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ENVIRONMENTAL ASSESSMENT

for Seawall Repair and Restoration at Naval Support Activity Annapolis Annapolis, Maryland

August 2019

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Abstract

Designation: Environmental Assessment

Title of Proposed Action: Seawall Repair and Restoration

Project Location: Naval Support Activity Annapolis, Maryland

Lead Agency for the EA: Department of the Navy

Affected Region: Annapolis, Maryland

Action Proponent: Naval Support Activity Annapolis

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Date: August 2019

Naval Support Activity Annapolis, a command of the U.S. Navy, has prepared this Environmental Assessment (EA) in accordance with the National Environmental Policy Act (NEPA), as implemented by the Council on Environmental Quality Regulations and Navy regulations for implementing NEPA. The Proposed Action would repair and restore approximately 19,334 linear feet of seawalls and shoreline at NSA Annapolis, Maryland. The seawall and shoreline repair and restoration would occur on the shoreline of the Lower Yard along the Severn River, College Creek, Spa Creek, and Santee Basin; portions of the Upper Yard along the Severn River and College Creek; and portions of the North Severn area along the Severn River and Yard Patrol Basin. The repairs and restoration would address existing structural deficiencies and potential impacts from future extreme weather events, storm surge, sea level rise, and land subsidence. This EA evaluates a range of techniques to repair and redesign designated reaches, including hardened structures, log toe stabilization, and living shoreline. It also evaluates the potential environmental impacts associated with three action alternatives and the No Action Alternative on the following resource areas: air quality, water resources, geological resources, cultural resources, biological resources, visual resources, noise, transportation, and hazardous materials and wastes.

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Executive Summary

ES.1 Proposed Action

Naval Support Activity (NSA) Annapolis, a command of the U.S. Navy (hereinafter, referred to as the Navy), proposes to repair and restore seawall and shoreline along the installation perimeter to include portions of the Upper Yard and Lower Yard along the Severn River, College Creek, Spa Creek, and Santee Basin; and portions of North Severn along the Severn River and Yard Patrol Basin. The repairs and restoration would address structural deficiencies on the existing seawall and potential impacts from future extreme weather events, storm surge, sea level rise, and land subsidence. Repairs and restoration would occur along approximately 19,334 linear feet of shoreline that is divided into 15 "reaches."

Specific restoration and enhancement techniques could include hardened structures, log toe stabilization, and living shoreline, where appropriate. Hardened structures include bulkhead, sheet pile seawall, riprap, or a combination of these techniques. To date, Reach 9 (along the Lower Yard) and a portion of the North Severn seawall have undergone preliminary design. Construction along Reach 9 may be completed in phases, dependent on funding allocations, would likely begin within the next few years, and could last approximately three and a half years. Subsequent reaches would be prioritized for repair—as funding becomes available—based on condition, elevation, and mission criticality. It is assumed that construction would occur over 10 to 20 years for all 15 reaches.

ES.2 Purpose of and Need for the Proposed Action

The purpose of the Proposed Action is to repair and restore portions of the NSA Annapolis seawalls and shoreline that have been damaged or made vulnerable by degradation over time. The Proposed Action is primarily needed to address existing structural deficiencies along the NSA Annapolis seawalls and shoreline to maintain the safety and function of mission-critical areas behind the shorelines and seawalls. A secondary need for the Proposed Action is to address the potential impacts due to future extreme weather events, storm surge, sea level rise, and land subsidence. Of the 15 reaches included in this project area, three have been assessed as serious and three as poor, meaning all six of these reaches (totaling 9,174 linear feet, or 47 percent of the total shoreline) included in this Environmental Assessment (EA) are exhibiting advanced deterioration and overstressing, with localized or widespread failures possible. The remaining nine reaches have been assessed as good, satisfactory, or fair.

NSA Annapolis is adjacent to the Chesapeake Bay. Elevations range from sea level to 80 feet above mean sea level, which makes the installation vulnerable to localized flooding and storm surge. Flooding events have increased over the past 20 years; in 2018, a record number of 41 flood events occurred at NSA Annapolis. Hurricane Isabel in 2003 caused an immense amount of water and storm damage at the U.S. Naval Academy. Climate change could exacerbate current conditions and increase inundation over time, which could lead to loss of land or damage mission-critical facilities, preventing NSA Annapolis and the U.S. Naval Academy from accomplishing their missions.

ES.3 Alternatives Considered

Alternatives were developed for analysis based on the following reasonable screening factors:

- Seawalls must be built to heights that are feasible and structurally sound.
- Repair and restoration of existing functional structures must provide for compatible use.
- Width of waterway, depth of waterway, bottom material, fetch, shoreline orientation, and existing structures must be considered when determining the type of repair and restoration

structure. Fetch is defined as an area of the ocean over which the wind blows in an essentially constant direction, thus generating waves.

- Structures cannot be constructed within navigation channels or interfere with existing navigation.
- Seawall height and the type of structure must take into account varying tide levels, storms, and wave conditions.

The Navy is considering three action alternatives and the No Action Alternative:

- **Alternative 1:** Hardened structures would be used to accommodate for the 10-year storm and 75-year sea level rise prediction along the Upper Yard (Reaches 1, 2, and 3), and the 50-year storm and 75-year sea level rise prediction along the Lower Yard (Reaches 4 through 12) and North Severn (Reaches 13, 14, and 15). Each of the repairs to and restoration of the seawalls may include extending base support further into the water and allowing for phased elevation increase of the hardened structure over time, up to a maximum height for specific reaches as warranted to address sea level rise over the life expectancy of the structures. Construction would likely occur in phases, with an initial height being increased in the future as necessary due to future sea level rise and storm surge.
- **Alternative 2:** Hardened structures would be used to accommodate for the 10-year storm and 50-year sea level rise prediction along the Upper Yard (Reaches 1 and 2), and the 50-year storm and 50-year sea level rise prediction along the Lower Yard (Reaches 4 through 12) and North Severn (Reaches 13, 14, and 15). Reach 3 would use log toe stabilization built to its existing height with the option to modify the design or height to accommodate for sea level rise if needed in the future.
- **Alternative 3:** Hardened structures would be used along Reaches 1, 2, and 4 through 15 to existing heights, which does not accommodate for future sea level rise. Reach 3 would use living shoreline techniques that could be modified to accommodate for sea level rise if needed in the future.
- **No Action Alternative:** No seawall repair or restoration would be undertaken. Sections of the existing seawall and shoreline would continue to deteriorate over time and could eventually fail.

ES.4 Summary of Environmental Resources Evaluated in the Environmental Assessment

Council on Environmental Quality regulations, the National Environmental Policy Act, and Navy instructions for implementing the National Environmental Policy Act, specify that an EA should address resource areas that are potentially subject to impacts. In addition, the level of analysis should be commensurate with the anticipated level of environmental impact.

The Proposed Action involves in-water demolition or removal of existing hardened structures and construction of new hardened structures along shorelines, which has the potential to affect coastal resources and sensitive aquatic environments, including essential fish habitat. A Coastal Consistency Determination will be prepared and included in Appendix A. The U.S. Naval Academy is a National Historic Landmark and listed on the National Register of Historic Places. Anne Arundel County is in nonattainment for ozone and sulfur dioxide; a conformity applicability analysis and Record of Non-Applicability (RONA) are included in Appendix B.

This EA addresses the following resource areas: air quality, water resources, geological resources, cultural resources, biological resources, visual resources, noise, transportation, and hazardous materials and wastes. It does not address resources for which potential impacts were considered negligible or nonexistent; these include land use, airspace, infrastructure, public health and safety, socioeconomics, and environmental justice.

ES.5 Summary of Potential Environmental Consequences of the Action Alternatives

Table ES-1 summarizes the potential impacts on the resources associated with the No Action Alternative and the action alternatives analyzed in this EA.

ES.6 Public Involvement

The Navy will coordinate and consult with agencies including the U.S. Army Corps of Engineers pursuant to the Clean Water Act and Section 10 of the Rivers and Harbors Act; National Oceanic and Atmospheric Administration (NOAA) Fisheries pursuant to the Magnuson-Stevens Fishery Conservation and Management Act; Maryland Department of the Environment (MDE) pursuant to the Coastal Zone Management Act, Maryland Water Quality Certification, and Joint Permit Application for Wetlands and Waterways; and Maryland State Historic Preservation Office pursuant to Section 106 of the National Historic Preservation Act. The Navy will also coordinate or consult with additional agencies, including the U.S. Fish and Wildlife Service, Maryland Department of Natural Resources, and Maryland Department of Planning (Maryland State Clearinghouse) regarding the Proposed Action.

The Navy will publish a Notice of Availability of the Draft EA and hold a public meeting to describe the environmental impacts of the Proposed Action and alternatives and to receive comments.

Table ES-1 Summary of Potential Impacts on Resource Areas

Resource Area	***No Action Alternative***	***Alternative 1***	***Alternative 2***	***Alternative 3***
Air Quality	Continuation of ozone and sulfur dioxide nonattainment in the short- to mid-term. Minor increases in air emissions from regional growth possible. No significant impact.	Short-term, minor air emissions from construction equipment, waste removal, and material delivery. No significant impact.	Similar to Alternative 1, but lower emissions due to fewer estimated materials. No significant impact.	Similar to Alternatives 1 and 2, but lower emissions due to fewer estimated materials. No significant impact.
Water Resources	Short- and long-term, minor, adverse impacts due to sedimentation from failing seawalls and increased flooding events. No significant impact.	Direct and indirect, short-term, minor, adverse impacts from construction. Indirect, long-term, minor-to-moderate, beneficial effects from reduced shoreline erosion and sedimentation. No significant impact.	Direct and indirect, short-term, minor, adverse impacts from construction. Indirect, long-term, minor, beneficial effects from reduced shoreline erosion and sedimentation. No significant impact.	Direct and indirect, short-term, minor, adverse impacts from construction. Indirect, long-term, negligible, beneficial effects from seawall repair and restoration with no height increases. No significant impact.
Geological Resources	Short-term, negligible, adverse impacts from soil loss; long-term, adverse impacts from bank erosion, land subsidence, and loss of property. No significant impact.	Short-term, minor, adverse impacts from construction; long-term, beneficial effects from a reduction in bank and soil erosion, and land subsidence. No significant impact.	Short-term, minor, adverse impacts from construction; long-term, beneficial effects but less than Alternative 1. No significant impact.	Short-term, minor, adverse impacts from construction; long-term, beneficial effects but less than Alternatives 1 and 2. No significant impact.
Cultural Resources	Long-term, minor adverse effects on deteriorating, contributing seawalls. Long-term, adverse effects on USNA from flood events, which can damage historic elements. No significant impacts.	Long-term, adverse effects on the seawalls of USNA from construction and demolition. Long-term, adverse effects on significant views associated with USNA. Long-term, beneficial effects on the USNA with increased protection from water damage. No significant impacts.	Long-term, adverse effects on the seawalls of USNA from construction and demolition. Long-term, adverse effects on significant views associated with USNA. Long-term, beneficial effects on the USNA with increased protection from water damage. No significant impacts.	Long-term, adverse effects on USNA from storm surge and flood damage events from the lack of proper protection. No significant impacts.

Resource Area	***No Action Alternative***	***Alternative 1***	***Alternative 2***	***Alternative 3***
Biological Resources	Adverse impacts from continued sea level rise, storm surge, land subsidence, and erosion. No significant impact.	Short-term, minor, adverse impacts from construction activity. Long-term benefits to biological resources from prevention of land subsidence and erosion. No significant impact.	Similar to Alternative 1, with added benefits from application of log toe stabilization. No significant impact.	Similar to Alternative 1, with added benefits from application of living shoreline. No significant impact.
Visual Resources	Long-term, negligible-to-minor, adverse impacts from seawall deterioration. No significant impact.	Short- and long-term, minor, adverse impacts from construction and increasing seawall height. No significant impact.	Similar to Alternative 1. No significant impact.	Direct, short-term, negligible, adverse impacts from construction. Direct, long-term, negligible-to-minor beneficial impacts from seawall repair. No significant impact.
Noise	No change in baseline conditions. No significant impact.	Short-term airborne and underwater minor adverse impacts. No long-term impacts. No significant impact.	Similar to Alternative 1. No significant impact.	Similar to Alternative 1. No significant impact.
Transportation	Long-term, adverse impacts on traffic regardless of implementation of the Proposed Action. Long-term, adverse impacts from continued sea level rise and storm surge. No significant impact.	Short-term, minor adverse effects from construction traffic. No long-term impacts. No significant impact.	Similar to Alternative 1. No significant impact.	Similar to Alternative 1. No significant impact.

Resource Area	***No Action Alternative***	***Alternative 1***	***Alternative 2***	***Alternative 3***
Hazardous Materials and Wastes	The Navy would continue to operate with existing management plans and policies that govern hazardous materials and wastes. No significant impact.	Short-term, minor impacts from small quantities of hazardous materials/wastes during construction. Treated wood, electrical equipment, lighting ballasts, and other debris from removed shoreline structures would need characterization to determine appropriate disposal. Increased seawall height could offer improved long-term protection and management of facilities that store hazardous materials/wastes. No significant impact.	Similar to Alternative 1. No significant impact.	Short-term impacts associated with construction would be similar to Alternatives 1 and 2. Long-term impacts would be similar to the No Action Alternative. No significant impact.

Key: USNA = U.S. Naval Academy.

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Seawall Repair and Restoration at
Naval Support Activity Annapolis
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Appendices

Abbreviations and Acronyms

Acronym	Definition
µPa	micropascal
AADT	average annual daily traffic
ACM	asbestos-containing material
APE	Area of Potential Effect
BMP	best management practice
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CO_2e	carbon dioxide equivalents
dB	decibel
dBA	A-weighted sound level
DERP	Defense Environmental Restoration Program
DoD	United States Department of Defense
DPS	Distinct Population Segment
EA	Environmental Assessment
EFH	Essential Fish Habitat
EO	Executive Order
FEMA	Federal Emergency Management Agency
GHG	greenhouse gas
HAP	hazardous air pollutant
IRP	Installation Restoration Program
LBP	lead-based paint

Acronym	Definition
Lmax	highest A-weighted sound level measured during a single event
LOS	level of service
MD	Maryland State Route
MDE	Maryland Department of the Environment
MDNR	Maryland Department of Natural Resources
MDOT	Maryland Department of Transportation
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NHL	National Historic Landmark
NHPA	National Historic Preservation Act
NIOSH	National Institute for Occupational Safety and Health
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NRHP	National Register of Historic Places
NSA	Naval Support Activity
PCB	polychlorinated biphenyl

Acronym	Definition
PM_{10}	particulate matter less than or equal to 10 microns in diameter
$PM_{2.5}$	particulate matter less than or equal to 2.5 microns in diameter
ppt	parts per thousand
PSD	Prevention of Significant Deterioration
RCRA	Resource Conservation and Recovery Act
RMS	root mean square
RONA	Record of Non-Applicability
SAV	submerged aquatic vegetation
SHPO	State Historic Preservation Officer
SIP	State Implementation Plan
SPCC	Spill Prevention, Control, and Countermeasure
TMDL	Total Maximum Daily Load
U.S.	United States
U.S.C.	United States Code
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USNA	U.S. Naval Academy

1 Purpose of and Need for the Proposed Action

1.1 Introduction

Naval Support Activity (NSA) Annapolis, a command of the U.S. Navy (hereinafter, referred to as the Navy), proposes to repair and restore seawall and shoreline along portions of the installation perimeter. This includes portions of the Upper Yard and Lower Yard along the Severn River, College Creek, Spa Creek, and Santee Basin, and portions of shoreline of North Severn along the Severn River and Yard Patrol Basin. North Severn is the part of the installation across the Severn River to the northeast. The repairs and restoration would address structural deficiencies on the existing seawall and potential impacts from future extreme weather events, storm surge, sea level rise, and land subsidence. Repairs and restoration would occur along approximately 19,334 linear feet of shoreline.

The Navy has prepared this Environmental Assessment (EA) in accordance with the National Environmental Policy Act (NEPA), as implemented by the Council on Environmental Quality (CEQ) Regulations and Navy regulations for implementing NEPA.

1.2 Background

The U.S. Naval Academy (USNA) was first established in 1845 and consisted of a naval school on a 10-acre parcel on Fort Severn, located along the Severn River in Annapolis, Maryland. The USNA grew over the next century, and the Navy commissioned Naval Station Annapolis in 1947 as a support facility for enlisted personnel assigned to the USNA. NSA Annapolis was established in 2006, to streamline operations at the installation to better support the USNA and provide a more efficient and responsive organization for the training of Navy Midshipmen and the support of USNA faculty, staff, and family members. NSA Annapolis projects power by expertly supporting the development of Midshipmen into Fleet leaders. The installation provides exceptional security by maintaining a secure environment for 4,400 Midshipmen and over 6,000 employees while managing thousands of special events and over two million annual visitors despite increased force protection pressure; stewardship by maintaining more than 120 aging, historic facilities and associated infrastructure in superb condition as required by university accreditation standards and as appropriate for a National Register site; and community relationships by promoting high services and quality of life initiatives while coordinating closely and communicating openly with city, county, state, and community leaders whose well-being is inextricably linked to that of the installation (CNIC Naval Support Activity Annapolis, 2019).

NSA Annapolis supports multiple tenants, of which the USNA is the main one. Other large tenants include the Naval Health Clinic Annapolis, Naval Facilities Engineering Command, the USNA Alumni Association/Naval Academy Foundation, and the Naval Academy Athletic Association (NAVFAC Washington, 2018a).

1.3 Location

NSA Annapolis is located in Anne Arundel County, Maryland, along the Severn River and Chesapeake Bay in Annapolis, approximately 30 miles southeast of Baltimore and 33 miles east of Washington, DC. This EA includes the three proximate areas of NSA Annapolis: North Severn, Upper Yard, and Lower Yard. The Upper Yard and Lower Yard are located along the southern shore of the Severn River, and are separated by College Creek (Figure 1-1). The USNA campus is located within these areas. North Severn is located on the northern shore of the Severn River at the confluence with the Chesapeake Bay (Figure 1-1).

Figure 1-1 Naval Support Activity Annapolis Location Map

The Upper Yard and Lower Yard are surrounded by the fairly dense development of Annapolis, but the North Severn area is more suburban and buffered by forest. Adjacent to NSA Annapolis on North Severn, and entirely surrounded by NSA Annapolis property, is the Annapolis Partners site. This land was former Navy property but transferred to Anne Arundel County as part of a 1995 Base Realignment and Closure action and later sold to a private development group. The site has not yet been redeveloped, but redevelopment could occur in the future (NAVFAC Washington, 2018a).

1.4 Purpose of and Need for the Proposed Action

The purpose of the Proposed Action is to repair and restore portions of the NSA Annapolis seawalls and shoreline that have been damaged or made vulnerable by degradation over time. Seawall and shoreline repair and stabilization measures would help to repair deteriorating seawalls along portions of the NSA Annapolis shoreline, which in turn would help to protect against the loss of mission-critical areas, reduce the vulnerability of Navy property and infrastructure to flooding, and reduce damage to the installation from deteriorating seawall conditions along the Severn River, College Creek, and Spa Creek shorelines of the Upper Yard, Lower Yard, and North Severn areas of the installation (see Figure 1-2).

The Proposed Action is primarily needed to address existing structural deficiencies along the NSA Annapolis seawalls and shoreline to maintain the safety and function of mission-critical areas behind the shorelines and seawalls. A secondary need for the Proposed Action is to address the potential impacts due to future extreme weather events, storm surge, sea level rise, and land subsidence.

The *Waterfront Facilities Inspections and Assessments at United States Naval Academy Annapolis, Maryland* report, August 2017 (NAVFAC, 2017), provided an assessment of the general physical condition of facilities, operational restrictions, and recommendations. At the time of the inspection, Sherman Field, Farragut Field, and the east wall of the Santee Basin bulkheads exhibited increased deterioration of the steel sheet piles with corrosion holes developing below the concrete pile caps. In these areas, backfill was seen escaping through the corrosion holes, with sinkholes developing behind the bulkheads. As a result, operational restrictions and repairs for conditions at the Sherman Field bulkhead, Farragut Field bulkhead, and portions of the Santee Basin bulkhead and Santee Basin were advised. It was recommended that heavy vehicles (those with a gross vehicle weight rating exceeding 10,000 pounds) be prohibited within 15 feet of the bulkheads. In addition, it was recommended that mooring and berthing along the Farragut Field bulkhead should be restricted to mild weather conditions (which includes sustained winds of less than 35 knots and currents less than 1 knot). At the Santee Basin, several sections are failing, with wave action occasionally overtopping the hardened structures and undercutting occurring in several areas, resulting in flooding and failure of the road and parking areas in several locations behind the seawall, particularly during extreme high tides.

Table 1-1 shows the engineering assessment rating, with a corresponding Engineering Management System Condition Index rating, that is given to waterfront facilities based on their condition. Facilities are given a condition index rating number that corresponds to an assessment rating and description, as shown in the table.

Table 1-2 shows the assessment rating that was given to the 15 sections or reaches within the project area (NAVFAC, 2019a). Only three reaches were given the rating of good or satisfactory. Six reaches were considered fair, three were considered poor, and three were deemed serious. Those reaches considered poor or serious total 9,174 linear feet, or 47 percent of the assessed shoreline.

Figure 1-2 Proposed Extent of Naval Support Activity Annapolis Seawall and Shoreline Repairs and Restoration

Table 1-1 Engineering Assessment Rating for Waterfront Facilities

Assessment Rating	*Equivalent Condition Index Rating*	*Description*
Good	84–100	No problems or only minor problems noted. Structural elements may show some very minor deterioration, but no significant reduction in structural capacity.
Satisfactory	67–83	Minor-to-moderate defects and deterioration observed, but no significant reduction in structural capacity.
Fair	54–66	All primary structural elements are sound, but minor-to-moderate defects and deterioration observed. Localized areas of moderate-to-advanced deterioration may be present but do not significantly reduce the structural capacity.
Poor	37–53	Advanced deterioration or overstressing observed on widespread portions of the structure. Some reduction in structural capacity.
Serious	26–36	Advanced deterioration, overstressing, or breakage may have significantly affected the load-bearing capacity of primary structural components. Local failures are possible.
Critical	0–25	Very advanced deterioration, overstressing, or breakage has resulted in localized failure(s) of primary structural components. More widespread failures are possible or likely to occur.

Source: NAVFAC, 2017.

Table 1-2 Seawall and Bulkhead Assessment Ratings and Length

Reach No.	*Reach Name*	*Assessment Rating*	*Seawall Length (feet)*
1	Sherman Field Bulkhead	53/Poor	2,988
2	Columbarium Seawall	56/Fair	1,060
3	Upper Yard Riprap	65/Fair	1,253
4	College Creek Bulkhead	71/Satisfactory	835
5	Rodgers Road Bulkhead	60/Fair	780
6	McNair Road/Nimitz Library Bulkheads	90/Good	980
7	Dewey Field Bulkhead	60/Fair	2,405
8	Santee Basin	NA/Poor	760
9	Farragut Field Bulkhead	NA/Poor	1,370
10	Farragut Field Riprap	84/Good	1,877
11	Halsey Fieldhouse Quaywall	60/Fair	510
12	Halsey Fieldhouse Quaywall 2	60/Fair	460
13	Yard Patrol Basin Relieving Platform	36/Serious	2,063
14	Yard Patrol Basin Steel Sheet Pile Bulkhead	36/Serious	883
15	Yard Patrol Basin Concrete Encased Bulkhead	36/Serious	1,110

Source: NAVFAC, 2019a.

Seawall Assessment Rating Color Key: Good Satisfactory Fair Poor Serious

Given the elevation of the installation, which ranges from sea level to 80 feet above mean sea level (NAVFAC Washington, 2011), and its location adjacent to the Chesapeake Bay, NSA Annapolis is vulnerable to localized flooding and storm surge associated with major weather events and higher water levels, particularly during high tides. Climate change would exacerbate these conditions (NAVFAC Washington, 2018a).

Storm surge occurs when there is temporary flooding and water inundation along coastlines during storm events such as tropical depressions or hurricanes. The most recent hurricane that caused major flooding damage due to storm surge at NSA Annapolis was Hurricane Isabel in 2003 (see Figure 1-3 and Figure 1-4). This hurricane caused an immense amount of water and storm damage at the USNA, with inundation in numerous buildings. High water events similar to what occurred during Hurricane Isabel are expected to become more frequent, and the amount of inundation can increase over time (NAVFAC Washington, 2018a).

The Chesapeake Bay region is considered one of the nation's most vulnerable areas to sea level rise, as data have shown that sea level rise is occurring at the highest rate on the Atlantic Coast. There are two reasons for this: the ground in the region is sinking due to natural land subsidence, and ocean levels are rising (USGS, 2013). In 2018, a record number of 41 flood events occurred at NSA Annapolis. Flooding events have increased over the past 20 years, and there is the potential for increased frequency in the future due to sea level rise. Table 1-3 and Figure 1-5 show estimated sea level rise projections from 2000 to 2100 based on various scenarios. The projected increase in sea level rise varies from low to extreme scenarios. In Annapolis, this increase ranges from 1.64 feet for the low scenario to 11.15 feet for the extreme scenario in 2100 (U.S. Army Corps of Engineers, 2017).

In addition to the factors that have already been discussed, the Proposed Action is needed to maintain the safety and function of mission-critical areas at the installation. The mission at NSA Annapolis includes seamanship and sail training; small arms weapons familiarization; and navigation and engineering professional development. The mission of the USNA is to develop Midshipmen morally, mentally, and physically and to imbue them with the highest ideals of duty, honor, and loyalty in order to graduate leaders who are dedicated to a career of Naval service and have potential for future development in mind and character to assume the highest responsibilities of command, citizenship, and government. Increased frequency or severity of flood events could result in loss of land or damaged facilities in these mission-critical areas and could prevent either NSA Annapolis or the USNA from accomplishing their missions.

1.5 Scope of Environmental Analysis

This EA includes an analysis of potential environmental impacts associated with three action alternatives and the No Action Alternative. The environmental resource areas analyzed in this EA are air quality, water resources, geological resources, cultural resources, biological resources, visual resources, noise, transportation, and hazardous materials and waste. The study areas for the resources analyzed may differ due to how the Proposed Action interacts with or impacts the resource. For instance, the study area for geological resources may only include the construction footprint of a building, whereas the noise study area would expand out to include areas that may be affected by facility operations, traffic, or construction.

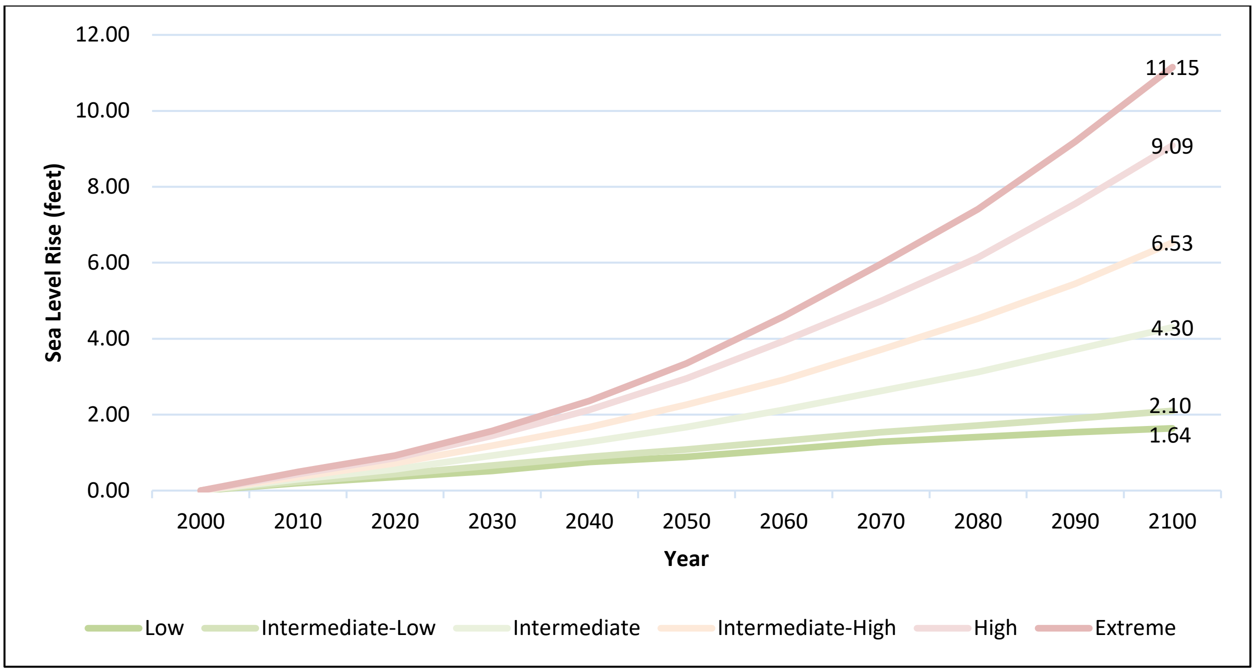
Figure 1-3 Flooding after Hurricane Isabel 2003, Photo I

Figure 1-4 Flooding after Hurricane Isabel 2003, Photo II

Table 1-3 National Oceanic and Atmospheric Administration Sea Level Rise Projections for Annapolis, Maryland (2017)

Year	*Low*	*Intermediate-Low*	*Intermediate*	*Intermediate-High*	*High*	*Extreme*
2000	0.00	0.00	0.00	0.00	0.00	0.00
2010	0.20	0.23	0.30	0.36	0.43	0.49
2020	0.36	0.43	0.56	0.72	0.85	0.92
2030	0.52	0.66	0.92	1.18	1.44	1.57
2040	0.75	0.89	1.28	1.67	2.13	2.36
2050	0.89	1.08	1.67	2.26	2.95	3.35
2060	1.08	1.31	2.13	2.92	3.94	4.59
2070	1.28	1.54	2.62	3.71	4.99	5.97
2080	1.41	1.71	3.12	4.53	6.14	7.41
2090	1.54	1.90	3.71	5.45	7.55	9.19
2100	1.64	2.10	4.30	6.53	9.09	11.15

Source: U.S. Army Corps of Engineers, 2017.
Notes: All values are in units of feet.



Source: U.S. Army Corps of Engineers, 2017.

Figure 1-5 National Oceanic and Atmospheric Administration Sea Level Rise Projections for Annapolis, Maryland (2017)

1.6 Relevant Laws and Regulations

The Navy has prepared this EA based on federal and state laws, statutes, regulations, and policies pertinent to the implementation of the Proposed Action, including the following:

- NEPA (42 U.S. Code [U.S.C.] sections 4321–4370h), which requires an environmental analysis for major federal actions that have the potential to significantly impact the quality of the human environment
- CEQ Regulations for Implementing the Procedural Provisions of NEPA (40 Code of Federal Regulations [CFR] parts 1500–1508)
- Navy regulations for implementing NEPA (32 CFR part 775), which provides Navy policy for implementing CEQ regulations and NEPA
- Clean Air Act (42 U.S.C. section 7401 et seq.)
- Clean Water Act (33 U.S.C. section 1251 et seq.)
- Rivers and Harbors Act (33 U.S.C. section 407)
- Coastal Zone Management Act (16 U.S.C. section 1451 et seq.)
- National Historic Preservation Act (54 U.S.C. section 306108 et seq.)
- Endangered Species Act (16 U.S.C. section 1531 et seq.)
- Magnuson-Stevens Fishery Conservation and Management Act (16 U.S.C. section 1801 et seq.)
- Marine Mammal Protection Act (16 U.S.C. section 1361 et seq.)
- Migratory Bird Treaty Act (16 U.S.C. section 703–712)
- Bald and Golden Eagle Protection Act (16 U.S.C. section 668–668d)
- Comprehensive Environmental Response, Compensation, and Liability Act (42 U.S.C. section 9601 et seq.)
- Emergency Planning and Community Right-to-Know Act (42 U.S.C. sections 11001–11050)
- Federal Insecticide, Fungicide, and Rodenticide Act (7 U.S.C. section 136 et seq.)
- Resource Conservation and Recovery Act (42 U.S.C. section 6901 et seq.)
- Toxic Substances Control Act (15 U.S.C. sections 2601–2629)
- Executive Order (EO) 11988, *Floodplain Management*
- EO 12088, *Federal Compliance with Pollution Control Standards*
- EO 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-income Populations*
- EO 13045, *Protection of Children from Environmental Health Risks and Safety Risks*
- EO 13175, *Consultation and Coordination with Indian Tribal Governments*
- EO 13834, *Efficient Federal Operations*
- National Defense Authorization Act for Fiscal Year 2019, section 2805
- Maryland Living Shoreline Protection Act (Maryland House Bill 973)

A description of the Proposed Action's consistency with these laws, policies, and regulations, as well as the names of regulatory agencies responsible for their implementation, is presented in Chapter 5 of this EA.

1.7 Public and Agency Participation and Intergovernmental Coordination

CEQ Regulations direct agencies to involve the public in preparing and implementing their NEPA procedures. All public involvement and agency correspondence materials will be added to Appendix A as they occur.

The Navy will publish a Notice of Availability for the Draft EA for three consecutive days in a local newspaper. The notice will describe the Proposed Action, solicit public comments on the Draft EA, provide dates of the public comment period, and announce where a copy of the EA is available for review. The Navy will hold a public meeting to describe the environmental impacts of the Proposed Action and alternatives and to receive comments on the Draft EA.

Project requirements include regulatory permitting under Section 10 of the Rivers and Harbors Act and 404 of the Clean Water Act from the U.S. Army Corps of Engineers, Maryland Water Quality Certification and Joint Permit Application for Wetlands and Waterways from Maryland Department of the Environment (MDE), and coordination with the Maryland State Historic Preservation Office regarding archaeological and historical properties. The Navy will coordinate or consult with additional agencies associated with the EA, including the U.S. Fish and Wildlife Service, National Oceanic and Atmospheric Administration (NOAA) Fisheries, Maryland Department of Natural Resources, and Maryland Department of Planning (Maryland State Clearinghouse), regarding the Proposed Action. The Navy will prepare and submit a Coastal Consistency Determination to the MDE.

2 Proposed Action and Alternatives

2.1 Proposed Action

The Navy proposes to repair and restore the seawall and shoreline of the Lower Yard along the Severn River, College Creek, Spa Creek, and Santee Basin; portions of the Upper Yard along the Severn River and College Creek; and portions of shoreline on North Severn along the Severn River and Yard Patrol Basin. The repairs and restoration would address structural deficiencies and potential impacts from future extreme weather events, storm surge, sea level rise, and land subsidence. The Proposed Action would include repairs along approximately 19,334 linear feet of shoreline. The existing shoreline in these areas is mostly hardened, consisting of a mixture of bulkhead and riprap sections. Several of these sections are failing, with wave action occasionally overtopping the hardened structures and undercutting occurring in several areas. The deficiencies in these shoreline structures have resulted in persistent flooding issues and failure of the road and parking areas in several locations behind the seawall, particularly during extreme high tides.

Naval Support Activity (NSA) Annapolis has identified a variety of alternative repair and restoration approaches that are potentially feasible for the Proposed Action. In the future, it is likely that additional long-term initiatives will be required to address sea level rise impacts. However, at this time, no additional stormwater or sea level rise planning solutions are being considered. As such, this Environmental Assessment (EA) focuses solely on seawall repair and restoration. The alternative approaches deemed most feasible are based on site conditions, environmental impacts, and practicability of implementing the repair and restoration. The project area for this EA has been divided into “reaches,” as identified in Table 1-2 and Table 2-1 and depicted in Figure 2-1 and Figure 2-2. These areas have been defined geographically as well as based on the extent of damage and potential restoration measures applicable. To date, Reach 9 (along the Lower Yard) and a portion of the North Severn seawall have undergone preliminary design. Construction along Reach 9 may be completed in phases, dependent on funding allocations, would likely begin in the next few years, and could last approximately three and a half years. Construction on other reaches would occur as funding becomes available. Subsequent reaches would be prioritized for repair based on condition, elevation, and mission criticality.

As part of the Proposed Action, a cable would need to be relocated at the corner of the seawall at the Triton Light, which is southeast of the Santee Basin. The cable is a 13.8-kilovolt armored submarine cable that is approximately 6,800 linear feet. It was originally anchored in concrete approximately 10 feet from the wall. Over time the anchors that kept the cable secure in the riverbed failed, and the cable is now approximately 6 inches from the wall. To relocate the cable, it is likely that a barge would connect to it at several locations and pull the cable away from the wall. The cable would then be reanchored in concrete on the riverbed. Only the portion of cable necessary to conduct work on the seawalls would be relocated. The total soil disturbance between the cable relocation and the new anchors along the seawall near the Triton Light is anticipated to be less than 10 cubic yards (Jones, 2019; Zurzolo, 2019). Cables may need to be relocated along other portions of the seawall as well, if they have migrated along other reaches. The extent of cable migration in other areas is unknown and would be determined during the design phase for each reach.

Table 2-1 Description of Reaches in the Proposed Action

Reach No.	*Reach Name*	*Length (linear feet)*	*Description*
1	Sherman Field Bulkhead	2,988	Located along the eastern shoreline of the Upper Yard along the Severn River and at the confluence with College Creek. Consists of steel sheet piling with a concrete cap, which is tied to timber piles. Assessed as being in poor condition.
2	Columbarium Seawall	1,060	Located along the southern shoreline of the Upper Yard along College Creek near the confluence with the Severn River. Composed of riprap with a stone cap. Assessed as being in fair condition.
3	Upper Yard Riprap	1,253	Located along the southern shoreline of the Upper Yard along College Creek. Composed of riprap. Assessed as being in fair condition.
4	College Creek Bulkhead	835	Located along the northern shoreline of the Lower Yard along College Creek. Consists of steel sheet piling with a 7-foot-wide concrete cap. Assessed as being in satisfactory condition.
5	Rodgers Road Bulkhead	780	Located along the northern shoreline of the Lower Yard along College Creek. Consists of steel sheet piling in front of an original bulkhead, along with a 7-foot-wide concrete cap. Assessed as being in fair condition.
6	McNair Road/Nimitz Library Bulkheads	980	Located along the northern shoreline of the Lower Yard along College Creek near the confluence with the Severn River. Concrete tilt slab construction supports McNair Road and the library walkway. Nimitz Library bulkheads are made of steel piles attached to a concrete pile cap and a concrete deck surface. Assessed as being in good condition.
7	Dewey Field Bulkhead	2,405	Located along the eastern shoreline of the Lower Yard along the Severn River. Serves as a docking location for Navy yard patrol boats. Consists of steel sheet piling with a concrete cap incorporating a parapet wall, tied back to timber piles. Assessed as being in fair condition.
8	Santee Basin	760	Located along the eastern shoreline of the Lower Yard and around the Santee Basin. Bulkhead is 5.5 feet wide and serves as a mooring and docking location for various sailing vessels at the U.S. Naval Academy. Consists of steel sheet piling with a concrete cap, except for the southern side, which consists of a concrete cap on timber piles with riprap protection to the channel bottom. Assessed as being in poor condition. A portion of the Santee Basin seawall was recently repaired, but the height was not increased.
9	Farragut Field Bulkhead	1,370	Located along the eastern shoreline of the Lower Yard, along the Severn River. Consists of steel sheet piling with a concrete cap incorporating a parapet wall, tied back to timber piles. Assessed as being in poor condition.

Reach No.	***Reach Name***	***Length (linear feet)***	***Description***
10	Farragut Field Riprap	1,877	Located along the southern shoreline of the Lower Yard, near the confluence of the Severn River with the Chesapeake Bay. Composed of riprap. Assessed as being in good condition.
11	Halsey Fieldhouse Quaywall	510	Located along the southern shoreline of the Lower Yard on Spa Creek at the Severn River confluence. This section (bulkhead) is composed of steel sheet piling with a concrete cap and curb. Assessed as being in fair condition.
12	Halsey Fieldhouse Quaywall 2	460	Located along the southern shoreline of the Lower Yard on Spa Creek. Bulkhead is 13.75 feet in width. This section is composed of timber sheeting with a timber relieving platform supported by timber piles. The backwall is constructed of built-up, multilayer timber sheet piling and a concrete cap. Assessed as being in fair condition.
13	Yard Patrol Basin Relieving Platform	2,063	Located within the Yard Patrol Basin along the shoreline of North Severn. This section is composed of timber sheeting, piles, and deck. There is a concrete retaining wall and deck on top of a portion of the timber piles. Assessed as being in serious condition.
14	Yard Patrol Basin Steel Sheet Pile Bulkhead	883	Located along the Yard Patrol Basin and Severn River shoreline of North Severn. This is a steel sheet pile bulkhead with a concrete cap. Assessed as being in serious condition.
15	Yard Patrol Basin Concrete Encased Bulkhead	1,110	Located along the shoreline of North Severn along the Severn River near the confluence with the Chesapeake Bay. The timber sheet pile has concrete placed behind the timber; there is a concrete cap on top of the bulkhead. Assessed as being in serious condition.
Total		**19,334**	

Sources: NAVFAC, 2017; Navy, 2018a; Navy, 2018b.

Seawall Assessment Rating Color Key: Good Satisfactory Fair Poor Serious

Figure 2-1 Location of Reaches along the Upper Yard and Lower Yard Project Area

Figure 2-2 Location of Reaches along the North Severn Project Area

As previously discussed, the Proposed Action is to repair and restore approximately 19,334 linear feet of shoreline at NSA Annapolis. As part of this action, specific restoration and enhancement techniques were considered and evaluated for the reaches at NSA Annapolis, including hardened structures, log toe stabilization, and living shoreline, where appropriate. Hardened structures include bulkhead, sheet pile seawall, riprap, or a combination of these techniques. These techniques are detailed below.

2.1.1 Hardened Structures

Hardened structures are shoreline-armoring systems placed on banks or bluffs to absorb the energy of incoming waves. They are usually built to preserve existing uses of the shoreline and protect the slope, and to armor and protect the land behind them. They may be watertight, covering the slope completely, or porous, allowing water to filter through after the wave energy has dissipated. Specific types of hardened structures include bulkheads, sheet pile seawalls, and riprap, which are further described below.

2.1.1.1 Bulkheads

Bulkheads are vertical retaining walls composed of wood, steel sheet, stone, concrete, plastic, or other similar material that are constructed parallel to the shoreline. They are designed to protect shorelines by providing a barrier to waves, to retain soil behind them, and to provide berthing for ships. Bulkheads derive their stability through mobilization of passive earth pressures between the mudline and embedded tip of the wall, and, in most cases, from a lateral anchorage system installed between mean low water and top of the wall. See example bulkhead in Figure 2-3.

The exact method for the construction or repair of bulkheads in the project area is unknown at this time; it is likely that materials or methods would be slightly different along various reaches, as specific site conditions warrant. Methods could include mechanical impact hammers and rams and saw cutting to complete the demolition of the concrete components. Any corrosion on the bulkhead would be removed. A timber formwork (which acts as a mold) could be constructed adjacent to the existing steel bulkhead. Concrete could then be poured into the formwork resulting in a concrete encasement about six inches thick with the timber formwork kept in place to protect the concrete encasement. Excavation could occur below the existing mudline to expose the existing wall for installation of a new encasement; this area would then be backfilled upon completion (NAVFAC, 2019b). Driving of new steel sheet piles could be performed via a floating plant of barge-mounted cranes and pile-driving equipment. Partial excavations could occur to expose existing seawall wale and lateral anchorage systems. The new sheet pile bulkhead could connect to existing structures or tie-back anchorages, and grout infill could be installed between existing and new sheet pile seawalls. Reinforced concrete caps and/or integrated walls could then be installed to meet future sea level rise requirements.

