the Draft EA, the Navy strongly reiterated this concern, and also requested the earliest possible consultation on possible service interruptions. We have placed these requirements into the Section 8, Summary of Best Management Practices/Mitigation Measures.

Additional effects of this alternative would be that the existing public overhead electrical, telephone, and cable lines would be replaced with new lines, which would be attached to the new bridge. There is no City water or sewer infrastructure in the ROI, so none would be affected.

A beneficial permanent impact would be the replacement of the three existing overhead utilities. There could be adverse temporary effects due to very brief, phased outages during construction. These would be coordinated with all affected utility companies to minimize impacts to customers. There could also be accidental outages during construction. Contingency plans to cover this instance would be in place. If this occurred, immediate coordination with the affected utility would occur to reestablish service as soon as possible.

This alternative would have temporary and permanent direct and indirect adverse effects on the fuel line and its operations. Temporary and permanent adverse effects range from minor to moderate. With respect to public utilities, this alternative would have permanent beneficial effects, and temporary, indirect, adverse effects that are negligible to minor.

7.16.3 Alternative 6, West Alignment Fixed Bridge

This alternative would not encroach permanently into the current footprint occupied by the privately-owned Nustar fuel line within the ROI. However, the fuel line footprint could be in the construction zone. Construction equipment should be staged away from the fuel line to the extent possible. Construction workers must be advised of the location of the fuel line and trained on safety. During construction, any disruptions to fuel line supply must be avoided to the maximum extent practicable; as these would require alternate transportation of fuel supply by tanker trucks to the Navy. If construction near the fuel line is unavoidable, the fuel line would need to be protected or temporarily relocated during construction to avoid damage and disruption. Further coordination with Nustar would be required to address any temporary encroachment near the fuel line, and to minimize adverse effects. An emergency spill plan must be in place, should accidental damage occur during construction.

All other effects of this alternative would be the same as Alternative 4. Therefore, this alternative would have temporary, minor, adverse effects to the fuel line. With respect to public utilities, this alternative would have permanent beneficial effects, and temporary, indirect, adverse effects that are negligible to minor.

7.16.4 Cumulative Effects

Implementation of the No Build, Alternative 4, or Alternative 6 is not predicted to substantially cumulatively or synergistically interact with climate change and/or other effects to utilities.

7.17 Air Quality

7.17.1 Alternative 1, No Action/Future without Project

All of the existing infrastructure including the bridge and approaches would remain in place and in use.

According to the traffic study completed by the USACE and its engineering firm, for the No Build/FWOP Alternative, the average daily traffic volumes and associated greenhouse gas emissions are expected to increase by approximately 66%, from a base year of 2009 and its volume of 10,108 vehicles, through the year 2040 and its projected volume of 16,798 vehicles. Projections of navigational traffic volumes are not available at this time. Both roadway and navigational traffic would continue to be required to stop and idle for bridge openings and closings. Also, occasional bridge closures due to malfunctions and/or maintenance, and temporary detours of at least 15 miles for roadway traffic for a few days at a time would be expected to continue.

According to EPA's Greenbook, the Hampton Roads Area is currently in attainment for all criteria pollutants. ("Green Book | USEPA", 2019), and it is expected that this would continue for the 50-year period of analysis.

This alternative would have temporary and permanent, indirect, minor adverse impacts on air quality. These would be due to the increased volume of traffic and temporary construction equipment emissions expected through the 50-year period of analysis. However, neither is expected to affect the region's attainment status.

7.17.2 Alternative 4, East Alignment Fixed Bridge

According to the traffic study, for either Alternative 4 or 6, the average daily traffic volumes and associated greenhouse gas emissions are expected to increase by approximately 71%, from a base year of 2009 and its volume of 10,108 vehicles, through the year 2040 and its projected volume of 17,310 vehicles. This is only a slight increase over the increase over the projected volume of 16,798 vehicles for the No-Build/FWOP Alternative. Without the need for bridge closures and openings, there would be less idling of either roadway or navigational traffic within the ROI. The roadway approaches and the bridge tender controls will be less vulnerable to coastal flooding, both nuisance and storm-induced. Because there will be less maintenance required for a new fixed bridge, and less expected flooding along the ROI due to high water events, there would rarely if ever be a need to close the bridge and detour traffic during the 50-year planning period of analysis.

Either Alternative 4 or 6 would meet all applicable air quality requirements of NEPA, and as applicable, all federal and state conformity requirements. Because the Hampton Roads area is in attainment for all NAAQSs, no conformity analysis required for either the temporary construction emissions or the permanent resulting emissions of vehicular and navigational traffic using the ROI. As such, neither alternative would cause or contribute to a new violation, increase the frequency or severity of any violation, or delay timely attainment of national ambient air quality standards (NAAQS) established by the USEPA. Nevertheless, VDEQ Air Division notes in its CZMA concurrence determination comments that the Hampton Roads Area is in an emission control area for NO_x and VOCs.

During construction, equipment and structures associated with roadway and bridge construction would be operating along the entire corridor, including on the bridge, to the sides of the bridge, and near the waterway. Construction would be phased for a period of approximately three years. During construction, equipment and paving will generate temporary emissions, and both navigational and roadway traffic would continue to utilize the ROI. The VDEQ noted the standard applicable conditions during construction for minimization of fugitive dust and construction equipment idling, limitations on “cut back” asphalt, and restrictions on open burning. Localized increases in fuel combustion-related emissions during construction, but they would be temporary and negligible.

Based on the foregoing, this alternative would have temporary and permanent, indirect, negligible adverse impacts on air quality. These would be due to an increase in traffic volume emissions, and temporary construction emissions. Conversely, however, it also could result overall in slightly less emissions than the No Build Alternative, due to less idling of traffic and fewer detours needed.

7.17.3 Alternative 6, West Alignment Fixed Bridge

This alternative would have the same effects on and due to air quality as Alternative 4.

7.17.4 Cumulative Effects

The past, present, and reasonably foreseeable effects of any alternative must be considered. The roadway corridor is being designed to handle two lanes of traffic as before; and based on the results of the traffic study, Alternative 4 will only draw approximately 6% more traffic than it would for the no action alternative. Because it is an existing roadway, it also would not have the cumulative effect of inducing additional development in or near the ROI. There will be negligible to minor cumulative effects on air quality during construction.

Because USEPA has designated the region to be in attainment for all of the NAAQS, the potential for cumulative impacts associated with the project is not expected to be significant.

Other than described in this section, implementation of the No build, Alternative 4, or Alternative 6 is not predicted to substantially cumulatively or synergistically interact with climate change or other effects to air quality.

7.18 Noise

7.18.1 Alternative 1, No Action/Future without Project

Airfield Noise. NALF Fentress and the operational noise levels associated with it would be expected to remain within the ROI. The APZ-2 designation and the noise designation within the 75 dBA DNL (day night average sound level) noise contour is also expected to remain in place. The nature of its future operational use over the 50-year planning period of analysis is unknown and noise levels associated with its use could change, however. This project considers the airfield noise as an ambient noise; as such, the USACE would not be responsible for noise abatement.

Traffic Noise. Roadway traffic would still be delayed briefly by regular bridge openings. The bridge will continue to be used by overweight vehicles, some of which make loud noise when crossing the bridge decks.

According to the traffic study completed by the USACE and its engineering firm, for the No Build/FWOP Alternative, the average daily traffic volumes are expected to increase by approximately 66%, from a base year of 2009 and its volume of 10,108 vehicles, through the year 2040 and its projected volume of 16,798 vehicles. This is considered to be a substantial change, and the traffic noise level change would be commensurate with the traffic volumes. According to the traffic study, a volume of 16,000 vehicles per day on a two-lane rural road is considered to be at capacity; therefore, this alternative would be at capacity prior to the end of the 50-year planning period of analysis.

The USACE would continue to own the AIWW federal navigation channel and to maintain it as needed. The existing vessel counts are provided in Chapter 2, and future estimates of vessel counts are not known at this phase of the study. It is assumed that vessel counts over the period of analysis will remain similar to what they are currently. Therefore, any noise levels generated by vessel traffic would be expected to continue and would be similar to current levels.

Eventually, the bridge will become too old and/or damaged to maintain or repair. At that point, if it is not replaced, it would have to be closed for safety reasons. Roadway traffic noise would be nearly eliminated, as over 11,000 vehicles per day would be rerouted permanently on a 15-mile detour.

Based on the foregoing, the No-Build/FWOP Alternative would have no new direct, temporary or permanent, adverse impacts on noise. An indirect effect would be that traffic noise would continue to increase commensurate with increased traffic volumes.

7.18.2 Alternative 4, East Alignment Fixed Bridge

For this alternative, the main noise effects to be assessed would be traffic noise and construction noise, for the residents to remain and for the proposed park along the ROI for noise, in case the latter is constructed.

Airfield Noise. NALF Fentress and the operational noise levels associated with it would be expected to remain within the ROI. The APZ-2 designation and the noise designation within the 75 dBA DNL (day night average sound level) noise contour due to the proximity of NALF Fentress is also expected to remain in place. As explained in the noise section of Chapter 3, it should be noted that this designation does not imply a constant noise level of 75 dBA; i.e., it does not provide specific information on the *number* of noise events or the *individual sound levels* that occur during the 24-hour period. The nature of its future operational use over the 50-year planning period of analysis is unknown and noise levels associated with its use could change, however. This project considers the airfield noise as an ambient noise; the USACE would not be responsible for noise abatement.

Traffic Noise. The new bridge would meet all current safety standards for width, weight, and capacity. It would no longer be weight-restricted, so larger and heavier vehicles would be able to use it. Also, the existing noisy bridge deck would be eliminated, and at the location of the bridge, traffic noise will be redistributed to higher elevations than it is currently.

According to the traffic study, for either Alternative 4 or 6, the average daily traffic volumes are expected to increase by approximately 71%, from a base year of 2009 and its volume of 10,108 vehicles, through the year 2040 and its projected volume of 17,310 vehicles. This is only a slight

increase over the projected volume of 16,798 vehicles for the No-Build/FWOP Alternative. Traffic noise would be expected to increase over time, commensurate with traffic volumes and usage.

The USACE does not generally construct public roadways; so it does not have a specific noise policy or regulations relative to assessing traffic noise. However, we gave consideration to the policies of other agencies that construct roads. The Federal Highway Administration (FHWA) has its own regulations with respect to traffic noise effects. In order to address those regulations, the Virginia Department of Transportation (VDOT) developed the "Virginia Department of Transportation's Highway Traffic Noise Impact Guidance Manual." The manual explains that the appropriate level of analysis for noise depends on the presence of noise sensitive land uses, probable occurrence of highway traffic noise impacts, the potential for noise mitigation measures, and noise related public concerns (VDOT 2018). According to the manual, typically a noise analysis is conducted for FHWA-funded roadways that will have either a "substantial horizontal alternation" or a "substantial vertical alteration," relative to a receptor. A project that has a "substantial horizontal alternation" is defined as one that "halves the distance between the traffic noise source and the closest receptor between the existing conditions to the future build conditions." A project with a "substantial vertical alteration" is one that "removes shielding therefore exposing the line-of-sight between the receptor and the traffic noise source. This is done by either altering the vertical alignment of the highway or altering the topography between the highway traffic noise source and receptor." "Receptor" is defined as "a discrete or representative location of a noise sensitive area," and residential and parkland are among the land uses that are considered noise sensitive areas. However, in addition to noise impact analysis, another important consideration is whether or not noise mitigation would be appropriate and/or practicable (VDOT 2018).