2.1.1.2 Sheet Pile Seawalls

Sheet pile seawalls consist of interconnecting, very tightly spaced sheets of material (wood, stone, steel, concrete, or plastic) driven vertically into the ground with special equipment. The interlocked sheet piles form a wall for lateral earth support with reduced groundwater inflow. The wall may be cantilevered or anchored. See Figure 2-4. Unlike bulkheads, seawalls are not intended for ship berthing.

Steel sheet pile seawalls generally consist of steel sheet piles, unreinforced grout infill material between existing and new seawalls, and reinforced concrete caps and wall structures. The seawall restoration could include complete or partial demolition of the existing wall concrete cap and ancillary structures to facilitate installation and connection of a new sheet pile seawall. Methods would likely be similar to

Source: NAVFAC, 2019b.

Figure 2-3 Example Bulkhead at Naval Support Activity Annapolis, Farragut Field

Source: NAVFAC, 2017.

Figure 2-4 Example Sheet Pile Seawall Structure with Concrete Cap

those discussed under bulkheads, involving mechanical impact hammers and rams and saw cutting for partial or complete the demolition. Floating barge-mounted cranes and pile-driving equipment could be used. Reinforced concrete caps and/or integrated walls could be installed to meet future sea level rise requirements.

2.1.1.3 Riprap

Riprap is used to protect and stabilize embankment soils from erosion from flowing water and waves. A typical riprap system consists of a filter layer of gravel or cloth designed to prevent soil movement into or through the riprap layer while allowing water to drain from the embankment, and a stone layer of appropriate gradation and thickness to resist the shearing forces of water. See Figure 2-5.

Typically, to install riprap, the subgrade surface on which the rock riprap and filter is to be placed would be cut or filled and graded to the lines and grades specified in the design drawings. The filter would be placed on the surface and then the rocks are placed on the filter. Larger rocks are uniformly distributed with the smaller rocks and spalls filling the voids between the larger rock.

2.1.2 Log Toe Stabilization

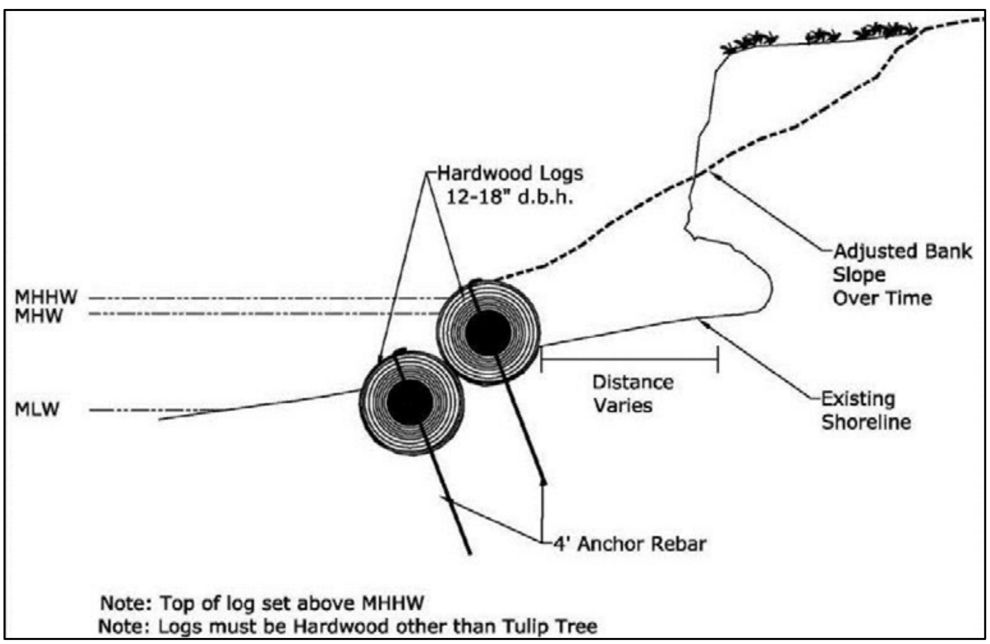
Log toe stabilization uses untreated hardwood logs installed to repair the undercut toe-of-slope. The logs are installed to support the undercut bank and help trap soils that can otherwise be dissolved and washed away when tides saturate the toe-of-slope. Felled trees and branches are cut to fit under the banks. One or more logs are wedged beneath the undercut bank, and the outermost log is anchored with rebar. Once the toe erosion is halted, the upper banks may continue to slump until a stable angle of repose is reached, which would allow the regrowth of vegetation on the banks. It is this regrowth of vegetation that would help provide long-term stabilization of the shoreline. The logs can last up to several decades. See Figure 2-6.

2.1.3 Living Shoreline

Living shoreline designs are a more natural bank stabilization approach that uses plants, sand, and a limited amount of rock to provide shoreline protection and enhance and maintain valuable habitat. These designs incorporate a small amount of rock, natural sand material, and native tidewater vegetation in a configuration strategically placed to use the natural dynamics of a particular site. Living shorelines have proven to be an effective means of stabilizing eroding shorelines while maintaining more of the vital fish and wildlife habitat along the shoreline. In most suitable areas, living shorelines would be created using breakwaters or sills, sand material, and native vegetation. The Navy would determine the exact locations for these living shorelines and specifications based on the type of habitat to be created, and site conditions. Living shorelines cannot be used where shorelines are subject to strong, persistent wave energy; considerable amounts of slope erosion; deeper water levels; and high fetch, which is the distance traveled by wind or waves across open water. See Figure 2-7. The fetch, exposure, water depth, and existing functional use of existing shoreline protection structures on Spa Creek, the Severn River, and the mouth of College Creek limit the suitability of living shorelines on Reaches 1, 2, and 5–15.

Source: NAVFAC, 2017.

Figure 2-5 Example Riprap at Naval Support Activity Annapolis Upper Yard



Source: NAVFAC Washington, 2015.
MHW=mean high water; MHHW=mean higher-high water; MLW=mean low water; d.b.h.=diameter at breast height.

Figure 2-6 Typical Detail of Log Toe Stabilization

Source: NAVFAC Washington, 2018b.

Figure 2-7 Typical Living Shoreline

2.2 Screening Factors

The National Environmental Policy Act's (NEPA) implementing regulations provide guidance on the consideration of alternatives to a federally proposed action and require rigorous exploration and objective evaluation of reasonable alternatives. Only alternatives determined to be reasonable and to meet the Proposed Action's purpose and need (see Section 1.4) require detailed analysis.

Potential alternatives that meet the Proposed Action's purpose and need were evaluated against the following screening factors:

- Seawalls must be built to heights that are feasible and structurally sound.
- Repair and restoration of existing functional structures must provide for compatible use.
- Width of waterway, depth of waterway, bottom material, fetch, shoreline orientation, and existing structures must be considered when determining type of repair and restoration structure.
- Structures cannot be constructed within navigation channels or interfere with existing navigation.
- Seawall height and type of structure must take into account varying tide levels, storms, and wave conditions.

The following alternatives were evaluated against the screening factors:

- taking no action (the No Action Alternative)
- hardened structures to accommodate for 75-year sea level rise projection (Alternative 1)
- hardened structures to accommodate for 50-year sea level rise projection (Alternative 2)
- structures to match existing conditions and height (Alternative 3)

2.3 Alternatives Carried Forward for Analysis

Based on the reasonable alternative screening factors and meeting the project purpose and need, three action alternatives were identified and are analyzed in this EA, as well as the No Action Alternative, as further described below. Because the primary purpose and need for the repair and restoration of the seawalls is to address existing structural deficiencies, this EA focuses solely on seawall repair and restoration. The Navy prefers design alternatives that would allow for phased elevation increases to help protect against future sea level rise, if necessary. Proposed structure types for specific reaches were selected based on an assessment of the width of waterway, depth of waterway, bottom material, fetch, shoreline orientation, and functional use of existing structures.

2.3.1 No Action Alternative

Under the No Action Alternative, the Proposed Action would not be implemented. The seawall and shoreline would not be repaired or restored along the Lower Yard, portions of the Upper Yard, or portions of North Severn at NSA Annapolis. Sections of the existing seawalls and shoreline would continue to deteriorate over time and then fail, resulting in continued flooding issues and failure of road and parking areas in locations behind the seawall. With potential continued storm surge, sea level rise, and land subsidence, these conditions would worsen over time and result in increased flooding and failure events. The No Action Alternative would not meet the purpose of and need for the Proposed Action; however, the No Action Alternative is carried forward for analysis in this EA to establish a comparative baseline for analysis.

2.3.2 Alternative 1: Hardened Structures to Accommodate for 75-year Sea Level Rise Projection

Under Alternative 1, the Proposed Action would be implemented on the shoreline of the Lower Yard along the Severn River, College Creek, Spa Creek, and Santee Basin; portions of the Upper Yard along the Severn River and College Creek; and portions of North Severn along the Severn River and Yard Patrol Basin. Repairs would occur along approximately 19,334 linear feet of shoreline. Alternative 1 would employ hardened structures along Reaches 1 through 15, which are shown in Figure 2-1 and Figure 2-2. The repair and restoration of each reach would be completed as described in Table 2-2.

Each reach would be designed to accommodate for 10- or 50-year design storm and the 75-year sea level rise scenarios as predicted by the 2017 National Oceanic and Atmospheric Administration's (NOAA's) Intermediate-Low and Intermediate Scenarios (see Table 2-3). Shore protection on the Lower Yard and North Severn is designed to the 50-year design storm and the 75-year sea level rise projection. Shore protection on the Upper Yard (i.e., Sherman Field, College Creek) is designed to the 10-year storm and the 75-year sea level rise projection.

The NOAA scenarios take into account ice sheet mass changes, glacier mass changes, oceanographic processes, land-water storage, glacial isostatic adjustment, and tectonics and sediment compaction. Sea level rise was estimated at NSA Annapolis using the U.S. Army Corps of Engineers' Sea Level Rise Curve Calculator (2017). The NOAA Intermediate-Low Scenario estimates a mean sea level rise of approximately 2.10 feet by the year 2100. The NOAA Intermediate Scenario estimates a mean sea level rise of approximately 4.30 feet by 2100 at Annapolis (NAVFAC Washington, 2018a). Table 2-2 shows the maximum design height at each reach to accommodate the estimated sea level rise at the installation under these scenarios.

Table 2-2 Repair and Restoration Method by Reach for Each Alternative

Reach No.	*Reach Name*	*Existing Height (NAVD88)*	*Alternative 1: Proposed Structure Type*	*Alternative 1: Maximum Design Height*	*Alternative 2: Proposed Structure Type*	*Alternative 2: Maximum Design Height*	*Alternative 3: Proposed Structure Type*	*Alternative 3: Maximum Design Height*
1	Sherman Field Bulkhead	3–4	Hardened	6.10	Hardened	5.54	Hardened	to existing
2	Columbarium Seawall	1–2	Hardened	6.10	Hardened	4.2	Hardened	to existing
3	Upper Yard Riprap	1–2	Hardened	6.10	Log Toe Stabilization	to existing; option for increased height	Living Shoreline	to existing; could be modified in future to adapt for sea level rise
4	College Creek Bulkhead	3–4	Hardened	9.7	Hardened	8.02	Hardened	to existing
5	Rodgers Road Bulkhead	3–4	Hardened	9.7	Hardened	8.02	Hardened	to existing
6	McNair Road/Nimitz Library Bulkheads	1–2	Hardened	9.7	Hardened	8.02	Hardened	to existing
7	Dewey Field Bulkhead	5	Hardened	9.7	Hardened	8.02	Hardened	to existing
8	Santee Basin	3–4	Hardened	9.7	Hardened	8.02	Hardened	to existing
9	Farragut Field Bulkhead	5	Hardened	9.7	Hardened	8.02	Hardened	to existing
10	Farragut Field Riprap	3–5	Hardened	9.7	Hardened	8.02	Hardened	to existing
11	Halsey Fieldhouse Quaywall	5	Hardened	9.7	Hardened	8.02	Hardened	to existing
12	Halsey Fieldhouse Quaywall 2	5	Hardened	9.7	Hardened	8.02	Hardened	to existing
13	Yard Patrol Basin Relieving Platform	NA	Hardened	9.7	Hardened	8.02	Hardened	to existing
14	Yard Patrol Basin Steel Sheet Pile Bulkhead	NA	Hardened	9.7	Hardened	8.02	Hardened	to existing
15	Yard Patrol Basin Concrete Encased Bulkhead	NA	Hardened	9.7	Hardened	8.02	Hardened	to existing

Source: Navy, 2018c.

Key: NAVD88 = North American Vertical Datum of 1988, which is a vertical control datum of height—in feet—established for U.S. vertical control surveying.

Seawall Assessment Rating Color Key: Good Satisfactory Fair Poor Serious

Note: Hardened structures could mean bulkhead, sheet pile seawall, riprap, or a combination of these techniques. The maximum design height includes the existing height of the structure.

Table 2-3 Design Storm and Sea Level Rise by Reach for Each Alternative

Reach No.	*Reach Name*	*Alternative 1: Design Storm*	*Alternative 1: Sea Level Rise*	*Alternative 2: Design Storm*	*Alternative 2: Sea Level Rise*	*Alternative 3: Design Storm*	*Alternative 3: Sea Level Rise*
1	Sherman Field Bulkhead	10 year	75 year	10 year	50 year	None	None
2	Columbarium Seawall	10 year	75 year	10 year	None	None	None
3	Upper Yard Riprap	10 year	75 year	None *	None *	None *	None *
4	College Creek Bulkhead	50 year	75 year	50 year	50 year	None	None
5	Rodgers Road Bulkhead	50 year	75 year	50 year	50 year	None	None
6	McNair Road/Nimitz Library Bulkheads	50 year	75 year	50 year	50 year	None	None
7	Dewey Field Bulkhead	50 year	75 year	50 year	50 year	None	None
8	Santee Basin	50 year	75 year	50 year	50 year	None	None
9	Farragut Field Bulkhead	50 year	75 year	50 year	50 year	None	None
10	Farragut Field Riprap	50 year	75 year	50 year	50 year	None	None
11	Halsey Fieldhouse Quaywall	50 year	75 year	50 year	50 year	None	None
12	Halsey Fieldhouse Quaywall 2	50 year	75 year	50 year	50 year	None	None
13	Yard Patrol Basin Relieving Platform	50 year	75 year	50 year	50 year	None	None
14	Yard Patrol Basin Steel Sheet Pile Bulkhead	50 year	75 year	50 year	50 year	None	None
15	Yard Patrol Basin Concrete Encased Bulkhead	50 year	75 year	50 year	50 year	None	None

Source: Navy, 2018c.

Seawall Assessment Rating Color Key: Good Satisfactory Fair Poor Serious

Note: *Could be modified in future to accommodate storms and sea level rise.

For each reach, the maximum design height was selected based on an assessment of projected sea level rise over the intended structural design life, as well as the level of risk tolerance to coastal storm impacts. The heights included in Table 2-2 are considered the potential maximum height to be implemented at each reach for analysis within this EA. The approach for Alternative 1 would allow for phased elevation (height) increases over time as warranted to address sea level rise over the life expectancy of the structure. Construction would likely occur in phases, with an initial height being increased if needed due to future sea levels and storm surge conditions.

In addition to sea level rise, the design of reach elevation takes into account wave action and wave runup. Wave runup is the added elevation reached by water above the still-water level as waves interact with structures or slopes. Wave runup is one of the water-level components causing flooding as recognized by the Federal Emergency Management Agency. Wave action can be substantial along the NSA Annapolis coastline, particularly along the Farragut bulkhead and riprap (Reaches 9 and 10), the Yard Patrol bulkhead (Reaches 14 and 15), the Halsey Quaywall (Reaches 11 and 12), and the Dewey seawall (Reach 7). Large waves may be generated by winds blowing northeast-east-southeast across the Chesapeake Bay, or they may be generated by large vessels passing in the Severn River. Given the wave energy, topography, tide levels, exposure, and fetch of the areas along the reaches, most seawalls need to remain hardened structures.

Each of the repairs to and restoration of the seawalls may include extending base support further into the water and allowing for phased elevation increase over time, up to a maximum height for specific reaches as warranted to address sea level rise over the life expectancy of the structures. Construction would likely occur in phases, with an initial height being increased if necessary due to future sea level rise and storm surge. The hardened structures would include concrete bulkhead, sheet pile seawall, riprap, or a combination of these techniques. The work for the hardened structure repair, restoration, and replacement would be completed either from dry land, in the water, or a combination depending on the land and water constraints in the various work areas.

Specific details for the reaches are not known at this time since design work has not yet commenced for all of the seawalls. Some preliminary designs have information on the methods and the amount of disturbance to be expected with the repairs and restorations to seawalls. These are considered general estimates for the basis of the analysis within this EA but may not be applied to each reach that would undergo repair and restoration. For most of the steel sheet pile seawalls, disturbances within the water are expected to be approximately 18 inches away from the outboard-most extent of the existing wall alignments during the installation of the new sheet piles. Other construction methods could have different distances. No dredging is anticipated unless desired design basis vessels are determined to require additional clearances, which would be decided with input from the USNA on the desired design vessels, and the results of a hydrographic survey of the existing channel bottom. Disturbance on land would be anticipated to be limited to the extent necessary to safely excavate and expose existing seawall wale and anchorage systems to facilitate connections to the newly installed components. Equipment and laydown needs may require limited use of barricaded areas, which would be explored more as design phases progress.

Fill material for steel sheet pile seawalls would only be anticipated to occur in the narrow gaps between existing seawall alignment and the new seawall alignment. Armor stone may be designated for installation along the toe of the seawall to protect against scour from vessel activities.

2.3.3 Alternative 2: Hardened Structures to Accommodate for 50-year Sea Level Rise Projection

Under Alternative 2, hardened structures would be repaired or replaced along Reaches 1 through 15, which are shown in Figure 2-1 and Figure 2-2. The repair and restoration of each reach would be completed as described in Table 2-2. Each reach under Alternative 2 would consist of a hardened structure, except for Reach 3, which would consist of log toe stabilization. Reach 3 would be built to the current height, with the option to modify the height in the future to accommodate for sea level rise. Each of the repairs to the seawalls may include extending base support further into the water.

The reaches would be designed to accommodate for 10- or 50-year design storm and the 50-year sea level rise scenarios as predicted by the 2017 NOAA Intermediate-Low and Intermediate Scenarios. Shore protection on the Lower Yard and North Severn is designed to the 50-year design storm and the 50-year sea level rise projection. Shore protection on the Upper Yard is designed to the 10-year storm and the 50-year sea level rise projection.

Given the wave energy, topography, tide levels, exposure, and fetch of the areas along the reaches, most seawalls need to remain hardened structures. The hardened structures would include concrete bulkhead, sheet pile seawall, riprap, or a combination of these techniques. The work for the hardened structure repair, restoration, and replacement would be accomplished either from dry land, in the water, or a combination depending on the land and water constraints in the various work areas.

The log toe stabilization method along Reach 3 includes the placement of untreated hardwood logs at the undercut toe-of-slope in order to repair the slope toe. The logs would be anchored with rebar and would potentially include grading of the embankment to a lower slope.

2.3.4 Alternative 3: Seawall to Match Existing Conditions and Height

Under Alternative 3, the existing hardened structures would be repaired or replaced to the existing height, without accommodating for future sea level rise. Given the wave energy, topography, tide levels, exposure, and fetch of the areas along the reaches, most seawalls need to remain hardened structures. All reaches would be repaired or replaced with hardened structures (except for Reach 3). Hardened structures include bulkhead, sheet pile seawall, riprap, or a combination of these techniques. Therefore, the reaches could be repaired with the same materials of which are currently made, or they could be replaced with another type of hardened structure material. Under Alternative 3, the Upper Yard riprap at Reach 3 would be replaced by a living shoreline that could be modified in the future to accommodate increased sea levels (see Table 2-2).

Under Alternative 3, the primary purpose and need would be met. The purpose of the Proposed Action to repair and restore portions of the NSA Annapolis seawall and shoreline that have been damaged or made vulnerable by degradation over time would be satisfied. The secondary need of the Proposed Action, to address the potential impacts due to extreme weather events, storm surge, sea level rise, and land subsidence would not be met. However, Alternative 3 is carried forward for analysis in this EA so that reaches needing repair would be repaired, and mission-critical areas at the installation would be maintained for the short term.

2.4 Alternatives Considered but not Carried Forward for Detailed Analysis

2.4.1 Hardened Structures to Accommodate for 75-year Sea Level Rise + 100-year Storm Projection

Under this alternative, hardened structures would be repaired or replaced along Reaches 1 through 15. Each of the reaches would be designed to accommodate for a 100-year storm plus the 75-year sea level rise scenario as predicted by the 2017 NOAA Intermediate Scenario. To accommodate this scenario, the final design height of the seawall would be approximately 10.35 feet. The seawall design life is approximately 75 years, so given the anticipated lifetime of the seawall restoration (which is less than 75 years), and the visual impacts and costs of the increased height, the Navy determined that this level of protection was not warranted at this time. Therefore, this scenario was eliminated from further analysis.

2.4.2 Offshore Breakwater Alternative

This alternative would involve the construction of breakwaters offshore along the entire shoreline of the project area. The breakwaters would control the tidal wave action along the shore by dissipating energy from storm surges and wind-generated waves, and, over time, naturally encouraging a sediment substrate to support tidal marsh vegetation between the shoreline and the breakwater. The breakwaters would be aligned to provide the greatest area of shoreline protection available. However, this alternative would not be appropriate for all areas due to the width of waterway, depth of waterway, bottom material, fetch, shoreline orientation, and functional use of existing structures. In addition, the breakwaters could obstruct navigation in some areas. As such, offshore breakwaters would not meet the screening factors for the Proposed Action. Therefore, this alternative was eliminated from further analysis.

Using the screening criteria in Section 2.2, the three alternatives discussed in Sections 2.3.2, 2.3.3, and 2.3.4 best meet the purpose and need discussed in Section 1.4.

2.5 Best Management Practices Included in the Proposed Action

This section presents an overview of the best management practices (BMPs) that would be incorporated into the Proposed Action. BMPs are existing policies, practices, and measures that the Navy would adopt to reduce the environmental impacts of designated activities, functions, or processes. Although BMPs mitigate potential impacts by avoiding, minimizing, or reducing/eliminating impacts, they are distinguished from potential mitigation measures because BMPs are (1) existing requirements for the Proposed Action; (2) ongoing, regularly occurring practices; or (3) not unique to this Proposed Action. In other words, the BMPs identified in this document are inherently part of the Proposed Action and are not potential mitigation measures proposed as a function of the NEPA environmental review process for the Proposed Action. Table 2-4 includes a list of BMPs. Mitigation measures, if applicable, will be discussed separately in Chapter 3.

Table 2-4 Best Management Practices

Best Management Practice	***Description***	***Impacts Reduced/Avoided***
Fugitive dust practices	Examples of measures could include wetting soil, covering soil stockpiles, and ceasing operations during high winds.	Control fugitive dust emissions.
Construction equipment	Good housekeeping measures for construction equipment (i.e., petroleum, oil, and/or lubricants) for optimal performance.	Prevent leeching of contaminants into groundwater and surface water.
Erosion and sediment control	Would depend on site conditions and design. Could include silt fences, silt or turbidity curtains, inlet and outlet protection, erosion-control matting, sediment logs, construction entrances, temporary and permanent seeding, mulching, check dams.	Minimize sediment transport into surface water.
In-water noise reduction during construction	Project timing, pile placement, and equipment used.	Minimize exposure of fish to sound generated during pile driving.

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3 Affected Environment and Environmental Consequences

This chapter presents a description of the environmental resources and baseline conditions that could be affected from implementing any of the alternatives and an analysis of the potential direct and indirect effects of each alternative.

All potentially relevant environmental resource areas were initially considered for analysis in this Environmental Assessment (EA). In compliance with the National Environmental Policy Act (NEPA), the Council on Environmental Quality (CEQ), and Department of Navy guidelines, the discussion of the affected environment (i.e., existing conditions) focuses only on those resource areas potentially subject to impacts. Additionally, the level of detail used in describing a resource is commensurate with the anticipated level of potential environmental impact.

"Significantly," as used in NEPA, requires considerations of both context and intensity. Context means that the significance of an action must be analyzed in several contexts such as society as a whole (e.g., human, national), the affected region, the affected interests, and the locality. Significance varies with the setting of a proposed action. For instance, in the case of a site-specific action, significance would usually depend on the effects in the locale rather than in the world as a whole. Both short- and long-term effects are relevant. Intensity refers to the severity or extent of the potential environmental impact, which can be thought of in terms of the potential amount of the likely change. In general, the more sensitive the context, the less intense a potential impact needs to be in order to be considered significant. Likewise, the less sensitive the context, the more intense a potential impact would be expected to be significant.

This chapter includes air quality, water resources, geological resources, cultural resources, biological resources, visual resources, noise, transportation, and hazardous materials and wastes.

The potential impacts on the following resource areas are considered to be negligible or nonexistent, so they were not analyzed in detail in this EA.

Land Use: The Proposed Action would repair and restore deteriorating seawalls that are vulnerable to storm surge, sea level rise, and land subsidence; thus, the repair and restoration would contribute to long-term sustainment of installation lands and associated land uses. Erosion and flood risk to operations, support, and open space would be reduced from these efforts, and there would be no changes to existing land use on Naval Support Activity (NSA) Annapolis. Therefore, land use is not analyzed in detail.

Airspace: The Proposed Action would not interfere with airspace use at any point during or after construction. Therefore, airspace is not analyzed in detail.

Infrastructure: The Proposed Action would repair and restore shoreline infrastructure components to ensure continuation of the mission now and into the foreseeable future at NSA Annapolis. Some shoreline segments contain various lighting, electrical conduit, potable water, stormwater, or communications components, with some of those components exhibiting defects, as identified in the waterfront facilities assessment report (NAVFAC, 2017). Utility components that are defective or attached to shoreline structures would be replaced during construction. A 13.8-kilovolt armored submarine cable that has migrated from its original position in the vicinity of Reach 9 would also need to be pulled outboard during seawall construction, then reanchored following construction (Jones, 2019; Zurzolo, 2019). Only the portion of cable necessary to conduct work on the seawalls would be relocated. Cables may need to be relocated along other portions of the seawall as well, if they have migrated along other reaches. The extent of cable migration in other areas is unknown and would be determined during the design phase for each reach.

Other than replacement in-kind, or measures to avoid impacts such as for the submarine cable at Reach 9, the Proposed Action does not involve any long-term upgrades to, increased use of, or increased demand on utility systems. Construction activities could have localized, short-term effects associated with construction or utility interconnection, but any long-term effects on utilities would be associated with improved system reliability and considered beneficial. Therefore, infrastructure is not analyzed in detail.

Public Health and Safety: Construction and operational activities associated with the Proposed Action would be conducted in accordance with applicable federal, state, and local regulations. No long-term impacts on police, fire, or emergency response would be expected.

Children reside in military family housing neighborhoods on and surrounding NSA Annapolis, and there are more than a dozen schools for children within approximately one mile of the shoreline reaches considered in this Proposed Action. However, construction sites would be marked, and children would not be expected within active construction areas. Secondary effects, such as air quality or noise, are discussed in those resource sections. No disproportionate impacts on children are expected.

Therefore, no impacts would be expected; public health and safety are not analyzed in detail.

Socioeconomics: Direct, beneficial effects on the local economy would be expected from the generation of short-term construction jobs, as well as indirect, beneficial effects on the economy from the increase in jobs and income in the area. These effects would be negligible given the size of the regional economy and workforce and would not result in noticeable changes in the population, employment characteristics, schools, or housing occupancy status in the region. No long-term socioeconomic impacts would be felt. Therefore, socioeconomic resources are not analyzed in detail.

Environmental Justice: Anne Arundel County is in the 43rd (state) and 23rd (national) percentiles for low-income populations and 38th (state) and 50th (national) for minority populations (USEPA, 2018). These levels do not meet the U.S. Environmental Protection Agency's (USEPA) recommended threshold of the 80th percentile for further assessing at-risk populations for environmental justice concerns (USEPA, 2016). The Proposed Action would not disproportionately affect minorities or economically disadvantaged populations protected under Executive Order (EO) 12898, *Environmental Justice for Low-Income and Minority Populations*. Therefore, environmental justice is not analyzed in detail.

3.1 Air Quality

This discussion of air quality includes criteria pollutants, standards, sources, permitting, and greenhouse gases (GHGs). Air quality in a given location is defined by the concentration of various pollutants in the atmosphere. A region's air quality is influenced by many factors, including the type and amount of pollutants emitted into the atmosphere, the size and topography of the air basin, and the prevailing meteorological conditions.

Most air pollutants originate from human-made sources, including mobile sources (e.g., cars, trucks, buses), stationary sources (e.g., factories, refineries, power plants), and indoor sources (e.g., some building materials and cleaning solvents). Air pollutants can also be released from natural sources such as volcanic eruptions and forest fires.

3.1.1 Regulatory Setting

3.1.1.1 Criteria Pollutants and National Ambient Air Quality Standards

The principal pollutants defining the air quality, called "criteria pollutants," include carbon monoxide, sulfur dioxide, nitrogen dioxide, ozone, suspended particulate matter less than or equal to 10 microns in diameter (PM_{10}), fine particulate matter less than or equal to 2.5 microns in diameter ($PM_{2.5}$), and lead. Carbon monoxide, sulfur dioxide, lead, and some particulates are emitted directly into the atmosphere from emissions sources. Ozone, nitrogen dioxide, and some particulates are formed through atmospheric chemical reactions that are influenced by weather, ultraviolet light, and other atmospheric processes.

Under the Clean Air Act, USEPA has established National Ambient Air Quality Standards (NAAQS) (40 Code of Federal Regulations [CFR] part 50) for these pollutants. NAAQS are classified as primary or secondary. Primary standards protect against adverse health effects; secondary standards protect against welfare effects, such as damage to farm crops and vegetation and damage to buildings. Some pollutants have long-term and short-term standards. Short-term standards are designed to protect against acute, or short-term, health effects, while long-term standards were established to protect against chronic health effects.

Areas that are and have historically been in compliance with the NAAQS are designated as attainment areas. Areas that violate a federal air quality standard are designated as nonattainment areas. Areas that have transitioned from nonattainment to attainment are designated as maintenance areas and are required to adhere to maintenance plans to ensure continued attainment.

The Clean Air Act requires states to develop a general plan to attain and maintain the NAAQS in all areas of the country and a specific plan to attain the standards for each area designated nonattainment for any NAAQS. These plans, known as State Implementation Plans (SIPs), are developed by state and local air quality management agencies and submitted to USEPA for approval.

In addition to the NAAQS for criteria pollutants, national standards exist for hazardous air pollutants (HAPs), which are regulated under Section 112(b) of the 1990 Clean Air Act Amendments. The National Emission Standards for Hazardous Air Pollutants regulate HAP emissions from stationary sources (40 CFR part 61).

3.1.1.2 General Conformity

The USEPA General Conformity Rule applies to federal actions occurring in nonattainment or maintenance areas when the total direct and indirect emissions of nonattainment pollutants (or their precursors) exceed specified thresholds. The emissions thresholds that trigger requirements for a conformity analysis are called *de minimis* levels. *De minimis* levels vary by pollutant and also depend on the severity of the nonattainment status for the air quality management area in question.

A conformity applicability analysis is the first step of a conformity evaluation and assesses if a federal action must be supported by a conformity determination. This is typically done by quantifying applicable direct and indirect emissions that are projected to result due to implementation of the federal action. Indirect emissions are those emissions caused by the federal action and originating in the region of interest, but which can occur later or in a different location from the action itself and are reasonably foreseeable. The federal agency can control and will maintain control over the indirect action due to a continuing program responsibility of the federal agency. Reasonably foreseeable emissions are projected future direct and indirect emissions that are identified at the time the conformity evaluation is performed. The locations of such emissions are known, and the emissions are quantifiable, as described and documented by the federal agency based on its own information and after reviewing any information presented to the federal agency. If the results of the applicability analysis indicate that the total emissions would not exceed the *de minimis* emissions thresholds, then the conformity evaluation process is completed. The *de minimis* threshold emissions are presented in Table 3-1.

Table 3-1 General Conformity *de minimis* Levels

Pollutant	***Area Type***	***tpy***
Ozone (VOC or NO_x)	Serious nonattainment	50
	Severe nonattainment	25
	Extreme nonattainment	10
	Other areas outside an ozone transport region	100
Ozone (NO_x)	Marginal and moderate nonattainment within an ozone transport region	100
	Maintenance	100
Ozone (VOC)	Marginal and moderate nonattainment within an ozone transport region	50
	Maintenance within an ozone transport region	50
	Maintenance outside an ozone transport region	100
Carbon monoxide, sulfur dioxide, and nitrogen dioxide	All nonattainment and maintenance	100
PM_{10}	Serious nonattainment	70
	Moderate nonattainment and maintenance	100
$PM_{2.5}$ Direct emissions of $PM_{2.5}$, sulfur dioxide, NO_x (unless determined not to be a significant precursor), VOC or ammonia (if determined to be significant precursors)	All nonattainment and maintenance	100
Lead	All nonattainment and maintenance	25

Key: VOC = volatile organic compound; NO_x = nitrogen oxides; PM_{10} = suspended particulate matter less than or equal to 10 microns in diameter; $PM_{2.5}$ = fine particulate matter less than or equal to 2.5 microns in diameter; tpy = tons per year.

3.1.1.3 Permitting

New Source Review (Preconstruction Permit)

New major stationary sources and major modifications at existing major stationary sources are required by the Clean Air Act to obtain an air pollution permit before commencing construction. This permitting process for major stationary sources is called New Source Review and is required whether the major source or major modification is planned for nonattainment areas or attainment and unclassifiable areas. In general, permits for sources in attainment areas and for other pollutants regulated under the major source program are referred to as Prevention of Significant Deterioration (PSD) permits, while permits for major sources emitting nonattainment pollutants and located in nonattainment areas are referred to as nonattainment New Source Review permits. In addition, a proposed project might have to meet the requirements of nonattainment New Source Review for the pollutants for which the area is designated as nonattainment and PSD for the pollutants for which the area is in attainment. Additional PSD permitting thresholds apply to increases in stationary source GHG emissions. PSD permitting can also apply to a new major stationary source (or any net emissions increase associated with a modification to an existing major stationary source) that is constructed within 6.2 miles of a Class I area, and which would increase the 24-hour average concentration of any regulated pollutant in the Class I area by one microgram per cubic meter or more. Navy installations shall comply with applicable permit requirements under the PSD program per 40 CFR 51.166. The construction activities associated with this Proposed Action are temporary and would not affect any Class I PSD areas. Furthermore, no new major sources (greater than 250 tons per year of any pollutant) would be constructed. Therefore, New Source Review and PSD requirements do not apply to this Proposed Action.

Title V (Operating Permit)

The Title V Operating Permit Program consolidates all Clean Air Act requirements applicable to the operation of a source, including requirements from the SIP, preconstruction permits, and the air toxics program. It applies to stationary sources of air pollution that exceed the major stationary source emission thresholds, and other non-major sources specified in a regulation. The program includes a requirement for payment of permit fees to finance the operating permit program whether implemented by USEPA or a state or local regulator. Navy installations subject to Title V permitting shall comply with the requirements of the Title V Operating Permit Program, which are detailed in 40 CFR part 70 and all specific requirements contained in their individual permits.

3.1.1.4 Greenhouse Gases

GHGs are gas emissions that trap heat in the atmosphere. These emissions occur from natural processes and human activities. Scientific evidence indicates a trend of increasing global temperature over the past century due to an increase in GHG emissions from human activities. The climate change associated with this global warming is predicted to produce negative economic and social consequences across the globe.

USEPA issued the Final Mandatory Reporting of Greenhouse Gases Rule on September 22, 2009. GHGs covered under the Final Mandatory Reporting of Greenhouse Gases Rule are carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, sulfur hexafluoride, and other fluorinated gases including nitrogen trifluoride and hydrofluorinated ethers. Each GHG is assigned a global warming potential. The global warming potential is the ability of a gas or aerosol to trap heat in the atmosphere. The global warming potential rating system is standardized to carbon dioxide, which has a value of one. The carbon dioxide equivalent (CO_2e) rate is calculated by multiplying the emissions of each GHG by its global warming potential and adding the results together to produce a single, combined emissions rate representing all GHGs. Under the rule, suppliers of fossil fuels or industrial GHGs, manufacturers of mobile sources and engines, and facilities that emit 25,000 metric tons or more per year of GHG emissions as CO_2e are required to submit annual reports to USEPA.

GHG emissions are also regulated under PSD and Title V permitting programs, which was initiated by a USEPA rulemaking issued on June 3, 2010, known as the GHG Tailoring Rule (75 *Federal Register* 31,514). GHG emissions thresholds for permitting of stationary sources are an increase of 75,000 tons per year of CO_2e at existing major sources and facility-wide emissions of 100,000 tons per year of CO_2e for a new source or a modification of an existing minor source. The 100,000 tons per year of CO_2e threshold defines a major GHG source for both construction (PSD) and operating (Title V) permitting, respectively. However, on June 23, 2014, the U.S. Supreme Court issued its decision in *Utility Air Regulatory Group v. USEPA* (No. 12-1146). As a result of the decision, USEPA will no longer apply or enforce federal regulatory provisions or the USEPA-approved PSD SIP provisions that require a stationary source to obtain a PSD permit if GHGs are the only pollutant that the source emits or has the potential to emit above the major source thresholds, or for which there is a significant emissions increase and a significant net emissions increase from a modification (e.g., 40 CFR 52.21 (b)(49)(v)). Nor does USEPA intend to continue applying regulations that would require that states include in their SIP a requirement that such sources obtain PSD permits.

Similarly, USEPA will no longer apply or enforce federal regulatory provisions or provisions of the USEPA approved Title V programs that require a stationary source to obtain a Title V permit solely because the source emits or has the potential to emit GHGs above the major source thresholds (e.g., the regulatory provision relating to GHG subject to regulation in 40 CFR 71.2). USEPA also does not intend to continue applying regulations that would require Title V programs submitted for approval by USEPA to require that such sources obtain Title V permits.

3.1.2 Affected Environment

NSA Annapolis is in Anne Arundel County, which is within the Metropolitan Baltimore Intrastate Air Quality Control Region (40 CFR 81.28). The Maryland Department of the Environment (MDE) is responsible for implementing and enforcing state and federal air quality regulations in Maryland. Anne Arundel County is designated as a nonattainment area for eight-hour ozone, with a classification of moderate for the 2008 standard and marginal for the 2015 standard (USEPA, 2019). A portion of the county, which includes NSA Annapolis, is also in nonattainment for sulfur dioxide under the 2010 standard. Anne Arundel County was formerly classified as a maintenance area for the 1997 $PM_{2.5}$ standard, but this standard was revoked in 2016. This installation is also within the Ozone Transport Region. The Ozone Transport Region was established by the 1990 Clean Air Act Amendments and includes Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, the District of Columbia, and portions of the Northern Virginia suburbs. Because the county is in nonattainment for ozone and sulfur dioxide, a General Conformity evaluation is required.

The most recent emissions inventory for Anne Arundel County is shown in Table 3-2. Volatile organic compound and nitrogen oxide emissions are used to represent ozone generation because they are precursors of ozone.

The U.S. Naval Academy (USNA) operates under Title V permit no. 24-003-00310 that includes a central heating plant, portable boilers, water heaters, a spray paint booth, and emergency generators (MDE, 2014). North Severn is not included in the Title V permit. Recent annual criteria pollutant and HAP emissions for USNA are shown in Table 3-3.

USNA quantifies and reports facility-wide GHG emissions annually under the Title V permit requirements, though PSD requirements for GHG emissions have not been triggered for any construction projects to date. Recent GHG emissions for USNA are shown in Table 3-4.

CEQ's NEPA regulations require evaluation of the degree to which a proposed action affects public health (40 CFR 1508.27). Children, elderly people, and people with illnesses are especially sensitive to the effects of air pollutants; therefore, hospitals, schools, convalescent facilities, and residential areas are sensitive receptors for air quality impacts. The Naval Clinic on North Severn and the John T. Harrison Health Center at St. John's College, just outside the Lower Yard boundary, are medical facilities within one mile of the project reaches. Preschools and schools within one mile of the project reaches include

Table 3-2 Anne Arundel County Air Emissions Inventory (2011)

Location	*NO_x (tpy)*	*VOC (tpy)*	*CO (tpy)*	*SO_2 (tpy)*	*PM_{10} (tpy)*	*$PM_{2.5}$ (tpy)*
Anne Arundel County	16,008	10,652	66,357	13,696	5,477	1,895
Metropolitan Baltimore Intrastate Air Quality Control Region	59,761	45,570	278,054	18,164	40,537	10,332

Source: USEPA, 2014.
Note: The Metropolitan Baltimore Intrastate Air Quality Control Region includes Anne Arundel, Baltimore, Carroll, Harford, and Howard Counties and Baltimore City.
Key: NO_x = nitrogen oxides; VOC = volatile organic compound; CO = carbon monoxide; SO_2 = sulfur dioxide; PM_{10} = suspended particulate matter less than or equal to 10 microns in diameter; $PM_{2.5}$ = fine particulate matter less than or equal to 2.5 microns in diameter; tpy = tons per year.

Table 3-3 U.S. Naval Academy Air Emissions Inventory

Year	*NO_x (tpy)*	*VOC (tpy)*	*CO (tpy)*	*SO_2 (tpy)*	*PM_{10} (tpy)*	*Total HAP (tpy)*
2008	16.7	1.1	11.6	1.9	0.20	NR
2009	17.6	1.1	14.6	1.7	0.03	NR
2010	13.3	0.8	12.3	0.6	0.07	NR
2011	12.4	0.8	11.6	1.4	0.01	0.0099
2012	9.5	0.7	10.3	0.6	0.29	0.0084
2017	13.7	0.8	16.3	0.1	0.30	0.0450
Total Potential to Emit	219	8.48	112	446	25.3	2.58

Sources: MDE, 2014; USNA, 2018.
Key: NO_x = nitrogen oxides; VOC = volatile organic compound; CO = carbon monoxide; SO_2 = sulfur dioxide; PM_{10} = suspended particulate matter less than or equal to 10 microns in diameter; HAP = hazardous air pollutants; tpy = tons per year; NR = not reported.

Table 3-4 U.S. Naval Academy Greenhouse Gas Emissions Summaries

Year	*CO_2e from CO_2 (tpy)*	*CO_2e from CH_4 (tpy)*	*CO_2e from N_2O (tpy)*	*Total CO_2e (tpy)*
2012	NR	NR	NR	**15,286**
2017	14,959	0.61	0.27	**15,055**
Total Potential to Emit	237,779	3.18	3.31	**238,845**

Sources: MDE, 2014; USNA, 2018.
Note: Conversion factors for CO_2e are different for each greenhouse gas. CO_2 = 1, CH_4 = 25, and N_2O = 298.
Key: CO_2e = carbon dioxide equivalents; CO_2 = carbon dioxide; CO_4 = methane; N_2O = nitrous oxide; tpy = tons per year; NR = not reported.

Naval Academy Primary School; Annapolis Elementary School; St. Mary's Elementary, Middle, and High Schools; Adams Park Elementary School; Calvary Center School; Book of Life Academy; Eastport Elementary School; West Annapolis Elementary School; and The Learning Community. Furthermore, Bates Middle School, Sunny Acre Private School, Wiley Bates Middle School, Germantown Elementary School, Phoenix Academy, and Weems Creek Nursery School and Kindergarten are just outside the one-mile-radius from the project reaches. Family housing areas on NSA Annapolis and other residences outside of NSA Annapolis are also within one mile of the project reaches.

Air Quality Potential Impacts:

- No Action: Continuation of ozone and sulfur dioxide nonattainment in the short- to mid-term. Minor increases in air emissions from regional growth possible. No significant impact.
- Alternative 1: Short-term, minor air emissions from construction equipment, waste removal, and material delivery. No significant impact.
- Alternative 2: Similar to Alternative 1, but lower emissions due to fewer estimated materials. No significant impact.
- Alternative 3: Similar to Alternatives 1 and 2, but lower emissions due to fewer estimated materials. No significant impact.

3.1.3 Environmental Consequences

Effects on air quality are based on estimated direct and indirect emissions associated with the action alternatives. The study area for assessing air quality impacts is the air basin in which the project is located, the Metropolitan Baltimore Intrastate Air Quality Control Region.

Estimated emissions from a proposed federal action are typically compared with relevant national and state standards to assess the potential for increases in pollutant concentrations.

3.1.3.1 No Action Alternative

Anne Arundel County is a developed, urban area. Air quality in Anne Arundel County and the Metropolitan Baltimore Intrastate Air Quality Control Region would continue to be affected by local and regional urban influences, such as mobile emissions from vehicles, area sources (e.g., drycleaners and consumer products), and stationary sources (e.g., power plants), as well as sources outside the Metropolitan Baltimore Intrastate Air Quality Control Region as evidenced by Maryland's designation as an Ozone Transport Region. Regional population is expected to increase gradually in the long term, an estimated 6 percent increase from 2015 to 2035 in Anne Arundel County (Anne Arundel County, 2009). Air quality is expected to continue to be adversely affected by these sources, with some increases possible from the additional population, though continued enforcement of criteria pollutant limits and control measures established in Maryland's SIPs would continue to be enacted with the long-term goal of achieving attainment with the NAAQS.

Under the No Action Alternative, the Proposed Action would not occur. The Navy would continue to maintain portions of existing shoreline structures by accomplishing minor, as-needed repairs, which could have localized, intermittent, negligible air emissions from operation of small, hand-held equipment while these activities occur. Conducting maintenance as needed on small portions of seawall structures is the status quo and would have no noticeable effects on air quality. Therefore, no significant impacts on air quality or air resources would occur under the No Action Alternative.

3.1.3.2 Alternative 1 Potential Impacts

Alternative 1 would result in short-term, minor air emissions during demolition and construction of hardened shoreline structures and associated work (e.g., infrastructure repairs) along the project reaches. Once construction is complete, long-term emissions may be generated from routine maintenance and repair of seawall components from hand-held equipment. As these kinds of emissions would be similar to what is already occurring for minor maintenance and repairs of the existing seawall, these emissions are assumed to be negligible and were not estimated. Estimated air emissions are shown in Table 3-5. Appendix B contains more detailed information about project inputs and assumptions used in estimating air emissions.

Table 3-5 Alternative 1 Estimated Emissions Compared to *de minimis* Thresholds

Activity	*NO_x (tpy)*	*VOC (tpy)*	*CO (tpy)*	*SO_2 (tpy)*	*PM_{10} (tpy)*	*$PM_{2.5}$ (tpy)*
Total Construction (10 to 20 years)	9.16	0.97	5.39	0.03	1.09	0.52
Applicable *de minimis* Thresholds	100	50	—	100	—	—

Key: NO_x = nitrogen oxides; VOC = volatile organic compound; CO = carbon monoxide; SO_2 = sulfur dioxide; PM_{10} = suspended particulate matter less than or equal to 10 microns in diameter; $PM_{2.5}$ = fine particulate matter less than or equal to 2.5 microns in diameter; tpy = tons per year.
Note: Detailed emissions estimates are in Appendix B.

Short-term air quality impacts would occur from combustion emissions due to the use of fossil-fuel-powered equipment during construction and demolition activities and fugitive dust emissions (i.e., PM_{10} and $PM_{2.5}$) during earth-moving activities on bare soil. Construction activities would involve a mix of construction equipment that would vary as the work progresses. The emissions from the total construction project were estimated, based on averages of criteria pollutants emitted from a variety of construction equipment over time. Emissions would include those emitted directly from the construction site, including backhoes, forklifts, impact hammers, pile drivers, saws, diesel generators, and cranes; and those emitted indirectly from diesel-powered heavy delivery trucks or tug boats pulling material barges and gasoline-powered passenger trucks from construction workers that would travel to and from the site from outside NSA Annapolis.

The Navy anticipates that a mix of onroad trucks and barges would be used to remove deteriorated seawall components and other construction waste and to deliver construction materials to the reaches that are under construction. However, because this project is in the early planning stages, the Navy does not know what this ratio of truck-to-barge traffic would be. Furthermore, the Navy has only preliminary notions about the kind of work that may be required for each reach, including what kind and how much of the components would be removed and replaced, and the amount of additional materials needed to increase the height of the seawall along individual reaches. Therefore, the air analysis puts forth the maximum impact that could occur for the purposes of estimating air emissions, which assumes that all bulkhead and seawall reaches would be 100 percent demolished and replaced essentially in-kind, and riprap reaches would need a 10 percent replacement of stones to achieve appropriate placement and distribution. Alternative 1 would include concrete seawalls (and other types of hardened structures) to provide the increased design height. Because the mix of trucks and barges is unknown, this analysis assumes that onroad trucks would transport 100 percent of the waste from and materials to the site. Actual emissions would be expected to be much lower than those presented in Table 3-5 as barges can carry 1,450 to 1,500 tons of cargo per load, and a truck can carry approximately 25 tons of cargo. Therefore, the use of barges for the delivery of materials would reduce air emissions because fewer trips would be needed over the ten- to twenty-year construction period for the Proposed Action. Even assuming heavy trucks would transport all materials, construction-related emissions from operating equipment would be minor.

Fugitive dust emissions would also occur during construction activities. Fugitive dust occurs directly from vehicles disturbing and suspending particulate matter while operating on unpaved surfaces, or from soil stockpiles on an active construction site; it also occurs indirectly from dust and dirt being brought onto paved surfaces from nonroad construction operations, and then disturbed and suspended as vehicles drive over it. Site preparation and grading activities generally have the greatest potential to generate fugitive dust because excavation, clearing, grading, digging, earthwork, and temporary soil stockpiling are at the highest levels. Measures would be implemented to control fugitive dust emissions, such as wetting dry soil or using chemical additives to minimize wind erosion, stabilizing/covering soil stockpiles, and stabilizing/planting disturbed areas that are not being actively worked. Much of the work associated with this project would be in-water and generate minimal fugitive dust.

Construction activities would increase the concentration of criteria pollutants in the environment immediately surrounding the area of construction. Ambient air quality is generally marginal in and around NSA Annapolis, as evidenced by its status as an ozone and sulfur dioxide nonattainment area. The estimated emissions from Alternative 1 would not be expected to noticeably diminish air quality or affect sensitive receptors, such as nearby medical facilities, schools, and residences, because emissions would be well below *de minimis* thresholds and only be produced during active construction activities. Projected emissions from Alternative 1 would represent minor regional increases within Anne Arundel County and the Metropolitan Baltimore Intrastate Air Quality Control Region (refer to Table 3-2) and would not violate any NAAQS.

General Conformity

A Record of Non-Applicability (RONA) was prepared and is included in Appendix B. As demonstrated in the Air Conformity Applicability Analysis, also in Appendix B, air emissions would be well below *de minimis* thresholds. Therefore, a full conformity determination is not required.

Greenhouse Gases

Implementation of Alternative 1 would contribute directly to emissions of GHGs from the combustion of fossil fuels. Construction activities, including removing and disposing of existing shoreline components and installing or constructing new segments, would generate approximately 3,074 tons (2,789 metric tons) of CO_2e distributed over ten to twenty years. Once the construction period is over, repaired and restored seawalls would have no long-term emissions, except for the possibility of intermittent, localized, minor maintenance, which would have negligible emissions of CO_2e. These limited emissions would not likely contribute to global warming to any discernible extent.

Implementation of Alternative 1 would not result in significant impacts on air quality.

3.1.3.3 Alternative 2 Potential Impacts

Alternative 2 would result in short-term, minor air emissions during demolition and construction of hardened structures along the project reaches. Once construction is complete, long-term emissions may be generated from routine maintenance and repair of seawall components from hand-held equipment.

As these kinds of emissions would be similar to what is already occurring for minor maintenance and repairs of the existing seawall, these emissions are assumed to be negligible and were not estimated. Alternative 2 estimated air emissions are shown in Table 3-6. Appendix B contains more detailed information about project inputs and assumptions used in estimating air emissions.

Table 3-6 Alternative 2 Estimated Emissions Compared to *de minimis* Thresholds

Activity	*NO_x (tpy)*	*VOC (tpy)*	*CO (tpy)*	*SO_2 (tpy)*	*PM_{10} (tpy)*	*$PM_{2.5}$ (tpy)*
Total Construction (10 to 20 years)	7.95	0.86	4.89	0.03	1.03	0.47
Applicable *de minimis* Thresholds	100	50	—	100	—	—

Key: NO_x = nitrogen oxides; VOC = volatile organic compound; CO = carbon monoxide; SO_2 = sulfur dioxide; PM_{10} = suspended particulate matter less than or equal to 10 microns in diameter; $PM_{2.5}$ = fine particulate matter less than or equal to 2.5 microns in diameter; tpy = tons per year.
Note: Detailed emissions estimates are in Appendix B.

Air emissions would be comparable to those described under Alternative 1. However, the seawall heights would be lower under Alternative 2, which would reduce the weight and volume of construction materials needed to construct seawall along all 15 project reaches over ten to twenty years. The lower emissions for Alternative 2 in Table 3-6, compared with Alternative 1, reflect reduced transportation emissions for raw construction materials. Other demolition and construction, such as the equipment needed to remove old shoreline structures and install new ones and the generation of fugitive dust emissions from land-based construction would be essentially the same as described for Alternative 1.

Implementation of Alternative 2 would generate approximately 2,673 tons (2,425 metric tons) of CO_2e distributed over ten to twenty years. Similar to Alternative 1, these limited GHG emissions would not likely contribute to global warming to any discernible extent.

Implementation of Alternative 2 would not result in significant impacts on air quality.

3.1.3.4 Alternative 3 Potential Impacts

Alternative 3 would result in short-term, minor air emissions during demolition and construction of hardened structures along the project reaches. Once construction is complete, long-term emissions may be generated from routine maintenance and repair of seawall components from hand-held equipment. As these kinds of emissions would be similar to what is already occurring for minor maintenance and repairs of the existing seawall, these emissions are assumed to be negligible and were not estimated. Alternative 3 estimated air emissions are shown in Table 3-7. Appendix B contains more detailed information about project inputs and assumptions used in estimating air emissions.

Air emissions would be comparable to those described under Alternatives 1 and 2. However, shoreline structures would be constructed to existing heights under Alternative 3, which would reduce the weight and volume of construction materials needed to restore and repair shoreline structures along all 15 project reaches over ten to twenty years. The lower emissions for Alternative 3 in Table 3-7, compared with Alternatives 1 and 2, reflect reduced transportation emissions for raw construction materials. Other demolition and construction, such as the equipment needed to remove old shoreline structures and install new ones and the generation of fugitive dust emissions from land-based construction would be essentially the same as described for Alternatives 1 and 2.

Table 3-7 Alternative 3 Estimated Emissions Compared to *de minimis* Thresholds

Activity	*NO_x (tpy)*	*VOC (tpy)*	*CO (tpy)*	*SO_2 (tpy)*	*PM_{10} (tpy)*	*$PM_{2.5}$ (tpy)*
Total Construction (10 to 20 years)	5.39	0.64	3.82	0.02	0.91	0.37
Applicable *de minimis* Thresholds	100	50	—	100	—	—

Key: NO_x = nitrogen oxides; VOC = volatile organic compound; CO = carbon monoxide; SO_2 = sulfur dioxide; PM_{10} = suspended particulate matter less than or equal to 10 microns in diameter; $PM_{2.5}$ = fine particulate matter less than or equal to 2.5 microns in diameter; tpy = tons per year.
Note: Detailed emissions estimates are in Appendix B.

Implementation of Alternative 3 would generate approximately 1,825 tons (1,656 metric tons) of CO_2e distributed over ten to twenty years. Similar to Alternatives 1 and 2, these limited GHG emissions would not likely contribute to global warming to any discernible extent.

Implementation of Alternative 3 would not result in significant impacts on air quality.

3.2 Water Resources

This discussion of water resources includes groundwater, surface water, wetlands, floodplains, and shorelines. This section also discusses the physical characteristics of water and wetlands; wildlife and vegetation are addressed in Section 3.5, Biological Resources. Bathymetry is discussed in Section 3.3, Geological Resources.

Groundwater is water that flows or seeps downward and saturates soil or rock, supplying springs and wells. Groundwater is used for water consumption, agricultural irrigation, and industrial applications. Groundwater properties are often described in terms of depth to aquifer, aquifer or well capacity, water quality, and surrounding geologic composition. Sole source aquifer designation provides limited protection of groundwater resources that serve as drinking water supplies.

Surface water resources generally consist of wetlands, lakes, rivers, and streams. Surface water is important for its contributions to the economic, ecological, recreational, and human health of a community or locale. A Total Maximum Daily Load (TMDL) is the maximum amount of a substance that can be assimilated by a water body without causing impairment. A water body can be deemed impaired if water quality analyses conclude that exceedances of water quality standards occur.

Wetlands are jointly defined by USEPA and the U.S. Army Corps of Engineers (USACE) 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.”

Floodplains are areas of low-level ground present along rivers, stream channels, large wetlands, or coastal waters. Floodplain ecosystem functions include natural moderation of floods, flood storage and conveyance, groundwater recharge, and nutrient cycling. Floodplains also help to maintain water quality and are often home to a diverse array of plants and animals. In their natural vegetated state, floodplains slow the rate at which the incoming overland flow reaches the main water body. Floodplain boundaries are most often defined in terms of frequency of inundation, that is, the 100-year and 500-year flood.

Floodplain delineation maps are produced by the Federal Emergency Management Agency and provide a basis for comparing the locale of a proposed action to floodplains.

Shorelines can be located along marine (oceans), brackish (estuaries), or fresh (lakes) bodies of water. Physical dynamics of shorelines include tidal influences, channel movement and hydrological systems, flooding or storm surge areas, erosion and sedimentation, water quality and temperature, presence of nutrients and pathogens, and sites with potential for protection or restoration. Shoreline ecosystems are vital habitat for multiple life stages of many fish, birds, reptiles, amphibians, and invertebrates. Different shore zones provide different kinds and levels of habitat, and when aggregated, can significantly influence life. Organic matter that is washed onto the shore, or “wrack,” is an important component of shoreline ecosystems, providing habitat for invertebrates, soil and organic matter, and nutrients to both the upland terrestrial communities and aquatic ecosystems.

3.2.1 Regulatory Setting

The Safe Drinking Water Act is the federal law that protects public drinking water supplies throughout the nation. Under the Safe Drinking Water Act, the USEPA sets standards for drinking water quality. Groundwater quality and quantity are regulated under several statutes and regulations, including the Safe Drinking Water Act.

EO 13508, *Chesapeake Bay Protection and Restoration*, was signed on May 12, 2009, to renew efforts by the federal government to restore and protect the Chesapeake Bay watershed. In addition, the Chesapeake Bay Watershed Agreement was signed on June 16, 2014, which sets goals for a partnership of states (Delaware, District of Columbia, Maryland, Pennsylvania, New York, Virginia, and West Virginia) in ten areas: sustainable fisheries, vital habitats, water quality, toxic contaminants, healthy watersheds, stewardship, land conservation, public access, environmental literacy, and climate resiliency.

The Clean Water Act establishes federal limits, through the National Pollutant Discharge Elimination System (NPDES) program, on the amounts of specific pollutants that can be discharged into surface waters to restore and maintain the chemical, physical, and biological integrity of the water. The NPDES program regulates the discharge of point (i.e., end of pipe) and nonpoint sources (i.e., stormwater) of water pollution. Within Maryland, MDE is the administrative authority for water quality under the Clean Water Act.

The Maryland NPDES stormwater program requires construction site operators engaged in clearing, grading, and excavating activities that disturb one acre or more to obtain coverage under an NPDES Construction General Permit for stormwater discharges. Construction or demolition that necessitates an individual permit also requires preparation of a Notice of Intent to discharge stormwater and a Stormwater Pollution Prevention Plan that is implemented during construction. As part of the 2014 Final Rule for the Clean Water Act, titled *Effluent Limitations Guidelines and Standards for the Construction and Development Point Source Category*, activities covered by this permit must implement non-numeric erosion and sediment controls and pollution prevention measures.

Wetlands are currently regulated by the USACE under Section 404 of the Clean Water Act as a subset of all “Waters of the United States.” Waters of the United States are defined as (1) traditional navigable waters, (2) wetlands adjacent to navigable waters, (3) non-navigable tributaries of traditional navigable waters that are relatively permanent where the tributaries typically flow perennially or have continuous flow at least seasonally (e.g., typically 3 months), and (4) wetlands that directly abut such tributaries under Section 404 of the Clean Water Act, as amended, and are regulated by USEPA and USACE. The

Clean Water Act requires that Maryland establish a Section 303(d) list to identify impaired waters and establish TMDLs for the sources causing the impairment.

Section 404 of the Clean Water Act authorizes the Secretary of the Army, acting through the Chief of Engineers, to issue permits for the discharge of dredge or fill into wetlands and other Waters of the United States. Any discharge of dredge or fill into Waters of the United States requires a permit from the USACE.

Freshwater wetlands in Maryland are protected by the Nontidal Wetlands Protection Program, which sets a state goal of no overall net-loss of nontidal wetlands acreage and functions. Activities in nontidal wetlands require a nontidal wetland permit or a letter of exemption, unless the activity is exempt by regulation. Any activity that involves excavating, filling, changing drainage patterns, disturbing the water level or water table, grading, and removing vegetation in a nontidal wetland or within a 25-foot buffer, requires a permit.

Section 438 of the Energy Independence and Security Act establishes stormwater design requirements for development and redevelopment projects. Under these requirements, federal facility projects larger than 5,000 square feet must “maintain or restore, to the maximum extent technically feasible, the predevelopment hydrology of the property regarding the temperature, rate, volume, and duration of flow.”

Section 10 of the Rivers and Harbors Act provides for USACE permit requirements for any in-water construction. USACE and some states require a permit for any in-water construction. Permits are required for construction of piers, wharfs, bulkheads, pilings, marinas, docks, ramps, floats, moorings, and like structures; construction of wires and cables over the water, and pipes, cables, or tunnels under the water; dredging and excavation; any obstruction or alteration of navigable waters; depositing fill and dredged material; filling of wetlands adjacent or contiguous to waters of the United States; construction of riprap, revetments, groins, breakwaters, and levees; and transportation of dredged material for dumping into ocean waters.

Congress enacted the National Wild and Scenic Rivers System in 1968 to preserve certain rivers with outstanding natural, cultural, and recreational values in a free-flowing condition for the enjoyment of present and future generations. The Wild and Scenic Rivers Act is notable for safeguarding the distinctive character of these rivers, while also recognizing the potential for their appropriate use and development. It encourages river management that crosses political boundaries and promotes public participation in developing goals for river protection.

EO 11990, *Protection of Wetlands,* requires that federal agencies adopt a policy to avoid, to the extent possible, long- and short-term adverse impacts associated with destruction and modification of wetlands and to avoid the direct and indirect support of new construction in wetlands whenever there is a practicable alternative.

EO 11988, *Floodplain Management*, requires federal agencies to avoid to the extent possible the long- and short-term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct and indirect support of floodplain development unless it is the only practicable alternative. Flood potential of a site is usually determined by the 100-year floodplain, which is defined as the area that has a one percent chance of inundation by a flood event in a given year.

Through the Coastal Zone Management Act of 1972, Congress established a national policy to preserve, protect, develop, restore, or enhance resources in the coastal zone. The Coastal Zone Management Act encourages coastal states to properly manage use of their coasts and coastal resources, prepare and implement coastal management programs, and provide for public and governmental participation in decisions affecting the coastal zone. To this end, the Coastal Zone Management Act imparts an obligation upon federal agencies whose actions or activities affect any land, water use, or natural resource of the coastal zone to be carried out in a manner consistent to the maximum extent practicable with the enforceable policies of federally approved state coastal management programs. As a federal agency, the Navy is required to determine whether its proposed activities would affect the coastal zone. This takes the form of a consistency determination, a negative determination, or a determination that no further action is necessary. The project reaches are adjacent to Maryland's coastal zone; therefore, a Coastal Consistency Determination will be submitted to MDE (refer to Appendix A).

3.2.2 Affected Environment

The following discussions provide a description of the existing conditions for each of the categories under water quality resources at NSA Annapolis.

3.2.2.1 Groundwater

Drinking water for the USNA is provided from the Patapsco Aquifer, which is approximately 600 to 700 feet below the ground surface, by three groundwater wells located in the Upper and Lower Yards (NSA Annapolis, 2012). Drinking water for North Severn has been provided by Anne Arundel County since 1999, when the former David Taylor Research Center's water treatment plant was closed (NAVFAC Washington, 2015). The County obtains its water from the Patapsco and Patuxent Aquifers. The Patapsco Aquifer continues to experience additional demand as saltwater intrusion concerns for more shallow aquifers has encouraged increased use of this deeper aquifer (U.S. Geological Survey, 2012). The Patuxent Aquifer, which is deeper than the Patapsco Aquifer, similarly has experienced increased pressures, resulting in water level decline. The NSA Annapolis Environmental Department monitors groundwater to ensure that surface activities do not affect water quality. A draft wellhead protection plan is under development and will be implemented once finalized.

3.2.2.2 Surface Water

The Chesapeake Bay and Severn River are the major surface water features in the vicinity of NSA Annapolis. The USNA and North Severn are within the Severn River watershed, which has a drainage area of 70 square miles (USNA, 2001). The Severn River watershed is within the Chesapeake Bay watershed, which comprises all tributaries, backwaters, and side channels and their watersheds that drain into the Chesapeake Bay in Delaware, Maryland, New York, Pennsylvania, Virginia, West Virginia, and the District of Columbia. The Severn River watershed contains the following subbasins near the project area: Carr Creek, College Creek, Mill Creek, Severn River, Shady Lake, and Spa Creek. This portion of the Severn River is at its confluence with the Chesapeake Bay, so tidally interconnected surface waters are brackish in salinity.

The 12.5-mile long Severn River is a tidal tributary of the Chesapeake Bay. It was declared a Scenic River by the General Assembly of Maryland in 1971. Maryland water quality standards specify that all surface waters of the State shall be protected for water contact recreation, fishing, and protection of aquatic life and wildlife. The designated use of the Severn River is Class II, Support of Estuarine and Marine Aquatic Life and Shellfish Harvesting. The MDE has identified the waters of the Severn River as impaired by the nutrients nitrogen and phosphorus (1996), sediments (1996), fecal coliform in tidal portions of the basin (1996), and polychlorinated biphenyls (PCBs) in fish tissue (2006) (MDE, 2019). MDE classifies the tidal areas of the Severn River for nursery use from February 1 to May 31, shallow water submerged aquatic vegetation use from April 1 to October 30 to a depth of one meter, and open water fish and shellfish use year-round (COMAR, 2014).

3.2.2.3 Wetlands

An estimated 56 acres of wetlands are found at NSA Annapolis within the installation boundary. At the USNA, the National Wetlands Inventory conducted by the Department of the Interior identified approximately two acres of estuarine emergent and scrub-shrub wetlands adjacent to Shady Lake (see Figure 3-1). The Shady Lake site is composed of a shallow tidal lagoon connected to the Severn River by a narrow tidal connection. Approximately 54 acres of wetlands are found at North Severn (see Figure 3-2). Figures 3-1 and 3-2 show the wetlands that are within the installation boundary only. Wetlands shown in Figure 3-2 consist of estuarine intertidal emergent persistent and palustrine forested needle-leaved evergreen, seasonally tidal (NAVFAC Washington, 2011). A non-tidal wetland delineation was conducted on approximately 230 acres at Greenbury Point in 2002, and a delineation was performed for a small area of wetlands (0.85 acre) at the head of Carr Creek. No jurisdictional determinations have been made for these delineations by the USACE. None of these wetlands are near the project reaches considered in this EA.

Outside of the installation boundary, the National Wetlands Inventory has defined the surface waters adjacent to the installation (i.e., Carr Creek, College Creek, Mill Creek, Spa Creek, and the Severn River) as estuarine and marine deepwater systems. The estuarine system consists of deepwater tidal habitats and adjacent tidal wetlands that are usually semi-enclosed by land but have open, partly obstructed, or sporadic access to the open ocean, and in which ocean water is at least occasionally diluted by freshwater runoff from the land (NWI, 2013).

3.2.2.4 Floodplains

At the USNA, approximately 44.5 acres (13 percent) are within the 100-year floodplain and another 76.59 acres (22 percent) are within the 500-year floodplain (see Figure 3-3), including much of the project area considered in this EA. Although much of the wetlands and low-lying areas at North Severn were filled prior to the 1950s, floodplains are associated with Carr Creek, Mill Creek, and the Chesapeake Bay. Approximately 23.0 acres (3 percent) of North Severn are within the 100-year floodplain and another 16.8 acres (2 percent) are within the 500-year floodplain (see Figure 3-4), including a small portion adjacent to Reach 13. In 2003, Hurricane Isabel caused extensive flooding and damage at NSA Annapolis, demonstrating the need for better planning and flood awareness.

3.2.2.5 Shorelines

The USNA has approximately four miles of shoreline along the Severn River, College Creek, and Spa Creek. North Severn has approximately six miles of shoreline along the Severn River, Carr Creek, and Mill Creek.

3.2.2.6 Coastal Zone Management

The USNA and North Severn are located entirely within Maryland's coastal zone. Activities conducted along shorelines are reasonably likely to affect use of lands, waters, or natural resources of the coastal zone beyond the boundaries of federal property and must be consistent to the maximum extent practicable with the enforceable policies of Maryland's Coastal Zone Management Program in accordance with the federal Coastal Zone Management Act of 1972. Maryland's Coastal Zone

Figure 3-1 Wetlands within the Upper Yard and Lower Yard

Figure 3-2 Wetlands within North Severn

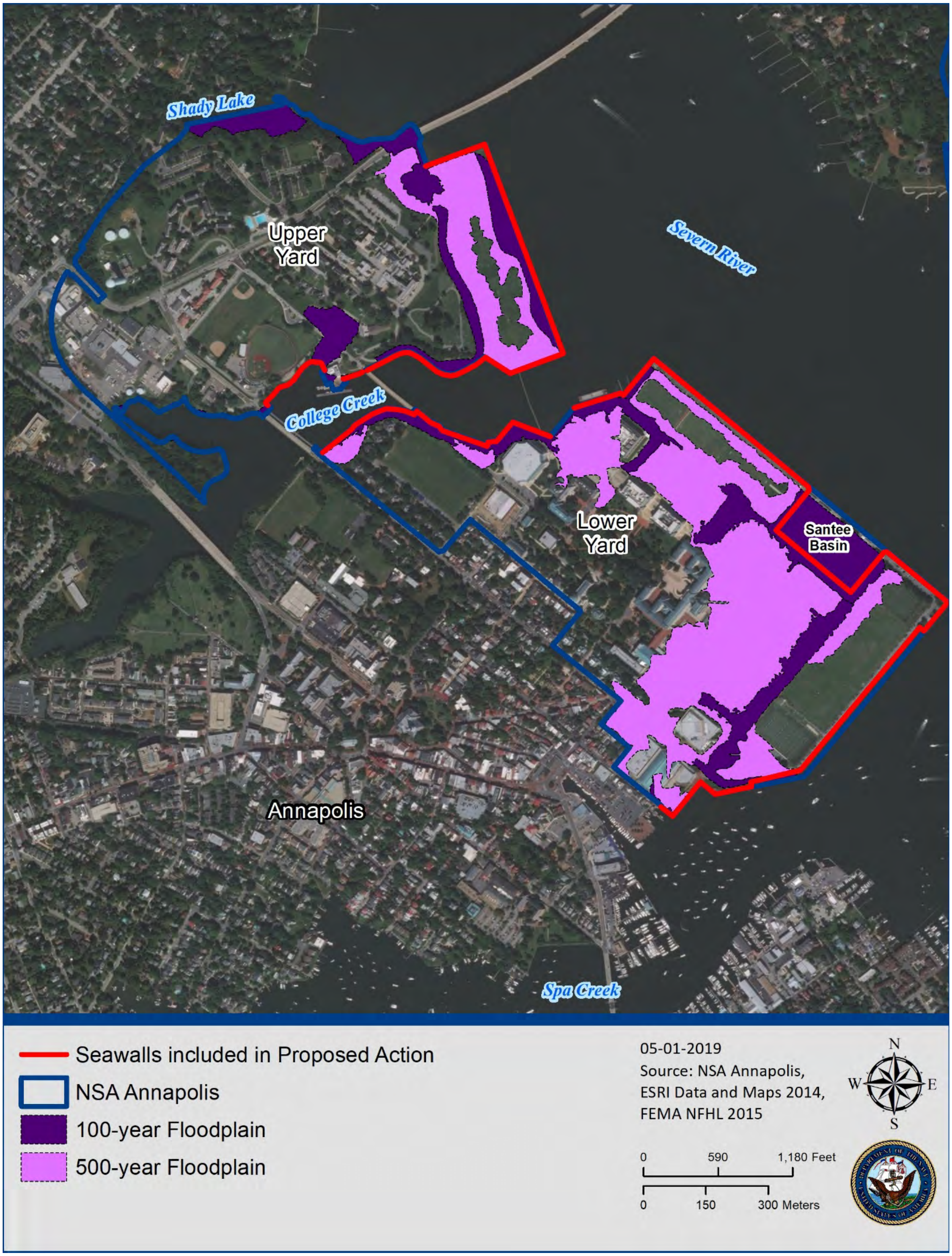


Figure 3-3 Floodplains (100-year and 500-year) within the Upper Yard and Lower Yard

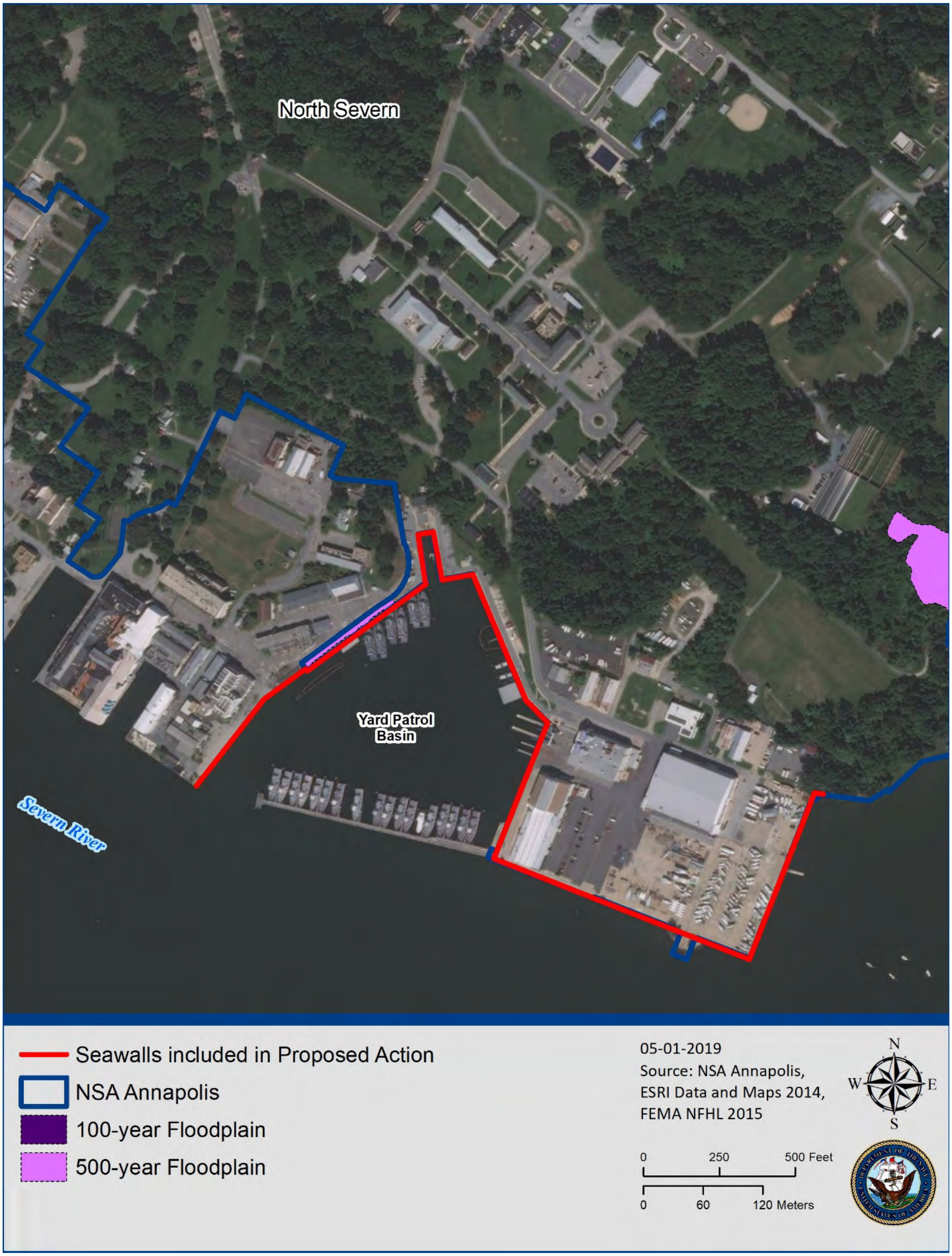


Figure 3-4 Floodplains (100-year and 500-year) within North Severn

Management Program addresses coastal hazards, growth management, habitat and living resources, non-point source pollution, non-tidal wetlands, provision of public access, and tidal wetlands, and it encompasses several state laws and regulatory programs, of which the Clean Water Act is specifically applicable to the Proposed Action.

A memorandum of understanding between the State of Maryland and the Department of Defense (DoD), signed May 2013, outlines the application and implementation of certain enforceable policies of Maryland's Coastal Zone Management Program as they relate to federal actions (State of Maryland and Department of Defense, 2013).

Water Resources Potential Impacts:

- No Action: Short- and long-term, minor, adverse impacts due to sedimentation from failing seawalls and increased flooding events. No significant impact.
- Alternative 1: Direct and indirect, short-term, minor, adverse impacts from construction. Indirect, long-term, minor-to-moderate, beneficial effects from reduced shoreline erosion and sedimentation. No significant impact.
- Alternative 2: Direct and indirect, short-term, minor, adverse impacts from construction. Indirect, long-term, minor, beneficial effects from reduced shoreline erosion and sedimentation. No significant impact.
- Alternative 3: Direct and indirect, short-term, minor, adverse impacts from construction. Indirect, long-term, negligible, beneficial effects from seawall repair and restoration with no height increases. No significant impact.

3.2.3 Environmental Consequences

In this EA, the analysis of water resources looks at the potential impacts on groundwater, surface water, wetlands, floodplains, shorelines, and coastal zone management. Groundwater analysis focuses on the potential for impacts on the quality, quantity, and accessibility of the water. The analysis of surface water quality considers the potential for impacts that could change the water quality, including both improvements and degradation of current water quality. The impact assessment of wetlands considers the potential for impacts that could change the local hydrology, soils, or vegetation that support a wetland. The analysis of floodplains considers if any new construction is proposed within a floodplain or could impede the functions of floodplains in conveying floodwaters. The analysis of shorelines considers if the Proposed Action would affect shoreline ecological functions such as channel movement and hydrological systems, flooding or storm surge areas, areas of erosion and sedimentation, water quality and temperature, presence of nutrients and pathogens, and sites with the potential for protection or restoration. Coastal zone management discusses the Proposed Action's consistency with the federally enforceable policies of Maryland's Coastal Zone Management Program, as outlined in the 2013 memorandum of understanding (State of Maryland and Department of Defense, 2013).

3.2.3.1 No Action Alternative

Under the No Action Alternative, the proposed repair and restoration of the seawalls and shoreline would not occur, and existing conditions along the shoreline would continue to decline. Even with minor seawall repairs and maintenance, deterioration of the seawalls would continue due to various states of functionality. As a result, the seawalls would gradually become more porous allowing water behind them, which could cause severe floods. Existing seawalls would not effectively sustain the 10- and 50-year design storm or the 50- and 75-year sea level rise projections, resulting in continued sea level rise, storm surge, and land subsidence at NSA Annapolis. Consequently, an increased number of flooding events would be expected. Water quality would continue to decline as a result of sedimentation in coastal and surface waters. The No Action Alternative would not result in significant impacts.

3.2.3.2 Alternative 1 Potential Impacts

The study area for the analysis of effects on water resources associated with Alternative 1 includes groundwater, surface water, wetlands, floodplains, shorelines, and coastal waters within NSA Annapolis, specifically along the defined project reaches.

Use of best management practices (BMPs; e.g., good housekeeping measures for construction equipment containing petroleum, oil, and/or lubricants, and minimizing sediment transport) would prevent leeching of construction-related contaminants into groundwater resources. Furthermore, implementation of Alternative 1 would not increase the demand on pumped groundwater. Therefore, no effects on groundwater resources would be expected as a result of implementing Alternative 1.

Implementation of Alternative 1 would temporarily affect the water quality of the Severn River watershed, including the Severn River, College Creek, Spa Creek, Santee Basin, and Yard Patrol Basin. These potential impacts would occur during demolition and construction of the hardened structures (bulkhead, sheet pile seawall, riprap, or a combination of these techniques) from ground disturbance, which leads to increased sedimentation and turbidity. Construction would directly affect surface water in the project area near the shoreline and indirectly affect surface water bodies downstream from the project area. Construction vehicles and equipment, such as cranes and dump trucks, would transport and install materials such as armor stone at the hardened structures, including within the intertidal zone (i.e., the area above water during low tide and underwater during high tide). Construction activity would likely loosen and introduce sandy sediments into the water column of the intertidal and nearshore waters. Additional suspended sediments would result in an increase in turbidity, reducing water quality.

There is no known contamination of in-water sediments that would be disturbed under Alternative 1. However, if any is discovered, it would be handled in accordance with applicable regulations.

Although increases in turbidity may occur, impacts would be localized and temporary, lasting only as long as equipment and materials are being used on-site. After construction activity is complete, sedimentation and turbidity levels would return to preconstruction levels as less turbid, upstream waters are transported into the local intertidal zone.

Impacts on water resources from runoff during construction activities would be minimized by construction management and planning. The Navy would prepare a soil erosion- and sediment-control plan and a stormwater management plan when proposed earth disturbance is more than 5,000 square feet or 100 cubic yards. These plans would be developed in accordance with Maryland soil erosion and sediment control guidelines. BMPs specific to each construction site would be identified in these plans. Examples of such BMPs include silt fences, silt or turbidity curtains, inlet and outlet protection, erosion control matting, sediment logs, construction entrances, temporary and permanent seeding, mulching, check dams, and other measures deemed appropriate for that specific action. If a project discharges to an impaired water body with a Total Maximum Daily Load allocation for sediment, additional level of controls may be warranted. Given that the Severn River was identified as impaired by sediments in 1996, additional controls may be required. This can include accelerated stabilization, redundant controls, increased buffers, passive or active chemical treatment, or a reduction in the size of the grading unit (MDE, 2017).

If the new seawall height changes the runoff characteristics and creates points of concentrated flow where previously there was sheet flow, MDE may require additional water quantity management to minimize adverse impacts from the change in drainage patterns. NSA Annapolis would comply with any applicable MDE regulations regarding stormwater management.

The repair and restoration of the shoreline would result in long-term benefits for water quality by reducing the amount of sediments entering the watershed due to fewer storm surge and flooding events. Excavation, clearing, and grading at all of the reaches combined would disturb more than one acre; therefore, an MDE General Permit for Stormwater Associated with Construction Activity would be required, and erosion and sediment controls and pollution prevention measures would be implemented.

Section 404 of the Clean Water Act regulates the discharge of dredged or fill material into waters of the United States. USACE issues this permit, which requires that steps be taken to avoid impacts on aquatic resources; that potential impacts be minimized; and that compensation be provided for all remaining unavoidable impacts. The USACE also issues permits for in-water work under Section 10 of the Rivers and Harbors Act. Given that discharge of material into the Severn River would likely occur under Alternative 1, and part of the construction would occur in-water, an individual permit from USACE would likely be required.

Wetlands on the installation are not located within or near the project areas (see Figure 3-1 and Figure 3-2). The closest jurisdictional wetland is located approximately 930 feet from Reach 1 at the Upper Yard and approximately 750 feet from Reach 15 at North Severn. Non-jurisdictional estuarine and marine deepwater wetlands have been mapped for Carr Creek, College Creek, Mill Creek, Spa Creek, and the Severn River. Under Alternative 1, work would occur within these tidal wetlands. Consequently, a joint federal and state permit for the Alteration of Any Tidal Wetland in Maryland would be required for temporary, construction-related impacts. This permit requires that the action implement BMPs applicable to work in tidal waters and wetlands to mitigate adverse effects. Alternative 1 would also reduce the potential for long-term disturbance of estuarine and marine deepwater wetlands associated with sedimentation during flood and stormwater runoff events as compared to the No Action Alternative. As such, there would be no net long-term, adverse impacts on estuarine and marine deepwater wetlands from implementation of Alternative 1.

Much of the project area at the Upper and Lower Yards, as well as a small portion of Reach 13, are within the 100-year or 500-year floodplains. EO 11988 directs agencies to avoid impacts on floodplains or, if impacts cannot be avoided, to develop measures to minimize impacts and restore and preserve the floodplain, as appropriate. Under Alternative 1, there would be short-term, minor impacts on floodplains from construction activities adjacent to the shoreline. After construction is completed, equipment would be removed from the floodplains and the disturbed area restored to preconstruction conditions.