For this project, the substantial vertical alteration would apply for the length of the ROI; and the substantial horizontal alteration could apply to a select few homes. The bridge and approaches would be elevated above current at-grade location, traffic noise will be dispersed differently from the way it is currently.

Generally, projected traffic noise is determined through consideration of the projected traffic volume information in conjunction with existing noise receptor readings of the "worst traffic hour," using an FHWA Noise Analysis Model Tool. Typically, if noise impacts are identified above the threshold of 67-70 dBA for the "worst traffic hour", or the project results in a "substantial increase" (greater than 10 dBA), then *practicable* abatement measures are considered.

In order to assess fully the noise effects of the project, the USACE commissioned a traffic noise study by an Institute of Noise Control Engineering (INCE) Board Certified noise modeler. The modeler used a Cadna-A model with its FHWA TNM module to assess traffic noise consequences in the community surrounding the North Landing Bridge. A total of 12 noise-sensitive community receptors were selected for analysis. Existing 2015, No-Build 2040 and Build 2040 traffic data was used to populate the models, and the results were evaluated for compliance with FHWA and VDOT traffic noise criteria. The results indicate that traffic noise impact is expected at one of the 12 receptors, namely site R12 on the east side of North Landing Road (Table 7-3). The impacted parcel is depicted in Figure 7-8.

Table 7-3. Results of Traffic Noise Modeling (September 2019). Source: WSP

Receptor	Existing 2015 Leq(h) dBA	No-Build 2040 Leq(h) dBA	Build 2040 Leq(h) dBA	Relative Increase dBA	FHWA/VDOT Criteria Limit dBA	VDOT Relative Increase Limit dBA	FHWA/VDOT Exceedance dBA	VDOT Relative Exceedance dBA
R1	58	60	59	1	66	10	OK	OK
R2	52	55	60	8	66	10	OK	OK
R3	61	63	59	-2	66	10	OK	OK
R4	55	57	58	3	66	10	OK	OK
R5	55	57	55	0	66	10	OK	OK
R6	57	59	58	0	66	10	OK	OK
R7	54	56	53	-1	66	10	OK	OK
R8	54	57	55	2	66	10	OK	OK
R9	54	57	53	-2	66	10	OK	OK
R10	58	60	58	0	66	10	OK	OK
R11	56	58	54	-2	66	10	OK	OK
R12	56	58	72	16	66	10	6	6

Figure 7-8. Traffic Noise-Impacted Parcel (R12). (Source: Google Earth).

The currently proposed East side road realignment design shows the impacted parcel on the east side of North Landing Road where the primary residential structures are directly impacted by the fee interest footprint required for the bridge and bridge approach structural footprints. The resulting displacement of the residents/landowners would most likely require buy-out; therefore, noise mitigation would not be needed in that case.

There will be at least another 3-6 residences that will have a 24-foot-tall bridge section or a solid concrete wall adjacent to their properties. For all residents to remain on the east side of the corridor, the temporary and permanent traffic noise effects of the roadway will be closer to their homes. In addition, for this alternative, a 400-500-foot section of the bridge would pass directly over a proposed City of Virginia Beach passive use park property. It is unclear whether the property would still be developed into a park if this alternative were implemented; but if so, parkland would be underneath a bridge section that would be approximately 30 – 60 feet above the ground. However, as shown in Table 7-3, none of these would exceed FHWA/VDOT traffic noise criteria limits.

There are no sensitive land uses on the south side of the AIWW; therefore, a traffic study was not necessary there.

The USACE would continue to own the AIWW federal navigation channel and to maintain it as needed. The existing vessel counts are provided in Chapter 2, and future estimates of vessel counts are not known at this phase of the study. It is assumed that vessel counts over the period of analysis will remain similar to what they are currently. Therefore, any noise levels generated by vessel traffic would be expected to continue and would be similar to current levels.

Construction Noise. Construction noise is inevitable and will occur to varying levels during the three-year construction schedule. However, construction noise levels will be minimized through compliance with the noise ordinances for both cities unless otherwise exempted for specific actions and timeframes. The OSHA requirements, including noise protection, will be in place for all construction workers during construction.

Based on the foregoing, and considering the future noise analysis and any appropriate mitigation, this alternative would have direct and indirect, temporary and permanent, minor effects on noise.

7.18.3 Alternative 6, West Alignment Fixed Bridge

This alternative would have similar levels of effects as Alternative 4, except that the actual properties and residences taken would be different ones. For all residents to remain on the west side of the corridor, the temporary and permanent noise impacts of the roadway will be closer to their homes. There are 1-2 potential total takes, one of which is a waterfront home on this side; if these must be taken, then they would not be assessed for noise effects. If the homes are able to be avoided, they along with approximately 3-6 residences and the proposed park to remain are the most likely receptors to be affected by traffic and construction noise. However, there would be less noise impacts on the proposed park for this alternative; instead of passing over top of the park, the bridge alignment would pass just to west of the current roadway alignment. For all residents to remain on the west side of the corridor within the ROI for noise, the temporary and permanent noise impacts of the roadway will be closer to their homes. For all remaining residents on both sides of the corridor within the ROI for noise (approximately 15-20 homes), the VDOT manual recommends assessing effects within 500 feet of the alignment.

Based on the foregoing, and considering the future noise analysis and any appropriate mitigation, this alternative would have direct and indirect, temporary and permanent, minor effects on noise.

7.18.4 Cumulative Effects

The past, present, and reasonably foreseeable effects of any alternative must be considered. Based on this and on both cities' comprehensive plans, existing land uses in the ROI will remain similar, and no other changes to noise levels or intensities are anticipated or known at this time. With any appropriate and practicable mitigation as needed for traffic noise, implementation of the No Build, Alternative 4, or Alternative 6 is not predicted to substantially cumulatively or synergistically interact with climate change and/or other effects to noise.

7.19 Climate Change

This section considers both the effects of the Alternatives on climate change, and the effects of climate change on the Alternatives.

7.19.1 Alternative 1, No Action/Future without Project

Currently, the region has a humid subtropical climate with moderate changes of seasons and has an average annual precipitation of 46.55 inches. Climate change may lead to increased ocean temperatures, ocean acidification, sea level rise, and changes in currents, upwelling and weather patterns and has the potential to cause changes in the nature and character of the freshwater tidal ecosystem in the ROI. The pace of sea level rise in the region is the highest on the East Coast because the shoreline is subsiding and global warming is increasing the rate of sea level rise, both because of thermal expansion and the melting of land ice (J.A. Church and N.J. White, 2006).

Within the ROI, however, considering past storm tides, wind tides, and/or heavy rainfall, history shows that the water levels do not fluctuate significantly given the large channel and wide

overbanks. The vast acreage of wetlands help to serve as hydraulic storage areas and buffers against development. Based on the USACE medium sea level rise curve estimate, it does not appear that residences in the ROI would be flooded directly by sea level rise alone. However, long-term impacts from sea level rise, land subsidence, and climate change could cause the flooding during high water events in the low-lying areas of the ROI in particular to worsen over time.

Without implementation of an action alternative, it is expected the North Landing Bridge and its approaches will continue to be impacted occasionally by high water flooding events, resulting in continued damage/repairs to bridge motors and electrical components and temporary road and navigation closures. If the existing culvert under North Landing Road that drains the Upper North Landing River becomes blocked with debris, it appears the water will be able to overtop the adjacent land and then flow into the AIWW and North Landing River, thus it would not exacerbate upstream flooding.

According to the traffic study completed by the USACE and its engineering firm, for the No Build/FWOP Alternative, the average daily traffic volumes and associated greenhouse gas emissions are expected to increase by approximately 66%, from a base year of 2009 and its volume of 10,108 vehicles, through the year 2040 and its projected volume of 16,798 vehicles. Projections of navigational traffic volumes are not available at this time. Both roadway and navigational traffic would continue to be required to stop and idle for bridge openings and closings. Also, occasional bridge closures due to malfunctions and/or maintenance, and temporary detours of at least 15 miles for roadway traffic for a few days at a time would be expected to continue.

This alternative would have permanent, indirect, negligible adverse impacts on, or due to, climate change. These would be due to the increased volume of traffic and greenhouse gas emissions, and the expected increased frequency of flooding from high water events.

7.19.2 Alternative 4, East Alignment Fixed Bridge

Sea level rise was included in setting the elevation of the proposed bridge alternatives. The USACE used a 50-year sea level projection using our calculation for the intermediate sea level rise curve, for the upstream gage station at Sewell's Point, Virginia, and the downstream gage station at Oregon Inlet, North Carolina. The intermediate curve value calculated for Sewell's Point is 1.45 feet of increase, and for Oregon Inlet it is 1.40 feet of increase. To account for sea level rise increase in the bridge design, the values are added to the 100-year floodplain elevation 3.0 feet, and the resulting analysis determined that the bottom of any new constructed bridge should be no lower than elevation 4.45 feet, per Executive Orders for Adaptation, Climate Preparedness, and Resilience. This should result in fewer roadway flooding events within the ROI. Also, if the on-site compensatory wetland mitigation alternative of grading down the existing roadbed is chosen, it could create approximately one acre of wetlands and additional floodwater storage area for high water events.]

According to the traffic study, for either Alternative 4 or 6, the average daily traffic volumes and associated greenhouse gas emissions, are expected to increase by approximately 71%, from a base year of 2009 and its volume of 10,108 vehicles, through the year 2040 and its projected volume of 17,310 vehicles. However, without the need for bridge closures and openings, there would be less idling of either roadway or navigational traffic within the ROI. The roadway

approaches and the bridge tender controls will be less vulnerable to coastal flooding, both nuisance and storm-induced. Because there will be less maintenance required for a new fixed bridge, and less expected flooding along the ROI than with the No Build/FWOP Alternative, there would rarely if ever be a need to close the bridge and detour traffic during the 50-year planning period of analysis.

During construction, equipment and structures associated with roadway and bridge construction would be present along the entire corridor, including on the bridge, to the sides of the bridge, and near the waterway. Construction would be phased for a period of approximately three years. During construction, equipment will generate temporary emissions, and both navigational and roadway traffic would continue to utilize the ROI. Localized increases in fuel combustion-related emissions during construction, but they would be temporary and negligible.

Based on the foregoing, this alternative would have temporary and permanent, indirect, negligible adverse impacts on, or due to, climate change. These would be due to a very minor increase in traffic volume emissions, and temporary construction emissions of greenhouse gases. Conversely, however, it may result overall in slightly less greenhouse emissions than the No Build Alternative, due to less idling of traffic and fewer detours needed. Either Alternative 4 or 6 also would have the permanent, minor beneficial effect of being better adapted to the effects of climate change, such as sea level rise.

7.19.3 Alternative 6, West Alignment Fixed Bridge

This alternative would have the same effects on and due to climate change as Alternative 4.

7.19.4 Cumulative Effects

The ROI is within a wide floodplain area that contains vast hydraulic storage area for high water events; and the ROI is expected to remain in similar condition, other than the impacts described herein.

Sea level rise is expected to occur over time due to climate change, and may cause increased flooding frequencies in particularly the low-lying areas of the ROI and in the wetlands within the watershed but outside of the ROI. As described earlier, a 50-year sea level projection using our calculation for the intermediate sea level rise curve, approximately 1.40-1.45 feet of sea level rise is expected, and either alternative would be designed accordingly. Also, as a result of sea level rise, some less saturation-tolerant plant and/or animal species could migrate to drier ground or die off.