In the long term, negligible localized changes in the demarcation of the floodplain behind the seawall along affected reaches could occur with the proposed increases in seawall heights. Considering the overall volume of the Chesapeake Bay, Severn River, Spa Creek, and College Creek, the estimated potential water displacement from the higher NSA Annapolis seawalls would have no to negligible impact on surrounding properties. NSA Annapolis is in close coordination with the City of Annapolis on proposed seawall repair and restoration efforts, including specific design heights (for both Alternative 1 and Alternative 2). Given that the seawalls are currently within a floodplain, impacts on the floodplain are unavoidable. NSA Annapolis would comply with EO 11988 and the DoD memorandum *Floodplain Management on Department of Defense Installations* (February 11, 2014) to minimize the impacts.

The entire project area is within Maryland's coastal zone. In accordance with Section 307 of the Coastal Zone Management Act, the Navy will submit a Coastal Consistency Determination to the MDE.

Implementation of appropriate sediment- and erosion-control BMPs during the construction phase would minimize short-term, adverse impacts on water resources. Long-term impacts on water resources as a result of Alternative 1 would be beneficial because shoreline erosion and sedimentation caused by flooding would be reduced; higher seawall design heights for the reaches under Alternative 1 would accommodate a 10- and 50-year design storm and 75-year sea level rise.

Therefore, implementation of Alternative 1 would not result in significant impacts on water resources.

3.2.3.3 Alternative 2 Potential Impacts

The study area for the analysis of effects on water resources associated with Alternative 2 includes groundwater, surface water, wetlands, floodplains, shorelines, and coastal waters within NSA Annapolis, specifically along the defined project reaches.

Impacts on water resources under Alternative 2 would be similar to those described for Alternative 1 apart from Reach 3, which would use log toe stabilization to repair and restore the shoreline. Potential adverse impacts on water resources along Reach 3 would be less than those described under Alternative 1 because construction activity would be limited to the placement and anchoring of logs along the eroded toe of the shoreline slope, which would result in a decrease of hardened structures and have beneficial effects on drainage and water resources along this reach. Compliance with permits and implementation of BMPs, as described under Alternative 1, would further minimize and avoid impacts on water resources. The seawall design heights would be 0.56 to 1.90 feet lower than Alternative 1 (see Table 2-2), which would accommodate for a lower sea level rise projection (i.e., 50-year instead of 75-year). This would result in an increased risk for flooding compared to Alternative 1, resulting in potential for increased sedimentation in surface water bodies. Although seawall heights would be lower under Alternative 2, the repair and restoration of the shoreline would still result in long-term, minor benefits for water quality by reducing the amount of sediments entering the watershed.

Impacts on wetlands under Alternative 2 would be the same as those described for Alternative 1 (see Figure 3-1 and Figure 3-2). A joint federal and state permit for the Alteration of Any Tidal Wetland in Maryland would be required for temporary, construction-related impacts. This permit requires that the action implements BMPs applicable to work in tidal waters and wetlands. Alternative 2 would reduce the potential for long-term disturbance to estuarine and marine deepwater wetlands associated with sedimentation during flood and stormwater runoff events as compared to the No Action Alternative. As such, there would be no net long-term adverse impacts on estuarine and marine deepwater wetlands from implementation of Alternative 2.

If the new seawall height changes the runoff characteristics and creates points of concentrated flow where previously there was sheet flow, MDE may require additional water quantity management to minimize adverse impacts from the change in drainage patterns. NSA Annapolis would comply with any applicable MDE regulations on stormwater management.

Impacts on floodplains under Alternative 2 would be similar to Alternative 1. There would be short-term, minor impacts on floodplains from construction activities adjacent to the shoreline. In the long term, negligible localized changes in the demarcation of the floodplain behind the seawall along affected reaches could occur with the proposed increases in seawall heights. Considering the overall volume of the Chesapeake Bay, Severn River, Spa Creek and College Creek, the estimated potential water displacement from the higher NSA Annapolis seawalls would have no to negligible impact on surrounding properties. NSA Annapolis is in close coordination with the City of Annapolis on proposed seawall repair and restoration efforts, including specific design heights (for both Alternative 1 and Alternative 2). Impacts on the floodplain are unavoidable, and NSA Annapolis would comply with EO 11988 and the DOD memorandum *Floodplain Management on Department of Defense Installations* (February 11, 2014) to minimize impacts. The anticipated impact on properties adjacent to NSA Annapolis would be negligible, similar to as described in Section 3.2.3.2.

Therefore, implementation of Alternative 2 would not result in significant impacts on water resources.

3.2.3.4 Alternative 3 Potential Impacts

The study area for the analysis of effects on water resources associated with Alternative 3 includes groundwater, surface water, wetlands, floodplains, shorelines, and coastal water within NSA Annapolis, specifically along the defined project reaches.

Short-term impacts on water resources under Alternative 3 would be similar to those described for Alternatives 1 and 2 apart from Reach 3, which would use living shoreline to repair and restore the shoreline. Potential adverse impacts on water resources along Reach 3 would be less than those described under Alternative 1 because construction would be minimally invasive. Small amounts of rock, natural sand material, and native tidewater vegetation would be used to mimic natural habitats and to stabilize eroding shorelines. Living shorelines enhance water quality by removing nitrogen from the water, a process called denitrification, which would contribute to improvements in the Severn River for nutrient impairments. Living shoreline would also decreasing hardened structures, resulting in beneficial effects on drainage and water resources along this reach. Under Alternative 3, repair and restoration of all reaches would be at existing heights, resulting in flooding events comparable to those described under the No Action Alternative, which increases sedimentation into nearby watersheds and decreases water quality.

Impacts on wetlands under Alternative 3 would be the same as those described for Alternative 1 (see Figure 3-1 and Figure 3-2). A joint federal and state permit for the Alteration of Any Tidal Wetland in Maryland would be required for temporary, construction-related impacts. This permit requires that the action implements BMPs applicable to work in tidal waters and wetlands. Alternative 3 would reduce the potential for long-term disturbance to estuarine and marine deepwater wetlands associated with sedimentation during flood and stormwater runoff events as compared to the No Action Alternative. As such, there would be no net long-term adverse impacts on estuarine and marine deepwater wetlands from implementation of Alternative 3.

Under Alternative 3 there would be short-term, minor impacts on floodplains from construction activities adjacent to the shoreline. After construction is completed, equipment would be removed from the floodplains and the disturbed area restored to preconstruction conditions.

Therefore, implementation of Alternative 3 would not result in significant impacts on water resources.

3.3 Geological Resources

This discussion of geological resources includes topography, geology, and soils of a given area. For projects involving in-water demolition or construction, this may also include bathymetry and marine sediments. Topography is typically described with respect to the elevation, slope, and surface features found within a given area. The geology of an area can include bedrock materials, mineral deposits, and fossil remains. The principal geological factors influencing the stability of structures are soil stability and seismic properties. Soil refers to unconsolidated earthen materials overlying bedrock or other parent material. Soil structure, elasticity, strength, shrink-swell potential, and erodibility determine the ability for the ground to support structures and facilities. Soils are typically described in terms of their type, slope, physical characteristics, and relative compatibility or limitations regarding construction activities and types of land use.

Bathymetry is described in terms of the topography of the sea floor or river bottoms where a proposed action would occur. Marine sediments are the solid fragments of organic and inorganic matter created from weathering rock transported by water, wind, and ice (glaciers) and deposited at the bottom of bodies of water. Components of sediment range in size from boulders, cobble, and gravel to sand (particles 0.05 to 2.0 millimeters in diameter), silt (0.002 to 0.05 millimeters), and clay (less than or equal to 0.002 millimeters). Sediment deposited on the continental shelf is delivered mostly by rivers but also by local and regional currents and wind. Most sediment in nearshore areas and on the continental shelf is aluminum silicate derived from rocks on land that is deposited at rates of greater than ten centimeters per 1,000 years. Sediment may also be produced locally as nonliving particulate organic material ("detritus") that travels to the bottom. Some areas of the deep ocean contain an accumulation of the shells of marine microbes composed of silicon and calcium carbonate, termed biogenic ooze. Through the downward movement of organic and inorganic particles in the water column, substances that are otherwise scarce in the water column (e.g., metals) are concentrated in bottom sediment (NAVFAC Washington, 2016).

3.3.1 Regulatory Setting

Consideration of geologic resources extends to prime or unique farmlands. The Farmland Protection Policy Act was enacted in 1981 to minimize the loss of prime farmland and unique farmlands because of federal actions. The implementing procedures of the Farmland Protection Policy Act require federal agencies to evaluate the adverse effects of their activities on farmland, which includes prime and unique farmland and farmland of statewide and local importance, and to consider alternative actions that could avoid adverse effects.

Erosion- and sediment-control plans are required for grading activities that disturb 5,000 square feet or more of land area or 100 cubic yards or more of earth. This includes excavating, filling, stockpiling of earth materials, or topsoil disturbance (MDE, 2015).

3.3.2 Affected Environment

The following discussions provide a description of the existing conditions for each of the categories under geological resources at NSA Annapolis.

3.3.2.1 Topography

NSA Annapolis lies in the Atlantic Coastal Plain Physiographic Province, a gently undulating plain along the Atlantic and Gulf of Mexico coast from northwestern New Jersey to Mexico. The topography of the

USNA portion of the installation is relatively flat, ranging from sea level to 80 feet above mean sea level, with most of the installation around 20 to 40 feet above mean sea level. The steepest slopes are north of College Creek and east of Bowyer Road. North Severn is relatively flat on Greenbury Point at sea level to 20 feet above mean sea level, with elevations increasing towards the north and west, rising to a high point of 80 feet above mean sea level on the golf course (Navy, 2014).

3.3.2.2 Geology

The Atlantic Coastal Plain is underlain by unconsolidated sediments containing gravels, sands, and clays of the late Mesozoic and Cenozoic Age, 100 million years old or younger. Geologic formations occurring in the area include the Aquia Greensand and Matawan Formation, which overlie the Magothy Formation. There are no major geographical structural features and no active fault lines in the Annapolis area (Navy, 2012).

3.3.2.3 Soils

Six major soil series are at USNA, including the Annapolis, Collington-Wist, Cumberstone-Mattapex, Donlonton, Udorthents, and Urban series. Fourteen major soil series are at North Severn, including the Colemantown, Deale-Shadyoak complexes, Donlonton, Mispillion and Transquaking, and Widewater and Issue soils that are hydric and prone to flooding. The Annapolis, Collington-Wist, Cumberstone-Mattapex, Downer-Phalanx, Patapsco-Evesboro, Russett, and Sassafras soils, outside of previously built areas, are classified as prime farmland or farmland of statewide importance by the Natural Resources Conservation Service (Navy, 2014).

3.3.2.4 Bathymetry

NSA Annapolis is located along the Severn River near its juncture with the Chesapeake Bay. Approximate depths in the vicinity of the project reaches are as follows: 9.8 to 10.8 feet along Reach 1 in the Severn River, 5.9 feet near Reaches 3 and 4 in College Creek, 15.7 to 19.7 feet along Reach 7 in the Severn River, 12.8 to 14.8 feet near Reaches 7 and 8 in the Santee Basin, 6.9 feet along Reach 10 in the Severn River, 11.8 feet at Reach 12 in Spa Creek, 11.8 to 15.7 feet near Reaches 13 and 14 in the Yard Patrol Basin, and up to 18.7 feet at Reach 15 in the Severn River (GPS Nautical Charts, 2019).

3.3.3 Environmental Consequences

Geological resources are analyzed in terms of drainage, erosion, prime farmland, land subsidence, and seismic activity. The analysis of topography and soils focuses on the area of soils that would be disturbed, the potential for erosion of soils from construction areas, and the potential for eroded soils to become pollutants in downstream surface water during storm events. The analysis also examines potential impacts related to seismic events. Standards and controls are identified to minimize soil impacts and prevent or control pollutant releases into stormwater. The potentially affected environment for geological resources is limited to lands that would be disturbed by any proposed facility development or demolition.

3.3.3.1 No Action Alternative

Under the No Action Alternative, seawalls would continue to deteriorate and would gradually become more porous allowing water behind them, which could cause severe floods. The shoreline within the project area would erode; soils would be disturbed; and sediments would be released into the Severn River, College Creek, Spa Creek, and ultimately the Chesapeake Bay. This would result in eroded soils polluting surface water as the seawalls disintegrated. In the long term, the seawalls would not function properly, leading to eroded banks and land subsidence. This would further accelerate bank and soil erosion, resulting in continued flooding issues and failure of road and parking areas in locations behind the seawall. The No Action Alternative would result in short-term, negligible, adverse impacts from continued soil loss during storm events, and long-term, adverse impacts from bank erosion, land subsidence, and loss of property behind the seawalls.

Geological Resources Potential Impacts:

- No Action: Short-term, negligible adverse impacts from soil loss; long-term adverse impacts from bank erosion, land subsidence. No significant impact.
- Alternative 1: Short-term, minor, adverse impacts from construction; long-term, beneficial effects from a reduction in bank and soil erosion and land subsidence. No significant impact.
- Alternative 2: Short-term, minor, adverse impacts from construction; long-term, beneficial effects but less than Alternative 1. No significant impact.
- Alternative 3: Short-term, minor, adverse impacts from construction; long-term, beneficial effects but less than Alternatives 1 and 2. No significant impact.

3.3.3.2 Alternative 1 Potential Impacts

The study area encompasses the proposed construction and ground-disturbance areas related to Alternative 1. All of the existing seawalls along the project reaches consist of hardened materials. Some sections of the seawalls would need to be dismantled or demolished before they would be rebuilt. In addition, since the seawalls would be elevated under Alternative 1, new excavation of soils could occur if some sections need to be deeper or wider.

As previously discussed, an armored submarine cable may need to be relocated along several reaches, including Reach 9 southeast of Santee Basin. The cable would be moved from approximately 6 inches from the wall to 10 feet from the wall. The cable would then be reanchored in concrete on the riverbed. The total soil disturbance between the cable relocation and the new anchors is anticipated to be less than 10 cubic yards. Other potential in-water construction activities include excavation behind the seawall and excavations on the sea floor to expose the existing wall. These areas would be backfilled. Depending on the type of seawall and constructed needed, soil test borings and hydrographic survey may be completed to confirm the channel bottom depths, subsurface condition, and establish the geotechnical parameters that would be used for design.

Construction activities would result in soil disturbance, which could increase sedimentation during storm events. Several methods would be used to minimize soil erosion. Before construction would begin, applicable erosion- and sediment-control measures would be implemented to reduce sedimentation in the water. Erosion- and sediment-control plans are required for grading activities that disturb 5,000 square feet or more of land area or 100 cubic yards or more of earth. This includes excavating, filling, stockpiling of earth materials, or topsoil disturbance (MDE, 2015). Maryland regulations require plans that include temporary and permanent stabilization (see also Section 3.2.3.2 in Water Resources).

During the construction period, construction equipment would be stored at laydown locations on the installation. Soils in these areas would be compacted, and vegetation could also be lost. However, these kinds of effects would be temporary as all disturbed sites would be restored to preconstruction conditions once the construction equipment is removed.

Although some of the soils in the project area are classified as prime farmland or farmland of statewide importance, the project area consists of hardened structures. Under Alternative 1, some soils adjacent to the existing seawalls could be disturbed; however, this would be minimal. Currently, the project area is within a built region and is not being farmed. No prime farmland or farmland of statewide importance would be affected.

In the long term, the proposed elevated seawalls would limit bank and soil erosion that can result from flooding due to structural deficiencies, storm surge, and sea level rise. As previously mentioned, sea level rise in the Chesapeake Bay region is occurring twice as fast as the rest of the nation. Soil erosion and land subsidence increase sedimentation in the water. Under Alternative 1, each reach would be designed to accommodate for the 10- or 50-year design storm and the 75-year sea level rise scenarios. Therefore, Alternative 1 would limit impacts on geological resources such as bank and soil erosion and land subsidence. Furthermore, Alternative 1 would stabilize road and parking areas behind proposed seawalls, increasing the resiliency of these facilities during future flooding events.

Elevated seawalls under Alternative 1 could alter some drainage patterns and impact soils. As discussed in Section 3.2.3.2, if the new seawall height changes the runoff characteristics and creates points of concentrated flow where previously there was sheet flow, MDE may require additional water quantity management to minimize adverse impacts from the change in drainage patterns. NSA Annapolis would comply with any applicable MDE regulations on stormwater management.

Given that the project area currently consists of hardened structures, and the seawalls would be rebuilt and raised above their existing heights, there would be short-term, minor, adverse impacts on soils from construction. However, implementation of Alternative 1 would repair structural deficiencies and aid in reducing impacts on soils from storm surge and sea level rise, resulting in long-term, beneficial effects. Therefore, implementation of Alternative 1 would not result in significant impacts on geological resources.

3.3.3.3 Alternative 2 Potential Impacts

The study area under Alternative 2 is the same as Alternative 1 and encompasses the proposed construction and ground-disturbance areas. Some sections of the seawalls would need to be dismantled or demolished before they would be rebuilt. Under Alternative 2, the proposed seawalls would be higher than the existing heights but lower than under Alternative 1 by 0.56 to 1.90 feet. New excavation of soils could occur if some sections of the seawalls need to be deeper or wider. These activities would result in soil disturbance, which could increase sedimentation during storm events. However, as discussed in Section 3.3.3.2, erosion- and sediment-control measures would be implemented to reduce sedimentation in the water.

Similar to Alternative 1, soils in construction laydown areas would be compacted and vegetation would be lost. However, these kinds of effects would be temporary as all disturbed sites would be restored to preconstruction conditions once construction equipment is removed.

Although some of the soils in the project area are classified as prime farmland or farmland of statewide importance, the project area consists of hardened structures. No prime farmland or farmland of statewide importance would be affected.

In the long term, the proposed elevated seawalls would limit bank and soil erosion that can result from flooding due to structural deficiencies, storm surge, and sea level rise. Given that the reaches would be designed to accommodate for 10- or 50-year design storm and the 50-year sea level rise scenarios, implementation of Alternative 2 would result in beneficial effects as compared to existing conditions and the No Action Alternative. However, since the seawalls would be lower as compared to Alternative 1, the benefits of limiting impacts on geological resources such as bank and soil erosion and land subsidence would be less than those described under Alternative 1.

All of the reaches in the project area consist of hardened structures; these reaches would be repaired with a hardened structure except for Reach 3 at the Upper Yard. This reach is currently made of riprap but would be replaced by log toe stabilization. This would result in a decrease in hardened structures and beneficial effects on drainage and geological resources by creating a stable bank of soil that allows for the regrowth of revegetation, which helps to maintain coastal processes and create natural drainage during storm events. Similar to Alternative 1, some drainage patterns could be altered. However, if there are changes to runoff characteristics, the MDE may require additional water quantity management to minimize adverse impacts from the change in drainage patterns.

Given that the project area currently consists of hardened structures, and the seawalls would be rebuilt and raised above their existing heights, there would be short-term, minor, adverse impacts on soils during construction. However, implementation of Alternative 2 would repair structural deficiencies and reduce impacts on soils from storm surge and sea level rise, resulting in long-term, beneficial effects. Therefore, implementation of Alternative 2 would not result in significant impacts on geological resources.

3.3.3.4 Alternative 3 Potential Impacts

The study area under Alternative 3 is the same as Alternatives 1 and 2 and encompasses the proposed construction and ground-disturbance areas. Some sections of the seawalls would need to be dismantled or demolished before they would be rebuilt, which would result in soil disturbance and sedimentation in the water. However, as discussed in Section 3.3.3.2, erosion- and sediment-control measures would be implemented to reduce sedimentation in the water.

Similar to Alternatives 1 and 2, soils in construction laydown areas would be compacted and vegetation would be lost. However, these kinds of effects would be temporary as all disturbed sites would be restored to preconstruction conditions once construction equipment is removed.

Although some of the soils in the project area are classified as prime farmland or farmland of statewide importance, the project area consists of hardened structures. No prime farmland or farmland of statewide importance would be affected.

Under Alternative 3, the existing hardened structures would be repaired or replaced to the existing height, without accommodating for future sea level rise. In the long term, repairing the seawalls would limit bank and soil erosion from flooding because of structural deficiencies. However, Alternative 3 would not limit bank and soil erosion from storm surge and sea level rise.

All of the reaches in the project area consist of hardened structures; these reaches would be repaired with a hardened structure material except for Reach 3 at the Upper Yard. This reach is currently made of riprap but would be replaced by a living shoreline. This would result in a decrease in hardened structures and beneficial effects on drainage and geological resources. Similar to Alternative 1, if changes occurred to water runoff patterns at the other reaches, the MDE may require additional water quantity management to minimize adverse impacts from the change in drainage patterns.

Alternative 3 would result in short-term minor, adverse impacts on soils during construction. However, Alternative 3 would repair structural deficiencies and aid in reducing impacts that affects soils, resulting in long-term, beneficial effects. Therefore, implementation of Alternative 3 would not result in significant impacts on geological resources.

3.4 Cultural Resources

This discussion of cultural resources includes prehistoric and historic archaeological sites; historic buildings, structures, and districts; and physical entities and human-made or natural features important to a culture, a subculture, or a community for traditional, religious, or other reasons. Cultural resources can be divided into three major categories:

- Archaeological resources (prehistoric and historic) are locations where human activity measurably altered the earth or left deposits of physical remains.
- Architectural resources include standing buildings, structures, landscapes, and other built-environment resources of historic or aesthetic significance.
- Traditional cultural properties include archaeological resources, structures, neighborhoods, prominent topographic features, habitat, plants, animals, and minerals that Native Americans or other groups consider essential for the preservation of traditional culture.

3.4.1 Regulatory Setting

Cultural resources are governed by other federal laws and regulations, including the National Historic Preservation Act (NHPA), Archeological and Historic Preservation Act, American Indian Religious Freedom Act, Archaeological Resources Protection Act of 1979, and the Native American Graves Protection and Repatriation Act of 1990. Federal agencies' responsibility for protecting historic properties is defined primarily by Sections 106 and 110 of the NHPA. Section 106 requires federal agencies to consider the effects of their undertakings on historic properties. Section 110 of the NHPA requires federal agencies to establish—in conjunction with the Secretary of the Interior—historic preservation programs for the identification, evaluation, and protection of historic properties. Cultural resources also may be covered by state, local, and territorial laws.

3.4.2 Affected Environment

Cultural resources listed in the National Register of Historic Places (NRHP) or eligible for listing in the NRHP are "historic properties" as defined by the NHPA. The list was established under the NHPA and is administered by the National Park Service on behalf of the Secretary of the Interior. The NRHP includes properties on public and private land. Properties can be determined eligible for listing in the NRHP by the Secretary of the Interior or by a federal agency official with concurrence from the applicable State Historic Preservation Office (SHPO). An NRHP-eligible property has the same protections as a property listed in the NRHP. Historic properties include archaeological and architectural resources.

The Navy has conducted inventories of cultural resources at the USNA to identify historic properties that are listed or potentially eligible for listing in the NRHP (NAVFAC Washington, 2018c).

The area of potential effect (APE) for cultural resources is the geographic area or areas within which an undertaking (project, activity, program, or practice) may cause changes in the character or use of any historic properties present. The APE is influenced by the scale and nature of the undertaking and may be different for various kinds of effects caused by the undertaking. For this Proposed Action, the Navy determined that the APE is defined as the entire USNA, both the Upper and Lower Yards; the portions of the North Severn Complex that would undergo ground disturbance; the entire Annapolis Historic District; and all areas from which the proposed construction would be visible. See APE boundaries in Figure 3-5.

3.4.2.1 Archaeological Resources

Forty-three archaeological surveys have been conducted at USNA including both the Upper and Lower Yards and North Severn Complex. A total of 46 archaeological sites have been identified, counting prehistoric sites and historic domestic and military sites; most of these have not been evaluated. Five sites have been determined NRHP eligible, and one is listed in the NRHP. Site 18AN550 (Fort Nonsense) located on North Severn Complex, which was listed on the National Register in 1984, is approximately 0.2 miles from the Yard Patrol Basin. The five NRHP-eligible sites include the following: Site 18AP81 (USNA Mess Hall/Seamanship Building), Site 18AP82 (USNA, Buchanan Road), Site 18AP83 (USNA, Governor's Mansion), Site 18AN944 (North Severn Complex, Towne Neck), and Site 18AN1127 (North Severn Complex, Area 5) (NAVFAC Washington, 2018c).

None of these sites would be affected by ground disturbance from the undertaking.

3.4.2.2 Architectural Resources

The USNA was designated a National Historic Landmark (NHL) in 1961 and a National Register Historic District in 1966. Both district designations share the same boundary and encompass most of the USNA property. The district includes 139 buildings, structures, and sites that define the USNA character and significance. A variety of landscape features contribute to the district's historical significance, including the historic seawalls (Kuhn & Groesbeck, 2013).

Adjacent to the USNA, to the southwest is the Annapolis Historic District, designated an NHL in 1965 and a National Register Historic District in 1966. It covers approximately 230 acres. Across Spa Creek from the Annapolis Historic District and the USNA is NRHP-listed Chance Boatyard located in Eastport. Chance Boatyard contains nine contributing resources and covers an entire block of 2.7 acres.

The Naval Radio Transmitter Facility on North Severn Complex was at one time determined NRHP-eligible as a historic district; however, due to demolitions, it has lost its historic integrity and is no longer eligible (Maryland Historical Trust concurred in 2003). The Yard Patrol Basin has been evaluated as well as the buildings associated with the historic Naval Station Annapolis adjacent to the basin. The Yard Patrol Basin was determined not eligible. Buildings 002NS, 003NS, and 004NS were determined eligible.

The Severn River Bridge located to the north of the USNA has been surveyed, evaluated, and recommended NRHP-eligible. MHT has not provided concurrence on this recommendation. See Figure 3-6 for locations of the historic properties within or adjacent to the APE.

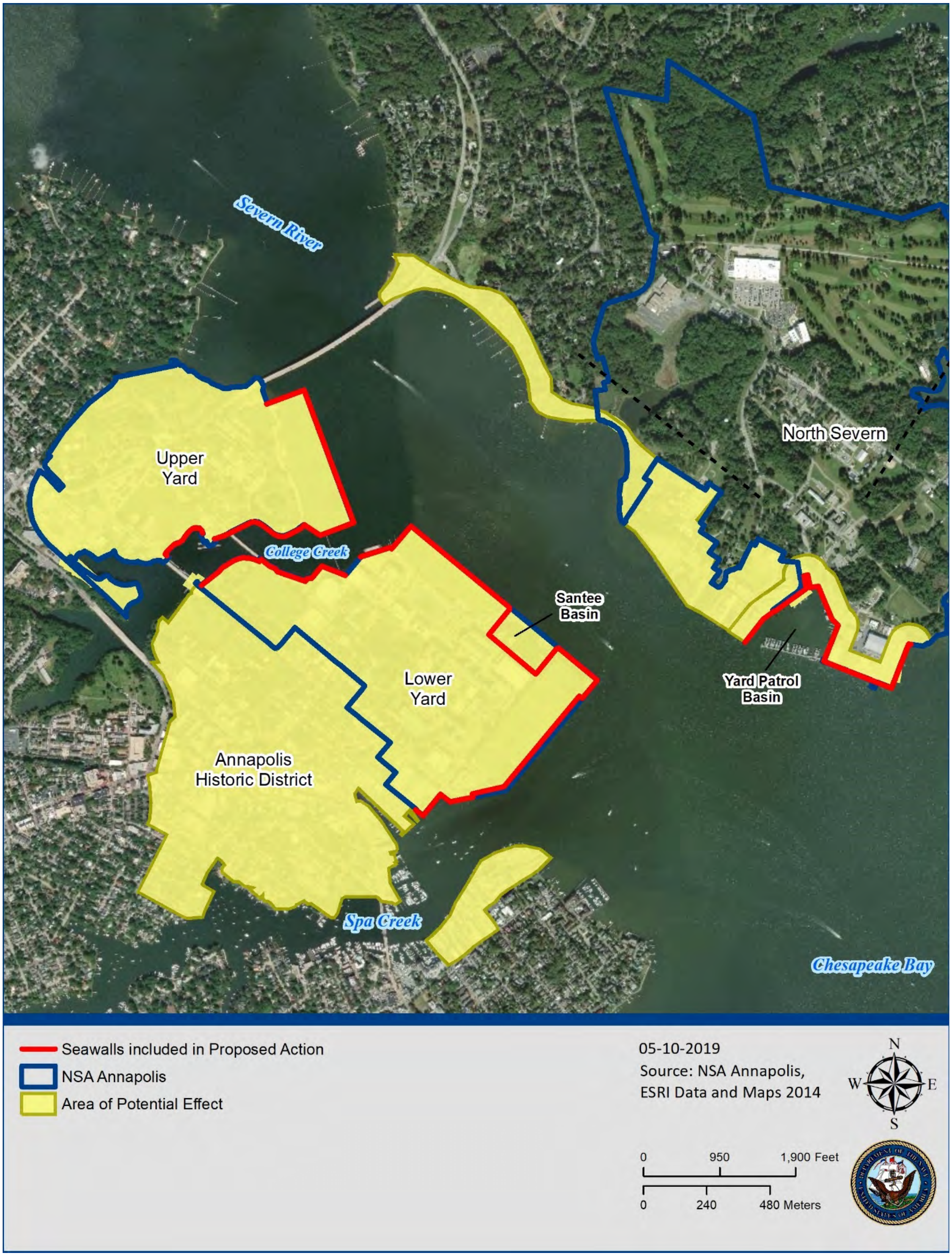


Figure 3-5 Area of Potential Effect for Cultural Resources

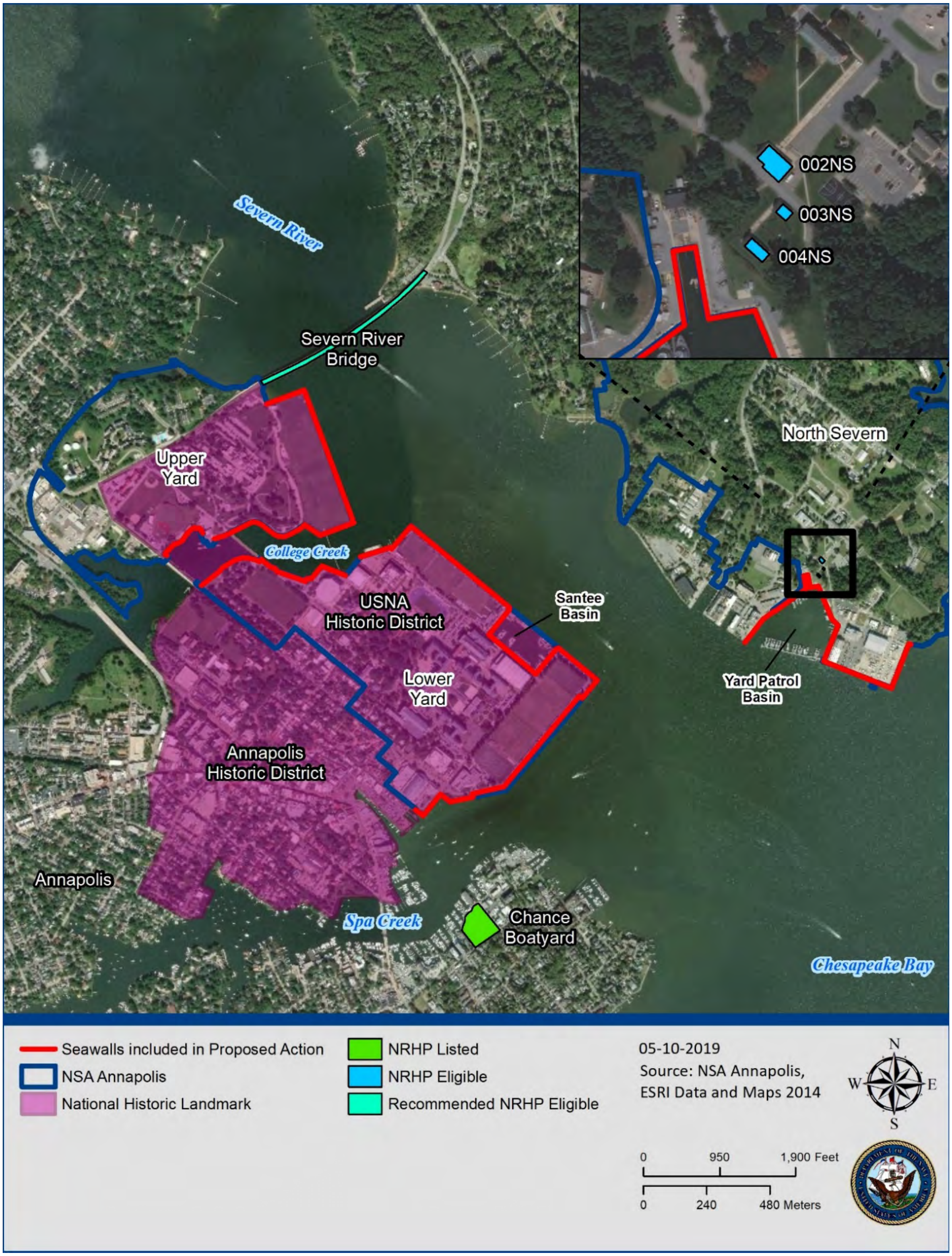


Figure 3-6 Location of Historic Properties Within or Adjacent to the Area of Potential Effect

3.4.2.3 Traditional Cultural Properties

No traditional cultural properties are known to be located within the Upper and Lower Yards or North Severn.

3.4.3 Environmental Consequences

Analysis of potential impacts on cultural resources considers both direct and indirect impacts. Direct impacts can be the result of physically altering, damaging, or destroying all or part of a resource; altering characteristics of the surrounding environment that contribute to the importance of the resource; introducing visual, atmospheric, or audible elements that are out of character for the period the resource represents (thereby altering the setting); or neglecting the resource to the extent that it deteriorates or is destroyed.

Cultural Resources Potential Impacts:

- No Action: Long-term, minor adverse effects on deteriorating, contributing seawalls. Long-term, adverse effects on USNA from flood events, which can damage historic elements. No significant impacts.
- Alternative 1: Long-term, adverse effects on the seawalls of USNA from construction and demolition. Long-term, adverse effects on significant views associated with USNA. Long-term, beneficial effects on the USNA with increased protection from water damage. No significant impacts.
- Alternative 2: Long-term, adverse effects on the seawalls of USNA from construction and demolition. Long-term, adverse effects on significant views associated with USNA. Long-term, beneficial effects on the USNA with increased protection from water damage. No significant impacts.
- Alternative 3: Long-term, adverse effects on USNA from storm surge and flood damage events from the lack of proper protection. No significant impacts.

3.4.3.1 No Action Alternative

Under the No Action Alternative, the proposed repair and restoration of the seawalls and shoreline would not occur, and existing conditions along the shoreline would continue to decline. Seawalls would continue to deteriorate, and functionality would decline. As a result, the seawalls would gradually become more porous allowing water behind them, which would exacerbate flooding. Existing seawalls would not effectively sustain the 10- and 50-year design storm or the 50- and 75-year sea level rise projections, resulting in continued sea level rise and storm surge at NSA Annapolis. The increased number of floods may cause major damage to the buildings and landscape features of the Upper and Lower Yards, many of which are contributing to the NHL Historic District. Negligence to maintain historic resources is considered an adverse effect. The historic seawalls are contributing resources to the historic district of USNA. Therefore, allowing the seawalls to deteriorate would be an adverse effect. In addition, allowing the current level of flooding as well as the predicted 10- and 50-year design storms to occur without preventative measures would result in long-term, adverse effects on the contributing buildings, landscape features, and seawalls of USNA. In the long term, if no action is taken to prevent flooding, part of the historic district would likely be underwater. As a result, long-term, moderate, adverse impacts on the historic district of USNA could occur. Deterioration of the seawalls associated with the Yard Patrol Basin (Reaches 13, 14, and 15) would not be an adverse effect on cultural resources.

Allowing the historic seawalls to deteriorate would result in short-term, minor, adverse impacts and long-term, moderate, adverse impacts. Therefore, implementation of the No Action Alternative would not result in significant impacts on cultural resources.

3.4.3.2 Alternative 1 Potential Impacts

The study area (APE) for Alternative 1 is the entire USNA installation, portions of North Severn Complex immediately adjacent to Reaches 13, 14, and 15, the viewsheds within the installation to the Severn River and College Creek, the entire Annapolis Historic District, and all the areas from which the proposed construction would be visible. Under Alternative 1, hardened structures would either be repaired, restored, or replaced based on the predicted 10- or 50-year design storm and the 75-year sea level rise scenarios presented by NOAA. The hardened structures would include concrete bulkheads, sheet pile seawalls, riprap, or a combination of these techniques. A submarine cable may need to be relocated along several reaches, including Reach 9.

The seawalls constructed around the mid-twentieth century or earlier are contributing resources to the historic landscape of USNA. Demolition, as well as construction or repairs not done according to the Secretary of the Interior's Standards for Rehabilitation would be considered an adverse effect to the contributing walls. According to the Standards, the historic character must be retained and preserved. The Standards also state that if replacement of a feature is necessary based on the severity of deterioration, the new feature shall match the old, where possible. Increasing the height or the materials of the walls would be considered an adverse effect.

Increasing the height of the perimeter bulkhead would be an adverse effect to the views significant to the USNA historic district. The setting, siting, and environment is unique to USNA and is significant in the history of the Naval Academy. The historic landscape study identified nine significant views on the campus looking to the Severn River or College Creek that are contributing to the historic district (Kuhn & Groesbeck, 2013). After further review of each of these nine views in June 2019, two views did not include visibility of either Severn River or College Creek. Increasing the height of each bulkhead around the perimeter of USNA would impede seven historically significant views and, therefore, be considered an adverse effect. The addition of structures to protect against storm surge would likely produce adverse effects due to the introduction of incompatible and non-historic uses as well as a visual intrusion. Figures 3-7 through 3-13 provide current views of Reaches 1, 2, 5, 6, 7, 9, and 10, along with renderings of their respective alternatives.

The increased height on the perimeter bulkhead or the introduction of structures that would protect against storm surge would also have a long-term, beneficial effect on the historic district and its contributing buildings and landscape features of USNA. Floods can cause major damage to structures both internally and externally. Many times, flood damage is irreparable, and materials must be replaced, which would be an adverse effect. Increasing the functionality of the current seawalls by repairing and or replacing them would better protect the USNA historic district and preserve its individual resources and historic materials.

Increasing the height of the seawalls around USNA would have a negligible effect on the adjacent Annapolis Historic District. As described in Section 3.2.3.2, there would be negligible increases in water during flood events under Alternative 1 from the proposed seawall height increase. Floodwater would be further dissipated by the Severn River, Spa Creek, and College Creek, and would have a negligible increase on the City of Annapolis.

There would be no adverse effects on Buildings 002NS, 003NS, and 004NS on North Severn, Chance Boatyard in Eastport, or the Severn River Bridge from implementing Alternative 1. There would be no adverse effects from relocating the submarine cable near Reach 9.

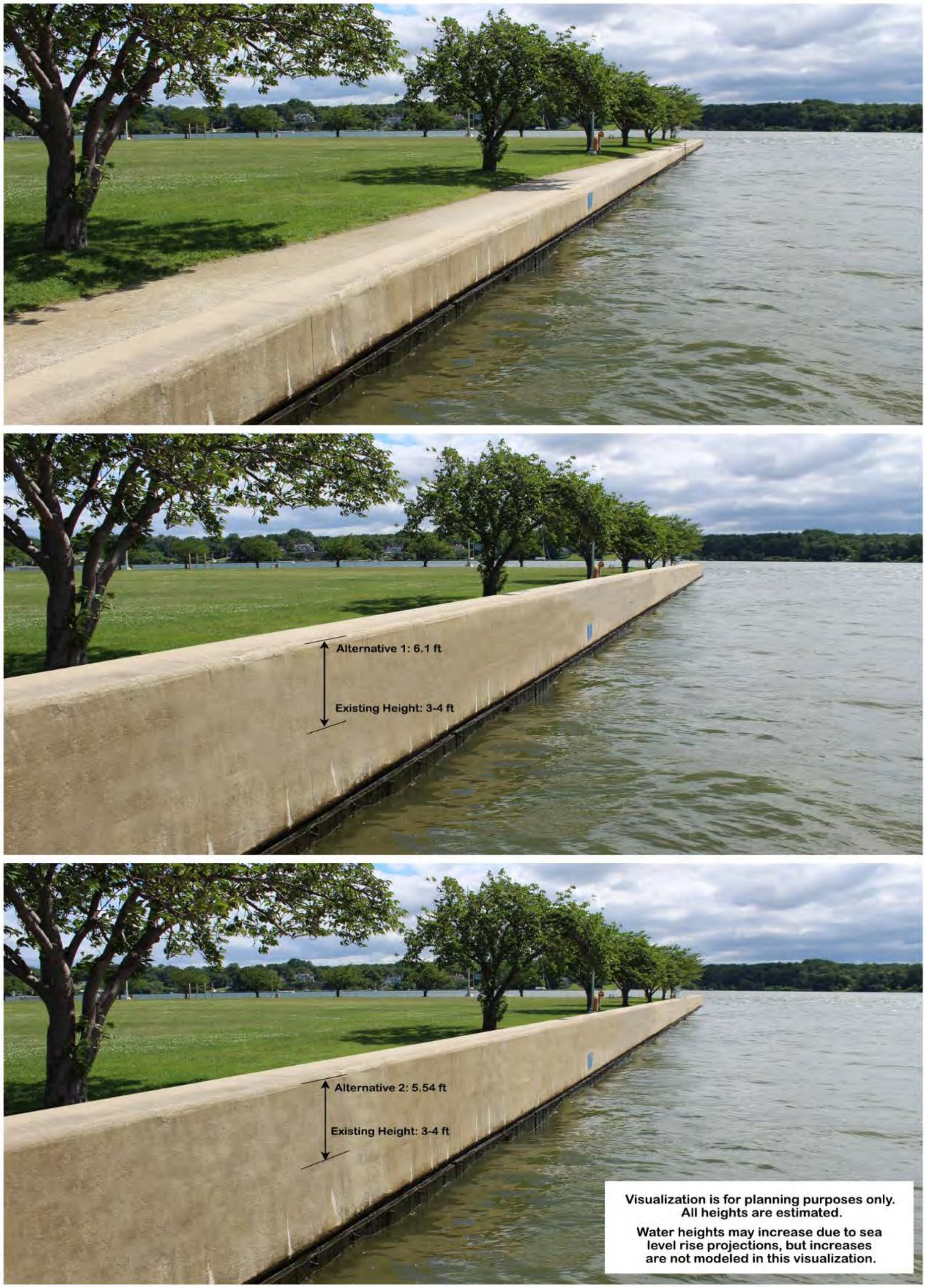


Figure 3-7 View of Reach 1 with Current View and Alternatives 1 and 2

Figure 3-8 View of Reach 2 with Current View and Alternatives 1 and 2

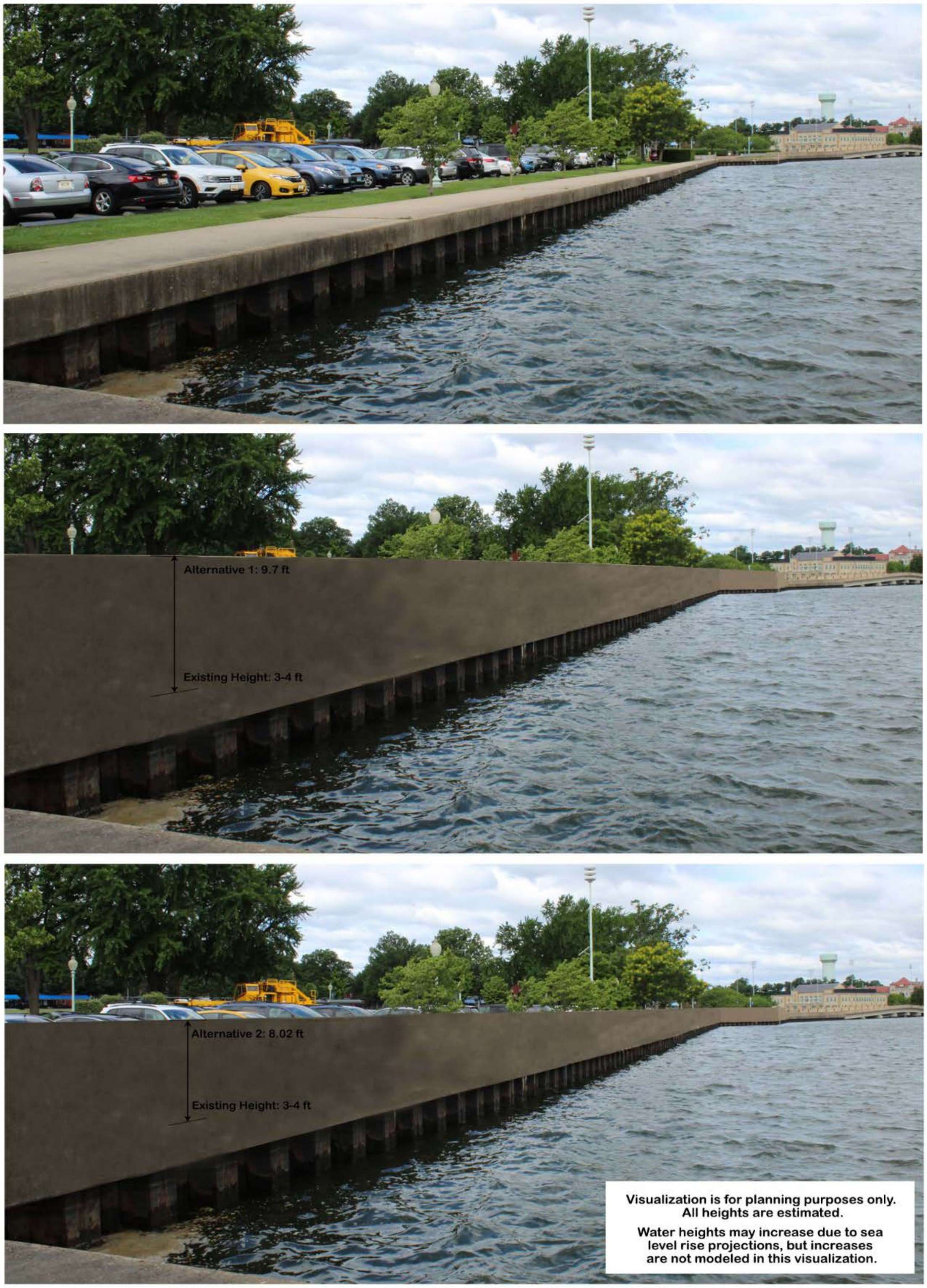


Figure 3-9 View of Reach 5 with Current View and Alternatives 1 and 2

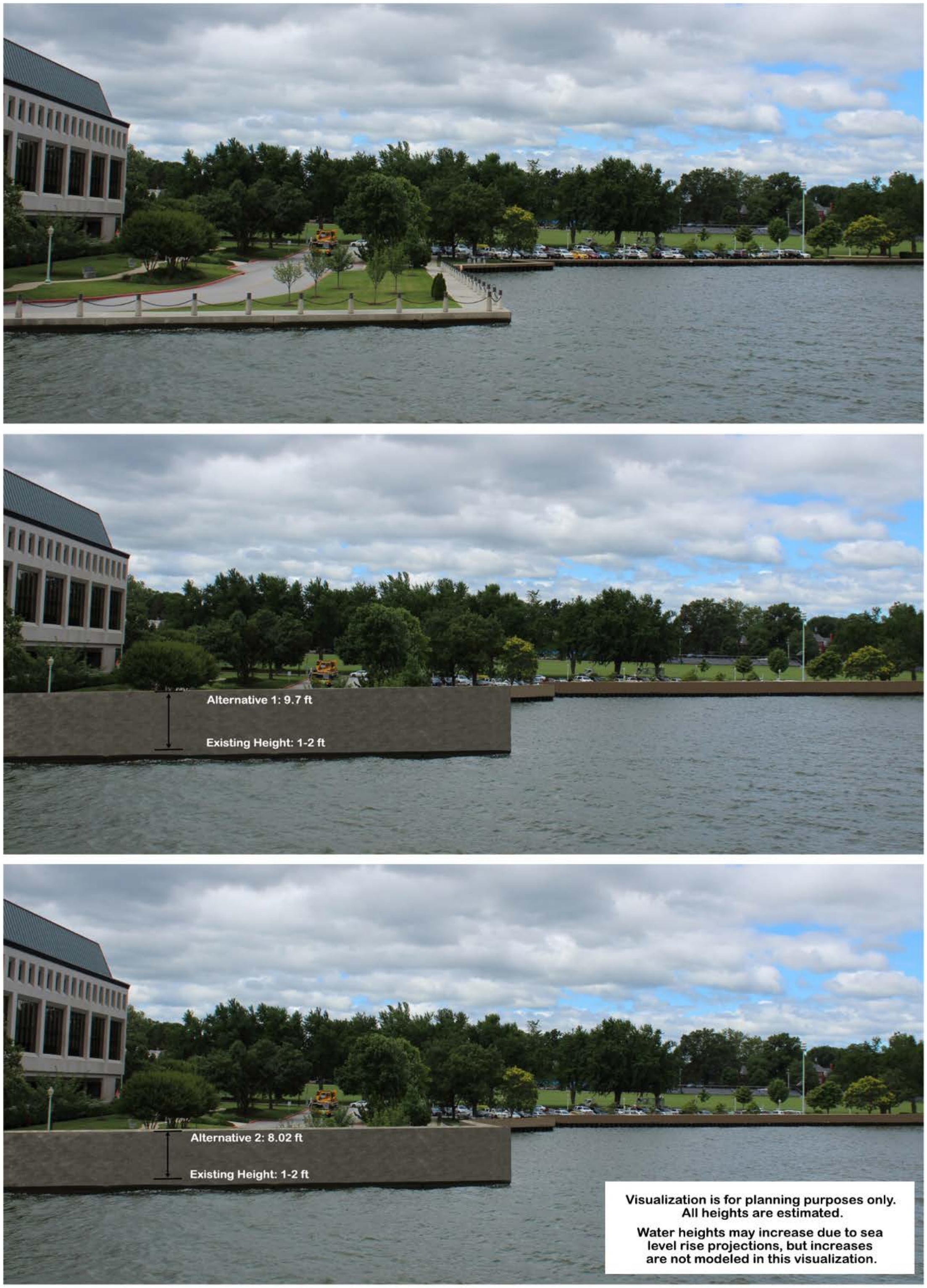


Figure 3-10 View of Reaches 5 and 6 with Current View and Alternatives 1 and 2

Figure 3-11 View of Reach 7 with Current View and Alternatives 1 and 2

Figure 3-12 View of Reach 9 with Current View and Alternatives 1 and 2

Figure 3-13 View of Reach 10 with Current View and Alternatives 1 and 2

Implementation of Alternative 1 would result in adverse effects on the seawalls and the significant views of USNA. It would also result in long-term, beneficial effects by better protecting the historic resources from future flooding and sea level rise. Therefore, implementation of Alternative 1 would not result in significant impacts on cultural resources.

3.4.3.3 Alternative 2 Potential Impacts

The study area under Alternative 2 is the same as Alternative 1 and encompasses the proposed construction and ground-disturbance areas and the viewsheds to the Severn River and College Creek. Under Alternative 2, the proposed seawalls would be higher than the existing height but lower than under Alternative 1 by 0.56 to 1.90 feet. They would be designed to accommodate for the 10- or 50-year design storm and the 50-year sea level rise scenarios. Under Alternative 2, hardened structures would be repaired or replaced along Reaches 1 through 15. Each would consist of a hardened structure, except for Reach 3, which would consist of log toe stabilization.

Effects would be similar to Alternative 1. There would be adverse effects on the seawalls for any construction or demolition to the historic structures. An increased height of the perimeter bulkhead would cause adverse effects on the historic significant views within the campus to the Severn River and College Creek, though they would be less than those described under Alternative 1 due to the lower seawall heights. An increase in functionality and protection to flooding and storm surge compared to existing conditions would be a beneficial effect by protecting the historic resources from irreparable damage. Since the seawalls would be lower as compared to Alternative 1, the benefits of limiting impacts on cultural resources within USNA would be less than those described under Alternative 1. Increasing the height of the seawalls around USNA could have an adverse effect to the adjacent Annapolis Historic District by pushing water further into that district. The adverse effects would be less than those described under Alternative 1 due to the lower seawall heights. There would be no adverse effects on Buildings 002NS, 003NS, and 004NS on North Severn, Chance Boatyard in Eastport, or the Severn River Bridge from implementing Alternative 2. There would be no adverse effects from relocating the submarine cable near Reach 9.

Implementation of Alternative 2 would not result in significant impacts on cultural resources.

3.4.3.4 Alternative 3 Potential Impacts

The study area under Alternative 3 is the same as Alternative 1 and encompasses the proposed construction and ground-disturbance areas. The existing hardened structures would be repaired or replaced to the existing height, without accommodating for future sea level rise. All reaches would be repaired or replaced with hardened structures, except for Reach 3, which would be replaced with a living shoreline.

Alternative 3 would involve repairs and restoration to damaged or degraded seawalls. These would be done according to the Secretary of the Interior’s Standards for Rehabilitation and, therefore, would not cause adverse effects.

Mitigation of potential impacts due to storm surge and sea level rise would not be met under Alternative 3. There would be potential adverse effects on the USNA Historic District and its contributing resources and landscape features from damage caused by flooding and storm surge events from the lack of proper protection. Since the seawalls would remain at the existing height, benefits of limiting impacts to cultural resources would be less than Alternative 1 and 2. There would be no adverse effects on Buildings 002NS, 003NS, and 004NS on North Severn, Chance Boatyard in Eastport, or the Severn River

Bridge from implementing Alternative 2. There would be no adverse effects from relocating the submarine cable near Reach 9.

Implementation of Alternative 3 would not result in significant impacts on cultural resources.

3.5 Biological Resources

Biological resources include living, native, or naturalized plant and animal species and the habitats within which they occur. Plant associations are referred to generally as vegetation, and animal species are referred to generally as wildlife. Habitat can be defined as the resources and conditions present in an area that support a plant or animal.

Within this EA, biological resources are divided into three major categories: (1) terrestrial vegetation, (2) terrestrial wildlife, and (3) marine species. Threatened, endangered, and other special-status species are discussed in their respective categories.

3.5.1 Regulatory Setting

Special-status species, for the purposes of this assessment, are those species listed as threatened or endangered under the Endangered Species Act and species afforded federal protection under the Marine Mammal Protection Act or the Migratory Bird Treaty Act.

The purpose of the Endangered Species Act is to conserve the ecosystems upon which threatened and endangered species depend and to conserve and recover listed species. Section 7 of the Endangered Species Act requires action proponents to consult with the U.S. Fish and Wildlife Service (USFWS) or National Oceanic and Atmospheric Administration (NOAA) Fisheries to ensure that their actions are not likely to jeopardize the continued existence of federally listed threatened and endangered species or result in the destruction or adverse modification of designated critical habitat. Critical habitat cannot be designated on any areas owned, controlled, or designated for use by the DoD where an Integrated Natural Resources Management Plan has been developed that, as determined by the Department of the Interior or Department of Commerce Secretary, provides a benefit to the species subject to critical habitat designation.

All marine mammals are protected under the provisions of the Marine Mammal Protection Act. This act prohibits any person or vessel from "taking" marine mammals in the United States or the high seas without authorization. The Marine Mammal Protection Act defines "take" to mean "to harass, hunt, capture, or kill or attempt to harass, hunt, capture, or kill any marine mammal."

Birds, including migratory and most native-resident bird species, are protected under the Migratory Bird Treaty Act, and their conservation by federal agencies is mandated by EO 13186, *Migratory Bird Conservation*. Under the Migratory Bird Treaty Act, it is unlawful by any means or in any manner to pursue, hunt, take, capture, kill, attempt to take, capture, or kill, [or] possess migratory birds or their nests or eggs at any time, unless permitted by regulation. The 2003 National Defense Authorization Act gave the Secretary of the Interior authority to prescribe regulations to exempt the Armed Forces from the incidental taking of migratory birds during authorized military readiness activities. The final rule authorizing the DoD to take migratory birds in such cases includes a requirement that the Armed Forces must confer with the USFWS to develop and implement appropriate conservation measures to minimize or mitigate adverse effects of a proposed action if the action will have a significant negative effect on the sustainability of a population of a migratory bird species.

Bald and golden eagles are protected by the Bald and Golden Eagle Protection Act. This act prohibits anyone, without a permit issued by the Secretary of the Interior, from taking these eagles, including their parts, nests, or eggs. The Act defines "take" as "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb."

The Magnuson-Stevens Fishery Conservation and Management Act provides for the conservation and management of fisheries. Under the Act, essential fish habitat (EFH) consists of the waters and substrate needed by fish to spawn, breed, feed, or grow to maturity.

3.5.2 Affected Environment

No federal rare, threatened, or endangered species are known to occur at NSA Annapolis. Northern long-eared bat (*Myotis septentrionalis*), a federally threatened species, has the potential to occur but has not been documented. The bald eagle (*Haliaeetus leucocephalus*), which is delisted but still protected under the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act, is present in the vicinity. The closest bald eagle nest is documented south of the Chesapeake Bay Bridge, approximately two miles east of North Severn (NAVFAC Washington, 2011).

In addition, Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*) and shortnose sturgeon (*Acipenser brevirostrum*) are present in the Chesapeake Bay and some of its tributary rivers; both species are listed as endangered under the Endangered Species Act. These species are discussed further in Section 3.5.2.3, Marine Species. A number of federally protected marine mammal and sea turtle species also have the potential to occur in the Chesapeake Bay but have not been observed at NSA Annapolis. These species are also discussed further in Section 3.5.2.3.

Protected species, including state-listed species, are discussed in each respective section below.

3.5.2.1 Terrestrial Vegetation

Vegetation includes terrestrial plant as well as freshwater aquatic communities and constituent plant species.

NSA Annapolis contains diverse vegetation communities including forested areas, grasslands, improved (developed) land, and agricultural fields. The Upper and Lower Yards of the USNA are predominantly landscaped areas and improved lands with the exception of a small four-acre forested peninsula reaching into College Creek. This four-acre peninsula is the last tract of mature natural forest within the City of Annapolis. The site is dominated by chestnut oak (*Quercus prinus*) with scattered white oak (*Q. alba*), southern red oak (*Q. falcata*), and black oak (*Q. velutina)*. Within the understory, the common species include flowering dogwood (*Cornus florida*), sassafras (*Sassafras albidum*), spicebush (*Lindera benzoin*), privet (*Ligustrum* spp.), and maple-leaf viburnum (*Viburnum acerifolium*). Approximately six acres of wooded areas also occur along the western border of the Upper Yard adjacent to Shady Lake (NAVFAC Washington, 2011).

North Severn contains over 225 acres of forests, woodlands, or semi-natural areas with trees and shrubs. Forested area on North Severn is composed of hardwood, mixed hardwood-pine, and pine. For a detailed description of the forest species occurring at NSA Annapolis, refer to Sections 4.D.6 and 5.C.6 of the 2011 Integrated Natural Resources Management Plan (NAVFAC Washington, 2011).

The reaches considered under the Proposed Action, as shown in Figure 1-2, occur along the shorelines of Upper Yard, Lower Yard, and North Severn. No wetlands, forests, or woodlands exist along the project reaches; the land abutting all reaches is composed of roads, walkways, parking areas for vehicles and boats, and maintained lawn with some landscaped trees. Reaches 1, 3, and 4 have maintained grass with landscaped and urban trees and shrubs along the existing seawall. Reach 3 has some additional trees and vegetation just south of the King George Street bridge.

A hardwood forest is located adjacent to the Yard Patrol Basin, near Reaches 13, 14, and 15. This forest stand is composed of a discontinuous canopy of loblolly pine (*Pinus taeda*) with large areas of black cherry (*Prunus serotina*), black locust (*Robinia pseudoacacia*), and other hardwood species. Poison ivy (*Toxicodendron radicans*) and Japanese honeysuckle (*Lonicera japonica*) are the dominant ground cover species (NAVFAC Washington, 2011).

As previously mentioned, there are no federally listed threatened, endangered, or candidate species on NSA Annapolis. Surveys were conducted at USNA and Greenbury Point (part of North Severn) in 1996, but other portions of North Severn or aquatic surveys of the adjacent creeks and rivers were not conducted. The 1996 survey identified Lancaster's sedge (*Cyperus lancastriensis*), which is considered "Status Uncertain" by the Maryland Department of Natural Resources (MDNR) Wildlife and Heritage Division. Subsequent surveys also identified grass-leaved arrowhead (*Sagittaria graminea*), also listed as "Status Uncertain" and broad-fruited bur-reed (*Sparganium eurycarpum*), classified as S3, rare to uncommon in the state. Carolina milkvine (*Matelea carolinensis*) is considered state endangered and classified as S2S3, rare to vulnerable in the state (MDNR, 2019). The species has been observed in several locations in North Severn but does not exist along the NSA Annapolis shorelines.

Based on available regional data, one species of submerged aquatic vegetation (SAV), claspingleaf pondweed (*Potamogeton perfoliatus*), which is classified as S3 by MDNR Wildlife and Heritage Division, has been mapped in College Creek. SAV is further discussed in Section 3.5.2.3, Marine Species.

3.5.2.2 Terrestrial Wildlife

Wildlife includes all animal species (i.e., insects and other invertebrates, freshwater fish, amphibians, reptiles, birds, and mammals) focusing on the species and habitat features of greatest importance or interest.

NSA Annapolis provides food, cover, and nesting opportunities for a variety of wildlife species, many of which use NSA Annapolis for all or part of their life cycle requirements. Generally, the wildlife species (mammals, birds, reptiles, amphibians, and insects) known to occur at NSA Annapolis are consistent with native fauna communities throughout the mid-Atlantic coastal region. Although detailed fauna surveys have not been completed, the habitat diversity at NSA Annapolis provides valuable breeding, foraging, and stopover habitat for many species in the increasingly urbanized Annapolis area. NSA Annapolis is also home to a variety of nuisance wildlife and feral pets, in particular at the North Severn property. White-tailed deer (*Odocoileus virginianus*), resident Canada goose (*Branta canadensis*), raccoon (*Procyon lotor*), and feral cats (*Felis catus*) are the most prominent nuisance species of concern as they can overharvest vegetation and outcompete and prey upon native wildlife species. Recreational hunting is not allowed at NSA Annapolis; therefore, these species are afforded a low-risk, maintained, natural area in which to live.

Amphibians and Reptiles

An amphibian and reptile survey was conducted in 1997 and 1998 at Greenbury Point on North Severn and the four-acre woods peninsula on the Upper Yard. Eight species of frogs and toads were observed over the two-year period, including the American toad (*Bufo americanus*), gray treefrog (*Hyla versicolor*), spring peeper (*Pseudacris crucifer*), bullfrog (*Rana catesbeiana*), green frog (*Rana clamitans*), pickerel frog (*Rana palustris*), wood frog (*Rana sylvatica*), and southern leopard frog (*Rana utricularia*). Five species of turtles, five species of snakes, and one salamander species were also observed. The turtles found include the common snapping turtle (*Chelydra serpentina*), northern diamondback terrapin (*Malaclemys terrapin*), eastern mud turtle (*Kinosternon subrubrum*), eastern painted turtle (*Chrysemys picta*), and the eastern box turtle (*Terrapene carolina*). Snake species include eastern worm snake (*Carphophis amoenus*), northern black racer (*Coluber constrictor*), black rat snake (*Elaphe obsoleta*), northern water snake (*Nerodia sipedon*), and the eastern garter snake (*Thamnophis sirtalis*). Redback salamander (*Plethodon cinereus*) was also observed (NAVFAC Washington, 2016).

Mammals

General observations of mammals at NSA Annapolis include white-tailed deer, groundhog (*Marmota monax*), eastern cottontail (*Sylvilagus floridanus*), raccoon, gray squirrel (*Sciurus carolinensis*), gray fox (*Urocyon cinereoargenteus*), and red fox (*Vulpes vulpes*). Small mammals that have been observed at NSA Annapolis include short-tailed shrew (*Blarina brevicauda*), eastern mole (*Scalopus aquaticus*), meadow vole (*Microtus pennsylvanicus*), and house mouse (*Mus musculus*) (NAVFAC Washington, 2011). An acoustic survey for bat species was conducted in May 2016, and the following bat species are present at NSA Annapolis: big brown bat (*Eptesicus fuscus*), eastern red bat (*Lasiurus borealis*), silver-haired bat (*Lasionycteris noctivagans*), evening bat (*Nycticeius humeralis*), and hoary bat (*Lasiurus cinereus*) (NAVFAC Washington, 2017). Northern long-eared bat (*Myotis septentrionalis*), a federally threatened species, has the potential to occur within the project areas (USFWS, 2019). Acoustic and mist-net bat surveys were conducted at NSA Annapolis in 2016, and northern long-eared bat was not observed (NAVFAC Washington, 2017).

Birds

Over 150 bird species have been documented at NSA Annapolis and the adjacent waterbodies, including songbirds, shorebirds, wading birds, waterfowl, and raptors. Common bird species in the region frequently use the installation's open areas, forested areas, and urban settings. The marshes and shoreline of NSA Annapolis provide habitat for a number of shorebirds and wading birds including a number of gull species, great blue heron (*Ardea herodias*), snowy egret (*Egretta thula*), and green heron (*Butorides virescens*), as well as numerous red-winged blackbirds (*Agelaius phoeniceus*). Osprey (*Pandion haliaetus*), bald eagle, forest interior dwelling birds, and waterfowl are common in the region.

The ecological communities at NSA Annapolis provide important stopover habitat for migratory birds during spring and fall migration. Maryland is an important stopover for breeding and overwintering in the Atlantic Flyway, a major migratory flight route in North America, especially for waterfowl in winter and wading birds in summer (NAVFAC Washington, 2011). Table 3-8 contains a list of species protected under the Migratory Bird Treaty Act that could occur in the project area.

Of the migratory bird species listed in Table 3-8, the following have been observed at NSA Annapolis: bobolink, Bonaparte's gull, common loon, common tern, double-crested cormorant, great black-backed gull, herring gull, least tern, lesser yellowlegs, long-tailed duck, red-breasted merganser, ring-billed gull, surf scoter, and wood thrush (NAVFAC Washington, 2011).

A number of state-listed endangered bird species—mourning warbler, royal tern, and short-eared owl—and one state-listed threatened species—least tern—have been observed at or near North Severn.

Table 3-8 Migratory Birds with Potential to Occur in Project Area

Common Name	*Scientific Name*	*Potential Breeding in Project Area?*
Black scoter	*Melanitta nigra*	No
Black skimmer	*Rynchops niger*	May 20–September 15
Black-billed cuckoo	*Coccyzus erythropthalmus*	May 15–October 10
Black-legged kittiwake	*Rissa tridactyla*	No
Bobolink	*Dolichonyx oryzivorus*	May 20–July 31
Bonaparte’s gull	*Chroicocephalus philadelphia*	No
Brown pelican	*Pelecanus occidentalis*	January 15–September 30
Canada warbler	*Cardellina canadensis*	May 20–August 10
Clapper rail	*Rallus crepitans*	April 10–October 31
Common loon	*Gavia immer*	April 15–October 31
Common tern	*Sterna hirundo*	May 10–September 10
Double-crested cormorant	*Phalacrocorax auritus*	April 20–August 31
Dunlin	*Calidris alpina arcticola*	No
Great black-backed gull	*Larus marinus*	April 15–August 20
Herring gull	*Larus argentatus*	April 20–August 31
Kentucky warbler	*Oporornis formosus*	April 20–August 20
Least tern	*Sterna antillarum*	April 20–September 10
Lesser yellowlegs	*Tringa flavipes*	No
Long-tailed duck	*Clangula hyemalis*	No
Nelson’s sparrow	*Ammodramus nelsoni*	May 15–September 5
Northern gannet	*Morus bassanus*	No
Prairie warbler	*Dendroica discolor*	May 1–July 31
Purple sandpiper	*Calidris maritima*	No
Red-breasted merganser	*Mergus serrator*	No
Red-headed woodpecker	*Melanerpes erythrocephalus*	May 10–September 10
Red-throated loon	*Gavia stellata*	No
Ring-billed gull	*Larus delawarensis*	No
Royal tern	*Thalasseus maximus*	April 15–August 31
Ruddy turnstone	*Arenaria interpres marinella*	No
Rusty blackbird	*Euphagus carolinus*	No
Saltmarsh sparrow	*Ammodramus caudacutus*	May 15–September 5
Seaside sparrow	*Ammodramus maritimus*	May 10–August 20
Semipalmated sandpiper	*Calidris pusilla*	No
Short-billed dowitcher	*Limnodromus griseus*	No
Snowy owl	*Bubo scandiacus*	No
Sooty tern	*Onychoprion fuscatus*	March 10–July 31
Surf scoter	*Melanitta perspicillata*	No
White-winged scoter	*Melanitta fusca*	No
Willet	*Tringa semipalmata*	April 20–August 5
Wood thrush	*Hylocichla mustelina*	May 10–August 31

Source: USFWS, 2019.

Fish

Fish resources at and near NSA Annapolis are found in the brackish/saltwater fisheries of the Severn River, College Creek, Spa Creek, Carr Creek, and Mill Creek. Since these water bodies are not freshwater, information regarding fish is in Section 3.5.2.3, Marine Species.

Invertebrates

Many butterfly species are known to occur at Greenbury Point on North Severn. The most commonly occurring butterflies include the orange sulphur (*Colias eurytheme*), clouded sulphur (*Colias philodice*), common buckeye (*Junonia coenia*), cabbage white (*Pieris rapae*), and monarch (*Danaus plexippus*). Monarch butterfly is under USFWS review for listing under the Endangered Species Act (USFWS, n.d.).

3.5.2.3 Marine Species

Marine Vegetation

Marine vegetation includes plants occurring in marine or estuarine waters. These may include mangroves, algae, and various grasses.

Seventeen species of SAV are commonly found in the Chesapeake Bay and its tidal tributaries. Common SAV in the middle and upper portions of the bay where salinities are lower include claspingleaf pondweed (also called redhead grass; *Potamogeton perfoliatus*), sago pondweed (*Potamogeton pectinatus*), horned pondweed (*Pannichellia palustris*), and Eurasian milfoil (*Myriophyllum spicatum*). Widgeon grass (*Ruppia maritima*) is tolerant of both high- and low-salinity waters and is common throughout the Chesapeake Bay. Eelgrass (*Zostra marina*) is the dominant SAV species in the lower portion of the bay in areas of higher salinities (NAVFAC Washington, 2011).

Historically, SAV was present over 200,000 acres of the Chesapeake Bay, but concentrations of SAV steadily declined from the 1950s through the 1970s, when less than 40,000 acres of SAV remained. SAV beds are considered Special Aquatic Sites under Section 404 of the Clean Water Act (40 CFR Part 230, Section 404 (b)(1)) and are an important resource in the Chesapeake Bay. SAV provide protection and nursery habitat for a broad range of aquatic organisms and contribute to the oxygenation of the water.

NSA Annapolis has not conducted surveys for SAV on or near the installation. However, ongoing mapping of SAV by organizations such as the Chesapeake Bay Foundation and local watershed groups such as Friends of College Creek have mapped SAV in several rivers and creeks along NSA Annapolis. Mapping efforts in the Severn River, Spa Creek, College Creek, Carr Creek, and Mill Creek indicate SAV occurring in the area but generally limited to the upper portions of the creeks. Claspingleaf pondweed, which is classified as rare to uncommon by the state, has been mapped in College Creek (NAVFAC Washington, 2011).

Marine Mammals

NOAA Fisheries maintains jurisdiction over whales, dolphins, porpoises, seals, and sea lions. USFWS maintains jurisdiction for certain other marine mammal species, including walruses, polar bears, dugongs, sea otters, and manatees.

NSA Annapolis is located within the known range of ten marine mammal species that have regular or rare occurrences in the Chesapeake Bay: North Atlantic right whale (*Eubalaena glacialis*), humpback whale (*Megaptera novaeangliae*), fin whale (*Balaenoptera physalus*), West Indian manatee (*Trichechus manatus*), bottlenose dolphin (*Tursiops truncatus*), common dolphin (*Delphinus delphis*), harbor porpoise (*Phocoena phocoena*), harbor seal (*Phoca vitulina*), grey seal (*Halichoerus grypus*), and harp seal (*Pagophilus groenlandicus*). Of these, the North Atlantic right whale, humpback whale, fin whale, and West Indian manatee are listed as endangered under the Endangered Species Act. However, no stranding, bycatch, or sightings have been documented at NSA Annapolis for any of these marine mammals (NAVFAC Washington, 2011).

Sea Turtles

Of the six sea turtle species that are found in U.S. waters or that nest on U.S. beaches, all are designated as either threatened or endangered under the Endangered Species Act. Sea turtles are highly migratory and use the waters of more than one country in their lifetimes. USFWS and NOAA Fisheries share federal jurisdiction for sea turtles with the USFWS having lead responsibility on the nesting beaches and NOAA Fisheries on the marine environment.

Five species of sea turtles have been recorded in the Chesapeake Bay and may occur, if rarely, in the vicinity of NSA Annapolis: leatherback (*Dermochelys coriacea*), loggerhead (*Caretta caretta*), Atlantic green (*Chelonia mydas*), Atlantic hawksbill (*Eretmochelys imbricata*), and Kemp's ridley (*Lepidochelys kempii*). The vicinity of NSA Annapolis is designated as an area of primary occurrence for Kemp's ridley (endangered) and green (threatened) turtles from May to October; an area of secondary occurrence for the loggerhead (threatened) from May to June and September to October; and an area of rare occurrence for leatherback (endangered) from May to October. During the months of July and August, the mouth of the Severn River is designated a primary area of occurrence and the tributaries secondary areas of occurrence for the loggerhead turtle.

No stranding, bycatch, or sightings have been documented at NSA Annapolis for any of these sea turtles (NAVFAC Washington, 2011).

Fish

Fish are vital components of the marine ecosystem. They have great ecological and economic aspects. To protect this resource, NOAA Fisheries works with the regional fishery management councils to identify the essential habitat for every life stage of each federally managed species using the best available scientific information. EFH has been described for approximately 1,000 managed species to date. EFH includes all types of aquatic habitat including wetlands, coral reefs, seagrasses, and rivers, and all locations where fish spawn, breed, feed, or grow to maturity.

MDNR conducted fish surveys in the Severn River from 1989 through 1994. Fish that occur in the Severn River are influenced by the salinity, with freshwater fish dominating the fresher tidal headwater areas of the tributaries, and more salt-tolerant marine fish in the major tidal waters. Of the 40 species captured during the surveys, most were estuarine residents; however, 12 species were marine migrants, and 7 were primarily freshwater species. The most commonly observed fish include the inland silverside (*Menidia beryllina*), Atlantic menhaden (*Brevoortia tyrannus*), striped killifish (*Fundulus majalis*), striped bass (*Morone saxatilis*), mummichog (*Fundulus heteroclitus*), Atlantic silverside (*Menidia menidia*), bay anchovy (*Anchoa mitchilli*), Atlantic croaker (*Micropogonias undulatus*), white perch (*Morone americana*), and spot (*Leiostomus xanthurus*). Shellfish within the zones of higher salinity within the Severn River include blue crab (*Callinectes sapidus*), oyster, and clam.

Essential Fish Habitat

EFH has been designated for ten fish species in the vicinity of NSA Annapolis. In accordance with the Magnuson-Stevens Fisheries Conservation and Management Act, consultation with NOAA Fisheries is required when any land use changes, shoreline stabilization, or military operations are planned that have the potential to affect EFH. EFH has been designated for the species listed in Table 3-9 in the vicinity of NSA Annapolis, and descriptions of the species and their respective EFH follow. For context within the EFH descriptions below, the salinity of the Severn River averages between approximately 6 and 12 parts per thousand (ppt) throughout the year, with lower salinity occurring in the spring and the higher salinity occurring in the fall (Severn Riverkeeper, 2012).

Table 3-9 Essential Fish Habitat and Life Stages Near Proposed Action

Common Name	*Scientific Name*	*Eggs*	*Larvae*	*Juveniles*	*Adults*
Bluefish	*Pomatomus saltatrix*	—	—	Yes	Yes
Scup	*Stenotomus chrysops*	—	—	Yes	Yes
Summer flounder	*Paralichthys dentatus*	—	Yes	Yes	Yes
Black sea bass	*Centropristis striata*	—	—	Yes	Yes
Little skate	*Leucoraja erinacea*	—	—	—	Yes
Atlantic herring	*Clupea harengus*	—	—	Yes	Yes
Red hake	*Urophycis chuss*	Yes	Yes	Yes	Yes
Windowpane flounder	*Scophthalmus aquosus*	—	—	Yes	Yes
Winter skate	*Leucoraja ocellata*	—	—	—	Yes
Clearnose skate	*Raja eglanteria*	—	—	—	Yes

Source: NOAA Fisheries, 2019.

Bluefish (*Pomatomus saltatrix*): Bluefish is a highly migratory, schooling pelagic species found along the Atlantic coast. EFH for juvenile and adult bluefish includes the pelagic water column and inland with the mixing and seawater zones of between 0.5 and 25 ppt, and greater than 25 ppt salinity, respectively.

Scup (*Stenotomus chrysops*): Scup is a migratory, schooling, bottom-dwelling species found along the Atlantic coast. EFH for juvenile and adult scup includes the estuaries within mixing and seawater salinity zones. Generally found during the summer and spring in estuaries and bays with various sands, mud, mussel, and eelgrass bed-type substrates in water temperatures greater than 45 degrees Fahrenheit and salinities greater than 15 ppt.

Summer Flounder (*Paralicthys dentatus*): EFH for juvenile and adult summer flounder includes bottom waters, including tidal guts. Juveniles may use estuarine habitats such as SAV beds and open bay areas as nursery areas, and adults generally inhabit shallow estuarine waters during warmer months. Inshore EFH for summer flounder larvae is within the mixing (0.5–25.0 ppt) and seawater (>25 ppt) salinity zones. In general, summer flounder larvae are most abundant nearshore (12–50 miles from shore) at depths between 30 and 230 feet. Within the southern part of the Mid-Atlantic Bight, summer flounder larvae are most frequently found from November to May.

Black Sea Bass (*Centropristis striata*): EFH for juvenile and adult black sea bass includes estuaries within mixing and seawater salinity zones with temperatures warmer than 43 degrees Fahrenheit. Juveniles are found during summer and spring in estuaries with salinities greater than 18 ppt, and typically found in association with rough bottom, shellfish, and eelgrass beds, and man-made structures in sandy, shelly areas. Wintering adult black sea bass are typically found offshore.

Little Skate (*Leucoraja erinacea*): EFH for adult little skate includes intertidal and sub-tidal benthic habitat, extending to a maximum depth of approximately 330 feet, and including high salinity zones in the Chesapeake Bay. EFH occurs on sand and gravel substrates, but they are also found on mud. The Proposed Action is entirely within the mixing salinity zone of the Severn River and would not affect little skate. Therefore, this species is not discussed further.

Atlantic Herring (*Clupea harengus*): Atlantic herring is a pelagic schooling species found at various depths depending on life stage, season, and geographic location. EFH for adult Atlantic herring includes the seawater salinity zone of the Chesapeake Bay. The Proposed Action would occur entirely within the mixing salinity zone of the Severn River and would not affect Atlantic herring. Therefore, this species is not discussed further.

Red Hake (*Urophycis chuss*): Juvenile and adult seasonal visitors in the Chesapeake Bay are common during the late winter and spring months. The species occurs in the deeper channels of the bay mainstem as well as the deep channels of Hampton Roads Harbor and occasionally in the upper bay extending as far north as the Patuxent River, which is approximately 45 miles south of the Severn River. The Proposed Action is entirely within the mixing salinity zone of the Severn River and would not affect red hake. Therefore, this species is not discussed further.

Windowpane Flounder (*Scopthalmus aquosus*): EFH for juvenile and adult windowpane flounder includes bottom habitats with a substrate of mud of fine-grained sand, water temperatures below 77 degrees Fahrenheit, and salinities between 5.5 and 36 ppt.

Winter Skate (*Leucoraja ocellata*): EFH for adult winter skate includes sub-tidal benthic habitats in coastal waters from the shoreline to a maximum depth of approximately 260 feet, including the high salinity zones of the Chesapeake Bay. EFH occurs on sand and gravel substrates, but this species is also found on mud. The Proposed Action is entirely within the mixing salinity zone of the Severn River and would not affect winter skate. Therefore, this species is not discussed further.

Clearnose Skate (*Raja eglanteria*): EFH for adult clearnose skate includes sub-tidal benthic habitats in coastal waters from the shoreline to approximately 130 feet, including the high salinity zones of the Chesapeake Bay. EFH occurs primarily on mud and sand, but also on gravelly and rocky bottom. The Proposed Action is entirely within the mixing salinity zone of the Severn River, and would not affect clearnose skate. Therefore, this species is not discussed further.

No Habitat Areas of Particular Concern are present within the project area (NOAA Fisheries, 2019).

Other Protected Fish Species

Shortnose and Atlantic sturgeon are the only two sturgeon species on the Atlantic Coast; both are protected under the Endangered Species Act.

The Atlantic sturgeon Chesapeake Bay Distinct Population Segment (DPS) is federally and state-listed as endangered. The Chesapeake Bay DPS includes five critical habitat units for the species: Potomac River, Rappahannock River, York River system (including Pamunkey and Mattaponi Rivers), James River, and Nanticoke River/Marshyhope Creek (Federal Register, 2017). Atlantic sturgeon is an anadromous fish that spends most of its life in brackish or saltwater and migrates into freshwater to spawn. Spawning typically occurs in flowing water upriver of the salt front of estuaries and below the fall line of large rivers. Spawning sites are well-oxygenated areas with flowing water ranging in temperature from 55 degrees Fahrenheit to 26 degrees Fahrenheit, and hard-bottom substrate such as cobble, hard clay, and bedrock. Larval and juvenile Atlantic sturgeon remain in the natal estuary for up to six years before moving to marine waters (i.e., waters with salinity greater than 30 ppt) as an adult (Federal Register, 2017). Populations of Atlantic sturgeon in the Chesapeake Bay have been significantly reduced due to over-fishing, degradation or loss of habitat, and damming of rivers that prevented the species from reaching their spawning grounds (USFWS Chesapeake Bay Field Office, 2011). The species has not been found in the Severn River and is unlikely to inhabit the waters near the Proposed Action.

Shortnose sturgeon, federally and state-listed as endangered, is found in the Chesapeake Bay. This anadromous fish spends most of its life in brackish or saltwater and migrates into freshwater to spawn from February through April. This species prefers large, low-salinity river systems, and, near the Chesapeake Bay, are primarily found in the Potomac and Susquehanna Rivers; it has not been found in the Severn River or its tributaries (NOAA Fisheries, n.d.). As such, shortnose sturgeon is unlikely to be located in the waters near the Proposed Action.

Biological Resource Potential Impacts:

- No Action: Adverse impacts from continued sea level rise, storm surge, land subsidence, and erosion. No significant impact.
- Alternative 1: Short-term, minor, adverse impacts from construction activity. Long-term benefits to biological resources from prevention of land subsidence and erosion. No significant impact.
- Alternative 2: Similar to Alternative 1, with added benefits from application of log toe stabilization. No significant impact.
- Alternative 3: Similar to Alternative 1, with added benefits from application of living shoreline. No significant impact.

3.5.3 Environmental Consequences

This analysis focuses on wildlife or vegetation types that are important to the function of the ecosystem or are protected under federal or state law or statute.

3.5.3.1 No Action Alternative

Under the No Action Alternative, the Proposed Action would not occur; there would be continued sea level rise, storm surge, and land subsidence at NSA Annapolis, resulting in increased flooding and failure events. The degradation and deterioration of existing seawalls could result in erosion and soil loss with increased flooding events, which would affect vegetation and wildlife near terrestrial and aquatic communities.

Continued deterioration of seawalls would result in increased flooding and failure events. The shoreline beyond the existing seawalls would continue to erode, and the existing conditions along the shorelines would be expected to decline. Unstable eroding banks could uproot landscaped trees and shrubs along the reaches. Bank failure and soils sloughing would adversely affect plant communities adjacent to the shoreline over the long term. However, since the reaches are primarily along roads, walkways, and parking areas, impacts on soils and vegetation would be minor.

Water turbidity from soil erosion could also affect any SAV that may establish near NSA Annapolis; the density of SAV is currently low near NSA Annapolis and limited to the upper areas of College Creek and Spa Creek near the project reaches. Poor water quality from soil erosion could inhibit the establishment of SAV in the future. Effects on SAV under the No Action Alternative would be minor.

Continued and worsening erosion of the seawalls would result in sediment in the Severn River, College Creek, and Spa Creek, resulting in long-term water quality impacts. Aquatic species would likely avoid the area of degraded water quality, which would affect shorebirds that use the shorelines for fishing.

Areas near NSA Annapolis that serve as EFH for bluefish, scup, summer flounder, black sea bass, or windowpane flounder may be affected by increases in sediment load and turbidity from erosion. These impacts would be minor as erosion and flooding events occur with the existing conditions for the seawalls.

Increases in flooding events would also affect the terrestrial communities of NSA Annapolis and nearby waterbodies by increasing exposure to contaminated floodwaters. This would also result in adverse impacts on terrestrial and marine habitats on and near NSA Annapolis. Impacts would be long-term, minor, and indirect.

Therefore, no significant impacts on biological resources would occur under the No Action Alternative.

3.5.3.2 Alternative 1 Potential Impacts

The study area for the analysis of effects on biological resources associated with Alternative 1 includes the shoreline and habitats immediately adjacent to the project reaches.

Construction activity associated with the Alternative 1 seawall repair and restoration would result in short-term, minor, adverse impacts on biological resources. Construction activities would result in temporary noise and sedimentation impacts during the underwater installation and repair of seawalls, which would have minor impacts on wildlife on and near the reaches under construction. The seawall repair and restoration would not result in any permanent loss of vegetation or habitat. Implementation of Alternative 1 would not result in significant impacts on biological resources.