However, other than described in this section, implementation of the No build, Alternative 4, or Alternative 6 is not predicted to substantially cumulatively or synergistically affect climate change. Either Alternative 4 or 6 would result in a roadway and bridge corridor that is better adapted to the effects of climate change, such as sea level rise.

7.20 Summary of Environmental Impacts

Table 7-4 shows the summary of environmental impacts.

Table 7-4. Summary of Environmental Impacts

Environmental Factor	No Action	Alternative 4, East Alignment Fixed Bridge	Alternative 6, West Alignment Fixed Bridge
Land Use	No temporary or permanent, direct adverse or beneficial impacts on land use.	Adverse direct and indirect, minor adverse effects; and permanent direct and indirect minor to moderate adverse effects on public and private land use. Approximately 13 private properties (preliminary estimate) could be affected. It would pass through approximately 400-500 feet of a park proposed by the City of Virginia Beach, making it unclear whether the park could still move forward.	Adverse direct and indirect, minor adverse effects; and permanent direct and indirect minor to moderate adverse effects on public and private land use. Approximately 11 private properties (preliminary estimate) could be affected.
Geology, Soils, and Topography	No temporary or permanent, indirect or direct, adverse impacts on geology, soils, or topography	Temporary and permanent, direct and indirect, adverse effects on approximately 6.64 acres organic soils. Utilizing best management practices for logging and construction and access, such as use of temporary construction trestles instead of temporary fill, the adverse effects can be reduced to minor to moderate.	Same effect as Alternative 4, except temporary and permanent, indirect and direct adverse effects on approximately 7.62 acres organic soils.
Water Quality and Water Resources (Surface waters other than wetlands, public water supply, groundwater)	Permanent indirect minor adverse effect due to no existing stormwater treatment, occasional flooding of drawbridge control room, and possible release of very small amounts of fuels and/or hydraulic fluids into the waterway.	Temporary indirect minor adverse effect during construction, but permanent minor beneficial effect, because stormwater treatment will be incorporated. No effect on public water supply resources.	Same effect as Alternative 4.
Floodplains	Temporary, negligible to minor adverse effects on floodplains, due to occasional high water events. Negligible	Temporary, negligible to minor adverse effects on floodplains could occur during construction due to stormwater, but all applicable laws, including the Clean Water Act Section 402 and the Virginia Stormwater Management Act would be followed. This alternative would have temporary, direct or indirect,	Same temporary effect as Alternative 4. Very minor permanent effect; the hydrologic and hydraulic modeling shows that the large bridge opening and low roadway approach on the right overbank, upstream flood elevations increase only 0.1 feet for only the 0.2% annual chance

Environmental Factor	No Action	Alternative 4, East Alignment Fixed Bridge	Alternative 6, West Alignment Fixed Bridge
	permanent adverse effect on floodplains.	negligible to minor effects on floodplains during construction. This alternative would have minor direct or indirect permanent adverse effects on floodplains. There also may be a very minor beneficial effect on floodplains if removal or partial removal of the existing roadbed on the Chesapeake side occurs.	combined rainfall and tidal flood scenario.
Wetlands	No temporary or permanent, indirect or direct, adverse impacts.	Indirect and direct, temporary to permanent, minor to moderate adverse effects on wetlands. Estimated permanent impacts 0.94 acre. Estimated temporary impacts 5.7 acres. Estimated span acreage 1.8 acres. Best management practices needed to minimize temporary impacts. No significant impacts, due to compensatory mitigation required for permanent impacts; and temporary impacts and spanning impacts to be restored and resprigged with native tree species. Approximately 6.93 mitigation credits to be purchased within watershed service area, in accordance with Uniform Mitigation Assessment Methodology, an approved functional assessment tool. (Wetland delineation has not been completed for the entire site).	Indirect and direct, temporary to permanent, minor to moderate adverse effects on wetlands. Estimated permanent impacts 1.0 acre. Estimated temporary impacts 6.48 acres. Estimated span acreage 2.4 acres. Best management practices needed to minimize temporary impacts. No significant impacts, due to compensatory mitigation required for permanent impacts; and temporary impacts and spanning impacts to be restored and resprigged with native tree species. Approximately 8.22 mitigation credits to be purchased within watershed service area, in accordance with Uniform Mitigation Assessment Methodology, an approved functional assessment tool. (Wetland delineation has not been completed for the entire site).
Wildlife	Minor permanent effect.	Indirect and direct, temporary to permanent, adverse to beneficial minor effects on wildlife and wildlife habitat. The raised bridge may improve wildlife corridors by allowing safer passage underneath the bridge, as opposed to across the existing roadway.	Same effects as Alternative 4.
Special Status Species	No temporary or permanent,	Temporary and permanent indirect adverse effect. May affect, and is likely to adversely affect the	Same effect as Alternative 4.

Environmental Factor	No Action	Alternative 4, East Alignment Fixed Bridge	Alternative 6, West Alignment Fixed Bridge
	indirect or direct, adverse impacts.	Northern long-eared bat. However, because a buffer greater than 150 feet would be preserved around the tree (tree clearing is at least 1000 feet from roosting trees), this alternative would be excepted from the incidental take prohibitions specified in the PBO. USACE is relying on the PBO and its framework as our compliance with ESA, with concurrence from the USFWS. No effect on any other federal listed species.	
Cultural Resources	No temporary or permanent, indirect or direct, adverse impacts.	Permanent, direct, moderate adverse effect on the NRHP listed Albemarle & Chesapeake Canal Historic District. No significant impacts, because those impacts would be mitigated through the Programmatic Agreement (PA). Alternative 4 also has a slightly higher probability of impacting archaeological sites. Archeology survey ongoing.	Same effects as Alternative 4, except that Alternative 6 has a moderate probability of impacting archaeological sites. Archeology survey ongoing.
Recreational Resources	No direct temporary or permanent, adverse or beneficial impacts on recreational resources.	Temporary and permanent, direct minor to moderate adverse effect due to crossing of 400-500 feet of a potential proposed City of Virginia Beach park, either limiting its use or making it unclear whether or not the park would be viable. (However, as of this writing, there is no negotiated land sale for the park This alternative could also afford the opportunity to add bicycle and/or pedestrian trails to the corridor, and to connect with other trail networks.	This alternative would have all of the same effects described for Alternative 4, with the exception that it would not pass through or cause a permanent conflict with the potential proposed City of Virginia Beach park land.

Environmental Factor	No Action	Alternative 4, East Alignment Fixed Bridge	Alternative 6, West Alignment Fixed Bridge
Visual Resources	No new temporary or permanent indirect or direct, adverse impacts on visual resources.	Direct minor effects ranging from temporary to permanent, adverse to beneficial. New bridge will have a larger viewshed; with those residents remaining on the east side of the road having a closer view of the bridge. Viewshed from the water should be improved with the removal of the existing low-profile metal bridge and replacement with high bridge.	Same effects as Alternative 4, except that those residents remaining on the west side will have a closer view of the bridge.
Socioeconomics	Minor but prolonged impact due to bridge openings and breakdowns causing travel delays or detours. Moderate effect if bridge closes permanently.	Temporary minor adverse effect on the traveling public, but permanent, minor beneficial effect on the traveling public. Adverse temporary and/or permanent effects on approximately 13 properties.	Same effects as Alternative 4, except Adverse temporary and/or permanent effects on approximately 11 properties.
Hazardous, Toxic, Radioactive Waste (HTRW)	No temporary or permanent effect.	Temporary and permanent direct minor adverse effects on Nustar fuel line adjacent to the east side of the corridor. Relocation or incorporation into the design may be necessary. An emergency spill plan would be in place during construction. A Phase 2 Environmental Assessment would need to be done to determine the contents of bridge, bridge tender station, and overhead power lines to be demolished. Removal of the existing road bed may also be a risk for HTRW. If HTRW materials are found, they will be handled and disposed of in a lawful manner.	Same effect as Alternative 4, with the exception that there is less potential impact to HTRW for this alternative, due to there being less direct impact on the fuel line.
Safety	Minor, indirect, permanent, adverse, impacts on safety. Bridge does not meet current VDOT	Direct, permanent, beneficial effects on both roadway and waterway safety. During construction, it will have direct and indirect, temporary, adverse effects that are negligible to minor, on roadway, waterway,	Same effects as Alternative 4.

Environmental Factor	No Action	Alternative 4, East Alignment Fixed Bridge	Alternative 6, West Alignment Fixed Bridge
	safety standards for width, capacity, and weight.	workers, and air traffic safety. OSHA standards will be adhered to during construction.	
Transportation	Minor, indirect, permanent, minor adverse, impacts on safety. Bridge does not meet current VDOT safety standards for width, capacity, and weight. Roadway and navigation traffic would still be delayed briefly by regular bridge openings. If not replaced the bridge could close permanently, causing a permanent moderate adverse effect.	Direct, permanent, minor beneficial effects on both transportation and navigation due to elimination of bridge openings and delays. Roadway upgrades will result in a safer roadway and the elimination of vehicle weight restrictions. During construction, it will have direct and indirect, temporary, adverse effects that are negligible to minor, on roadway and navigational traffic.	Same effects as Alternative 4.
Utilities	No permanent or temporary, direct or indirect effect.	Temporary and permanent direct and indirect adverse effects on the Nustar fuel line and its operations range from minor to moderate. Fuel line would likely have to be relocated. USACE will continue to coordinate with NuStar on design and construction plans relative to the fuel line and tank facility. Navy would be notified at the earliest possible time of any interruptions in fuel supply. Fuel line will be protected to avoid damage during construction. With respect to public utilities, this alternative would have permanent beneficial effects, and temporary, indirect, adverse effects that are negligible to minor.	Same effects as Alternative 4, except this alternative would not encroach permanently into the current footprint of the fuel line. However, the fuel line footprint could be in the construction zone. With avoidance and protection during construction, this would have temporary, minor, adverse effects to the fuel line, and permanent beneficial effects, and temporary, indirect, adverse effects that are negligible to minor on public utilities.

Environmental Factor	No Action	Alternative 4, East Alignment Fixed Bridge	Alternative 6, West Alignment Fixed Bridge
Air Quality	Temporary and permanent, indirect, minor adverse impacts on air quality.	Temporary and permanent, indirect, minor adverse impacts on air quality. These would be due to an increase in traffic volume emissions, and temporary construction emissions. Conversely, however, it also could result overall in slightly less emissions than the No Action Alternative, due to less idling of traffic and fewer detours needed. No conformity determination required. Not expected to affect the region's attainment status.	Same effects as Alternative 4.
Noise	No new direct, temporary or permanent, adverse impacts on noise. An indirect effect would be that traffic noise would continue to increase commensurate with increased traffic volumes. Baseline noise conditions includes NALF Fentress air traffic noise and current roadway travel over existing bridge deck.	Temporary and permanent, direct and indirect, minor noise effects on nearby residents anticipated. Traffic noise analysis indicates that one residence would be impacted; however that residence is most likely going to be acquired for the project, in which case, no noise abatement would be needed. This will be further considered as design progresses. Construction noise would adhere to local noise ordinances unless specifically exempted. Vibration monitoring will occur during pile driving as appropriate.	Same effects as Alternative 4.
Climate Change	Permanent, indirect, negligible adverse impacts on, or due to, climate change, due to the increased volume of traffic and greenhouse gas emissions, and the expected increased frequency of flooding from	Temporary and permanent, indirect, negligible adverse impacts on, or due to, climate change. These would be due to an increase in traffic volume emissions, and temporary construction emissions of greenhouse gases. Permanent, minor beneficial effect of being better adapted to the effects of climate change, such as sea level rise.	Same effects as Alternative 4

Environmental Factor	No Action	Alternative 4, East Alignment Fixed Bridge	Alternative 6, West Alignment Fixed Bridge
	high water events.		

8 Summary of Best Management Practices / Mitigation Measures

Impact evaluations conducted during the preparation of this feasibility study have determined that no significant impacts would result from implementation of either alternative, provided these Best Management Practices and Mitigation Measures are implemented. This determination is based on a thorough review and analysis of existing resource information and coordination with knowledgeable, responsible personnel from the USACE and relevant local, state, and Federal agencies. Standard Best Management Practices (BMPs) would be implemented during project implementation and bridge construction to minimize potential impacts and disturbances to the environment and resources within the project extent.

8.1 Project-Specific BMPs for NuStar Fuel Line

- Coordination with the NuStar Fuel Line owners should be conducted as designs are further developed to address any temporary encroachment near the fuel line, and to minimize conflicts and adverse effects;
- Construction schedule should be coordinated with NuStar;
- Construction equipment should be staged away from the fuel line to the extent possible. If construction near the fuel line is unavoidable, the fuel line would need to be protected or temporarily or permanently relocated during construction to avoid damage and disruption, as per direction from NuStar;
- Construction workers must be advised of the location of the fuel line and trained on safety;
- During construction, any disruptions to fuel line supply must be avoided to the maximum extent practicable; as these would require alternate transportation of fuel supply by tanker trucks to the Navy;
- The Navy would need to notified at the earliest possible time of any fuel supply interruptions;
- Disturbance and disposal of any fuel lines with asbestos containing materials (ACM) would need to be done in accordance with all federal and state laws and regulations;
- An emergency spill plan must be in place prior to construction, should accidental damage to a fuel line occur during construction;
- VDEQ Emergency Spill hotline must be notified in the case of a spill.

8.2 Project-Specific BMPs for Wetlands Underlain by Organic Muck Soils

- Avoid and minimize temporary and permanent impacts to wetlands and waters; to ensure that either alternative does not have significant impacts on high-quality and difficult-to-mitigate wetlands and soils;
- Geotechnical borings throughout the entire roadway alignment will be critical, particularly across the bottomland hardwood forested wetlands on the Chesapeake side, and any other

areas mapped as Dorovan or Dorovan-Bellhaven. Typically, these soils are seasonally inundated, very unstable histosols, characterized by deep muck layers, and are highly prone to subsidence and compaction;

- It is recommended that methods such as "top-down" bridge construction should be considered for easier construction access, and to reduce temporary and permanent impacts on soils and wetlands;
- If top-down" bridge construction is not practicable, then these areas will need to be accessed by temporary structures such as work trestles during construction;
- Temporary fill for either logging or construction should not be placed in any areas verified by geotechnical borings as consisting of muck or peat soils.
- Tree-clearing for permanent fill and/or construction access should be limited as much as possible. Specialized equipment, such as low-pressure or high floatation tires, or dual-tired skidders, may be necessary (EPA, 2005). Walking logging equipment might also be able reduce soil impacts when clearing trees;
- To avoid long-term impacts that cannot be restored, a tree-clearing and temporary construction plan will need to be developed and coordinated with USACE biologist, who will coordinate with the EPA and/or the U.S Department of Forestry, during the PED phase;
- Stockpiling temporarily in wetlands would need to be avoided and minimized, and permanent disposal would need to be offsite; and
- All temporarily disturbed areas, including areas spanned by the bridge, must be restored to pre-existing contours, and sprigged of tree saplings. If they cannot be restored fully to pre-existing contours, the wetland compensation plan must be expanded to include mitigation for these areas.

8.3 Project-Specific BMPs for Species Potentially Impacted by the Project Extent*

Voluntary Conservation Measures for the Northern Long-eared Bat

In addition to reliance on the 4(d) Rule and PBO, the USFWS strongly encourages all Federal agencies to carry out voluntary conservation measures. USACE intends to adhere to the following conservation measures applicable to this project, <u>as practicable</u>.

- Conduct tree removal activities outside of the NLEB pup season (June 1-July 31). The USACE will attempt to time the clearing such that either:
    - All clearing is done outside of these timeframes, or
    - Clearing closest to the roosting trees is done outside of these timeframes.
- Evaluate the use of outdoor lighting during the active season and seek to minimize light pollution by angling lights downward or via other light minimization measures.
- <u>Construction workers should be given the fact sheet pertaining to the potential to encounter canebrake rattlesnake. If this species is encountered, USACE will need to contact VDGIF.</u>

8.4 Project-Specific BMPs for Transportation

- The construction schedule must be closely coordinated with the Public Works departments of both cities to avoid conflicts with other ongoing local transportation work, and to formulate a transportation plan;

- If applicable, the construction schedule must be coordinated with the City of Virginia Beach Parks and Recreation Department to avoid impacts on its proposed park, park access, and construction schedule.

8.5 Project-Specific BMPs for Navigation

- A USCG Bridge construction permit is required for either Alternative. Any associated permit conditions and best management practices would apply;
- Any temporary or permanent navigational channel restrictions or obstruction would require USCG and/or VDGIF authorization and any associated best management practices;
- Lighting and/or navigational markings on permanent and temporary instream structures may be required by the USCG.

8.6 Project-Specific BMPs for Traffic Noise Considerations

The results of a traffic noise analysis indicated that one residence, 3944 North Landing Road, is considered noise-impacted. However, this residence will most likely need to be taken to construct the project.

- Noise mitigation will only be necessary if the residence is not taken and if practicable, considering level of impact, design, and cost.

8.7 Project-Specific BMPs for Hazardous Materials

- A Phase 2 Environmental Assessment would need to be done to determine the contents of bridge, bridge tender station, abandoned NuStar fuel line, and overhead power lines to be demolished.
- Removal of any portion of the existing road bed may also be a risk for HRTW.
- If HRTW materials are found, they will be handled and disposed of in a lawful manner.
- If HRTW materials are found, coordination will occur with the VDEQ's Waste Division will occur, including coordination with the Division of Land Protection and Revitalization, Department of Labor and Industry, and Department of Professional Occupational Revitalization, as appropriate.

8.8 Project-Specific BMPs for Cultural Resources

- No ground disturbance will occur outside of areas identified as the Area of Potential Effects (APE) in the final cultural resources survey report;
- Ground disturbing activities will be suspended within 50 feet of observed potential archaeological sites unexpectedly discovered until significance has been determined, and treatment plan if significant;
- The project would be required to adhere to all stipulations according to the final Programmatic Agreement (PA).
- The existing cemetery along the east side of the road shall be fenced off during construction and shall not be disturbed, if at all possible. If disturbances to the cemetery cannot be avoided, the burials and headstones shall be relocated to an approved burial

ground in accordance with state and local laws and ordinances.

8.9 BMPs for Erosion and Sedimentation Control and Soil Impacts

- All clearing, grubbing, and grading activities during construction will adhere to the VDCR Erosion and Sediment Control Program. The program requires erosion and sedimentation control plans to minimize erosion and siltation that could impact local streams;
- Soil erosion and sedimentation control measures to control off-site runoff would be implemented during construction. An erosion and sediment control plan detailing construction BMPs would be prepared in accordance with the Virginia Erosion and Sediment Control Laws and Regulations and Virginia Storm Water Management Law and Regulations. Construction would be monitored to ensure erosion and stormwater management practices are adequate in preventing sediment and pollution migration into nearby surface waters. In addition to those listed under "Project-Specific BMPs for Wetlands Underlain by Organic Muck Soils, specific measures to minimize soil exposure and compaction and reduce potential impacts to stormwater that would be required to be followed during construction would consist of the following:
    - Equipment and vehicles would be operated outside of wetlands wherever feasible and use mats when work in wetlands would be unavoidable.
    - Heavy equipment, located in temporarily impacted mineral flats wetland areas, would be placed on mats, geotextile fabric or use other suitable measures to minimize soil disturbance to the maximum extent practicable.
    - Install erosion control measures prior to ground-disturbance;
    - Personnel and contractors would apply permanent or temporary soil stabilization to denuded areas within seven days after final grade is reached on any portion of the site.
    - Personnel and contractors would inspect stormwater water BMPs and potential risks to stormwater (e.g. material stockpiles, silt fences, etc.) (i) at least once every four business days or (ii) at least once every five business days and no later than 48 hours following a measurable storm event. In the event that a measurable storm event occurs when there are more than 48 hours between business days, the inspection would be conducted on the next business day.
    - Disturbed areas would be stabilized immediately whenever any clearing, grading, excavating, or other land-disturbing activities have permanently ceased on any portion of the site, or temporarily ceased on any portion of the site and would not resume for a period exceeding 14 days.

8.10 BMPs for Water Quality

- Stormwater BMPs would be used to prevent and mitigate erosion and sedimentation impacts that have the potential to cause short-term and long-term impacts to soils as well as water quality. Any onsite stormwater facilities must be designed in accordance with the Virginia Stormwater Management Act and the Virginia Runoff Reduction Model;
- To maintain water quality and limit turbidity during construction/maintenance of project features, the following BMPs may be implemented, to the extent practicable:

  - Contain all excavated material and loose fill to prevent entry into the waterway. Limit the amount and extent of turbidity and sedimentation. Use appropriate sedimentation and turbidity controls such as silt curtains and cofferdams; and specify the measures to be used in the construction plans.
  - Prevent sediment and debris from entering the water using geo-textile fabric, hay bales, or other methods. Use nets, tarps, and pans when demolishing bridge superstructures; remove demolition debris that falls into the water; and
  - Upon project completion, remove and stabilize all temporary construction materials with sediment and erosion control measures to prevent reentry into waterways.
- Prior to construction, permits to encroach on state-owned bottom and water quality certifications will be required by the Virginia Marine Resources Commission and the Virginia Department of Environmental Quality, respectively. Any associated permit conditions and best management practices would apply to the Proposed Action.

8.11 BMPs for Construction Noise Considerations

Construction activity may cause intermittent short-term fluctuations in noise levels in the vicinity of the project area. During construction phase of the project, all reasonable measures will be taken to minimize noise impact from these activities. Additionally, Section 107.16(b) 3 of VDOT's Road and Bridge Specifications prescribes contractor requirements for noise control during construction. These include, but are not limited to:

- Construction noise will adhere to local noise ordinance unless specifically exempted;
- Limiting exterior noise levels during noise-sensitive activities to no more than 80 decibels, and taking corrective action should construction activities surpass this level;
- Restricting certain portions of work that produce objectionable noise between 10 P.M. and 6 A.M. and following any additional noise restrictions established by local ordinances;
- Establishing alternative haul routes that direct vehicles away from developed areas and ensure that noise from hauling operations is kept to a minimum;
- Vibration monitoring will occur during pile driving as appropriate.

8.12 BMPs for Noise and Worker Safety

Best management practices that would be implemented to minimize noise effects would include the following:

- Clearing activities would occur during normal weekday business hours.
- Equipment mufflers would be properly maintained.
- Personnel or contractors conducting tree removal, cutting, topping and mowing operations would wear required Personal Protective Equipment at all times.
- Personnel would be excluded from work zones during tree removal, cutting, and topping operations and mowing operations to ensure occupational safety and health risks to personnel are not increased from implementation of any of the action alternatives.
- A safety plan would be developed in accordance with current regulations.

8.13 BMPs for Temporary Construction Conditions for Air Quality

- Fugitive dust must be kept to a minimum. Dust minimization measures such as

application of water to trails/roads or equivalent measures would be implemented as needed.