Long-term, minor, beneficial impacts on biological resources, relative to the No Action Alternative, would be expected. Repair and restoration of the seawalls would reduce erosion and flooding of the NSA Annapolis shoreline, improving water quality and benefiting terrestrial and aquatic species and EFH.

Terrestrial Vegetation

As previously mentioned, no wetlands, forests, or woodlands exist along the project reaches. Some maintained lawn with landscaping and urban trees occurs along Reaches 1, 3, and 4. Potential short-term, minor, adverse impacts on vegetation along these reaches could occur during the construction period from the installation of hardened structures, addition of fill material, and use of heavy construction equipment. Temporary construction areas, if needed, could also result in temporary impacts on vegetation. Trees, shrubs, and grasses may be damaged, removed, or trampled during the construction phase. With the implementation of appropriate erosion- and sediment-control BMPs (as described in Section 3.2) and prescribed by applicable permits, short-term impacts from ground disturbance on terrestrial vegetation would be reduced.

In the long term, localized changes in the demarcation of the floodplain along affected reaches could occur with the proposed increases in seawall heights. However, beneficial effects on vegetation would be expected from a reduction in flooding events due to storm surge and a reduction in shoreline erosion and sedimentation, which would help to create a more stable environment for vegetation along the seawalls.

Terrestrial Wildlife

Implementation of Alternative 1 would require the use of some heavy equipment. Short-term noise associated with the installation of structural components for the seawalls could disturb terrestrial wildlife, resulting in avoidance of the area while noise is occurring. Adverse effects from noise would be localized and limited to the duration of the activity. Many of the terrestrial species that occur in the project area are highly mobile and would be temporarily displaced during construction activity but would likely return when construction activity on a reach is complete. Smaller, less mobile species such as amphibians, reptiles, and burrowing mammals, could be inadvertently killed or injured during construction activity. However, local population levels would not be affected.

Marine Species

Short-term, adverse effects on aquatic resources and habitats would be expected during construction activities. Noise from construction activity, particularly if pile driving is needed to replace pilings due to deterioration or to increase seawall height, would affect marine species. The level and duration of noise exposure that can affect fish vary widely based on the rate of sound, pressure level, frequency, duration, and the size and life cycle of the fish. Underwater sound pressure caused by in-water pile driving could distress, injure, or kill fish near the project area. Ambient underwater sound levels are already fairly high due to the number of ships and industrial uses at NSA Annapolis. The thresholds of behavioral effects of pile-driving noise on fish that is considered harmful or harassment is not well known, and while fish may react to a sudden loud sound, they may also quickly habituate to the sound. NOAA Fisheries and USFWS generally use 150 decibel (dB) root mean square (RMS) sound pressure level as the threshold for behavioral effects on Endangered Species Act-listed fish species, citing that this level and above can cause temporary behavioral changes that could decrease a fish's ability to avoid predators (CalTrans, 2015). Noise impacts on fish are described in more detail in Section 3.7, Noise. The Navy commits to implementing appropriate avoidance and minimization measures and BMPs in accordance with regulations and ongoing consultations with NOAA Fisheries to reduce the impacts on fish and their habitat from pile-driving noise. The types of BMPs and avoidance and minimization measures that would be beneficial in reducing the impact on fish in the vicinity include, but are not limited to, timing and duration of pile-driving activities and the life phase of the fish exposed to the noise to reduce impacts on the fish within the vicinity; the use of a "soft start" or a system of warning strikes where the pile driving would begin at 25–40 percent of its total energy; portable noise barriers; impact cushions; or noise bellow systems. Juvenile and adult fish near the project area are highly mobile and are able to avoid the area immediately surrounding construction and increased noise.

Seawall repair and restoration and potential barge traffic would result in temporary disturbances to the existing shoreline and nearshore habitat. During construction activity, placement of seawall structures, and relocation of the submarine cable, some existing benthic resources might be displaced or adversely affected. The benthic communities found along the shorelines have adapted to varying conditions, including tidal fluctuations, shifting sediment, and wave action. Adverse impacts from construction would be short term, and the benthic community would be expected to recolonize the nearshore habitat following the disturbance. Shellfish, if present within the immediate area of a reach undergoing repair, could be affected by increased sedimentation from construction. Fish in the immediate construction area would be affected by construction activity, increased noise, and potential temporary decrease in water quality due to sedimentation. These impacts would be minor, and fish could avoid the area until construction is complete. The Navy would restrict in-water work during anadromous fish spawning in the spring (typically from mid-February through mid-June) if required by NOAA Fisheries or in accordance with project permits to would further minimize adverse effects on aquatic species during seawall repair and restoration.

The total soil disturbance between the cable relocation and the new anchors is anticipated to be less than 10 cubic yards, resulting in negligible-to-minor impacts on the marine species in the vicinity of the relocation.

As discussed in Section 3.5.2.3, SAV is not present along the project reaches. SAV is present in the upper portions of College Creek and Spa Creek, but these communities would not likely be affected during construction under Alternative 1.

BMPs may be incorporated in accordance with project permits and regulations to avoid and minimize adverse impacts on benthic communities, shellfish, fish, and SAV during in-water construction. BMPs may include, but are not limited to, turbidity curtains, which would limit sediment disturbance during construction activity, minimizing the effects of turbidity within the immediate area of construction.

Threatened and Endangered Species

No threatened or endangered species are known to occur within the study area of Alternative 1. The northern long-eared bat is not known to be present on NSA Annapolis, and because Alternative 1 would not result in substantial tree clearing (i.e., not equal to or greater than 15 acres, potential habitat for the species would not be affected.

No effects on leatherback sea turtle, Atlantic green sea turtle, Kemp's ridley sea turtle, North Atlantic right whale, humpback whale, fin whale, or West Indian manatee are expected as these species are unlikely to be within the project area. Loggerhead sea turtle is potentially present in the mouth of the Severn River; however, the species has not been observed near NSA Annapolis. The impacts from Alternative 1 would occur primarily along the shoreline, and loggerhead, if present, would be able to avoid the construction areas. Boats are often present in the Chesapeake Bay and Severn River, and the additional presence of construction barges during seawall repair and restoration would not have adverse impacts on the species. Noise disturbances associated with construction activities could occur.

Many species of migratory birds are found at NSA Annapolis. Seawall repair and restoration activities under Alternative 1 could have short-term, minor, adverse impacts on migratory bird species from noise, minor habitat alterations, and general disturbance. No migratory bird nesting is known to occur in the project area, and birds would be expected to relocate to areas not undergoing active repair and restoration. Over the long term, repair and restoration efforts could help enhance roosting and foraging habitat along the shoreline by protecting these areas from large-scale erosion. Thus, there would be long-term benefits on migratory birds, but these would be localized and minor.

As discussed in Section 3.5.2.3, neither Atlantic sturgeon or shortnose sturgeon are known to occur in the Severn River, and are unlikely to be present. As such, no impacts on these protected species would be expected under Alternative 1.

There would be no significant impact on threatened and endangered species and no formal consultation between the U.S. Navy and USFWS or NOAA Fisheries would be required. The Navy will coordinate with USFWS and NOAA Fisheries regarding potential effects of Alternative 1 on threatened and endangered species (see Appendix A). Coordination with MDNR Wildlife and Heritage Service will occur through the Maryland Clearinghouse (see Appendix A). Responses from each agency will be included in the EA, once received.

Essential Fish Habitat

EFH is in the Severn River, College Creek, and Spa Creek for several species of fish. During the construction period for Alternative 1, fish may avoid the area immediately surrounding the reaches under construction due to in-water construction activity, increased noise, and a possible temporary decrease in water quality from turbidity. Impacts on EFH are summarized in the following text. As explained in Section 3.5.2.3, little skate, Atlantic herring, red hake, winter skate, and clearnose skate are unlikely to occur within the mixing salinity zone of the Severn River and are not analyzed further.

Bluefish: Juvenile and adult bluefish EFH could be affected during construction activity. A highly mobile pelagic species, bluefish would be expected to avoid active construction areas, minimizing impacts on their EFH. Bluefish food sources would be available in adjacent, undisturbed areas. No long-term impacts on this EFH would be expected.

Scup: Juvenile and adult scup EFH could be affected during construction activity. A highly mobile species, scup would be expected to avoid active construction areas, minimizing impacts on their EFH. Food sources would be available in adjacent, undisturbed areas. No long-term impacts on this EFH would be expected.

Summer Flounder: EFH exists for larval, juvenile, and adult summer flounder, a bottom-dwelling species. Larvae are present in the Chesapeake Bay from January to April and may be present if construction occurs during this timeframe. Summer flounder larvae are pelagic and could avoid the construction area. Juvenile and adult summer flounder are highly mobile and would be expected to vacate the area during active construction, minimizing impacts. No long-term impacts on this EFH would be expected.

Black Sea Bass: Juvenile and adult black sea bass EFH could be affected during construction activity. A bottom-dwelling, mobile species, black sea bass would be expected to avoid active construction areas, minimizing impacts on their EFH. Food sources would be available in adjacent, undisturbed areas. No long-term impacts on this EFH would be expected.

Windowpane Flounder: Windowpane flounder are a bottom-dwelling species and could be affected during construction activity. EFH exists in the vicinity of the Proposed Action for juvenile and adult windowpane flounder, which is a highly mobile species. Individuals would be expected to vacate the area where active construction is occurring, thereby minimizing impacts. No long-term impacts on this EFH would be expected.

No Habitat Areas of Particular Concern are present within the project area.

Noise from construction activity, particularly if pile driving is needed to replace pilings due to deterioration or to increase seawall height, would adversely affect EFH in the vicinity of Alternative 1. Underwater sound pressure caused by in-water pile driving could distress, injure, or kill fish in the vicinity. In addition, barges may be used to transport material to the site or assist with demolition or construction. However, ambient underwater sound levels are already fairly high due to the number of ships and industrial uses at NSA Annapolis. The thresholds of behavioral effects of pile-driving noise on fish that is considered harmful or harassment is not well known, and while fish may react to a sudden loud sound, they may also quickly habituate to the sound. NOAA Fisheries and USFWS generally use 150 dB RMS as the threshold for behavioral effects on Endangered Species Act-listed fish species, citing that this level and above can cause temporary behavioral changes that could decrease a fish's ability to avoid predators (CalTrans, 2015). Noise impacts on fish are described in more detail in Section 3.7, but pile-driving activities could exceed 150 dB RMS. Avoidance and minimization measures to reduce the impacts on fish and their habitat from pile-driving noise can be incorporated into the project during the design phase, and BMPs can be incorporated into the project to minimize exposure of fish to sound generated during pile driving (see Underwater Noise in Section 3.7.3.2). Timing and duration of pile-driving activities and the life phase of the fish exposed to the noise can also reduce impacts on the fish within the vicinity.

As previously described, all EFH in the vicinity of the project area is for highly mobile species and life stages. Juvenile and adult fish could avoid the project area during construction noise. The Navy would implement appropriate BMPs in accordance with regulations and ongoing consultation to reduce sound generated by repair and restoration activity, reducing the impact on fish in the vicinity. During construction, BMPs and minimization measures may include, but are not limited to, silt fences and other stormwater management measures to reduce sedimentation released during construction activities on land, and the use of in-water construction BMPs, such as turbidity curtains, to limit sediment disturbance and minimize the effects of turbidity on EFH.

Alternative 1 may adversely affect EFH during construction. Long-term effects on EFH would be beneficial because shoreline erosion and sedimentation would be reduced, thereby improving the quality of EFH. The Navy will initiate consultation with NOAA Fisheries Habitat Conservation Division. Consultation with NOAA Fisheries Habitat Conservation Division would also occur as design plans for each reach are completed.

Therefore, implementation of Alternative 1 would not result in significant impacts on biological resources.

3.5.3.3 Alternative 2 Potential Impacts

The study area for the analysis of effects on biological resources associated with Alternative 2 includes the shoreline and habitats immediately adjacent to the project reaches.

Impacts under Alternative 2 would be the same as those described under Alternative 1, Section 3.5.3.2, with the exception of along Reach 3, for which the Navy would use log toe stabilization rather than the hardened structure proposed in Alternative 1.

Using log toe stabilization at Reach 3, which is currently riprap, would benefit biological resources in the long term. Log toe stabilization mimics natural shoreline processes better than hardened structures by establishing beaches along Reach 3 and restoring natural vegetation, which would improve wildlife habitat in the long term. In the short term, the installation of hardwood logs and rebar could require the removal of trees and other vegetation in order to achieve the correct slope for the structure. In addition, installation could also require excavation and infill to achieve the correct slope for the shoreline, potentially resulting in temporary erosion, sedimentation, and turbidity within College Creek. With the implementation of appropriate erosion- and sediment-control BMPs, as prescribed by applicable permits (and further described in Section 3.2), short-term impacts from ground disturbance on terrestrial vegetation would be reduced.

Therefore, implementation of Alternative 2 would not result in significant impacts on biological resources.

3.5.3.4 Alternative 3 Potential Impacts

The study area for the analysis of effects on biological resources associated with Alternative 3 includes the shoreline and habitats immediately adjacent to the project reaches.

Impacts under Alternative 3 would be the same as those described under Alternative 1, Section 3.5.3.2, with the exception of Reach 3, for which the Navy would use a living shoreline rather than the hardened structure proposed in Alternative 1.

Replacing the existing riprap at Reach 3 with a living shoreline would benefit biological resources in the long term. Living shorelines better mimic natural shoreline processes than hardened structures by establishing beaches along Reach 3 and restoring natural vegetation, which would improve wildlife habitat in the long term. Living shorelines provide shoreline access for wildlife and maintain ecosystem processes such as sand movement and nutrient cycling. In addition, living shorelines provide a natural shallow water habitat for plants and aquatic and terrestrial wildlife. In the short term, the removal of riprap to convert to a living shoreline may result in sedimentation and turbidity within College Creek. Clean dredge material and sand fill would likely be used to achieve the correct slope for the living shoreline, which would potentially result in temporary erosion, sedimentation, and turbidity. With the implementation of appropriate erosion- and sediment-control BMPs, as prescribed by applicable permits (and further described in Section 3.2), short-term impacts from ground disturbance on terrestrial vegetation would be reduced.

Therefore, implementation of Alternative 3 would not result in significant impacts on biological resources.

3.6 Visual Resources

This discussion of visual resources includes the natural and built features of the landscape visible from public views that contribute to an area’s visual quality. Visual perception is an important component of environmental quality that can be affected through changes created by various projects. Visual impacts occur as a result of the relationship between people and the physical environment.

3.6.1 Regulatory Setting

The framework for physical development on the installation is guided by the NSA Annapolis Installation Development Plan (NAVFAC Washington, 2018a), which provides installation-wide plans for anticipated development, considering existing constraints and opportunities, under one vision and to ensure that development activities result in consistent and appropriate physical appearance and functions.

Similarly, the NSA Annapolis Installation Appearance Plan (NSA Annapolis, 2008) is the official guidance for designing, developing, and reviewing all physical development at NSA Annapolis to help foster the civic beauty of the installation, protect natural and cultural resources, preserve the existing architectural fabric, and improve the overall quality of life for personnel and the public. The NSA Annapolis Installation Appearance Plan addresses appearance and design of buildings, site features, and landscaping, and is referenced when physical development could affect base appearance.

3.6.2 Affected Environment

The USNA consists of the Upper Yard, which is composed of 21 buildings, and the Lower Yard, which is composed of 46 buildings. The architecture of NSA Annapolis features two distinct types. The first is the classical nineteenth century buildings of the USNA, a national historic treasure which demands the highest level of design excellence for any improvement, renovation, or addition. The second is the eclectic nineteenth and twentieth century townscape of North Severn, a mix of classical and modern buildings, built over time and aggregated into a comfortable townscape. Any new improvement, renovation, or addition should respect the scale and materials of the surrounding buildings and landscape (NSA Annapolis, 2008).

Visual Resources Potential Impacts:

- No Action: Long-term, negligible-to-minor, adverse impacts from seawall deterioration. No significant impact.
- Alternative 1: Short- and long-term, minor, adverse impacts from construction and increasing seawall height. No significant impact.
- Alternative 2: Similar to Alternative 1. No significant impact.
- Alternative 3: Direct, short-term, negligible, adverse impacts from construction. Direct, long-term, negligible-to-minor beneficial impacts from seawall repair. No significant impact.

The Upper Yard and Lower Yard are surrounded by the fairly dense development of Annapolis, but the North Severn area is more suburban and buffered by forest. Adjacent to NSA Annapolis on North Severn, and entirely surrounded by NSA Annapolis property, is the Annapolis Partners site. This land was former Navy property but transferred to Anne Arundel County as part of a 1995 Base Realignment and Closure action and later sold to a private development group. The site has not yet been redeveloped, but redevelopment could occur in the future (NAVFAC Washington, 2018a).

Viewsheds are a valuable asset to the character and visual integrity at NSA Annapolis. Distant views are limited at NSA Annapolis, with the exception of vistas over the Severn River and Chesapeake Bay, because of the generally flat topography. Views across the Severn River provide a direct visual connection between the USNA and North Severn. Non-historic, significant views at NSA Annapolis include views of the Severn River adjacent to the athletic fields, Decatur Road adjacent to the parade ground, the pedestrian bridge across Dorsey Creek, and Greenbury Point Road in North Severn (NSA Annapolis, 2008).

3.6.3 Environmental Consequences

The evaluation of visual resources in the context of environmental analysis typically addresses the contrast between visible landscape elements. Collectively, these elements compose the aesthetic environment, or landscape character. The landscape character is compared to the proposed action’s visual qualities to determine the compatibility or contrast resulting from the buildout and demolition activities associated with a proposed action.

3.6.3.1 No Action Alternative

Under the No Action Alternative, the Proposed Action would not occur, and existing seawalls would continue to deteriorate. Minor seawall repairs would occur but would not effectively sustain the design storm and sea level rise projections due to their various states of functionality. This would result in continued sea level rise, storm surge, and land subsidence at NSA Annapolis, which would generate increased flooding and failure events. Long-term impacts from the degradation and deterioration of the existing seawalls would adversely affect the viewshed along the shoreline. Therefore, long-term, negligible-to-minor, adverse impacts would occur under the No Action Alternative.

3.6.3.2 Alternative 1 Potential Impacts

The project reaches and adjacent lands define the study area for visual resources analyses.

Short-term impacts from Alternative 1 would result from construction, demolition, and renovation activities, temporarily altering the visual character at the shoreline. Under Alternative 1, the height of the seawalls would increase, with potential to triple at some reaches, and would result in direct, long-term impacts on the visual character and integrity at USNA and North Severn in relation to the Severn River and Chesapeake Bay viewsheds. More specifically, some of the non-historic, views of the Severn River adjacent to the athletic fields (Reach 1) identified in Section 3.6.2 could be impeded by a shoreline structure, measuring 6 feet from NAVD88 (tidal datum). Although viewsheds towards the Severn River and Chesapeake Bay may be affected, the Navy would select the final design of each reach to preserve valuable views to the maximum extent practicable. However, the increased height on the perimeter bulkhead or the introduction of structures that would protect against storm surge would also have a long-term, beneficial effect on the historic district and its contributing buildings and landscape features of USNA.

Therefore, implementation of Alternative 1 would result in direct, short- and long-term, minor, adverse impacts on visual resources.

3.6.3.3 Alternative 2 Potential Impacts

The project reaches and adjacent lands define the study area for visual resources analyses.

Short- and long-term impacts on visual resources under Alternative 2 would be the same as those described for Alternative 1, apart from the maximum seawall height, which would be lower than the proposed Alternative 1 height and potentially double from existing conditions at some reaches. The lower seawall height, compared with Alternatives 1, would result in slightly less adverse impacts on the visual character at USNA and North Severn shorelines due to shorter structures impeding the viewsheds of the Severn River and Chesapeake Bay. Although viewsheds towards the Severn River and Chesapeake Bay may be affected, the Navy would select the final design of each reach to preserve valuable views to the maximum extent practicable.

Therefore, implementation of Alternative 2 would result in direct, short- and long-term, minor adverse impacts on visual resources.

3.6.3.4 Alternative 3 Potential Impacts

The project reaches and adjacent lands define the study area for visual resources analyses.

Under Alternative 3, the seawalls would not increase in height, but repair and restoration of the seawalls would still occur. Short-term impacts from Alternative 3 would result from construction, demolition, and renovation activities, temporarily altering views towards the shoreline. Restoration of the seawalls in various states of functionality would change existing visual character and integrity by enhancing the appearance of the existing structures along the shoreline, which would be beneficial to the visual character and integrity. Once constructed, new shoreline structures would be built to existing heights, which would not impede or block any of the existing Severn River and Chesapeake Bay viewsheds beyond existing conditions.

Therefore, implementation of Alternative 3 would result in direct, short-term, negligible, adverse impacts and direct, long-term, negligible-to-minor, beneficial effects on visual resources.

3.7 Noise

This discussion of noise includes the types or sources of noise and the associated sensitive receptors in the human environment. Noise in relation to biological resources and wildlife species is also discussed in Section 3.5, Biological Resources.

Sound is a physical phenomenon consisting of minute vibrations that travel through a medium, such as air or water, and are sensed by the human ear. Sound is all around us. The perception and evaluation of sound involves three basic physical characteristics:

- Intensity–the acoustic energy, which is expressed in terms of sound pressure, in decibels
- Frequency–the number of cycles per second the air vibrates, in Hertz
- Duration–the length of time the sound can be detected

Noise is defined as unwanted or annoying sound that interferes with or disrupts normal human activities. Although continuous and extended exposure to high noise levels (e.g., through occupational exposure) can cause hearing loss, the principal human response to noise is annoyance. The response of different individuals to similar noise events is diverse and is influenced by the type of noise; perceived importance of the noise; its appropriateness in the setting, time of day, and type of activity during which the noise occurs; and sensitivity of the individual.

Basics of Sound and A-Weighted Sound Level

The loudest sounds that can be detected comfortably by the human ear have intensities that are a trillion times higher than those of sounds that can barely be detected. This vast range means that using a linear scale to represent sound intensity is not feasible. The decibel is a logarithmic unit used to represent the intensity of a sound, also referred to as the sound level. All sounds have a spectral content, which means their magnitude or level changes with frequency, where frequency is measured in cycles per second or Hertz. To mimic the human ear's non-linear sensitivity and perception of different frequencies of sound, the spectral content is weighted. For example, environmental noise measurements are usually on an "A-weighted" scale that filters out very low and very high frequencies to replicate human sensitivity. It is common to add the "A" to the measurement unit to identify that the measurement has been made with this filtering process (i.e., dBA). In this document, the decibel unit refers to A-weighted sound levels. Table 3-10 provides a comparison of how the human ear perceives changes in loudness on the logarithmic scale.

Figure 3-14 provides a chart of A-weighted sound levels from typical noise sources. Some noise sources (e.g., air conditioner, vacuum cleaner) are continuous sounds that maintain a constant sound level for some period (Cowan, 1994). Other sources (e.g., automobile, heavy truck) are the maximum sound produced during an event like a vehicle pass-by. Other sounds (e.g., urban daytime, urban nighttime) are averages taken over extended periods of time. A variety of noise metrics have been developed to describe noise over different time periods, as discussed in the following text.

Noise Metrics

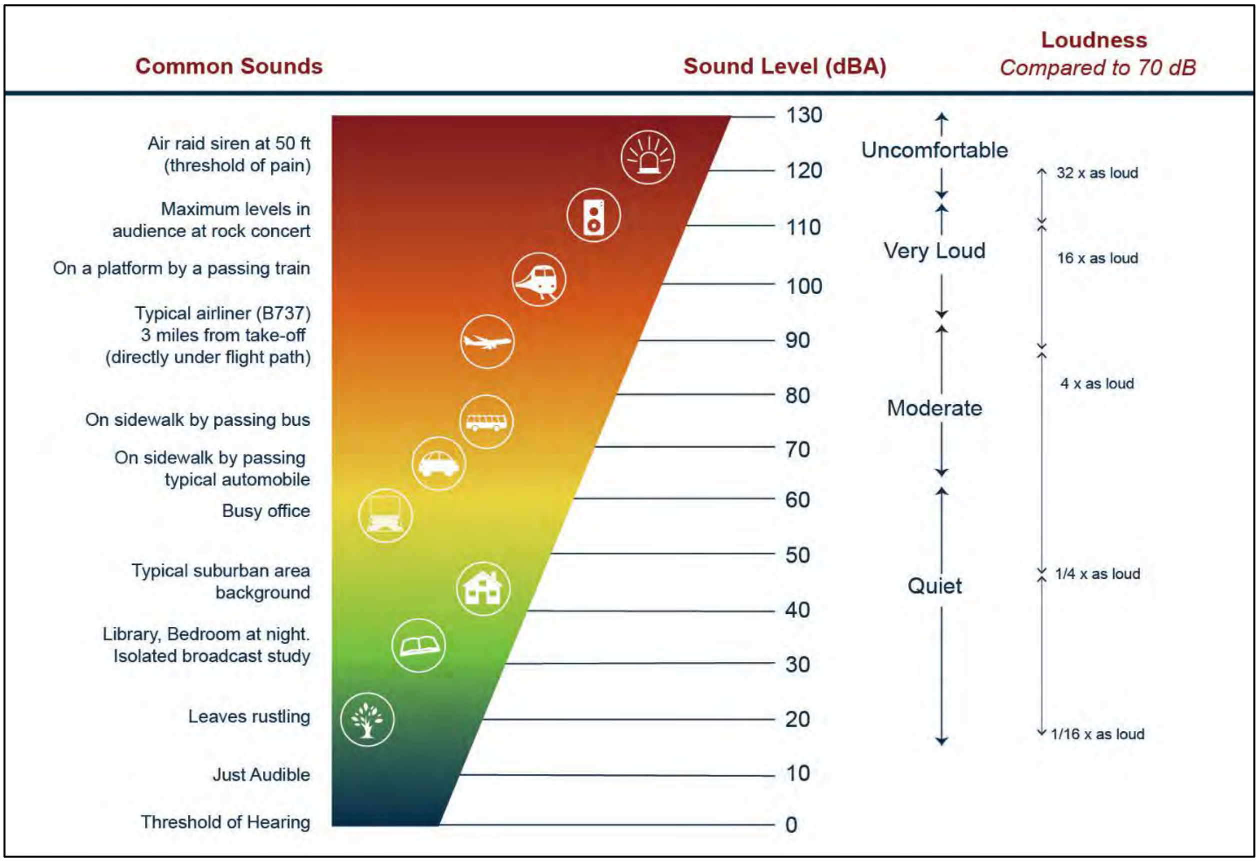
A metric is a system for measuring or quantifying a characteristic of a subject. Since noise is a complex physical phenomenon, different noise metrics help to quantify the noise environment.

Maximum Sound Level

The highest A-weighted sound level measured during a single event where the sound level changes value with time (e.g., an aircraft overflight) is called the maximum A-weighted sound level or Lmax. During an aircraft overflight, the noise level starts at the ambient or background noise level, rises to the maximum level as the aircraft flies closest to the observer, and returns to the background level as the aircraft recedes into the distance. Lmax defines the maximum sound level occurring for a fraction of a second. For aircraft noise, the "fraction of a second" over which the maximum level is defined is generally 1/8 second (American National Standards Institute, 1988).

Table 3-10 Subjective Responses to Changes in A-Weighted Decibels

Change	*Change in Perceived Loudness*
3 decibels	Barely perceptible
5 decibels	Quite noticeable
10 decibels	Dramatic—twice or half as loud
20 decibels	Striking—fourfold change



Source: Adapted from Cowan, 1994.

Figure 3-14 A-Weighted Sound Levels from Typical Sources

Root Mean Square

The root mean square (or RMS) is the square root of the mean of the squares of the pressure contained within a defined period from the initial time to a final time. For marine mammals, the RMS pressure historically has been calculated over the period of the pulse that contains 90 percent of the acoustical energy (the total energy minus the initial 5 percent and the final 5 percent).

Noise Effects

An extensive amount of research has been conducted regarding noise effects including annoyance, speech interference, sleep disturbance, noise-induced hearing impairment, nonauditory health effects, performance effects, noise effects on children, effects on domestic animals and wildlife, property values, structures, terrain, and archaeological sites.

Potential Hearing Loss

People living in high-noise environments for an extended period (40 years) can be at risk for hearing loss called noise-induced permanent threshold shift. Noise-induced permanent threshold shift defines a permanent change in hearing level, or threshold, caused by exposure to noise (USEPA, 1982). According to USEPA (1974), changes in hearing level of less than 5 dB are generally not considered noticeable. There is no known evidence that a noise-induced permanent threshold shift of less than 5 dB is perceptible or has any practical significance for the individual affected. Furthermore, the variability in audiometric testing is generally assumed to be plus or minus 5 dB. The preponderance of available information on hearing loss risk is from the workplace with continuous exposure throughout the day for many years.

Based on a report by Ludlow and Sixsmith (1999), there were no major differences in audiometric test results between military personnel who, as children, had lived in or near installations where fast jet operations were based, and a similar group who had no such exposure as children. Hence, for the purposes of this EA, the limited data are considered applicable to the general population, including children, and are used to provide a conservative estimate of the risk of potential hearing loss.

Speech Interference

Speech interference can cause disruption of routine activities, such as enjoyment of radio or television programs, telephone use, or family conversation, giving rise to frustration or irritation. In extreme cases, speech interference can cause fatigue and vocal strain to individuals who try to communicate over the noise.

Classroom Criteria and Noise Effects on Children

Research suggests that environments with sustained high background noise can have variable effects, including effects on learning and cognitive abilities and various noise-related physiological changes. Research on the impacts of noise in general on the cognitive abilities of school-aged children has received more attention in recent years.

Workplace Noise

In 1972, the National Institute for Occupational Safety and Health (NIOSH) published a criteria document with a recommended exposure limit of 85 dBA as an eight-hour time-weighted average. This exposure limit was reevaluated in 1998 when NIOSH made recommendations that went beyond conserving hearing by focusing on the prevention of occupational hearing loss. Following the reevaluation using a new risk assessment technique, NIOSH published another criteria document in 1998, which reaffirmed the 85-dB recommended exposure limit (NIOSH, 1998).

3.7.1 Regulatory Setting

Under the Noise Control Act of 1972, the Occupational Safety and Health Administration established workplace standards for noise. The minimum requirement states that constant noise exposure must not exceed 90 dBA over eight hours. The highest allowable sound level to which workers can be constantly exposed is 115 dBA and exposure to this level must not exceed 15 minutes within an eight-hour period. The standards limit instantaneous exposure, such as impact noise, to 140 dBA. If noise levels exceed these standards, employers are required to provide hearing protection equipment to reduce sound levels to acceptable limits.

3.7.2 Affected Environment

3.7.2.1 Airborne Noise

Many components may generate noise and warrant analysis as contributors to the total noise impact. Existing noise levels at and near the project reaches along the Upper and Lower Yards and North Severn are typical of those normally associated with nearby land uses and activities and with the overall level of development in the area, which can be characterized as moderately dense urban. The primary source of noise is vehicular traffic. Noise levels are low to moderate.

The Code of Maryland Regulations 26.02.03, Control of Noise Pollution, states that noise levels emanating from construction or demolition site activities should not exceed 90 dBA during daytime hours for all land uses and 55 dBA during nighttime hours for residential land uses (COMAR, 2019).

The federal government supports conditions free from noise that threaten human health and welfare and the environment. Response to noise varies, depending on the type and characteristics of the noise, distance between the noise source and whoever hears it (the receptor), receptor sensitivity, and time of day. A noise-sensitive receptor is defined as a land use where people involved in indoor or outdoor activities may be subject to stress or considerable interference from noise. Such locations or facilities often include residential dwellings, hospitals, nursing homes, educational facilities, and libraries. Sensitive receptors may also include noise-sensitive cultural practices, some domestic animals, or certain wildlife species.

3.7.2.2 Underwater Noise

Noise from underwater sources cannot be directly compared to airborne noise. A reference pressure of 20 micropascal (μPa) is used in air compared to 1 μPa in water. While airborne noise dissipates by 6 dB per doubling of distance, underwater noise only dissipates by approximately 4.5 dB per doubling of distance. This is because sound underwater is bound by the water surface and the seafloor, creating a channel, which prevents sound from dissipating (Anchor QEA and Greenbusch, 2015).

Exposure to low levels of underwater sound for a relatively long period of time, or exposure to higher levels of sound for shorter periods of time, may result in auditory tissue damage or temporary hearing loss on fish (CalTrans, 2015). Sound generated by pile driving, which is one of the loudest noises from construction and is used to drive piles into the water, has the potential to affect fish in several ways. The range of effects can include alteration of behavior to physical injury or mortality, depending on the intensity and characteristics of the sound, the distance and location of the fish in the water column relative to the sound source, the size and mass of the fish, and the fish's anatomical characteristics.

3.7.3 Environmental Consequences

Analysis of potential noise impacts includes estimating likely noise levels from the Proposed Action and determining potential effects on sensitive receptor sites.

Noise Potential Impacts:

- No Action: No change in baseline conditions. No significant impact.
- Alternative 1: Short-term airborne and underwater minor adverse impacts. No long-term impacts. No significant impact.
- Alternative 2: Short-term airborne and underwater minor adverse impacts. No long-term impacts. No significant impact.
- Alternative 3: Short-term airborne and underwater minor adverse impacts. No long-term impacts. No significant impact.

3.7.3.1 No Action Alternative

Under the No Action Alternative, the Proposed Action would not occur, and there would be no change in baseline noise levels. Therefore, no significant impacts due to the noise environment would occur under the No Action Alternative.

3.7.3.2 Alternative 1 Potential Impacts

The study area for noise includes the project reaches, areas adjacent to the installation, corridors that would be affected by construction traffic, and underwater regions adjacent to the project reaches.

Airborne Noise

Short-term impacts from Alternative 1 would include noise from construction, demolition, and renovation activities. Noise from these activities would consist of peak sound levels and would be intermittent, as equipment and activities would not occur at one continuous level. Overall, peak noise levels diminish with distance from the active project site. Table 3-11 shows typical noise levels at 50 feet from the source of heavy equipment that could be used during proposed construction, renovation, and demolition activities.

Noise-sensitive receptors closest to the proposed construction area at Reaches 4 and 5 include the French Soldiers Monument about 100 feet away and St. Johns' College about 600 feet to the south. Noise-sensitive receptors closest to the proposed construction area at Reach 12 include residences on St. Mary's Street and the City of Annapolis Downtown Playground, both roughly 400 feet to the southwest; the Historic Annapolis Museum and Store (about 400 feet to the west); and Annapolis Elementary School (about 500 feet to the west).

As shown in Table 3-11 and discussed in the previous paragraphs, peak noise (Lmax) from construction equipment can range from 74 dBA to 101 dBA at 50 feet (which includes noise from pile driving). Given those levels, noise at 100 feet would range from 68 dBA to 95 dBA at the French Soldiers Monument (see Appendix C, Noise Calculations). Residences on St. Mary's Street and the City of Annapolis Downtown Playground, which are about 400 feet from the project area, would be exposed to levels from 56 dBA to 83 dBA from construction equipment. Although these noise levels produced by construction equipment are approximate, 83 dBA is below the Code of Maryland Regulations stating that noise levels emanating from construction or demolition activities should not exceed 90 dBA during daytime hours.

Table 3-11 Construction Equipment Noise Emission Levels

Equipment	*Typical Noise Level (dBA) 50 feet from Source*
Air compressor	81
Backhoe	80
Ballast equalizer	82
Ballast tamper	83
Compactor	82
Concrete mixer	85
Concrete pump	82
Concrete vibrator	76
Crane, derrick	88
Crane, mobile	83
Dozer	85
Generator	81
Grader	85
Impact wrench	85
Jack hammer	88
Loader	85
Paver	89
Pile-driver (impact)	101
Pile-driver (sonic)	96
Pneumatic tool	85
Pump	76
Rail saw	90
Rock drill	98
Roller	74
Saw	76
Scarifier	83
Scraper	89
Shovel	82
Spike driver	77
Tie cutter	84
Tie handler	80
Tie inserter	85
Truck	88

Source: Federal Transit Administration, 2006.
Key: dBA = A-weighted decibels.
Note: Table based on a U.S. Environmental Protection Agency Report, which measured data from railroad construction equipment taken during the Northeast Corridor Improvement Project, and other measured data.

Short-term impacts would result from dump trucks hauling materials to and from the construction area. As shown in Table 3-11, construction trucks typically produce noise levels of approximately 88 dBA at 50 feet from the road. Consequently, short-term, minor impacts would occur to populations adjacent to the roadways for the duration of the construction period.

Therefore, implementation of Alternative 1 would not result in significant impacts on the noise environment.

Underwater Noise

NSA Annapolis has general purpose berthing and small craft berthing at the Lower Yard and North Severn. As previously mentioned, although the ambient underwater noise levels in the project area are unknown, sound levels in a large marine inlet with some recreational boat traffic have been recorded at 115 to 135 dB RMS. Naval vessels can produce peak noise levels up to 198 dB (CalTrans, 2015). Under Alternative 1, barges may be used during construction to transport material to the site or assist with demolition or building. However, given the existing tanker and naval vessel traffic, noise impacts from construction barges would be minor.

Underwater noise from pile driving during construction at approximately 33 feet is approximately 167 to 205 dB RMS with no attenuation system. NOAA Fisheries and USFWS generally use 150 dB RMS as the threshold for behavioral effects on Endangered Species Act-listed fish species, citing noise at this level and above can cause temporary behavioral changes by decreasing a fish’s ability to avoid predators (CalTrans, 2015).

BMPs and avoidance and minimization measures, in accordance with project permits or in consultation with NOAA Fisheries, would be incorporated into the project during the design phase to reduce impacts on fish and their habitat. These measures can include, but are not limited to, project timing, pile placement, and equipment used, the use of a “soft start” or a system of warning strikes where the pile driving would begin at 25–40 percent of its total energy, portable noise barriers, impact cushions, or noise bellow systems (CalTrans, 2015). Juvenile and adult fish near the project area are highly mobile and are able to avoid the area immediately surrounding construction and increased noise.

- **Project timing.** In-water work windows can be set to avoid or minimize the effects of construction on fish species. The in-water work windows represent periods with the least potential for a species, or a particular life stage of a species, to be present in areas that might be affected by a project.
- **Pile placement.** In-water pile driving is defined as the placement of piles within the ordinary high-water mark or in saturated soils adjacent to the reach. For some projects, it may be possible to design the project to avoid in-water work (i.e., where in-water reaches can be avoided by placing piles outside of ordinary high water or adjacent saturated soils). Another consideration is limiting the number of piles that need to be placed in the water.
- **Equipment.** In some instances, it may be possible to use alternative pile-driving equipment that produces lower peak sound levels. This includes the use of vibratory hammers, push- or press-in pile installation, or oscillating pile installation.

As previously described in Section 3.5.2.3, EFH is within the project area. The timing and duration of pile-driving activities and the life stage of fish exposed to noise are important factors in determining effects on the various species of fish that could be present during pile-driving activities. Under Alternative 1, pile-driving activities would be intermittent and temporary and would not occur for the entire duration of the project. Fish could avoid the area immediately surrounding construction during those activities. Consultation will occur with NOAA Fisheries, and NSA Annapolis would implement BMPs and avoidance and minimization measures as warranted by the agency. Consequently, short-term impacts on EFH would not be significant. Once construction is complete, the noise environment would return to current levels; therefore, no long-term effects on EFH from noise are expected. Implementation of Alternative 1 would not result in significant impacts on the underwater noise environment.

Once the seawalls are restored and the heights increased, short-term noise impacts would cease, and the ambient noise environment would return to the existing levels for both airborne and underground environments. No long-term impacts would occur. Therefore, implementation of Alternative 1 would not result in significant impacts on the noise environment.

3.7.3.3 Alternative 2 Potential Impacts

The project area for Alternative 2 is the same as Alternative 1. Therefore, the study area is the same, which includes the project reaches, areas adjacent to the installation, corridors that would be affected by construction traffic, and underwater regions adjacent to the project area. Under Alternative 2, the seawalls would be built to lower heights as compared to Alternative 1; however, the linear feet would be the same. Therefore, the construction time period under Alternative 2 could be slightly less than under Alternative 1.

Short-term impacts from Alternative 2 would include noise from construction, demolition, and renovation activities. Noise from these activities would consist of peak sound levels and would be intermittent, as equipment and activities would not occur at one continuous level. The distances to noise-sensitive receptors would be the same as discussed under Alternative 1, as well as the estimated short-term noise levels from airborne and underwater construction.

Once the seawalls are restored and the heights increased, short-term impacts would cease, and the ambient noise environment would return to existing levels for both airborne and underground environments. No long-term impacts would occur. Therefore, implementation of Alternative 2 would not result in significant impacts on the noise environment.

3.7.3.4 Alternative 3 Potential Impacts

The project area for Alternative 3 is the same as Alternative 1. Therefore, the study area is the same, which includes the project reaches, areas adjacent to the installation, corridors that would be affected by construction traffic, and underwater regions adjacent to the project reaches. Under Alternative 3, the seawalls would be repaired to existing heights, which would be lower as compared to Alternatives 1 and 2; however, the linear feet would be the same. Therefore, the construction time period under Alternative 3 would be less than under Alternative 1 or Alternative 2.

Short-term impacts from Alternative 3 would include noise from construction, demolition, and renovation activities. Noise from these activities would consist of peak sound levels and would be intermittent, as equipment and activities would not occur at one continuous level. The distances to noise-sensitive receptors would be the same as discussed under Alternative 1, as well as the estimated short-term noise levels from airborne and underwater construction.

Once the seawalls are restored and the heights increased, short-term impacts would cease, and the ambient noise environment would return to existing levels for both airborne and underground environments. No long-term impacts would occur. Therefore, implementation of Alternative 3 would not result in significant impacts on the noise environment.

3.8 Transportation

A discussion of transportation typically includes all the air, land, and sea routes with the means of moving passengers and goods. A transportation system can consist of any or all the following: roadways, bus routes, railways, subways, bikeways, trails, waterways, airports, and taxis, and can be studied on a local or regional scale. The discussion of transportation applicable to this project includes the pedestrian network, the bicycle network, public transit, and traffic (vehicular). Because there is no public boating access at NSA Annapolis, transportation impacts from construction barges are not analyzed in detail in this EA.

Traffic is commonly measured through average daily traffic and design capacity. These two measures are used to assign a roadway with a corresponding level of service (LOS). The LOS designation is a professional industry standard used to describe the perceived operating conditions of a roadway segment or intersection. LOS is defined on a scale of A to F that describes the range of operating conditions on a particular type of roadway facility. LOS A and LOS B indicate free flow travel. LOS C indicates stable traffic flow. LOS D indicates the beginning of traffic congestion. LOS E indicates the nearing of traffic breakdown conditions. LOS F indicates stop-and-go traffic conditions and represents unacceptable congestion and delay.

3.8.1 Regulatory Setting

EO 13834, *Efficient Federal Operations*, encourages government entities to improve building efficiency, performance, and management by including cost-effective strategies to optimize sustainable space usage and consideration of existing community transportation planning and infrastructure, including access to public transit, in the planning for new buildings or leases. This EO encourages the coordination of federal real property discussions with local communities to encourage planned transportation investments that aim to support public transit access.