- Spilled or tracked dirt or other materials must be removed promptly from paved streets and removal of dried sediments from streets.
- All reasonable precautions should be taken to limit emissions of volatile organic compounds (VOCs), and Nitrous oxides (NOx), principally by controlling or limiting the burning of fossil fuels;
- Open burning and asphalt paving are subject to Virginia Codes (VAC) 5-130 and 5-45-780, respectively;
- No unnecessary idling of trucks or other equipment shall occur when not in use during construction.

8.14 General BMPs

Below is a listing of other planned BMPs / mitigation measures that would be employed during project implementation with the Recommended Plan to the maximum, practical extent:

- Use of access roads/trails would be minimized and would not cross through saturated areas if possible or within 50 feet of any cultural resources sites. Existing roads will be used whenever possible and would not cross these areas. The width of roads would be restricted to the width of the largest vehicle that would be used onsite for the tree removal efforts. Turn around areas would be restricted and limited to minimize impacts to soils and vegetation. All access points would avoid existing water bodies/saturated areas to the maximum, practical extent. Should a crossing be necessary for vehicles and equipment, a bridge, culvert, pole ford or other equivalent BMP would be employed to minimize potential erosion and rutting.
- Tree removal sites or sites disturbed by temporary access roads would be brought back to original grade and replanted with a native, perennial seed mixture.
- Tree removal and cutting operations would be controlled in accordance with forestry BMPs to reduce potential disturbances to soils, natural resources, and cultural resources
- Equipment and cut trees would only be stored onsite during designated, upland staging areas. Any cut trees would not be left in wetland areas for more than one day after being cut.
- Surveyor’s flagging or an equivalent methodology would be used to flag sensitive areas where equipment is not allowed to cross.
- No storage of fuels or chemicals or refueling of vehicles or equipment would occur in environmentally sensitive areas including the upland forest areas or wetland sites.
- The contractor would be required to carry a spill control kit at all times should a spill of a hazardous material occur or if there is a vehicle or equipment leak. The spill kit would include absorbent material, clamps and plugs for leaks, a sturdy catch basin for leaks, digging tools, and tarps to protect soil during repair jobs.
- Any dragging of logs or further disturbance to soils following felling operations would be minimized to the maximum practical extent to reduce impacts to surrounding natural resources.
- Where feasible, equipment modifications would be used in the wetland sites to reduce potential impacts to soils, such as rubberized tracks, use of low ground pressure equipment, and use of lightweight equipment.
- No equipment or vehicles would be parked or stored in wetlands at any time.

- The tree removal operations should occur during suitable ground moisture conditions in order to avoid excessive site damage. When avoidable, do not conduct tree removal in excessively wet weather.
- Vehicles and equipment would be shut off when not in use.
- Any areas temporarily impacted by the project such as access roads would be restored to their pre-project condition.
- Blades of mowing equipment would remain above the ground surface to reduce potential soil disturbances to the maximum extent practical.
- Every effort will be made to avoid the spread of invasive species. All permit conditions relating to invasive species will be followed. All replanted wetland areas will be restored and planted with native species and monitored in accordance with the wetland mitigation plan monitoring requirements. If found, invasive species will be eradicated.

9 Environmental Compliance

Compliance with the following environmental laws (and implementing regulations) and Executive Orders (Table 9-2) is required for the project alternatives under consideration (note: this is not necessarily an exhaustive list of all applicable environmental requirements) (Table 9-1). Compliance with Permitting Requirements is listed in Table 9-3.

Table 9-1. Environmental Compliance

Title of Law	U.S. Code	Compliance Status
Abandoned Shipwreck Act of 1987	43 United States Code (U.S.C.) 2101	N/A
Air Commerce Act	49 U.S.C. 106	Coordination with Federal Aviation Administration (FAA) will be conducted prior to construction regarding construction crane heights.
American Bald and Golden Eagle Protection Act of 1962, as amended		N/A, no eagle nests within ¼ mile of the ROI
Anadromous Fish Conservation Act of 1965	16 U.S.C. 757 a et seq	N/A, National Marine Fisheries Service indicated no anadromous fish
Clean Air Act of 1972, as amended	42 U.S.C. 7401 et seq	Full compliance

Title of Law	U.S. Code	Compliance Status
Clean Water Act of 1972, as amended	33 U.S.C. 1251 et seq	A Mitigation Plan and a 404(b)(1) analysis has been prepared. Section 401 Water Quality Certification will be obtained during the Preconstruction, Engineering, and Design (PED) phase.
Coastal Barrier Resources Act	16 U.S.C. 3501 et seq	N/A, there are no resources within the ROI.
Coastal Zone Management Act of 1972, as amended	16 U.S.C. 1451 et seq	CZMA consistency determination concurrence received from VDEQ. Full compliance.
Comprehensive Environmental Responses, Compensation and Liability Act of 1980	42 U.S.C. 9601	Full Compliance
Deepwater Port Act of 1974, as amended	33 U.S.C. 1501	N/A
Emergency Wetlands Resources Act	16 U.S.C. 3901-3932	N/A
Endangered Species Act of 1973	16 U.S.C. 1531	Section 7 Consultation completed. Full Compliance.
Estuary Protection Act of 1968	16 U.S.C. 1221 et seq	N/A
Fish and Wildlife Coordination Act of 1958, as amended	16 U.S.C. 661	Fish and Wildlife Coordination Act Report/Planning Aid received. Full Compliance.
Land and Water Conservation Act	16 U.S.C. 460	Full Compliance

Title of Law	U.S. Code	Compliance Status
Magnuson-Stevens Fishery Conservation and Management Act	16 U.S.C. 1801	N/A, no EFH within the ROI
Marine Mammal Protection Act of 1972, as amended	16 U.S.C. 1361	N/A, no marine mammal habitat within the ROI
Marine Protection, Research, and Sanctuaries Act of 1972	33 U.S.C. 1401	N/A
Migratory Bird Conservation Act of 1928, as amended	16 U.S.C. 715	Full Compliance.
Migratory Bird Treaty Act of 1918, as amended	16 U.S.C. 703	Full Compliance.
National Environmental Policy Act of 1969, as amended	42 U.S.C. 4321 et seq	NEPA will conclude and be in compliance upon the issuance of a final Finding of No Significant Impact
National Historic Preservation Act of 1966, as amended	16 U.S.C. 470	Coordination as required per Section 106 the National Historic Preservation Act (NHPA) has been concluded through a Programmatic Agreement (PA) between USACE and the Virginia State Historic Preservation Officer. The PA has been finalized and signed by the required Signatories. Concurring Parties, while not required, were invited to sign if they choose. If available, some of the information required by the PA will be provided to SHPO, prior to the PED phase.

Title of Law	U.S. Code	Compliance Status
National Historic Preservation Act Amendments of 1980	16 U.S.C. 469a	Coordination as required per Section 106 the National Historic Preservation Act (NHPA) has been concluded through a Programmatic Agreement (PA) between USACE and the Virginia State Historic Preservation Officer. The PA has been finalized and signed by the required Signatories. Concurring Parties, while not required, were invited to sign if they choose. If available, some of the information required by the PA will be provided to SHPO, prior to the PED phase.
Native American Graves Protection and Repatriation Act of 1990	25 U.S.C. 3001	N/A
Noise Control Act of 1972, as amended	42 U.S.C. 4901	Traffic Noise Study was completed. One residence was found to be noise-impacted that will most likely be taken. Further consideration of taking and/or practicability of noise mitigation will occur in the design phase.
Resource Conservation and Recovery Act of 1976	42 U.S.C. 6901 et seq	A Phase 1 Environmental Assessment has been conducted, Phase 2 needed for all structures to be demolished and will be conducted during the PED phase, prior to construction.
River and Harbor Act of 1888, Section 11	33 U.S.C. 608	Full Compliance

Title of Law	U.S. Code	Compliance Status
River and Harbor Act of 1899, Section 9	33 U.S.C. 401 et seq	Initial coordination conducted with U.S. Coast Guard as a Cooperating Agency. Additional coordination to occur with the U.S. Coast Guard during permit process in the PED phase, to obtain permits for bridge, permits for channel closure or constriction during construction, and aids to navigation
Safe Drinking Water Act of 1974, as amended	42 U.S.C. 300	Full Compliance
Submerged Lands Act of 1953	43 U.S.C. 1301 et seq	N/A
Toxic Substances Control Act of 1976	15 U.S.C. 2601	A Phase 1 Environmental Assessment has been conducted, Phase 2 needed for all structures to be demolished and will be conducted during the PED phase, prior to construction.

Table 9-2. Executive Orders

Title of Executive Order	Executive Order Number	Compliance Status
Protection and Enhancement of Environmental Quality	11514/11991	Full Compliance
Protection and Enhancement of the Cultural Environment	11593	Coordination with federal, state, local agencies, tribal governments, and the public is ongoing
Floodplain Management	11988	Full Compliance

Title of Executive Order	Executive Order Number	Compliance Status
Protection of Wetlands	11990	A Mitigation Plan and a 404(b)(1) analysis has been prepared. Section 401 Water Quality Certification will be obtained during the Preconstruction, Engineering, and Design phase.
Federal Compliance with Pollution Control Standards	12088	Full Compliance
Offshore Oil Spill Pollution	12123	Full Compliance
Federal Compliance with Right-to-Know Laws and Pollution Prevention	12856	N/A
Federal Actions to Address Environmental Justice and Minority and Low-income Populations	12898	Full Compliance; no Environmental Justice adverse effects anticipated.
Protection of Children from Environmental Health Risks and Safety Risks	13045	Full Compliance
Invasive Species	13112	Full Compliance
Marine Protected Areas	13158	N/A
Consultation and Coordination with Indian Tribal Governments	13175	Coordination is ongoing.
Responsibilities of Federal Agencies to Protect Migratory Birds	13186	Full Compliance.
Facilitation of Cooperative Conservation	13352	N/A

Title of Executive Order	Executive Order Number	Compliance Status
Preparing the United States for Impacts of Climate Change	13659	Full Compliance
Efficient Federal Operations	13834	Full Compliance

Table 9-3. Permitting Requirements

Law	Agency Responsible	Permit, Agreement, Authorization, or Notification Required
Air Commerce Act	Federal Aviation Administration (FAA)	Due to the proximity to a navigation facility, an FAA Form 7460-1, Notice of Proposed Construction or Alteration is required for an FAA obstruction evaluation.
American Bald and Golden Eagle Protection Act of 1962, as amended	U.S. Fish and Wildlife Service (USFWS)	"Take" permit if any eagles are accidentally harmed or killed; no take permit is required
Chesapeake Bay Preservation Act	VDEQ/City of Norfolk	N/A, not within the Resource Protection Areas
Comprehensive Environmental Responses, Compensation and Liability Act of 1980, as amended	U.S. Environmental Protection Agency (USEPA)	Full Compliance
Clean Water Act, Section 401*	Virginia Department of Environmental Quality (VDEQ)	401 Water Quality Certification required prior to construction, to be obtained during PED phase.
Clean Water Act, Section 404	USACE	USACE does not permit itself, however it conducted a

Law	Agency Responsible	Permit, Agreement, Authorization, or Notification Required
		404(b)(1) analysis for compliance with this Act
Coastal Zone Management Act (CZMA)	VDEQ	CZMA Federal Consistency Concurrence Obtained
Endangered Species Act of 1973	NMFS	Section 7 completed. No effect
Endangered Species Act of 1973	USFWS	Section 7 completed. Adherence to the 4(d) Rule and Programmatic Biological Opinion for the northern long-eared bat.
Federal Land Managing Agency Permit	Federal agencies	N/A, no national parks, national wilderness, or national monuments affected.
Fish and Wildlife Coordination Act (FWCA)	USFWS	FWCA Report Obtained from USFWS
Magnuson-Stevens Fishery Conservation and Management Act	NMFS	N/A
Marine Mammal Protection Act of 1972, as amended	NMFS	N/A
Marine Protection, Research, and Sanctuaries Act of 1972*	USEPA	N/A
Migratory Bird Treaty Act of 1918, as amended	USFWS	“No take permit is required
National Historic Preservation Act of 1966, as amended	Advisory Council on Historic Preservation, Virginia	Programmatic Agreement has been drafted for coordination

Law	Agency Responsible	Permit, Agreement, Authorization, or Notification Required
	Department of Historic Resources	
National Pollutant Discharge Elimination System (NPDES)/Virginia Pollutant Discharge Elimination System (VPDES)	VDEQ	Permits required for any point source discharges to surface waters, or discharges of stormwater from Municipal Separate Storm Sewer Systems (MS4s). Permits to be obtained during PED phase.
Resource Conservation and Recovery Act of 1976	USEPA, VDEQ	Testing, quantification, and notification for any hazardous materials will be conducted in the Phase 2 Environmental Assessment, during PED phase. Any contaminated materials will be properly disposed of at a designated landfill.
Rivers and Harbors Act of 1899	U.S. Coast Guard	Permits from USCG required to construct bridge, for channel closures or restrictions during construction, and aids to navigation. Permits to be obtained during PED phase.
Rivers and Harbors Act of 1899	USACE	USACE does not permit itself; however, it will comply with this Act
Toxic Substances Control Act of 1976	USEPA, VDEQ	Testing, quantification, and notification for any hazardous materials will be conducted in the Phase 2 Environmental Assessment, during PED phase. Any contaminated materials will be properly

Law	Agency Responsible	Permit, Agreement, Authorization, or Notification Required
		disposed of at a designated landfill.
Virginia Code, Title 28.2, Fisheries and Habitat of the Tidal Waters	Virginia Marine Resources Commission (VMRC)	Permit required for structures and fill to encroach upon state-owned bottom to be obtained during PED phase.
Virginia Code, Title 9.25 Virginia Stormwater Management Program	VDEQ	Permits required for discharges of stormwater from construction activities to be obtained during PED phase

N/A = Not Applicable; DEQ = Virginia Department of Environmental Quality; NMFS = National Marine Fisheries Service; USEPA = U.S. Environmental Protection Agency; USFWS = U.S. Fish and Wildlife Service

9.1 National Environmental Policy Act of 1969, As Amended, 42 U.S.C. 4321 *et seq.*

The NEPA requires that all federal agencies use a systematic, interdisciplinary approach to protect the human environment. This approach promotes the integrated use of natural and social sciences in planning and decision-making that could have an impact on the environment. NEPA requires the preparation of an environmental impact statement (EIS) for any major federal action that could have a significant impact on quality of the human environment and the preparation of an Environmental Assessment (EA) for those federal actions that do not cause a significant impact but do not qualify for a categorical exclusion. The NEPA regulations issued by CEQ provide for a scoping process to identify and the scope and significance of environmental issues associated with a project. The process identifies and eliminates from further detailed study issues that are not significant. As previously stated, the USACE used this process to comply with NEPA and focus this feasibility study on the issues most relevant to the environment and the decision making process. For a description of the agency, tribal, and public coordination completed to date and information on the NEPA scoping that was completed, please refer to Public and Agency Coordination in Chapter 1, and the Environmental Correspondence section of the Environmental Appendix, Appendix C. The Draft EA has undergone a 30-day agency, tribal, and public review period. All comments/edits have been addressed in the development of the Final Feasibility Report/Final EA, and include responses to the comments. The Final Feasibility Report/Final EA, including all appendices and supporting documentation will fulfill requirements of the NEPA for the AIWW North Landing Bridge project. Upon completion of the Final Feasibility Report/EA, which is signified by the signing of the Finding of No Significant Impact, the project will be in full compliance with the NEPA.

9.2 Clean Water Act

The USACE will obtain a Water Quality Certification pursuant to Section 401, from the Commonwealth of Virginia, Department of Environmental Quality, pursuant to the Clean Water Act (CWA). The VDEQ has stated the requirement to obtain a 401 water quality certification for the project, but does not issue conditional certifications in response to NEPA documents. The VDEQ stated, "Provided the required Joint Permit Application (JPA) is submitted, Virginia Water Protection Permit (VWPP) is obtained, and all conditions of the authorization are adhered to, this project will be in compliance with its Water Quality Certification." The appropriate permits will be obtained during the PED phase of the project.

In addition, the CWA Section 404(b)(1) guidelines analysis is provided in Environmental Appendix, Appendix C.

9.3 Wetlands

Section 404 of the CWA and 33 C.F.R. 336(c)(4) and 33 C.F.R. 320.4(b) require the USACE to avoid, minimize, and mitigate impacts to wetlands. Moderate temporary and permanent jurisdictional wetlands impacts are anticipated with implementation of this project. The 404(b)(1) Guidelines indicate that only the least environmentally damaging practicable alternative should be implemented.

As of this writing, real estate right of entry access agreements have not been received for all of the parcels in the ROI. In June 2018, USACE Planning and Regulatory staff visited the areas that were publically accessible or where right of entry was granted were examined. The ROI was partially delineated by USACE, for the presence of jurisdictional waters and wetlands using the three criteria espoused by the USACE – hydric soils, vegetation, and hydrology. For those areas that were inaccessible, USGS, NWI, aerial mapping was closely examined to obtain an estimate. We developed a map of the combination of the partial delineation and the NWI mapping data. Estimated wetland impacts are as follows:

Alternative 4, Eastern Alignment Fixed Bridge

Total Forested Wetland Impacts	Permanent Spanned Temporary	0.66 1.74 4.91	NWI Geospatial & Field
Total Scrub-Shrub Wetland Impacts	Permanent Spanned Temporary	0.28 0.08 0.55	NWI Geospatial
Total Emergent wetland Impacts	N/A	0	NWI Geospatial & Field

Alternative 6, Western Alignment Fixed Bridge

Total Forested Wetland Impacts	Permanent Spanned Temporary	0.9 1.57 5.19	NWI Geospatial & Field
Total Scrub-Shrub Wetland Impacts	Permanent Spanned Temporary	0.1 0 0.12	NWI Geospatial
Total Emergent wetland Impacts	Permanent Spanned Temporary	0 0.84 1.17	Field

For either alternative, avoidance and minimization of wetlands impacts and compensatory wetland mitigation for any unavoidable wetland impacts will be required. In particular, minimization of temporary construction impacts through use of top-down bridge construction and/or use of temporary bridge construction trestle structures as opposed to temporary fill will be imperative to avoid irreversible construction impacts to wetlands, mudwaves, compaction, impacts to construction equipment, wetland permit violations, and additional required mitigation for difficult-to-mitigate impacts. It will also be necessary to meet the requirements of the 404(b)(1) Guidelines and the Executive Order 11990, Protection of Wetlands. Geotechnical borings to ensure the proper construction and minimization efforts will be critical, particularly in the organic-soil bottomland wetland areas.

The final wetland delineation will be completed in the PED phase of the project, once real estate access is secured and the project design is more finalized. Final impact amounts will be determined upon more complete design of the project. A functional assessment using the Uniform Mitigation Assessment Methodology (UMAM) has been completed. A conceptual compensatory wetland mitigation plan has been developed for this project and will be coordinated with regulatory agencies for approval. Based on the results of the UMAM analysis, we estimated approximately 6.93 wetland mitigation credits would need to be purchased for to compensate for wetland functional loss from implementation of Alternative 4, and approximately 8.22 wetland mitigation credits would need to be purchased to compensate for wetland functional loss with implementation of Alternative 6. The mitigation plan is provided in the Environmental Appendix, Appendix C. The plan will be finalized as wetland impacts are determined in greater detail. However, it is noted that compensatory wetland mitigation will also be required to be done in compliance with the requirements under State laws, regulations, and requirements. With avoidance and minimization of temporary and permanent wetland impacts as described above, and with the compensatory mitigation plan, including the restoration of

temporary wetlands restored to their pre-existing contours and sprigged with native species, the wetland impacts will be mitigated to prevent a significant impact.

9.4 Air Commerce Act, 49 U.S.C. 106

This law gives the Federal Aviation Administration (FAA) the authority to regulate structures that encroach into airspace near airports and airfields. The U.S. Navy has reviewed the conceptual fixed bridge vertical elevation design and indicated that it will not interfere with the U.S. Navy's operations at NALF Fentress. However, due to the project's proximity to the facility, a completed FAA Form 7460-1, Notice of Proposed Construction or Alteration is required to be submitted for an FAA obstruction evaluation prior to construction, so that vertical elevations of construction equipment may be considered and documented with respect to airspace.

In addition, the project designs will be done in consideration (or in accordance with) of the Unified Facilities Criteria Airfield and Heliport Planning Design (UFC) 3-260-01.

9.5 Rivers and Harbors Act, 33 U.S.C. 401 et al.

This law and its implementing regulations prohibit the construction of any bridge, dam, dike, or causeway crossing over or in navigable waters of the U.S. without Congressional approval. The U.S. Coast Guard (USCG) administers Section 9 and issues permits for construction of crossings over navigable waters. This law and its implementing regulations also allows the USCG to require necessary lighting and aids to navigation, and to approve any temporary or permanent closures or restrictions of navigation channels.

The bridge and fender system constitute crossings by definition, therefore, a permit must be obtained from the USCG once the structures are designed. The USACE will go through the permit process and obtain approval prior to construction.

9.6 Federal Coastal Zone Management Act, 16 U.S.C. 1451 et seq.

The Federal Coastal Zone Management Act (CZMA) requires each federal agency activity performed within or outside the coastal zone (including development projects) that affects land or water use, or natural resources of the coastal zone to be carried out in a manner which is consistent to the maximum extent practicable, i.e. fully consistent, with the enforceable policies of approved state management programs unless full consistency is prohibited by existing law applicable to the federal agency.

To implement the CZMA and to establish procedures for compliance with its federal consistency provisions, the U.S. Department of Commerce, National Oceanic and Atmospheric Administration (NOAA), promulgated regulations which are contained in 15 C.F.R. Part 930. As per 15 CFR 930.37, a federal agency may use its NEPA documents as a vehicle for its consistency determination.

The Virginia Coastal Management Program was established under the guidelines of the national Coastal Zone Management Act (1972) as a state-federal partnership to comprehensively manage coastal resources. The VDEQ is the designated state coastal management agency and is responsible for the implementation of the state's Coastal Management Program. Implementation includes the direct regulation of impacts to coastal resources within the critical areas of the state including coastal waters, tidelands, beaches and beach dune systems; and

indirect certification authority over federal actions and state permit decisions within the eight coastal counties.

The goals of the Virginia Coastal Management Program are attained by enforcement of the policies of the State as codified within the Virginia Code of Regulations. "Policy" or "policies" of the Virginia Coastal Management Program means the enforceable provisions of present or future applicable statutes of the Commonwealth of Virginia. The statutes cited as policies of the Program were selected because they reflect the overall program goals of developing and implementing a balanced program for the protection of the natural resources, as well as promoting sustainable economic development of the coastal area. In accordance with the CZMA, it has been determined that the proposed North Landing Bridge would be carried out in a manner that is fully consistent with the enforceable policies of the Virginia CMP (The Federal Consistency Determination with the CZMA is provided in the Environmental Appendix, Appendix C.