3.8.2 Affected Environment

NSA Annapolis has multiple pedestrian and vehicular gates at the Upper and Lower Yards; there are six vehicular access gates to the Upper Yard and four vehicular access gates to the Lower Yard. On the Upper Yard, Gate 8 is the most frequently used, and allows for 24-hour access for official traffic, contractors, deliveries, and large automobiles. Gate 8 is located on Bowyer Road, which is off of Baltimore Boulevard (Maryland State Route [MD] 450). On the Lower Yard, Gate 1 is the primary visitor entrance for commercial traffic. Gate 1 is located on King George Street (also MD 450), and is open 6:00 a.m. to 10:00 p.m., Sunday through Thursday, and 6:00 a.m. to 1:00 p.m., Friday through Saturday (NAVFAC Washington, 2018a). The average annual daily traffic (AADT) count for King George Street on the Lower Yard is 10,132 vehicles (MDOT, 2017).

Access to North Severn is through two vehicular access gates. The primary access route to North Severn is via Baltimore Annapolis Boulevard (which starts as MD 450), which becomes Greenbury Point Road at North Severn (MD 648) after the Severn River crossing. The first access gate to North Severn is at the intersection of Greenbury Point Road and Kinkaid Road. Further within North Severn is a second gate on Kinkaid Road. The AADT count for MD 648 just west of the intersection with Kinkaid Road is 9,020 vehicles (MDOT, 2017).

As a point of comparison, U.S. Route 50/301, which is a major east-west highway north of NSA Annapolis and the most heavily used road in the area, has an AADT of over 100,000 vehicles (MDOT, 2017).

King George Street as it traverses the Lower Yard and Upper Yard is considered a major collector road within Annapolis. Where King George Street (MD 450) turns east into Baltimore Annapolis Boulevard (also MD 450) and crosses the Upper Yard and the Severn River via the USNA, it is considered a major arterial route within the City of Annapolis (City of Annapolis, 2009). These roadways have experienced increasing traffic volumes and deteriorating LOS and are expected to experience severe congestion by 2030, as described in the Annapolis Comprehensive Plan. It is expected that sections of these roadways will operate at failing LOS during peak travel times (City of Annapolis, 2009).

NSA Annapolis roadways consist of primary, secondary, and tertiary roads. Overall, the roadway circulation network at the installation is adequate. On the Upper and Lower Yards, a number of roadways are subject to flooding: Brownson Road, McNair Road, Decatur Road, Holloway Road, and Ramsay Road. There are a high number of pedestrians present at the Lower Yard, including students, faculty, employees, and tourists (NAVFAC Washington, 2018a).

Several public roads traverse NSA Annapolis to provide public access through the installation. Maryland Department of Transportation (MDOT) has three easements on the Upper and Lower Yards:

- King George Street/Baltimore Annapolis Boulevard (State Highway 450), which traverses the Upper Yard, provides an alternative connection to U.S. Route 50. Gate 8 is located off of this road at a signalized intersection with Bowyer Road.
- King George Street to Wagner Street, crossing north/south from the Upper Yard to the Lower Yard across the College Creek Bridge, provides vehicular access to USNA and the downtown area of Annapolis.
- Badger Road on the Upper Yard provides access to the South Monroe Street apartments (off the installation) through the Arundel Estates Housing area (on the installation).

Anne Arundel County has three easements on North Severn for public access:

- Greenbury Point Road to the radio towers at the southern portion of Greenbury Point.
- Greenbury Point Road to Providence Road to provide access to the housing area to the north of the installation.
- Access through North Severn to the Annapolis Partners parcel to provide access for redevelopment and reuse.

The Upper Yard currently has a parking surplus following the relocation of the Naval Health Clinic Annapolis. There is insufficient parking on the Lower Yard, but construction of a parking structure on the Lower Yard began in 2016 that should alleviate parking shortages, once operational. Parking on North Severn is abundant and more than meets demand (NAVFAC Washington, 2018a).

The Annapolis Transit bus service serves the local area and has stops that serve the Upper Yard and at the intersection of MD 450 and Badger Road. In addition, the Annapolis Circulator trolley system runs a limited route through downtown Annapolis and stops several blocks from Gate 1 on the Lower Yard. There is no rail transit in Annapolis; there are Amtrak stations in the Baltimore and Washington, DC area, which connect to local buses that serve Annapolis (NAVFAC Washington, 2018a).

Bicycle access to NSA Annapolis is available via the Colonial Annapolis Maritime Trail, which runs just outside the Lower Yard and through Upper Yard and North Severn. The trails access the installation on the public right-of-way, and authorization is needed to enter the access-controlled areas of NSA Annapolis (NAVFAC Washington, 2018a).

There are no public piers or wharves for public boat access to NSA Annapolis.

Transportation Potential Impacts:

- No Action: Long-term, adverse impacts on traffic regardless of implementation of the Proposed Action. Long-term, adverse impacts from continued sea level rise and storm surge. No significant impact.
- Alternative 1: Short-term, minor adverse effects from construction traffic. No long-term impacts. No significant impact.
- Alternative 2: Similar to Alternative 1. No significant impact.
- Alternative 3: Similar to Alternative 1. No significant impact.

3.8.3 Environmental Consequences

Impacts on ground traffic and transportation are analyzed by considering the possible changes to existing traffic conditions and the capacity of area roadways from proposed increases in commuter and construction traffic.

3.8.3.1 No Action Alternative

Under the No Action Alternative, the Proposed Action would not occur, and there would be no change in transportation resulting from the proposed seawall repair and restoration. Changes to transportation would result from other factors, including general growth in and around Annapolis.

Impacts on traffic would be long-term and adverse from increases in traffic volumes throughout Annapolis. As described in the Annapolis Comprehensive Plan (City of Annapolis, 2009), forecasted growth in residents, workers, and visitors in Annapolis is expected to increase traffic congestion within the city. The city anticipates that several roadways, including King George Street (MD 450) and Baltimore Annapolis Boulevard (MD 450), which traverse the Upper and Lower Yards of NSA Annapolis, will experience congestion that result in failing LOS by 2030 without improvements. Anticipated future LOS on these roadways in and around NSA Annapolis would be unacceptable regardless of the Proposed Action. Therefore, long-term, adverse impacts on traffic would occur under the No Action Alternative.

In addition to impacts on local road networks, the No Action Alternative would have adverse effects on the NSA Annapolis road infrastructure. Under the No Action Alternative, the Proposed Action would not occur, and there would be continued sea level rise, storm surge, and land subsidence at NSA Annapolis, resulting in increased flooding and failure events. Several roadways on NSA Annapolis currently experience intermittent closures from flooding during storm surge, and the frequency of flooding events would increase as the existing seawalls continue to deteriorate.

Therefore, long-term adverse impacts on traffic and transportation would occur under the No Action Alternative.

3.8.3.2 Alternative 1 Potential Impacts

The study area for transportation under Alternative 1 is NSA Annapolis and the roadways in the vicinity of the installation. Short-term, minor, adverse impacts on transportation are expected from the implementation of Alternative 1.

Under Alternative 1, repair and restoration of the seawalls would require a combination of landside and waterside construction. Because there is no public boating access at NSA Annapolis, transportation impacts from construction barges are not analyzed; this analysis focuses exclusively on effects to landside transportation.

Proposed construction activities related to seawall repair and restoration would have short-term impacts on traffic within the study area. Alternative 1 would generate localized traffic associated with daily passenger vehicles for construction workers arriving at and departing from the project areas. In addition, construction vehicles and equipment would operate throughout the construction phase for repair or restoration of each reach. The movement of materials and equipment and the removal of construction and demolition debris would create further vehicle trips on and near NSA Annapolis. Under a most conservative scenario that assumes that all construction equipment would be brought to the reaches by truck and not by barge, Alternative 1 would be expected to have an average of 6 to 12 construction vehicles per day during the construction period. This is less than one percent of the AADT on the roadways surrounding NSA Annapolis. The construction would be dispersed through the Upper Yard, Lower Yard, and North Severn, dependent on the particular reach or reaches undergoing repairs, so impacts would be distributed throughout the various locations during the construction period.

Construction vehicles would likely enter through Gate 8 on the Upper Yard, off of Bowyer Road; Gate 1 on the Lower Yard, off of King George Street; and through the Greenbury Point Road/Kinkaid Road intersection gate on North Severn. Construction traffic would be dispersed throughout the day, typically outside of peak traffic hours. The additional vehicle trips from construction under Alternative 1 would not be expected to degrade any LOS on surrounding roadways to unacceptable levels. Increased vehicle trips would not be expected to result in significant impacts on traffic or transportation in the vicinity of NSA Annapolis during peak construction times.

Alternative 1 would not likely result in any potentially significant impacts on pedestrian facilities, bicycle facilities, or transit. Bicycle, pedestrian, and transit networks near NSA Annapolis would be able to support additional travelers, if construction workers use bicycle paths, pedestrian paths, or transit to access NSA Annapolis for the seawall repair and restoration.

Alternative 1 would not result in any change in employment levels at NSA Annapolis and, therefore, would not have any long-term impacts on transportation.

Therefore, implementation of Alternative 1 would not result in significant impacts on transportation.

3.8.3.3 Alternative 2 Potential Impacts

The study area for transportation under Alternative 2 is NSA Annapolis and the roadways in the vicinity of the installation.

Impacts on transportation under Alternative 2 would generally be the same as what is described under Alternative 1 in Section 3.8.3.2. There would be some additional excavation and infill required for the log toe stabilization proposed for Reach 3. However, the elevation of the seawalls would be lower than under Alternative 1; therefore, the amount of materials that would be transported would be less, which would result in fewer overall truck trips as compared to Alternative 1. The number of vehicle trips and impacts on traffic within the study area would be short term and minor.

Therefore, implementation of Alternative 2 would not result in significant impacts on transportation.

3.8.3.4 Alternative 3 Potential Impacts

The study area for transportation under Alternative 3 is NSA Annapolis and the roadways in the vicinity of the installation.

Impacts on transportation under Alternative 3 would generally be the same as what is described under Alternative 1 in Section 3.8.3.2. There would be some additional excavation and infill required for the living shoreline proposed for Reach 3. However, the elevation of the seawalls would be lower than under Alternative 1 and Alternative 2; therefore, the amount of materials that would be transported would be less, which would result in fewer overall truck trips as compared to Alternative 1 or Alternative 2. The number of vehicle trips and impacts on traffic within the study area would be short term and minor.

Therefore, implementation of Alternative 3 would not result in significant impacts on transportation.

3.9 Hazardous Materials and Wastes

This section discusses hazardous materials, hazardous waste, toxic substances, and contaminated sites.

3.9.1 Regulatory Setting

Hazardous materials are defined by 49 CFR section 171.8 as "hazardous substances, hazardous wastes, marine pollutants, elevated temperature materials, materials designated as hazardous in the Hazardous Materials Table, and materials that meet the defining criteria for hazard classes and divisions in 49 CFR part 173." Transportation of hazardous materials is regulated by the U.S. Department of Transportation.

Hazardous wastes are defined by the Resource Conservation and Recovery Act (RCRA), as amended by the Hazardous and Solid Waste Amendments, as "a solid waste, or combination of solid wastes, which because of its quantity, concentration, or physical, chemical, or infectious characteristics may (A) cause, or significantly contribute to, an increase in mortality or an increase in serious irreversible, or incapacitating reversible, illness; or (B) pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, or disposed of, or otherwise managed." Certain types of hazardous wastes are subject to special management provisions intended to ease the management burden and facilitate the recycling of such materials. These are called universal wastes and their associated regulatory requirements are specified in 40 CFR part 273. Four types of waste are currently covered under the universal waste regulations: hazardous waste batteries, hazardous waste pesticides that are either recalled or collected in waste pesticide collection programs, hazardous waste thermostats, and hazardous waste lamps, such as fluorescent light bulbs.

Special hazards are those substances that might pose a risk to human health and are addressed separately from other hazardous substances. Special hazards include asbestos-containing material (ACM), lead-based paint (LBP), and PCBs. USEPA is given authority to regulate special hazard substances by the Toxic Substances Control Act. Asbestos is also regulated by USEPA under the Clean Air Act, and the Comprehensive Environmental Response, Compensation, and Liability Act.

DoD established the Defense Environmental Restoration Program (DERP) to facilitate thorough investigation and cleanup of contaminated sites on military installations (active installations, installations subject to Base Realignment and Closure, and formerly used defense sites). The Installation Restoration Program (IRP) and the Military Munitions Response Program are components of the DERP. The IRP requires each DoD installation to identify, investigate, and clean up hazardous waste disposal or release sites. The Military Munitions Response Program addresses nonoperational rangelands that are suspected or known to contain unexploded ordnance, discarded military munitions, or munitions constituent contamination. The Environmental Restoration Program is the Navy's initiative to address DERP.

3.9.2 Affected Environment

The Navy has implemented a strict Hazardous Material Control and Management Program and a Hazardous Waste Minimization Program for all activities. These programs are governed Navy-wide by applicable Office of the Chief of Naval Operations instructions and at the installation by specific instructions issued by the Base Commander. The Navy continuously monitors its operations to find ways to minimize the use of hazardous materials and to reduce the generation of hazardous wastes.

3.9.2.1 Hazardous Materials

NSA Annapolis has Spill Prevention, Control, and Countermeasure (SPCC) Plans for USNA and North Severn that contain tank management; hazardous substances inventory; and hazardous materials storage areas, response facilities, and response procedures (NSA Annapolis, 2015; NSA Annapolis, 2014). The installation also has a pollution prevention program aimed at reducing use and controlling, managing, and reusing hazardous materials. Hazardous materials are managed in a central location on-site according to the Navy's Consolidated Hazardous Material Reutilization and Inventory Management Program.

The various departments, divisions, and tenants of the installation use different types of hazardous materials (Navy, 2009). Hazardous materials used on the installation include paints, aerosols, oils, cleaning solutions, and fluorescent bulbs. Building 194 serves as the central hazardous materials storage and distribution facility for USNA (NSA Annapolis, 2015), and Building 336NS serves for North Severn (NSA Annapolis, 2014). The largest bulk oil storage tanks (i.e., between 325,000 and 350,000 gallons of fuel) have appropriate secondary containment sized for the volume of the container. Smaller oil storage containers are either double walled, have secondary containment, or are stored in locations where the facility structure provides adequate containment (NSA Annapolis, 2015). USNA has only aboveground storage tanks (NSA Annapolis, 2015); North Severn has three underground storage tanks associated with the gas station (NSA Annapolis, 2014).

3.9.2.2 Hazardous Waste

NSA Annapolis is classified as a large-quantity generator of hazardous waste under RCRA (NSA Annapolis, 2017). Hazardous waste typically produced at the installation includes spent solvents, used oils, organic substances, waste paint, laboratory chemicals, dirt contaminated with oil and other organic liquids, batteries, and battery fluids. Buildings 194 and 336NS also provide hazardous waste storage in addition to hazardous materials storage (NSA Annapolis, 2017).

Existing hardened shoreline structures within the project reaches vary in material and date. Typical construction materials include combinations of steel (sheet piling and H-beams), timber, concrete, stone (granite), or brick (NAVFAC, 2017). Materials would have met any applicable standards at the time of construction, though initial construction periods and subsequent renovations range from the early 1900s through the 2000s. Wood is commonly treated with preservatives; three of the more common heavy-duty wood preservatives are chromated arsenicals (which contain chromium, copper, and arsenic), creosote, and pentachlorophenol (USEPA, 2017). These chemicals have been widely used to treat wood since the 1940s and 1950s and regulated by USEPA under the Federal Insecticide Fungicide and Rodenticide Act as pesticides. Creosote, arsenic, chromium, copper, and pentachlorophenol are also known to be toxic or carcinogenic. It is assumed that chromated arsenicals, creosote, and/or pentachlorophenol timber components may be present within the project reaches. The waterfront facilities assessment report identified the presence of creosote-treated piers within the Santee Basin (NAVFAC, 2017). Creosote-treated timbers were also found at a depth of approximately 20 feet below surface water during preliminary site investigations along Reach 9; sampling results for toxicity of waste streams were below thresholds for all constituents in the soil and water for this particular reach (Arc Environmental, 2019).

3.9.2.3 Special Hazards (Asbestos-Containing Materials, Lead Based Paint, Polychlorinated Biphenyls)

There is a strong likelihood that ACM, LBP, and PCBs are present on and within older structures and equipment (NAVFAC Washington, 2016). ACMs include, but are not limited to, pipe insulation, floor tiles, cement siding, and wall/ceiling coverings. Asbestos was added to a variety of building materials and other products in buildings constructed prior to 1980 because of its fire resistance, chemical resistance, and insulating properties. Similarly, LBP was used for coatings and finishes before the hazards associated with lead accumulation in children were identified, and so structures constructed prior to 1978, when regulations began, may contain LBP. Electrical equipment and lighting, unless documented PCB-free, are assumed to contain PCBs.

3.9.2.4 Defense Environmental Restoration Program

NSA Annapolis has one IRP site, Site 1, at North Severn to the west and southwest of the former Navy Exchange/Commissary (Building 329NS). This 42-acre IRP site is well removed from the project reaches along the Upper and Lower Yards and the Yard Patrol Basin.

No munition response sites are directly within the project reaches, but the westernmost portion of Reach 15 (Yard Patrol Basin) is adjacent to one (NAVFAC Washington, 2018a). This reach is also adjacent to the surface danger zone that is associated with outdoor rifle and pistol ranges. An additional surface danger zone is located at Reach 6 (Lower Yard) associated with ceremonial functions at the cemetery. While no issues regarding unexploded ordnance or munitions are known, there is the potential for lead to be encountered in soils and sediment in the areas within or immediately adjacent to the surface danger zone and munitions response site associated with munitions-related training.

3.9.3 Environmental Consequences

The hazardous materials and wastes analysis contained in the respective sections addresses issues related to the use and management of hazardous materials and wastes and the presence and management of specific cleanup sites at NSA Annapolis.

3.9.3.1 No Action Alternative

Under the No Action Alternative, the Proposed Action would not occur. The Navy would continue to maintain portions of the seawall by accomplishing minor, as-needed repairs. Conducting maintenance as needed on small portions of seawall is the status quo, which would have negligible impacts on hazardous materials and wastes due to the very small quantities that could be used or generated for these minor repairs.

Continuation of the status quo presents a risk in the event of a major storm event with storm surge, as heavy wind and waves are capable of damaging facilities that store oil or hazardous materials/wastes and spreading contamination rapidly, though this would not be a likely scenario due to tank containment measures and response plans that are in place. Buildings 194 and 336NS, where hazardous materials and wastes are stored, are in areas subject to storm surge from a hurricane of category 2 or higher (NAVFAC Washington, 2018a). Numerous other oil sources, such as transformers, cooking oil, emergency generator tanks and storage, and used oil accumulation tanks, are also within areas subject to storm surge from hurricanes of category 1 or higher. The Navy would continue to operate with existing management plans and policies that govern the transportation, use, storage, and disposal of hazardous materials and wastes, which would minimize possible risks. No significant impacts on hazardous materials and wastes would occur under the No Action Alternative.

Hazardous Material and Waste Potential Impacts:

- No Action: The Navy would continue to operate with existing management plans and policies that govern hazardous materials and wastes. No significant impact.
- Alternative 1: Short-term, minor impacts from small quantities of hazardous materials/wastes during construction. Treated wood, electrical equipment, lighting ballasts, and other debris from removed shoreline structures would need characterization to determine appropriate disposal. Increased seawall height could offer improved long-term protection and management of facilities that store hazardous materials/wastes. No significant impact.
- Alternative 2: Similar to Alternative 1. No significant impact.
- Alternative 3: Short-term impacts associated with construction would be similar to Alternatives 1 and 2. Long-term impacts would be similar to the No Action Alternative. No significant impact.

3.9.3.2 Alternative 1 Potential Impacts

The study area for hazardous materials and wastes for Alternative 1 is the entire area, including infrastructure and equipment, within and adjacent to the identified shoreline reaches in the Upper Yard, Lower Yard, and North Severn areas; management of hazardous materials and wastes extends to include all of NSA Annapolis.

Construction activities would use hazardous materials and generate hazardous wastes in small quantities. Common hazardous materials include diesel fuel, gasoline, propane, hydraulic fluids, oils, lubricants, and batteries. Common hazardous wastes include empty containers from hazardous materials, spent solvents, waste oil, lead-acid batteries, and any spill cleanup materials if used. Construction contractors are responsible for ensuring that the transport, use, storage, and disposal of hazardous materials and wastes complies with all applicable federal and state regulations. Adherence to policies, procedures, and regulations would minimize the potential impacts from exposure and accidental releases during construction. In the event of an accidental release, contaminated media would be treated on-site or would be promptly removed and disposed of in accordance with the SPCC Plans and applicable federal and state regulations.

Treated wood wastes removed from shoreline reaches would undergo further identification and characterization to determine if their disposal would require special management, transportation, or treatment. If any unexpected hazardous waste is discovered during the work, the PWD-A EV HW program manager would sign all manifests for waste leaving the installation. New shoreline structures would use wood for various components along the reaches, including timber sheeting, piles, wales, fenders, and others; given the aquatic environment, the use of treated wood is likely to prolong the life of the wood from decay and physical weathering. The kind of treatment would be selected for its appropriateness in an aquatic environment with pesticides and products that are water insoluble and comply with applicable construction and environmental standards.

If any ACM, LBP, or PCB are suspected or known to be present in various components of existing shoreline structures, those materials must be properly characterized for appropriate disposal in accordance with applicable federal and state regulations. If any unexpected hazardous waste is discovered during the work, the PWD-A EV HW program manager would sign all manifests for waste leaving the installation.

None of the project reaches are directly within areas where munitions are used or stored, except the small surface danger zone in Reach 6 associated with ceremonial functions. Reach 15 is adjacent to a munitions response site and a surface danger zone. Areas where munitions are used or have historically been used may have lead in soils or sediment. Soil samples would be taken and characterized prior to construction along these reaches to determine if lead is present; if lead were present, the Navy would conduct further surveying as necessary to remove and dispose of lead waste, as necessary. If any unexpected hazardous waste is discovered during the work, PWD-A EV HW program manager would sign all manifests for waste leaving the installation.

In the long term, repaired or restored shoreline structures would be maintained as necessary to ensure they are functioning correctly; maintenance activities would have negligible impacts on hazardous materials and wastes due to the very small quantities that would be used or generated for these minor repairs. Increasing the height of seawalls to accommodate for the 10- to 50-year design storm and 75-year sea level rise projection would afford increased protection to facilities that store hazardous materials or hazardous wastes, in the event of a major storm event. Hazardous material storage facilities—Building 174 near Reach 3 and Building 336NS near Reach 13—are subject to storm surge from a hurricane of category 2 or higher (NAVFAC Washington, 2018a). Therefore, repairs and restoration under Alternative 1 that increase resilience to sea level rise and storm surge would also improve management of hazardous materials at NSA Annapolis.

Implementation of Alternative 1 would not result in significant impacts with hazardous materials and wastes.

3.9.3.3 Alternative 2 Potential Impacts

The study area for hazardous materials and wastes for Alternative 2 is the entire area, including infrastructure and equipment, within and adjacent to the identified shoreline reaches in the Upper Yard, Lower Yard, and North Severn areas; management of hazardous materials and wastes extends to include all of NSA Annapolis.

The potential impacts on hazardous materials and wastes would be essentially the same as those described under Alternative 1.

Construction components under Alternative 2 could be slightly less intensive due to the lower heights of the anticipated hardened structures and the use of log toe stabilization at Reach 3. Therefore, use of hazardous materials needed for construction and the associated generation of hazardous wastes could be slightly less.

Increasing the height of seawalls to accommodate for the 10- to 50-year design storm and 50-year sea level rise projection would also afford increased protection to facilities that store hazardous materials or hazardous wastes, compared with the No Action Alternative. This design height is less than Alternative 1 but would be expected to have long-term improvements in hazardous materials management by providing increased protection to those facilities that store hazardous materials or wastes, in the event of a major storm event. The design of the log toe stabilization along Reach 3, which would initially be designed to existing height, could be modified in the future to adapt for sea level rise.

Implementation of Alternative 2 would not result in significant impacts with hazardous materials and wastes.

3.9.3.4 Alternative 3 Potential Impacts

The study area for hazardous materials and wastes for Alternative 3 is the entire area, including infrastructure and equipment, within and adjacent to the identified shoreline reaches in the Upper Yard, Lower Yard, and North Severn areas; management of hazardous materials and wastes extends to include all of NSA Annapolis.

The potential short-term impacts on hazardous materials and wastes would be essentially the same as those described under Alternative 1 or Alternative 2. Construction components under Alternative 3 could be slightly less intensive due to the lower heights of the anticipated hardened structures and the use of living shoreline at Reach 3. Therefore, use of hazardous materials needed for construction and the associated generation of hazardous wastes could be slightly less.

The long-term impacts would be similar to those described under the No Action Alternative because Alternative 3 would repair shoreline structures to existing heights. Reach 3, which would use living shoreline techniques, is near the hazardous materials storage facility. When used in appropriate areas, living shorelines have been demonstrated to be effective in absorbing wave energy, storm surge, and floodwater, and so the use of living shorelines at Reach 3 under Alternative 3 would be expected to be at least as effective if not more effective in the long term at protecting Building 174 than the No Action Alternative. Furthermore, the design of the living shoreline could be modified in the future to adapt for sea level rise.

Implementation of Alternative 3 would not result in significant impacts with hazardous materials and wastes.

3.10 Summary of Potential Impacts on Resources and Impact Avoidance and Minimization

Table 3-12 provides a tabular summary of the potential impacts on the resources associated with the No Action Alternative and the two action alternatives.

Table 3-12 Summary of Potential Impacts on Resource Areas

Resource Area	***No Action Alternative***	***Alternative 1***	***Alternative 2***	***Alternative 3***
Air Quality	Continuation of ozone and sulfur dioxide nonattainment in the short- to mid-term. Minor increases in air emissions from regional growth possible. No significant impact.	Short-term, minor air emissions from construction equipment, waste removal, and material delivery. No significant impact.	Similar to Alternative 1, but lower emissions due to fewer estimated materials. No significant impact.	Similar to Alternatives 1 and 2, but lower emissions due to fewer estimated materials. No significant impact.
Water Resources	Short- and long-term, minor, adverse impacts due to sedimentation from failing seawalls and increased flooding events. No significant impact.	Direct and indirect, short-term, minor, adverse impacts from construction. Indirect, long-term, minor-to-moderate, beneficial effects from reduced shoreline erosion and sedimentation. No significant impact.	Direct and indirect, short-term, minor, adverse impacts from construction. Indirect, long-term, minor, beneficial effects from reduced shoreline erosion and sedimentation. No significant impact.	Direct and indirect, short-term, minor, adverse impacts from construction. Indirect, long-term, negligible, beneficial effects from seawall repair and restoration with no height increases. No significant impact.
Geological Resources	Short-term, negligible, adverse impacts from soil loss; long-term, adverse impacts from bank erosion, land subsidence, and loss of property. No significant impact.	Short-term, minor, adverse impacts from construction; long-term, beneficial effects from a reduction in bank and soil erosion, and land subsidence. No significant impact.	Short-term, minor, adverse impacts from construction; long-term, beneficial effects but less than Alternative 1. No significant impact.	Short-term, minor, adverse impacts from construction; long-term, beneficial effects but less than Alternatives 1 and 2. No significant impact.
Cultural Resources	Long-term, minor adverse effects on deteriorating, contributing seawalls. Long-term, adverse effects on USNA from flood events, which can damage historic elements. No significant impacts.	Long-term, adverse effects on the seawalls of USNA from construction and demolition. Long-term, adverse effects on significant views associated with USNA. Long-term, beneficial effects on the USNA with increased protection from water damage. No significant impacts.	Long-term, adverse effects on the seawalls of USNA from construction and demolition. Long-term, adverse effects on significant views associated with USNA. Long-term, beneficial effects on the USNA with increased protection from water damage. No significant impacts.	Long-term, adverse effects on USNA from storm surge and flood damage events from the lack of proper protection. No significant impacts.

Resource Area	*No Action Alternative*	*Alternative 1*	*Alternative 2*	*Alternative 3*
Biological Resources	Adverse impacts from continued sea level rise, storm surge, land subsidence, and erosion. No significant impact.	Short-term, minor, adverse impacts from construction activity. Long-term benefits to biological resources from prevention of land subsidence and erosion. No significant impact.	Similar to Alternative 1, with added benefits from application of log toe stabilization. No significant impact.	Similar to Alternative 1, with added benefits from application of living shoreline. No significant impact.
Visual Resources	Long-term, negligible-to-minor, adverse impacts from seawall deterioration. No significant impact.	Short- and long-term, minor, adverse impacts from construction and increasing seawall height. No significant impact.	Similar to Alternative 1. No significant impact.	Direct, short-term, negligible, adverse impacts from construction. Direct, long-term, negligible-to-minor beneficial impacts from seawall repair. No significant impact.
Noise	No change in baseline conditions. No significant impact.	Short-term airborne and underwater minor adverse impacts. No long-term impacts. No significant impact.	Similar to Alternative 1. No significant impact.	Similar to Alternative 1. No significant impact.
Transportation	Long-term, adverse impacts on traffic regardless of implementation of the Proposed Action. Long-term, adverse impacts from continued sea level rise and storm surge. No significant impact.	Short-term, minor adverse effects from construction traffic. No long-term impacts. No significant impact.	Similar to Alternative 1. No significant impact.	Similar to Alternative 1. No significant impact.

Resource Area	*No Action Alternative*	*Alternative 1*	*Alternative 2*	*Alternative 3*
Hazardous Materials and Wastes	The Navy would continue to operate with existing management plans and policies that govern hazardous materials and wastes. No significant impact.	Short-term, minor impacts from small quantities of hazardous materials/wastes during construction. Treated wood, electrical equipment, lighting ballasts, and other debris from removed shoreline structures would need characterization to determine appropriate disposal. Increased seawall height could offer improved long-term protection and management of facilities that store hazardous materials/wastes. No significant impact.	Similar to Alternative 1. No significant impact.	Short-term impacts associated with construction would be similar to Alternatives 1 and 2. Long-term impacts would be similar to the No Action Alternative. No significant impact.

Key: USNA = U.S. Naval Academy.

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4 Cumulative Impacts

This section (1) defines cumulative impacts; (2) describes past, present, and reasonably foreseeable future actions relevant to cumulative impacts; (3) analyzes the incremental interaction the proposed action may have with other actions; and (4) evaluates cumulative impacts potentially resulting from these interactions.

4.1 Definition of Cumulative Impacts

The approach taken in the analysis of cumulative impacts follows the objectives of the National Environmental Policy Act (NEPA), Council on Environmental Quality (CEQ) regulations, CEQ guidance, and Navy regulations. A cumulative impact is defined in 40 Code of Federal Regulations (CFR) section 1508.7 as "the impact on the environment which results from the incremental impact of the action when added to the other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time."

To determine the scope of environmental impact analyses, agencies shall consider cumulative actions, which, when viewed with other proposed actions, have cumulatively significant impacts and should therefore be discussed in the same impact analysis document.

In addition, CEQ and the U.S. Environmental Protection Agency (USEPA) have published guidance addressing implementation of cumulative impact analyses—*Guidance on the Consideration of Past Actions in Cumulative Effects Analysis* (CEQ, 2005) and *Consideration of Cumulative Impacts in EPA Review of NEPA Documents* (USEPA, 1999). CEQ guidance entitled *Considering Cumulative Impacts Under NEPA* (1997) states that cumulative impact analyses should

> ". . . determine the magnitude and significance of the environmental consequences of the proposed action in the context of the cumulative impacts of other past, present, and future actions . . . identify significant cumulative impacts . . . [and] . . . focus on truly meaningful impacts."

Cumulative impacts are most likely to arise when a relationship or synergism exists between a proposed action and other actions expected to occur in a similar location or during a similar period. Actions overlapping with or near a proposed action would be expected to have more potential for a relationship than those more geographically separated. Similarly, relatively concurrent actions would tend to offer a higher potential for cumulative impacts. To identify cumulative impacts, the analysis needs to address the following three fundamental questions.

- Does a relationship exist such that affected resource areas of the Proposed Action might interact with the affected resource areas of past, present, or reasonably foreseeable actions?
- If one or more of the affected resource areas of the Proposed Action and another action could be expected to interact, would the Proposed Action affect, or be affected by, impacts of the other action?
- If such a relationship exists, then does an assessment reveal any potentially significant impacts not identified when the Proposed Action is considered alone?

4.2 Scope of Cumulative Impacts Analysis

The scope of the cumulative impacts analysis involves both the geographic extent of the effects and the time frame in which the effects could be expected to occur. For this Environmental Assessment (EA), the study area delimits the geographic extent of the cumulative impacts analysis. In general, the study area includes those areas previously identified in Chapter 3 for the respective resource areas. The time frame for cumulative impacts centers on the timing of the Proposed Action.

Another factor influencing the scope of cumulative impacts analysis involves identifying other actions to consider. Beyond determining that the geographic scope and time frame for the actions interrelated to the Proposed Action, the analysis employs the measure of "reasonably foreseeable" to include or exclude other actions. For the purposes of this analysis, public documents prepared by federal, state, and local government agencies form the primary sources of information regarding reasonably foreseeable actions. Documents used to identify other actions include notices of intent for Environmental Impact Statements and EAs, management plans, land use plans, and other planning related studies.

4.3 Past, Present, and Reasonably Foreseeable Actions

This section focuses on past, present, and reasonably foreseeable future projects at, and near, the Proposed Action locale. In determining which projects to include in the cumulative impacts analysis, a preliminary determination was made regarding past, present, or reasonably foreseeable actions. Specifically, using the first fundamental question included in Section 4.1, it was determined if a relationship exists such that the affected resource areas of the Proposed Action (included in this EA) might interact with the affected resource area of a past, present, or reasonably foreseeable action. If no such potential relationship exists, the project was not carried forward into the cumulative impacts analysis. In accordance with CEQ guidance (CEQ, 2005), these actions that were considered but excluded from further cumulative effects analysis are not catalogued here as the intent is to focus the analysis on the meaningful actions relevant to informed decision making. Projects included in this cumulative impact analysis are listed in Table 4-1 and briefly described in the following subsections.

4.3.1 Past Actions

Wastewater Treatment Plant Upgrades (Fiscal Year 2015). The Navy prepared an EA to evaluate the potential environmental impacts of upgrading the North Severn wastewater treatment plant to comply with current and future regulatory requirements and meet future treatment demand. The proposed action consisted of new construction, demolition, and conversion projects at the North Severn wastewater treatment plant, and installation of a water reuse conservation system (NAVFAC Washington, 2015).

Navy Exchange (Fiscal Year 2014), Commissary, Health Clinic (Fiscal Year 2015). The Navy prepared an EA to assess the potential environmental impacts of constructing and operating a new Navy Exchange, Commissary, and Health Clinic on North Severn. The Navy Exchange and Commissary complex, located between Kinkaid and Greenbury Point Roads, includes a one-story building with an 88,000-square-foot Navy Exchange and a 51,500-square-foot Commissary. A three-story 105,500-square foot-Health Clinic is located adjacent to the northwestern boundary of the golf course. A supporting 550-space parking area was constructed between the Navy Exchange and Commissary complex and the Health Clinic. The Navy Exchange and Commissary replace the existing facilities on North Severn; the existing Navy Exchange and Commissary buildings and their associated parking would be reused (potential reuse has not yet

Table 4-1 Cumulative Action Evaluation

Action	*Level of NEPA Analysis Completed*
Past Actions	
Wastewater Treatment Plant Upgrades	Environmental Assessment
Navy Exchange, Commissary, Health Clinic	Environmental Assessment
Rifle Range Repairs	unknown
Installation Restoration Program Site 1 Remediation	unknown
Repair and Restoration of the North Severn Shoreline	Environmental Assessment
Present and Reasonably Foreseeable Future Actions	
Construct U.S. Naval Academy Alumni Association and Foundation Headquarters at Perry Center	Environmental Assessment
Halligan Hall (Building 181) Energy Repairs	Categorical Exclusion
Bancroft Hall Watershed Improvements	Categorical Exclusion
New Football Facility-Addition to Ricketts Hall	Categorical Exclusion
Center for Cyber Security Studies	Environmental Assessment
Porter Road Stormwater Management Repairs	Categorical Exclusion
Chapel Roof Repairs	Categorical Exclusion
Rickover Hall Heating, Ventilation, and Air Conditioning (HVAC) Renovations	Categorical Exclusion

Sources: NAVFAC Washington, 2015; NAVFAC Washington, 2018d.
Key: NEPA = National Environmental Policy Act.

been determined). The new Health Clinic on North Severn replaced the Naval Health Clinic on the Upper Yard. The Navy Exchange/Commissary opened in September 2014, and construction of the Health Clinic was completed in 2017 (NAVFAC Washington, 2018d).

Rifle Range Repairs (Fiscal Year 2015). This project consists of a number of improvements to the rifle range at North Severn. It includes constructing and/or repairing a canopy to cover the 25 yards between the firing line and the target line, a steel and rubber bullet trap at the target line, and a masonry side containment wall; reshaping the existing earth berm; and providing a sloped wooden baffle to connect to the top of the berm (NAVFAC Washington, 2015).

Installation Restoration Program (IRP) Site 1 Remediation (Fiscal Year 2016). This project involves performing remediation work on IRP Site 1, a former refuse disposal site located west of the existing Navy Exchange/Commissary. The remediation work included treating contaminated soil and groundwater. An engineered cap was included on top of landfill waste (NAVFAC Washington, 2015).

Repair and Restoration of the North Severn Shoreline (Fiscal Year 2015). An EA was completed to evaluate the impacts of repairing and restoring approximately 28,000 linear feet of shoreline at North Severn. The project area included the shoreline of North Severn along Mill Creek, Carr Creek, the Severn River, and the Chesapeake Bay. Four potentially feasible repair and restoration methods were analyzed including hardened structure or revetment, sheet pile, log toe stabilization, and living shoreline (NAVFAC Washington, 2015). To date, revetments along Possum Point have been completed, as part of the repair and restoration work under this EA. In addition, restoration along 429 linear feet of Carr Creek shoreline on North Severn has been completed, which included log toe stabilization. A stone revetment shoreline restoration on the Greenbury Point peninsula on North Severn is in the preliminary design phase, and a living shoreline restoration project along 750 linear feet of shoreline on the Greenbury Point peninsula is in the design phase.

4.3.2 Present and Reasonably Foreseeable Actions

Construct U.S. Naval Academy (USNA) Alumni Association and Foundation Headquarters at Perry Center. The USNA Alumni Association and Naval Academy Foundation will construct a new 29,000–square-foot Alumni Service Center and Headquarters facility with a 90- to 120-vehicle parking lot on NSA Annapolis property located at the Perry Center in the southwestern portion of the Upper Yard. Construction of the facility and parking lot will require excavation, grading, and tree/vegetation removal resulting in 5,928 cubic yards of excavated material, 5,585 cubic yards of fill material, and 20,650 square feet of tree/vegetation removal. Project implementation is anticipated to begin in 2019 with a 24-month construction period (NAVFAC Washington, 2018d).

Halligan Hall (Building 181) Energy Repairs. This project consists of replacing the existing steam service and heating and air conditioning system in Halligan Hall (Building 181) with a more energy efficient ground-source heat pump, also known as a geothermal well system. Approximately 190 6-inch-diameter wells have been installed at a depth of up to 400 feet below Lawrence Field for the proposed ground-source heat pump system. The project also includes restoring and selectively replacing the existing windows to improve the building’s thermal performance. This project would be completed in phases (NAVFAC Washington, 2018d).

Bancroft Hall Watershed Improvements. This project consists of the construction of below-grade cisterns at Bancroft Hall that would collect stormwater. The stormwater would then be reused for irrigation, cooling, or other recycled water uses (NAVFAC Washington, 2018d).

New Football Facility-Addition to Ricketts Hall. The Navy plans to construct an addition to Ricketts Hall (Building 566) for additional administrative space for the football program. No increase in personnel or staff at Ricketts Hall would be associated with this project (NAVFAC Washington, 2018d).

Center for Cyber Security Studies. This project consists of the construction of an approximately 206,000-square-foot new multistory facility at the Lower Yard to house the Center for Cyber Security Studies and a supporting two-story parking garage structure. The facilities were designed and will be constructed for energy efficiency and sustainability including, at a minimum, a Leadership in Energy and Environmental Design Silver certification (NAVFAC Washington, 2018d).

Porter Road Stormwater Management Repairs. This project consists of repairs to stormwater management along Porter Road on the Lower Yard.

Chapel Roof Repairs. This project consists of roof repairs to the historic U.S. Naval Academy Chapel (Building 108), located on the Lower Yard of NSA Annapolis.

Rickover Hall HVAC Renovations. This project consists of renovations to the existing HVAC system in Rickover Hall (Building 590), located on the Lower Yard.

4.4 Cumulative Impact Analysis

Where feasible, the cumulative impacts were assessed using quantifiable data; however, for many of the resources included for analysis, quantifiable data are not available, and a qualitative analysis was undertaken. In addition, where an analysis of potential environmental effects for future actions has not been completed, assumptions were made regarding cumulative impacts related to this EA where possible. The analytical methodology presented in Chapter 3, which was used to determine potential impacts on the various resources analyzed in this document, was also used to determine cumulative impacts.

4.4.1 Air Quality

4.4.1.1 Description of Geographic Study Area

The study area for cumulative impacts on air quality is the Metropolitan Baltimore Intrastate Air Quality Control Region.

4.4.1.2 Relevant Past, Present, and Future Actions

All present and reasonably foreseeable future actions listed in Table 4-1 have the potential to affect air quality.

4.4.1.3 Cumulative Impact Analysis

Cumulative air quality impacts from past, present, and future actions within the study area would be less than significant. For present and future actions, construction would generate short-term criteria pollutant and fugitive dust emissions while ground-disturbing activities are occurring. Air emissions are based on the size and complexity of the project and whether construction activities would disturb the soil. All present and reasonably foreseeable future actions could collectively increase emissions of criteria pollutants temporarily in and around project sites at NSA Annapolis, but variations in the locations and timing of projects would distribute emissions geographically and temporally. Estimated construction emissions from proposed shoreline repair and restoration activities are well below *de minimis* thresholds. Per regulation, by demonstrating that this project would be below *de minimis* thresholds as discussed in Section 3.1, the project is not considered significant individually or cumulatively within the airshed. Therefore, implementation of the Proposed Action combined with the past, present, and reasonably foreseeable future projects, would not result in significant impacts on air quality within the study area.

4.4.2 Water Resources

4.4.2.1 Description of Geographic Study Area

The study area for assessment of cumulative impacts on water resources includes the shoreline along the defined project reaches, wetlands, groundwater, and surface water bodies within the installation and downstream water resources.

4.4.2.2 Relevant Past, Present, and Future Actions

All projects listed in Table 4-1 could contribute directly or indirectly to impacts on water resources.