9.7 Clean Air Act, as Amended, 42 U.S.C. 7401 et seq.

Although traffic volumes and emissions are expected to increase during the period of analysis, the project itself will not induce greater traffic congestion. Its capacity will remain the same. Traffic emissions will be minimized by the reduction in idling because roadway and navigational traffic will no longer have to stop for bridge openings/closures. Permanent minor increases in air emissions are expected due to rising volumes of traffic over time. There will be negligible, temporary increases in air emissions from operation of construction equipment during construction and maintenance operations. These emissions will be below *de minimis* levels. The Hampton Roads Intrastate Air Quality Control Region is in attainment with all National Ambient Air Quality Standards. Therefore, no conformity analysis is required for this project.

9.8 U.S. Fish and Wildlife Coordination Act, 16 U.S.C.661-666(C)

Coordination with the U.S. Fish and Wildlife Service (USFWS) and the National Oceanic and Atmospheric Administration (NOAA) was completed. A Fish and Wildlife Coordination Act Report was prepared by the USFWS, and is included in the Environmental Appendix, Appendix C.

9.9 Endangered Species Act

Table 9-4 lists the federally listed species known in the Action Area or have the potential to occur in the Action Area.

Table 9-4. Federally listed species known or with the potential to occur in the Action Area.

Taxonomic Category/Common Name	Scientific Name	Status	Critical Habitat	Affect Determination
Fish				

Atlantic sturgeon	*Acipenser oxyrinchus oxyrinchus*	T, E	Y*	No Effect
Shortnose sturgeon	*Acipenser brevirostrum*	E	N	No Effect
Mammals				
Northern long-eared bat	*Myotis septentrionalis*	T	N	May Affect, Likely to Adversely Affect

DPS = Distinct Population Segment; T = Threatened; E = Endangered; Y = Yes; N = No; ^Species status is reported as it pertains to the DPS/Action; *Critical Habitat not located in Action Area.

The two sturgeon species are within the jurisdiction of the NMFS, and the northern long-eared bat is within the jurisdiction of the USFWS. A Biological Assessment (BA) evaluating the potential impacts of the proposed action on endangered and threatened species were prepared and coordinated with each of these agencies. USACE will rely on the 4(d) rule for the Programmatic Biological Opinion (PBO) for the northern long-eared bat. There is no critical habitat in the Action Area. The BA's and coordination correspondence are provided in the Environmental Appendix, Appendix C.

9.10 Magnuson-Stevens Fishery Conservation and Management Act (MSA), 16 U.S.C. 1801 et seq.

This Act requires federal action agencies to consult with the National Marine Fisheries Service (NMFS) if a proposed action may affect EFH. There is no EFH in the ROI. No further coordination with the NMFS is required.

9.11 Anadromous Fish Conservation Act, 16 U.S.C. 757, et seq.

The Action Area does not contain EFH, and is not likely to affect anadromous fish. Coordination was conducted with NMFS, and there will be no effect on the Atlantic sturgeon and shortnose sturgeon, as indicated under Endangered Species Act.

9.12 Marine Mammal Project Act, 16 U.S.C. 1631, et seq.

The Marine Mammal Protection Act (MMPA) prohibits the take of marine mammals. No adverse effects to marine mammals are anticipated.

9.13 Section 106 and 110(F) of the National Historic Preservation Act, 16 U.S.C. 470 *et seq.*

The National Historic Preservation Act (NHPA) applies to properties listed in or eligible for listing in the National Register of Historic Places (NRHP); these are referred to as "historic properties." Historic properties eligible for listing in the NRHP include prehistoric and historic sites, structures, buildings, objects, and collections of these in districts. Section 106 of the NHPA and

its implementing regulations at 36 CFR Part 800, require the lead federal agency to assess the potential effects of an undertaking on historic properties that are within the proposed project's Area of Potential Effect (APE), which is defined as "the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist" (36 C.F.R. § 800.16[d]).

The USACE evaluated the potential for adverse impacts to archaeological or historic resources. The Albemarle and Chesapeake Canal Historic District and historical architecture may be adversely affected by this project. Archaeological sites may also exist within unsurveyed parts of the APE. As per a Programmatic Agreement (PA) with the Virginia State Historic Preservation Office, surveys and further coordination will be conducted for these areas during the PED Phase of the Project. The procedures for any mitigation if adverse effects to NRHP eligible properties are identified are also described in the PA.

9.14 Resource Conservation and Recovery Act, as amended, 42 U.S.C. 6901 et seq.

The Resource Conservation and Recovery Act (RCRA) RCRA controls the management and disposal of hazardous waste. "Hazardous and/or toxic wastes", classified by the Resource Conservation and Recovery Act (RCRA), are materials that may pose a potential hazard to human health or the environment due to quantity, concentration, chemical characteristics, or physical characteristics. This applies to discarded or spent materials that are listed in 40 CFR 261.31-.34 and/or that exhibit one of the following characteristics: ignitable, corrosive, reactive, or toxic. Radioactive wastes are materials contaminated with radioactive isotopes from anthropogenic sources (e.g., generated by fission reactions) or naturally occurring radioactive materials (e.g., radon gas, uranium ore).

For this report, we searched the Virginia Department of Environmental Quality (VDEQ) Waste Division records and Environmental Protection Agency (EPA) records to determine the number of Superfund sites, Brownfield sites, hazardous waste handlers, underground storage tanks (USTs), and other regulated hazardous material locations. One operational fuel depot and fuel line, owned by NuStar, were documented within the ROI.

Adverse impacts involving hazardous materials and wastes from implementation of either Alternative 4 or 6 are largely predicted to be minor and temporary during construction. Relocation or incorporation of the Nustar fuel line may be necessary for Alternative 4. Temporary, minor direct adverse effects on the Nustar fuel line may occur during construction if the line is disturbed, because the fuel line may contain asbestos, residual fuel or sludge. If encountered, disposal of all hazardous materials would be handled in a lawful manner. Also of concern would be the partial removal and proper disposal of the existing asphalt roadbed, the existing bridge, and the existing bridge tender's building, which may contain fuels, asbestos, lead paint, and PCBs. A Phase 2 Environmental Assessment would need to be done to determine the contents of bridge, bridge tender station, and overhead power lines to be demolished. In addition, extra precautions must be taken during construction to avoid impacting the existing NuStar fuel line. An emergency spill plan would be in place during construction. Removal of the existing road bed may also be a risk for HRTW. If HRTW materials are found, they will be handled and disposed of in a lawful manner.

9.15 Comprehensive Environmental Response, Compensation and Liability Act, 42 U.S.C. 9601 et seq.

The Comprehensive Environmental Response, Compensation and Liability Act (CERCLA or Superfund) governs the liability, compensation, cleanup, and emergency response for hazardous substances released into the environment and the cleanup of inactive hazardous substance disposal sites. There are no CERCLA sites within the ROI or affecting the ROI.

9.16 Executive Order 11988, Floodplain Management

Federal agencies should avoid, to the extent possible, the long-and short-term adverse impacts associated with the occupancy and modification of the Base Floodplain (1% annual chance floodplain as defined by FEMA), and the avoidance of direct and indirect support of development in the Base Floodplain wherever there is a practicable alternative. Under the EO, USACE is required to provide leadership and take action to: a. Avoid development in the Base Floodplain unless it is the only practicable alternative; b. Reduce the hazard and risk associated with floods; c. Minimize the impact of floods on human safety, health and welfare; and d. Restore and preserve the natural and beneficial values of the Base Floodplain. For critical facilities, the 0.2% annual chance floodplain should be evaluated.

From USACE ER 1165-2-26, in accordance with EO 11988, USACE uses the eight step process below to address floodplain management, with project-specific responses:

1. **Determine if the proposed action is in the Base Floodplain.** Due to the location and type of proposed project, bridge replacement over a body of water, all alternatives are located in the Base Floodplain.

2. **If the action is in the Base Floodplain, identify and evaluate practicable alternatives to the action or to location of the action in the Base Floodplain.** Considering bridge replacement over a body of water, all alternatives would be located in the Base Floodplain. Chapter 5 discusses the process of considering, screening, and comparing alternatives.

3. **If the action must be in the floodplain, advise the general public in the affected area and obtain their views and comments.** As shown in Chapter 1, as part of NEPA, a public scoping meeting was held on January 16, 2018 in Chesapeake. Twenty-three people attended and eight written comments were submitted during and after the meeting. None of the comments had specific concerns for flooding or the Base Floodplain. The Environmental Correspondence section of the Environmental Appendix, Appendix C has sign-in and comment sheets.

4. **Identify beneficial and adverse impacts due to the action and any expected losses of natural and beneficial floodplain values. Where actions proposed to be located outside the Base Floodplain will affect the Base Floodplain, impacts resulting from these actions should also be identified.** Table 7-3 provides a summary of beneficial and adverse impacts for the alternatives; the environmental analysis resulted in a Finding of No Significant Impact. In general, expected or possible losses or impacts to the natural and

beneficial floodplain values include wetlands, tree-clearing, construction conflicts with existing fuel line, roosting areas of the Northern long-eared bat, and erosion and sediment control. Mitigation measures and/or Best Management Practices will be used to minimize impacts. Aside from the No Action alternative, portions of the other alternatives, bridge structure and new pavement on the Virginia Beach side, will be located outside the Base Floodplain; however, no significant impacts are expected to affect the Base Floodplain; any impacts would be negligible and temporary.

5. **If the action is likely to induce development in the Base Floodplain, determine if a practicable non-floodplain alternative for the development exists.** The purpose of the project is to replace a structurally deficient and obsolete bridge. As noted in the report, based on the comprehensive plans and ordinances of both cities, land use is expected to remain largely as it is today. As is with existing bridge, the proposed project will also have two lanes. The project is not expected to induce development.

6. **As part of the planning process under the Principles and Guidelines, determine viable methods to minimize any adverse impacts of the action including any likely induced development for which there is no practicable alternative and methods to restore and preserve the natural and beneficial floodplain values. This should include reevaluation of the "no action" alternative.** As stated above, none of the alternatives are expected to induce development. Mitigation measures and/or Best Management Practices will be used to minimize identified adverse impacts and restore and preserve the natural and beneficial floodplain values.

7. **If the final determination is made that no practicable alternative exists to locating the action in the Base Floodplain, advise the general public in the affected area of the findings.** As part of NEPA, a public meeting was held on April 10, 2019 in Virginia Beach to communicate environmental effects of the proposed actions. Thirty-three people attended and nine written comments were submitted. None of the comments had specific concerns for flooding or the Base Floodplain. The Environmental Correspondence section of the Environmental Appendix, Appendix C has sign-in and comment sheets. In addition, there was a 30-day public review commenting period of the Draft North Landing Bridge Replacement Feasibility Study/Environmental Assessment report.

8. **Recommend the plan most responsive to the planning objectives established by the study and consistent with the requirements of the Executive Order.** The Recommended Plan is the most responsive to the planning objectives and consistent with the EO. The Recommended Plan would have negligible impacts to the Base Floodplain and is fully compliant with EO 11988.

9.17 Executive Order 11990, Protection of Wetlands

This EO directs all federal agencies to minimize the destruction, loss, or degradation of wetlands; and preserve and enhance the natural beneficial values of wetlands in the conduct of

the agency's responsibilities. Moderate temporary and permanent jurisdictional wetlands impacts are anticipated with implementation of this project. See Section 9.3 for a detailed summary.

9.18 Executive Order 13112, Invasive Species

The ROI currently contains invasive species (*Phragmites australis*). It will be removed as appropriate and handled according to this EO. Every effort will be made to avoid the spread of invasive species. All state permit conditions relating to invasive species will be followed. All replanted wetland areas will be restored and planted with native species. They will be monitored in accordance with the monitoring requirements found in the Wetland Mitigation Plan in the Environmental Appendix, Appendix C. If found in replanted wetland areas, invasive species will be treated with herbicide and eradicated.

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

In accordance with this EO, the USACE has determined that no group of people would bear a disproportionately high share of adverse environmental consequences resulting from the proposed work.

9.20 Executive Order 13045, Protection of Children from Environmental Health Risks and Safety Risks

This EO ensures that all federal actions address the unique vulnerabilities of children. In accordance with this EO, the USACE has determined that no children would bear a disproportionately high share of adverse environmental consequences resulting from the proposed work.

9.21 Migratory Bird Treaty Act, 16 U.S.C. 703 et seq.; Executive Order 13186, Federal Responsibility to Protect Migratory Birds

This Act makes it illegal for anyone to take, possess, import, export, transport, sell, purchase, barter, or offer for sale, purchase, or barter, any migratory bird, or the parts, nests, or eggs of such a bird except under the terms of a valid permit issued pursuant to federal regulations. Temporary to permanent adverse impacts to migratory birds would be negligible.

10 List of Preparers

The project delivery team for the study comprised team members from the USACE Norfolk District. The team members listed in Table 10-1 provided substantial text to the Feasibility Report.

Table 10-1. List of Preparers

Name	Contribution/Education	Affiliation	Years of Experience
Kathy Perdue	NEPA Team Lead/B.S. Environmental Science	USACE	27
Jennifer Shunfenthal	Plan Formulation/MS Environmental Management	USACE	5
Alicia Logalbo	NEPA/M.S. Biology	USACE	19
Daniel Hughes, Ph.D.	Project Planning / Ph.D. Applied Anthropology	USACE	27
John Haynes	Cultural Resources / MA, Anthropology	USACE	35
Paul Moye, P.E.	Floodplain Management / BS Civil Engineer	USACE	32
Carissa Agnese	NEPA/B.S. in Environmental Studies	USACE	25
Autumn Vaughn	NEPA/MS Biology	USACE	9
Kevin Kane	Realty Specialist / BA Ecological Studies	USACE	21
Robertas Simonavicius	Economics / MS Finance	USACE	3
Laura Frank	Economics	USACE	10
Sherry Jean	Cost Engineering	USACE	
Tammy Knecht	GIS Mapping	USACE	
Drew Johnson	Design Manager / BS in Civil Engineering Technology	USACE	12

10.1 Agencies, Tribal Governments and Persons Consulted

Table 10-2 lists the Agencies consulted during this project.

Table 10-2: Agencies Consulted

Agency/Government	Name of Contact People
Advisory Council on Historic Preservation	Christopher Daniel
U.S. Army Corps of Engineers	David Knepper, Scharlene Floyd, David Lekson, Andrea Hughes, Steve Currie, (Regulatory), Rosemarie Bradley, Terri Jordan-Sellers (Planning), Nathan Richards (ECO-PCX)
U.S. Coast Guard	LTC Barbara Wilk, LTC Pete Francisco
U.S. Department of the Navy	John Lauterback, LDCR Roel Orozco, James McDowell, Troy Griffin, Ray Firenze
U.S. Environmental Protection Agency (USEPA)	Barbara Okorn, Barbara Rudnick, Carrie Traver
U.S. Fish and Wildlife Service (USFWS)	Troy Andersen, Sumalee Hoskin, Chris Guy, Dr. Fred Pinkney
National Marine Fisheries Service (NMFS)	David O'Brien, Chris Vaccaro, Brian Hopper
Natural Resources Conservation Service (NRCS)	Greg Hammer
Institute for Water Resources (IWR)	Steve Martin
Virginia Department of Conservation and Recreation (VDCR)	Renee Hypes, Tyler Meader, Lynn Crump
Virginia Department of Environmental Quality (VDEQ)	Bettina Rayfield, Valerie Fulcher, Arlene Warren
Virginia Department of Historic Resources (VDHR)	Greg LaBudde, Samantha Henderson
Virginia Department of Transportation (VDOT)	Melissa Wolford, Naquana Jenkins, James Ponticello
Virginia Marine Resources Commission (VMRC)	Rachael Peabody

Agency/Government	Name of Contact People
City of Chesapeake	Sam Sawan, Troy Eisenberger
City of Virginia Beach	David Jarman, Corinna Green
City of Chesapeake, Historic Preservation Commission	co/City of Chesapeake Planning Department
City of Virginia Beach, Historic Preservation Commission	Mark A. Reed
Delaware Nation	Kimberly Penrod
Nansemond Indian Tribe	Lee Lockamy
Pamunkey Indian Tribe	Chief Robert Gray
Catawba Indian Nation	Dr. Wenonah Hare
The Nature Conservancy	Karen Johnson, Brian van Eerden, Kathryn Rubis
Great Bridge Battlefield & Waterways History Foundation	(organization mailing address, to Whom It May Concern)

11 Recommendations and Conclusions

11.1 Conclusions

The highway traffic problems created by the functionally obsolete AIWW Bridge at North Landing Bridge in the City of Chesapeake, VA and the City of Virginia Beach, VA have been reviewed and evaluated with regard to the overall public interest and with consideration to engineering, economic, environmental, social, and cultural concerns. The conclusions drawn by this study are as follows:

a) Significant traffic problems exist on and adjacent to the USACE owned AIWW Bridge at North Landing Bridge and impact the efficient and safe movement of highway traffic on Mount Pleasant Road.
b) Federal and state evaluation procedures indicate the bridge is unserviceable, functionally obsolete, and insufficient for public use. Functional obsolescence is due to roadway width, design capacity, equipment age, and inability to accommodate existing traffic volumes. The rating assigned to the existing bridge recommends that it be replaced.
c) At North Landing Bridge, the existing structure is a hindrance and often a hazard to traffic safety. Based on Federal and state guidelines, North Landing Bridge is insufficient to remain in service and qualifies for replacement.
d) The Recommended Plan, consisting of a two-lane, fixed, high rise bridge along the east alignment to the existing bridge and approach roadways evaluated under Section 216 of the 1970 Flood Control Act, as amended is an acceptable means of addressing the bridge and highway approach problems.
e) The Recommended Plan is economically, engineering, environmentally, culturally, and socially feasible. The Recommended Plan is the NED plan.
f) The City of Chesapeake, the local cost-sharing sponsor, has indicated a willingness to assume ownership and OMRR&R responsibility upon completion of the project.

11.2 Recommendations

I have considered all significant aspects in the overall public interest, which included environmental, social, and economic effects, as well as engineering feasibility. In view of these considerations and the conclusions presented above, I recommend that the existing USACE highway bridge at North Landing Bridge in Chesapeake and Virginia Beach, VA, be replaced in accordance with the Recommended Plan (the NED plan), with such modifications as is the discretion of the Commander, HQUSACE, may be advisable, at a total estimated first cost to the United States of $98,494,000. The Recommended Plan is subject to the non-Federal sponsor's agreeing to comply with all applicable Federal laws and policies and other requirements including but not limited to:

a) Accept full ownership of the recommended Atlantic Intracoastal Waterway replacement bridge, with ownership rights subordinate to the Federal Government's right to operate, maintain, repair, and rehabilitate the Albemarle and Chesapeake Canal (ACC) portion of the AIWW.

b) Assume responsibility for the operation, maintenance, repair, replacement, and rehabilitation (OMRR&R), currently estimated at $185,000 annually, of the project or completed functional portions of the project, including mitigation features without cost to the Government, in a manner compatible with the project's authorized purpose, and in accordance with applicable Federal and state laws and specific directions prescribed by the Government in the OMRR&R manual and any subsequent amendments thereto.

c) Give the Government a right to enter, at reasonable times and in a reasonable manner, upon land that the local sponsor owns or controls for access to the project for the purpose of inspection, and, if necessary, for the purpose of completing, operating, maintaining, repairing, replacing, or rehabilitating the project.

d) Pay all Government costs to accomplish any project betterments or other features requested by the Sponsor that cost in excess of the Government-recommended plan.

e) Comply with Section 221 of Public Law 91-611, Flood Control Act of 1970, as amended, and Section 103 of the Water Resources Development Act of 1986, Public Law 99-662, as amended, which provides that the Secretary of the Army shall not commence the construction of any water resources project or separable element thereof, until the non-Federal sponsor has entered into a written agreement to furnish its required cooperation for the project or separable element.

f) Hold and save the Government free from all damages arising for the construction as well as OMRR&R of the project and any project-related betterments, except for damages due to the fault or negligence of the Government or the Government's contractors.

g) Give the Federal government a right to enter, at reasonable times and in a reasonable manner, upon property that the Non-Federal sponsor owns or controls for access to the project for the purpose of completing, inspecting, operating and maintaining the GNFs;

h) Keep and maintain books, records, documents, and other evidence pertaining to costs and expenses incurred pursuant to the project to the extent and in such detail as will properly reflect total project costs.

i) Perform, or cause to be performed, any investigations for hazardous substances that are determined necessary to identify the existence and extent of any hazardous substances regulated under the Resource Conservation and Recovery Act (RCRA) 42 USC 6901**,** that may exist in, on, or under lands, easements or rights-of-way necessary for the construction, operation, and maintenance of the project; except that the non-Federal sponsor shall not perform such investigations on lands, easements, or rights-of-way that the Government determines to be subject to the navigation servitude without prior specific written direction by the Government.

j) Assume complete financial responsibility for all necessary cleanup and response costs of any CERCLA and/or RCRA regulated materials located in, on, or under lands, easements, or rights-of-way that the Government determines necessary for the construction as well as OMRR&R of the project.

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

l) Prescribe and enforce regulations to prevent obstruction of or encroachment on the Project that would reduce the level of protection it affords or that would hinder OMRR&R of the Project.

m) Comply with the applicable provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, Public law 91-646, as amended by Title IV of the Surface Transportation and Uniform Relocation Assistance Act of 1987 (Public Law 100-17), and the Uniform Regulations contained in 49 CFR part 24, in acquiring lands, easements, and rights-of-way, and performing relocations for construction and OMRR&R of the project, and inform all affected persons of applicable benefits, policies, and procedures in connection with said act.

n) Comply with all applicable Federal and State laws and regulations, including, but not limited to, Section 601 of the Civil Rights Act of 1964, Public Law 88-352, and Department of Defense Directive 5500.11 issued pursuant thereto, as well as Army Regulation 600-7, entitled “Nondiscrimination on the Basis of Handicap in Programs and Activities Assisted or Conducted by the Department of the Army,” and Section 402 of the Water Resources Development Act of 1986, as amended (33 U.S.C. 701b-12) , requiring non-Federal preparation and implementation of flood plain management plans.

o) Do not use Federal funds to meet the non-Federal sponsor’s share of total project costs unless the Federal granting agency verifies in writing that the expenditure of such funds is authorized by statute.

Federal participation in the recommended project is endorsed provided that, prior to construction, the non-Federal sponsor will execute the final Project Cooperation Agreement with the Federal Government.

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.

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Date Patrick V. Kinsman, PE

Colonel, Corps of Engineers
District Commander

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