4.4.2.3 Cumulative Impact Analysis

For past, present, and future projects at NSA Annapolis, all construction projects would be expected to increase sedimentation and turbidity, which could directly affect water resources within the study area or indirectly affect surface water bodies, wetlands, or groundwater outside the study area. Individually, projects would be expected to have negligible-to-minor impacts, dependent on the specific water resources (e.g., wetlands, floodplains, coastal zones) where the construction occurs, and would vary with the size, intensity, and duration of construction activities.

Development pressures in urbanized areas have the potential for contributing to long-term, adverse, cumulative effects by increasing impervious surfaces from parking, sidewalks and facilities, which can exacerbate stormwater and flooding issues and decrease groundwater infiltration. Cumulatively, the repair and restoration of North Severn shorelines and the Proposed Action would have long-term benefits on water resources by stabilizing banks, controlling erosion and sedimentation into surface water bodies, and increasing flood protection. The Bancroft Hall watershed improvements would include below-grade cisterns to collect stormwater, which would also be beneficial by reclaiming/ recycling water for other uses and controlling stormwater runoff. Overall, the balance of the Proposed Action's contributions to cumulative effects on water resources in the Severn River watershed would be beneficial but minor. Implementation of the Proposed Action combined with the past, present, and reasonably foreseeable future projects, would not result in significant water resource impacts within the study area.

4.4.3 Geological Resources

4.4.3.1 Description of Geographic Study Area

The study area for assessment of cumulative impacts on geological resources is the installation and adjacent areas that could receive indirect impacts.

4.4.3.2 Relevant Past, Present, and Future Actions

All projects listed in Table 4-1 could contribute directly or indirectly to impacts on geological resources.

4.4.3.3 Cumulative Impact Analysis

Most of the projects listed in Table 4-1 involve activities that result in soil disturbance. Given the location of the installation on the shoreline, if soil is disturbed, it can increase sedimentation into nearby surface water bodies. However, several methods would be used to minimize soil erosion. Erosion- and sediment-control plans are required for grading activities that disturbs 5,000 square feet or more of land area or 100 cubic yards or more of earth. Consequently, applicable erosion- and sediment-control measures would be implemented to reduce sedimentation in the water. None of the present or future actions included in Table 4-1 involve in-water work. The repair and restoration of the North Severn shoreline would not occur at the same time as the repair of the shorelines in this EA; therefore, there would be no short-term, cumulative impacts.

Given the low-lying topography of the installation, the cumulative projects would not change the topography of the area. If any of the projects change the runoff characteristics and create points of concentrated flow where previously there was sheet flow, the Maryland Department of the Environment may require additional water quantity management to minimize adverse impacts from the change in drainage patterns. Therefore, implementation of the Proposed Action combined with the past, present, and reasonably foreseeable future projects, would not result in significant impacts on geological resources within the study area.

4.4.4 Cultural Resources

4.4.4.1 Description of Geographic Study Area

The study area for assessment of cumulative impacts on cultural resources is the installation, and the viewsheds within the installation to the Severn River and College Creek, and from the water's edge along the Severn River looking to the north and east.

4.4.4.2 Relevant Past, Present, and Future Actions

All past, present, and reasonably foreseeable future actions listed in Table 4-1 have the potential to affect cultural resources, either directly if a building is within the USNA and the National Historic Landmark/Historic District boundaries, or if visible from the district.

4.4.4.3 Cumulative Impact Analysis

The Navy meets its stewardship requirements for cultural resources under Sections 106 and 110 of the National Historic Preservation Act. The installation has an Integrated Cultural Resources Management Plan that is a reference and a planning tool for management and preserving cultural resources while maintaining mission readiness (NAVFAC Washington, 2018c). Any alterations of a resource eligible for the National Register of Historic Places must be done to meet the Secretary of the Interior's Standards for Rehabilitation (36 CFR part 68). Consultation with the State Historic Preservation Officer (SHPO) (and/or other appropriate parties) must be undertaken prior a project's commencement. In this way, the Navy works to identify, avoid, minimize, and/or mitigate any potential impacts on cultural resources when implementing individual projects.

Although potential adverse effects from the construction of the Cyber Security Studies building included mitigation per a signed Programmatic Agreement, there may be cumulative impacts to consider. Alterations in the views from both the new building and the restored seawalls may cause long-term minor cumulative impacts. The Cyber Security Studies Programmatic Agreement identified the Navy's commitment to design the facility for compatibility with its surroundings, minimizing height and massing of the top floor, and to provide designs, once available, to consulting parties for review at various phases in the design process. The Navy is currently consulting with the SHPO regarding this Proposed Action. Implementation of the Proposed Action, when combined with past, present, and reasonably foreseeable future projects, would not be expected to result in significant impacts within the study area.

4.4.5 Biological Resources

4.4.5.1 Description of Geographic Study Area

The study area for assessment of cumulative impacts on biological resources is NSA Annapolis and the surrounding terrestrial and aquatic biological community.

4.4.5.2 Relevant Past, Present, and Future Actions

All projects listed in Table 4-1 could contribute directly or indirectly to impacts on biological resources.

4.4.5.3 Cumulative Impact Analysis

For past, present, and future projects at NSA Annapolis, all construction projects would be expected to generate some noise and fugitive dust, which could directly or indirectly affect wildlife species. Individually, projects would be expected to have negligible-to-minor impacts, dependent on the biological community where the construction occurs, and would vary with the size, intensity, and duration of construction activities. Given the amount of terrestrial and aquatic habitat in the vicinity of NSA Annapolis, wildlife would be able to retreat if disturbed by noise, dust, or increased human activities.

None of the present or future actions included in Table 4-1 include in-water work. The repair and restoration of the North Severn shoreline would not occur at the same time as the repair of the shorelines in this EA; therefore, there would be no short-term, cumulative impacts. Long-term impacts on essential fish habitat (EFH) from the repair and restoration of the North Severn shoreline are considered beneficial because shoreline erosion and sedimentation would be reduced, thereby improving the quality of EFH. Therefore, adverse cumulative impacts on aquatic species or EFH are not expected.

Implementation of the Proposed Action, combined with the past, present, and reasonably foreseeable future projects, would not result in significant impacts within the study area.

4.4.6 Visual Resources

4.4.6.1 Description of Geographic Study Area

The study area for assessment of cumulative impacts on visual resources is the project area at USNA and North Severn, the Severn River, and Chesapeake Bay viewsheds from the installation, and surrounding areas from which the installation is visible.

4.4.6.2 Relevant Past, Present, and Future Actions

All projects listed in Table 4-1 could contribute directly or indirectly to impacts on visual resources.

4.4.6.3 Cumulative Impact Analysis

For past, present, and future projects at NSA Annapolis, all construction projects would be expected to temporarily alter the visual character of the area from construction, demolition, and/or renovation activities. Individually, projects would be expected to have negligible-to-minor impacts, dependent on where the construction occurs, and would vary with the size, intensity, and duration of construction activities. The Navy would follow the Installation Appearance Plan (NSA Annapolis, 2008) to ensure all physical development fosters the civic beauty of the installation, protects natural and cultural resources, preserves the existing architectural fabric, and improves the overall quality of life for personnel and the public. In addition, the Navy would follow guidance in the Installation Development Plan (NAVFAC Washington, 2018a) to ensure that development activities result in consistent and appropriate physical appearance and functions.

Cumulatively, alterations in the views from both the cyber security building and the restored seawalls may cause long-term minor cumulative impacts. Both undertakings will take in consideration the adverse effects on significant views. A Programmatic Agreement was signed for the Cyber Security Studies building identifying the Navy’s commitment to design the facility for compatibility with its surroundings, minimizing height and massing of the top floor, and to provide designs, once available, to consulting parties for review at various phases in the design process. The Navy is currently consulting with the SHPO regarding this Proposed Action.

Implementation of the Proposed Action, combined with the past, present, and reasonably foreseeable future projects, would not result in significant impacts on visual resources within the study area.

4.4.7 Noise

4.4.7.1 Description of Geographic Study Area

The study area for assessment of cumulative impacts on the noise environment are the populations adjacent to the installation and the underwater receptors.

4.4.7.2 Relevant Past, Present, and Future Actions

All of the present and foreseeable future projects listed in Table 4-1 could contribute directly or indirectly to impacts on noise.

4.4.7.3 Cumulative Impact Analysis

Cumulative noise impacts from present and future actions within the study area could occur during construction activities if they were adjacent to noise-sensitive receptors and were occurring at the same time. However, noise from construction would be intermittent and temporary. Long-term impacts from the operation of the Center for Cyber Security Studies are not expected to be significant, and according to project schedule, construction of the Center for Cyber Security Studies would not overlap with this Proposed Action (NAVFAC Washington, 2015). The Proposed Action in this EA would not have long-term impacts; combined, these projects would not be expected to have long-term cumulative impacts on noise.

4.4.8 Transportation

4.4.8.1 Description of Geographic Study Area

The study area for the assessment of cumulative impacts on transportation is NSA Annapolis and the surrounding roadways.

4.4.8.2 Relevant Past, Present, and Future Actions

All past, present, and reasonably foreseeable future actions listed in Table 4-1 have the potential to affect transportation.

4.4.8.3 Cumulative Impact Analysis

Cumulative transportation impacts from present and future actions within the study area could occur during construction activities if they were occurring concurrently to the Proposed Action. Of the projects included in Table 4-1, the USNA Alumni Association facility, Halligan Hall energy repairs, Bancroft Hall watershed improvements, new football facility addition at Ricketts Hall, the Center for Cyber Security Studies facility, Porter Road stormwater management repairs, Chapel roof repairs, and Rickover Hall HVAC renovations would all involve construction vehicles, potential road closures, and parking area closures and would contribute to cumulative impacts on transportation within the study area. None of these projects are expected to contribute to a cumulative, significant, permanent increase in transportation. Temporary impacts on traffic during construction activities under the Proposed Action and these present and future projects could occur concurrently, pending project schedules, but are unlikely to all occur simultaneously. Each individual project impact would be temporary, and the cumulative implementation of the Proposed Action with these projects would not result in significant impacts to transportation within the study area. The largest of the past, present, or reasonably foreseeable future projects is the Center for Cyber Security Studies facility, which will be completed prior to when the Proposed Action would begin.

In the future, traffic volumes are expected to increase along Maryland State Route 450, which traverses the Upper and Lower Yards at NSA Annapolis. These roadways are expected to experience an increase in traffic that would result in a failing level of service (LOS) by 2030 without improvements (City of Annapolis, 2009). As described in Section 3.8, the increases in traffic in the region that would increase congestion and degrade LOS regardless of the Proposed Action. While the Proposed Action would result in minor increases in traffic during the construction period, it would not contribute to significant cumulative impacts. Therefore, implementation of the Proposed Action, combined with the past, present, and reasonably foreseeable future projects, would not result in significant impacts on transportation within the study area.

4.4.9 Hazardous Materials and Wastes

4.4.9.1 Description of Geographic Study Area

The study area for assessment of cumulative impacts on hazardous materials and wastes is NSA Annapolis.

4.4.9.2 Relevant Past, Present, and Future Actions

All present and reasonably foreseeable future actions listed in Table 4-1 have the potential to affect hazardous materials and wastes.

4.4.9.3 Cumulative Impact Analysis

Cumulative impacts associated with hazardous materials and wastes from past, present, and future actions within the study area would be less than significant. Construction, demolition, and renovation activities would be expected to use small quantities of hazardous materials and generate small quantities of hazardous wastes while these activities are occurring. Activities would adhere to existing hazardous material and management plans. The Navy continually monitors its operations to find ways to minimize the use of hazardous materials and to reduce the generation of hazardous wastes.

Past projects such as rifle range repairs and IRP Site 1 remediation have contributed to beneficial cumulative effects. The rifle range project included a bullet trap and masonry containment wall, both of which improved the Navy's ability to limit possible lead contamination to ranges. IRP remediation involved treating contaminated soil and groundwater and capping the landfill to prevent further contamination. The USNA Alumni Association project involves relocating the Navy's Consolidated Hazardous Material Reutilization and Inventory Management Program (currently in Building 194) further inland (NAVFAC Washington, 2018d). The new location would be removed from the anticipated hurricane storm surge area, unlike the current facility in Building 194, which is within an area subject to storm surge from a category 2 or higher hurricane. Moving the hazardous materials storage area would have beneficial cumulative effects by moving these potential contamination sources in the event of catastrophic storm surge. Alternatives 1 and 2 would be expected to have beneficial cumulative effects by increasing the heights of seawalls to accommodate for sea level rise and storm surge into the future, particularly for the existing and future transformers, emergency generators, oil accumulation tanks, or other sources of potential contamination that occur close to the shorelines. Therefore, implementation of the Proposed Action combined with the past, present, and reasonably foreseeable future projects, would not result in significant impacts within the study area.

5 Other Considerations Required by the National Environmental Policy Act

5.1 Consistency with Other Federal, State, and Local Laws, Plans, Policies, and Regulations

In accordance with 40 Code of Federal Regulations (CFR) section 1502.16(c), analysis of environmental consequences shall include discussion of possible conflicts between the Proposed Action and the objectives of federal, regional, state, and local land use plans, policies, and controls. Table 5-1 identifies the principal federal and state laws and regulations that are applicable to the Proposed Action at Naval Support Activity (NSA) Annapolis and describes briefly how compliance with these laws and regulations would be accomplished.

Table 5-1 Principal Federal and State Laws Applicable to the Proposed Action

Federal, State, Local, and Regional Land Use Plans, Policies, and Controls	***Status of Compliance***
NEPA; CEQ NEPA-implementing regulations; Navy procedures for implementing NEPA	This Environmental Assessment has been prepared in accordance with NEPA, as implemented by the CEQ and Navy regulations.
Clean Air Act	The Proposed Action would comply with applicable federal and state air quality regulations. The project area is in an eight-hour ozone and a sulfur dioxide nonattainment area. Estimated emissions would not exceed applicable *de minimis* thresholds. A general conformity applicability analysis and Record of Non-Applicability are in Appendix B.
Clean Water Act	The Proposed Action would result in discharge of dredged or fill material and construction within the Severn River, College Creek, Spa Creek, Santee Basin, and Yard Patrol Basin. An individual Section 404 permit from USACE would likely be required.
Rivers and Harbors Act	The Proposed Action would include construction within the Severn River, College Creek, Spa Creek, Santee Basin, and Yard Patrol Basin. A permit under Section 10 of the Rivers and Harbors Act from the USACE would likely be required.
Coastal Zone Management Act	A Coastal Consistency Determination for the Proposed Action will be submitted to the MDE.
National Historic Preservation Act	Demolition or modification of seawalls would alter their appearance, which would be an adverse effect to contributing elements to the U.S. Naval Academy National Historic Landmark/Historic District. Increasing the height of seawalls could affect significant views to the Severn River or College Creek that contribute to the historic district. However, increased height could also protect individual resources and historic material from loss due to flooding. Coordination pursuant to Section 106 is underway.

Federal, State, Local, and Regional Land Use Plans, Policies, and Controls	***Status of Compliance***
Endangered Species Act	No effect on threatened or endangered species would be expected. No formal consultation with the U.S. Fish and Wildlife Service or NOAA Fisheries under section 7 is required.
Magnuson-Stevens Fishery Conservation and Management Act	EFH has been designated for ten fish species in the vicinity of NSA Annapolis. In accordance with the Magnuson-Stevens Fisheries Conservation and Management Act, consultation with NOAA Fisheries will occur.
Marine Mammal Protection Act	Marine mammals have not been observed near NSA Annapolis. No impacts would be expected.
Migratory Bird Treaty Act	No impacts on migratory birds would be expected.
Bald and Golden Eagle Protection Act	No impacts on eagles would be expected.
Comprehensive Environmental Response, Compensation, and Liability Act	Not applicable.
Emergency Planning and Community Right-to-Know Act	Chemical substances would remain the same; reporting requirements would continue.
Federal Insecticide, Fungicide, and Rodenticide Act	The Navy would continue to use any pesticides or pesticide-treated products in accordance with applicable labeling.
Resource Conservation and Recovery Act (RCRA)	No changes would occur in the way that hazardous wastes are handled, stored, or disposed of, pursuant to RCRA requirements.
Toxic Substances Control Act	Chemical substances would remain the same; reporting requirements would continue.
Farmland Protection Policy Act	The project area is not being used as farmland and are not intended or zoned for farming purposes; no effects would be expected.
Executive Order 11988, *Floodplain Management*	Most of the project area is within 100-year or 500-year floodplains. If impacts cannot be avoided, minimization measures to restore and preserve the floodplain will be designed and implemented.
Executive Order 11990, *Protection of Wetlands*	There are no wetlands located within or near the project areas.
Executive Order 12088, *Federal Compliance with Pollution Control Standards*	The Proposed Action would comply with applicable pollution controls required by construction permits.
Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-income Populations*	No disproportionately high or adverse effects on minority or low-income populations would occur.
Executive Order 13045, *Protection of Children from Environmental Health Risks and Safety Risks*	No disproportionate effects on children would occur.
Executive Order 13089, *Coral Reef Protection*	Not applicable.
Executive Order 13175, *Consultation and Coordination with Indian Tribal Governments*	No traditional cultural properties are known to be located within or near the project reaches.
Executive Order 13834, *Efficient Federal Operations*	The Proposed Action does not include long-term operations.

Key: NEPA=National Environmental Policy Act; CEQ=Council on Environmental Quality; USACE = U.S. Army Corps of Engineers; RCRA = Resource Conservation and Recovery Act.

5.2 Irreversible or Irretrievable Commitments of Resources

Resources that are irreversibly or irretrievably committed to a project are those that are used on a long-term or permanent basis. This includes the use of non-renewable resources such as metal and fuel, and natural or cultural resources. These resources are irretrievable in that they would be used for this project when they could have been used for other purposes. Human labor is also considered an irretrievable resource. Another impact that could fall under this category is the irreversible destruction of natural resources that could limit the range of potential uses of that environment.

Implementation of the Proposed Action would involve human labor; the consumption of fuel, oil, and lubricants for construction vehicles during construction activities. However, the materials for the repair and restoration of approximately 19,334 linear feet of seawalls and shoreline is relatively small when compared to the resources available in the region. The use of the required construction materials would not have an adverse impact on the continued availability of region-wide usage. Commitment of these resources would not be significant. The Proposed Action would not result in a permanent loss of natural resources. Implementing the Proposed Action would not result in significant irreversible or irretrievable commitment of resources.

5.3 Unavoidable Adverse Impacts

This EA has determined that the alternatives considered would not result in any significant impacts. Implementing the alternatives would result in the following unavoidable environmental impacts:

- Short-term impacts on air emissions from construction equipment, waste removal, and material delivery.
- Short-term impacts on water and geological resources from sedimentation in surface waters.
- Long-term impacts on cultural resources from demolition and modifications to seawalls, which are contributing elements to a National Historic Landmark/Historic District, and increased height of seawalls, which may affect significant views to the Severn River or College Creek.
- Short-term impacts on biological resources from on-land and underwater construction activities.
- Short-term impacts on visual resources from construction and long-term impacts from increasing seawall height (Alternatives 1 and 2 only).
- Short-term impacts on human and biological noise sensitive receptors from construction activities including construction traffic.
- Short-term impacts from small quantities of hazardous materials/wastes during construction.

5.4 Relationship between Short-Term Use of the Environment and Long-Term Productivity

NEPA requires an analysis of the relationship between a project's short-term impacts on the environment and the effects that these impacts have on the maintenance and enhancement of the long-term productivity of the affected environment. Impacts that narrow the range of beneficial uses of the environment are of particular concern. This refers to the possibility that choosing one development site reduces future flexibility in pursuing other options, or that using a parcel of land or other resources often eliminates the possibility of other uses at that site.

In the short term, effects on the human environment with implementation of the Proposed Action would primarily relate to the construction activity itself. In the short-term, soil disturbance could lead to sedimentation and affect water, biological, and geological resources. In addition, short-term impacts on air quality, visual resources, noise, transportation, and hazardous materials and wastes and would occur during the construction phase, regardless of the alternative that may be implemented. With the implementation of BMPs, and avoidance, minimization, and mitigation measures, none of the impacts associated with any of the alternatives for the Proposed Action would be significant.

In the long term, the Proposed Action would have beneficial impacts from a reduction in bank and soil erosion and land subsidence on water, soil, and biological resources. The Proposed Action would not result in any impacts that would significantly reduce environmental productivity or permanently narrow the range of beneficial uses of the environment.

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Responsible for senior review

Contractors

Kristie Baynard (Marstel-Day, LLC)
M.S. Historic Preservation
Years of Experience: 19
Responsible for Cultural Resources

Ashleigh Benson (Marstel-Day)
B.S. Environmental Science
Years of Experience: 2
Responsible for water resources, visual resources

Dr. Sean Donahoe (Marstel-Day LLC)
Ph.D. Environmental Science and Policy
M.S. Biology
B.S. Mathematics, Biology
Years of Experience: 31
Responsible for senior review

Tanya Perry (Marstel-Day LLC)
B.S. Environmental Science
B.A. Communications
Years of Experience: 19
Responsible for project management, senior review, noise, geological resources

Elizabeth Pratt (Marstel-Day LLC)
B.A. Business Administration
Years of Experience: 11
Responsible for biological resources, transportation

Mary Young (Marstel-Day LLC)
B.S. Environmental Science
Years of Experience: 16
Responsible for air quality, hazardous materials and wastes

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Appendix A
Public Involvement and Agency Correspondence Materials

Contents of Appendix A

U.S. Fish and Wildlife Service List of Threatened and Endangered Species (IPaC)

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Chesapeake Bay Ecological Services Field Office
177 Admiral Cochrane Drive
Annapolis, MD 21401-7307
Phone: (410) 573-4599 Fax: (410) 266-9127
http://www.fws.gov/chesapeakebay/
http://www.fws.gov/chesapeakebay/endsppweb/ProjectReview/Index.html

In Reply Refer To: May 01, 2019
Consultation Code: 05E2CB00-2019-SLI-1309
Event Code: 05E2CB00-2019-E-03239
Project Name: NSA Annapolis Seawall Repairs

Subject: List of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. This species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF

Please be aware that bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 *et seq.*), and projects affecting these species may require development of an eagle conservation plan (http://www.fws.gov/windenergy/eagle_guidance.html). Additionally, wind energy projects should follow the wind energy guidelines (http://www.fws.gov/windenergy/) for minimizing impacts to migratory birds and bats.

Guidance for minimizing impacts to migratory birds for projects including communications towers (e.g., cellular, digital television, radio, and emergency broadcast) can be found at: http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/towers.htm; http://www.towerkill.com; and http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/comtow.html.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List
- USFWS National Wildlife Refuges and Fish Hatcheries
- Wetlands

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Chesapeake Bay Ecological Services Field Office
177 Admiral Cochrane Drive
Annapolis, MD 21401-7307
(410) 573-4599

Project Summary

Consultation Code:	05E2CB00-2019-SLI-1309
Event Code:	05E2CB00-2019-E-03239
Project Name:	NSA Annapolis Seawall Repairs
Project Type:	SHORELINE / BEACH PROTECTION / RENOURISHMENT

Project Description: The Navy proposes to repair and restore seawall and shoreline at NSA Annapolis along the Lower Yard, portions of the Upper Yard, and portions of North Severn. The repairs and restoration would address structural deficiencies and potential impacts from storm surge, sea level rise, and land subsidence due to future storm events and climate change. The proposed action would include repairs along approximately 19,334 linear feet of shoreline, divided into 15 reaches (see attached map). The existing shoreline in these areas is mostly hardened, consisting of a mixture of bulkhead and riprap sections. Several of these sections are failing, with wave action occasionally overtopping the hardened structures and undercutting occurring in several areas. Specific restoration and enhancement techniques being considered include hardened structures (bulkhead, sheet pile seawall, riprap, or a combination of these techniques), log toe stabilization, and living shoreline.

Proposed design techniques and heights for each reach are provided in the attached Table for three alternatives. Design heights were determined using a variety of design storm and sea level rise scenarios, as predicted by the 2017 National Oceanographic and Atmospheric Administration's Intermediate-Low and Intermediate Scenarios. Each of the repairs to seawall reaches may include extending base support further into the water to allow for phased elevation increases over time. The repair work would be completed either from dry land, in the water, or a combination, depending on the land and water constraints in the various work areas. BMPs such as silt fences and turbidity curtains would be utilized to minimize impacts to water quality and benthic communities from sedimentation. In addition, noise avoidance and minimization measures, such as project timing, specific equipment use, and pile type/size constraints, and noise BMPs, such as air bubble curtains, cofferdams and isolation casings, can be incorporated into project designs to avoid or minimize noise impacts to fish during repair activities. The Navy will consult with NOAA Fisheries regarding potential impacts to EFH under the propose action. No wetlands, forests, or woodlands exist along the project reaches, and no threatened or endangered species are known to occur within the study area. As such, impacts to terrestrial vegetation and wildlife are expected to be minimal.

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/place/38.983931493858975N76.47828447013126W

Counties: Anne Arundel, MD

Endangered Species Act Species

There is a total of 1 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species. Note that 1 of these species should be considered only under certain conditions.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

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1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Mammals

NAME	STATUS
Northern Long-eared Bat *Myotis septentrionalis* No critical habitat has been designated for this species. This species only needs to be considered under the following conditions: • Projects with a federal nexus that have tree clearing = to or > 15 acres: 1. REQUEST A SPECIES LIST 2. NEXT STEP: EVALUATE DETERMINATION KEYS 3. SELECT EVALUATE under the Northern Long-Eared Bat (NLEB) Consultation and 4(d) Rule Consistency key Species profile: https://ecos.fws.gov/ecp/species/9045	Threatened

Critical habitats

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

USFWS National Wildlife Refuge Lands And Fish Hatcheries

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS OR FISH HATCHERIES WITHIN YOUR PROJECT AREA.

Wetlands

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

WETLAND INFORMATION WAS NOT AVAILABLE WHEN THIS SPECIES LIST WAS GENERATED. PLEASE VISIT HTTPS://WWW.FWS.GOV/WETLANDS/DATA/MAPPER.HTML OR CONTACT THE FIELD OFFICE FOR FURTHER INFORMATION.

Appendix B
Air Conformity Applicability Analysis and Record of Non-Applicability

Abbreviations and Acronyms

Acronym	Definition
CFR	Code of Federal Regulations
NAAQS	National Ambient Air Quality Standards
NO_x	nitrogen oxides
NSA	Naval Support Activity
$PM_{2.5}$	fine particulate matter less than or equal to 2.5 microns in diameter
USEPA	U.S. Environmental Protection Agency
VOC	volatile organic compound

List of Tables

Air Quality Applicability Analysis

Introduction

The Clean Air Act requires federal actions in air pollutant nonattainment or maintenance areas to conform to the applicable State Implementation Plan. A State Implementation Plan is designed to achieve or maintain an attainment designation of air pollutants, as defined by the National Ambient Air Quality Standards (NAAQS). The regulations governing this requirement are found in 40 Code of Federal Regulations (CFR) part 93, also known as the General Conformity Rule. The threshold (*de minimis*) emission rates have been established for actions with the potential to have significant air quality impacts. A federal agency must determine if a project/action in a nonattainment area or maintenance area exceeds the *de minimi*s rates, which would require a general conformity determination prepared to address significant impacts.

The Navy is considering alternatives to repair and restore portions of the Naval Support Activity (NSA) Annapolis shoreline and seawalls that have been damaged or made vulnerable by degradation over time. NSA Annapolis is in Anne Arundel County, which is within the Metropolitan Baltimore Intrastate Air Quality Control Region (40 CFR 81.28). Anne Arundel County is designated as a nonattainment area for 8-hour ozone, with a classification of moderate for the 2008 standard and marginal for the 2015 standard (USEPA, 2019). A portion of the county, which includes NSA Annapolis, is also in nonattainment for sulfur dioxide under the 2010 standard. Anne Arundel County was formerly classified as a maintenance area for the 1997 standard for particulate matter less than or equal to 2.5 microns ($PM_{2.5}$), but this standard was revoked in 2016. It is unclassified or in attainment for all other criteria pollutants. Potential emission from all criteria pollutants are presented in this appendix; however, the *de minimis* thresholds for the ozone precursor pollutants nitrogen oxides (NO_x) and volatile organic compounds (VOC) and sulfur dioxide apply to the conformity applicability analysis. Because this region is also within the Ozone Transport Region that was established by the 1990 Clean Air Act Amendments, the *de minimis* threshold for VOCs is further reduced.

Project Description

The Navy proposes to repair and restore approximately 19,334 linear feet of shoreline and seawalls at NSA Annapolis, Maryland. The shoreline and seawall repair and restoration would occur on the shoreline of the Lower Yard along the Severn River, College Creek, and Santee Basin; portions of the Upper Yard along the Severn River and College Creek; and portions of the North Severn area along the Severn River and Yard Patrol Basin. The repairs and restoration would address existing structural deficiencies and potential impacts from future extreme weather events, storm surge, sea level rise, and land subsidence. The project area is divided into 15 “reaches,” which are presented in more detail in Chapter 2 of the Navy’s Environmental Assessment addressing this project.

The Navy is considering three action alternatives and the No Action Alternative:

- Alternative 1: Hardened structures would be used account for the 10-year storm and 75-year sea level rise prediction along the Upper Yard (Reaches 1, 2, and 3), and the 50-year storm and 75-year sea level rise prediction along the Lower Yard (Reaches 4 through 12) and North Severn (Reaches 13, 14, and 15).
- Alternative 2: Hardened structures would be used to account for the 10-year storm and 50-year sea level rise prediction along the Upper Yard (Reaches 1 and 2), and the 50-year storm and 50-year sea level rise prediction along the Lower Yard (Reaches 4 through 12) and North Severn

(Reaches 13, 14, and 15). Reach 3 would use log toe stabilization built to its existing height with the option to modify the design or height to account for sea level rise if needed in the future.

- Alternative 3: Hardened structures would be used along Reaches 1, 2, and 4 through 15 to existing heights, which does not account for future sea level rise. Reach 3 would use living shoreline techniques that could be modified to account for sea level rise if needed in the future.
- No Action Alternative: No seawall repair or restoration would be undertaken. Localized maintenance activities would be accomplished intermittently as necessary. Sections of the existing shoreline and seawall would continue to deteriorate over time and could eventually fail.

Under Alternatives 1, 2, and 3, hardened structures would include concrete bulkhead, sheet pile seawall, riprap, or a combination of these techniques. The work for the hardened structural repair, restoration, and replacement would be accomplished either from dry land, in the water, or a combination depending on the land and water constraints in the various work areas.

Reach 9 is the only project segment that has a general timeframe. It is anticipated that construction on Reach 9 would likely begin in the next few years and last approximately three and a half years. Construction on other reaches would occur as funding becomes available, and these reaches would be prioritized for repair based on condition, elevation, and mission criticality. The timeframe for construction of all reaches would be ten to twenty years.

Air Quality

Air quality is defined as the ambient air concentrations of specific criteria pollutants determined by the U.S. Environmental Protection Agency (USEPA) to be of concern to the health and welfare of the public. These criteria pollutants include ozone, carbon monoxide, nitrogen dioxide, sulfur dioxide, suspended particulate matter less than or equal to 10 microns, $PM_{2.5}$, and lead. USEPA has established two types of NAAQS for these criteria air pollutants. Primary ambient air quality standards are designed to protect public health with an adequate margin of safety. Secondary ambient air quality standards are designed to protect public welfare-related values including property, materials, and plant and animal life. The maximum primary and secondary standards (concentrations) of criteria pollutants, which are listed in 40 CFR part 50, apply throughout the United States.

Federal Requirements

Section 176(c) of the Clean Air Act, as amended, requires federal agencies to ensure that actions undertaken in nonattainment or maintenance areas are consistent with the Clean Air Act and with federally enforceable air quality management plans. The Clean Air Act places responsibility on individual states to achieve and maintain the NAAQS through USEPA-approved State Implementation Plans.

Under the General Conformity Rule (40 CFR part 93, subpart B), emissions of criteria pollutants and their precursors that are associated with an action in a nonattainment area for a given pollutant must be below *de minimis* emission rates for that pollutant to be exempt from a formal conformity determination. The *de minimis* rates for the NAAQS pollutants of concern are listed in Table B-1. Actions that contribute less than these amounts and have no other conformity requirements are exempt from the General Conformity Rule. Actions that exceed the pollutant *de minimis* rates in any given year must undergo a detailed analysis, and a formal conformity determination is required. Finally, mitigation would be required if the detailed analysis indicates an exceedance of the *de minimis* levels for any of the pollutants of concern.

Table B-1 Criteria Pollutant *de minimis* Emission Rates Applicable to the Proposed Action

Pollutant	*Attainment Status*	*Criteria Pollutant (tpy)*	*Precursor (tpy)*
NO_x	Moderate ozone nonattainment	—	100
VOC	Moderate ozone nonattainment, inside an ozone transport region	—	50
Sulfur dioxide	Nonattainment	100	—

Sources: 40 CFR 93.153; USEPA, 2019.
Key: NO_x = nitrogen oxides; VOC = volatile organic compound; tpy = tons per year.

Methodology

In accordance with 40 CFR part 93, subpart B, the incremental increase in emissions above the existing conditions has been considered and includes reasonably foreseeable direct and indirect emissions. The total estimated emissions from the Proposed Action have been evaluated to assess if any of the applicable *de minimis* rates would be exceeded.

The design of each reach is not yet known. Portions of structures or the entirety of structures could be removed or demolished. The Navy may construct concrete bulkhead, sheet pile seawall, riprap, or a combination of these techniques. The Navy may also use on-land or in-water construction methods, depending on the structure(s) design and the site conditions that would facilitate construction. Therefore, considering the variability of possible construction methods and materials, emissions resulting from the Proposed Action were estimated based on the maximum expected number, type, and duration of construction operations to complete the Proposed Action.

For the purposes of this analysis, all construction activities are calculated as if occurring within one calendar year; this approach presents a maximum impact.

Once construction is complete, long-term emissions may be generated from routine maintenance and repair of seawall components from hand-held equipment. As these kinds of emissions would be similar to what is already occurring for minor maintenance and repairs of the existing seawall, these emissions are assumed to be negligible and were not estimated.

Construction Emissions

Emissions resulting from the Proposed Action were estimated based on the expected number, type, and duration of construction operations to complete the Proposed Action. Construction emissions would result from the operation of heavy equipment, delivery trucks, and construction workers. The project would require a mix of construction equipment that would vary as the construction activity progresses. To estimate emissions, methodologies were used based on the kind of equipment (which all have varying rates of criteria pollutant emissions, referred to as emissions factors), and either the average hours to complete the work or the average distance traveled.

Nonroad Emissions from Construction Equipment

Nonroad emissions are those from the construction equipment operating immediately at the project site (such as backhoes, forklifts, impact hammers, pile drivers, saws, diesel generators, and cranes). Conservative construction equipment assumptions were developed based on review of other projects. Emissions factors for nonroad equipment (fleet year 2020) were estimated using composite emissions factors. Table B-2 and Table B-3 contain the emissions factors and operating hours assumptions and the total estimated emissions for nonroad construction equipment, respectively.

Alternatives 1, 2, and 3 are assumed to require similar nonroad equipment and operating hours for the purposes of estimating air emissions. The maximum anticipated seawall heights decrease from Alternatives 1 to 2 and Alternatives 2 to 3, so Alternatives 2 and 3 could result in slightly lower emissions than Alternative 1.

Table B-2 Nonroad Construction Equipment Emissions Factors and Operating Hours Assumptions

Equipment Description	*Total Operating Hours*	*NO_X (lb/hr)*	*ROG (lb/hr)*	*CO (lb/hr)*	*SO_x (lb/hr)*	*PM (lb/hr)*
Tractors/Loaders/Backhoes Composite	1,100	0.274	0.044	0.362	0.0008	0.013
Rough Terrain Forklifts Composite	1,100	0.349	0.053	0.446	0.0008	0.020
Other Construction Equipment Composite (Impact Hammer, Pile Driver)	2,200	0.352	0.056	0.351	0.0013	0.014
Concrete/Industrial Saws Composite	1,100	0.341	0.048	0.378	0.0007	0.020
Generator Sets Composite	1,100	0.323	0.040	0.273	0.0007	0.015
Cranes Composite	1,100	0.661	0.090	0.392	0.0014	0.026

Source: SCAQMD, 2018.
Key: NO_x = nitrogen oxides; ROG = reactive organic gases (= volatile organic compounds); CO = carbon monoxide; SO_x = sulfur oxides; PM = particulate matter; lb = pounds; hr = hour.
Note: Particulate matter is estimated to be 10 microns with 92 percent of that fraction being less than 2.5 microns in diameter.

Table B-3 Total Estimated Emissions from Nonroad Construction Equipment

Equipment	*NO_X*	*VOC*	*CO*	*SO_2*	*PM_{10}*	*$PM_{2.5}$*
Total Nonroad Construction Emissions (tons)	1.47	0.21	1.42	0.004	0.07	0.06

Source: SCAQMD, 2018.
Key: NO_x = nitrogen oxides; VOC = volatile organic compounds; CO = carbon monoxide; SO_2 = sulfur dioxide; PM_{10} = suspended particulate matter less than or equal to 10 microns in diameter; $PM_{2.5}$ = fine particulate matter less than or equal to 2.5 microns in diameter.
Notes:
Emissions (tons) = emissions factor (pounds/hour) × total hours operated × 1 ton/2,000 pounds, *for each kind of equipment*. Example: Nonroad NO_x emissions = {[1,100 hr × (0.274 + 0.349 + 0.341 + 0.323 + 0.661 lb/hr)] + (2,200 hr × 0.352 lb/hr)} × 1 ton/2,000 pounds = 1.47 tons NO_x.
For $PM_{2.5}$, the emissions factor was multiplied by 0.92 to obtain the $PM_{2.5}$ fraction of total particulate matter.

Onroad Emissions from Construction Equipment

Onroad emissions are those that come to and leave the site via the road network on a more frequent basis (including diesel-powered heavy delivery trucks and gasoline-powered passenger trucks from construction workers).

For this Proposed Action, the Navy anticipates that a mix of onroad trucks and barges would be used to remove deteriorated seawall components and other construction waste and deliver construction materials to the various reaches that are under construction. However, because this project is in the early planning stages, the Navy does not know what this ratio of truck-to-barge traffic would be. Furthermore, the Navy has only preliminary notions about the kind of work that may be required for each reach, including what kind and how much of the components would be removed and replaced, and the amount of additional materials needed to increase the height of the seawall along individual reaches under each alternative. This analysis puts forth the maximum impact that could occur for the purposes of estimating air emissions, which assumes that all bulkhead and seawall reaches would be 100 percent demolished and replaced essentially in-kind, and riprap reaches would need a 10 percent replacement of stones to achieve appropriate placement and distribution. Alternative 1 and Alternative 2 (except Reach 3 under Alternative 2) are assumed to include concrete seawall to provide the increased design height. The amount of construction materials being transported makes up the primary difference among the three action alternatives. Because the mix of trucks and barges is unknown, this analysis assumes that onroad trucks would transport 100 percent of the waste from and materials to the site. Actual emissions would be expected to be much lower than those presented in Table B-5 as barges can carry 1,450 to 1,500 tons of cargo per load, and a truck can carry approximately 25 tons of cargo. Therefore, the use of barges for the delivery of materials would reduce the onroad truck emissions because fewer trips would be needed over the ten- to twenty-year construction period for the Proposed Action.

Emissions factors for onroad equipment (2020 fleet year) were estimated using composite emissions factors. Table B-4 and Table B-5 show the emissions factors and vehicle miles traveled assumptions and the total estimated emissions for onroad construction equipment, respectively.

Fugitive Dust Emissions

Fugitive dust occurs directly from vehicles disturbing and suspending particulate matter while operating on unpaved surfaces, or from soil stockpiles on an active construction site; it also occurs indirectly from dust and dirt being brought onto paved surfaces from nonroad construction operations, and then disturbed and suspended as onroad vehicles drive over it. A conservative empirical estimate for fugitive dust was used for this analysis; actual fugitive dust emissions would likely be lower as they are directly proportional to the amount of activity that is being worked. Higher activity days have greater potential for generating fugitive dust than lower activity days that do not involve equipment actively disturbing the site. Most of the work associated with this project would be in-water and generate minimal fugitive dust. Therefore, this analysis assumes that an area of approximately 0.3 acres would be entirely exposed for the duration of one month per reach at a time as initial work is conducted along shorelines. Fugitive dust controls would be implemented; this analysis assumes an 80 percent fugitive dust control efficiency. Alternatives 1, 2, and 3 are assumed to generate similar fugitive dust emissions. The maximum anticipated seawall heights decrease from Alternatives 1 to 2 and Alternatives 2 to 3, so Alternatives 2 and 3 could result in slightly lower emissions because of less intense construction. See estimates and notes in Table B-6.

Table B-4 Onroad Construction Equipment Emissions Factors and Vehicle Miles Traveled Assumptions

Equipment Description	*VMT*	*NO_X (lb/mi)*	*ROG (lb/mi)*	*CO (lb/mi)*	*SO_x (lb/mi)*	*PM_{10} (lb/mi)*	*$PM_{2.5}$ (lb/mi)*
Alternative 1 Demolition & Construction Waste Removal, and Construction Materials Delivery: Heavy-Duty Diesel Truck (33,001+ lb) [1]	1,199,650	0.0127	0.0011	0.0053	0.00004	0.0006	0.0005
Alternative 2 Demolition & Construction Waste Removal, and Construction Materials Delivery: Heavy-Duty Diesel Truck (33,001+ lb) [2]	1,008,850	0.0127	0.0011	0.0053	0.00004	0.0006	0.0005
Alternative 3 Demolition & Construction Waste Removal, and Construction Materials Delivery: Heavy-Duty Diesel Truck (33,001+ lb) [3]	606,000	0.0127	0.0011	0.0053	0.00004	0.0006	0.0005
All Alternatives: Passenger Vehicles, Gasoline [4]	362,880	0.0004	0.0005	0.0044	0.00001	0.0001	0.0001

Sources: SCAQMD, 2008a, 2008b.
Key: NO_x = nitrogen oxides; ROG = reactive organic gases (=volatile organic compounds); CO = carbon monoxide; SO_x = sulfur oxides; PM_{10} = particulate matter less than 10 microns in diameter; $PM_{2.5}$ = particulate matter less than 2.5 microns in diameter; VMT = vehicle miles traveled; lb = pounds; hr = hour.
Notes: Assumed 20 years of construction for worst-case air impacts, or 4,032 days.
[1] VMT = 6 trucks per day × 50 miles per day × 4,032 days of construction.
[2] VMT = 5 trucks per day × 50 miles per day × 4,032 days of construction.
[3] VMT = 3 trucks per day × 50 miles per day × 4,032 days of construction.
[4] VMT = 3 workers per day × 30 miles per day × 4,032 days of construction.

Table B-5 Total Estimated Emissions for Each Alternative from Onroad Construction Equipment

Equipment	*NO_X*	*VOC*	*CO*	*SO_2*	*PM_{10}*	*$PM_{2.5}$*
Alternative 1 Total Onroad Construction Emissions (tons)	7.69	0.75	3.98	0.03	0.38	0.32
Alternative 2 Total Onroad Construction Emissions (tons)	6.48	0.65	3.47	0.02	0.32	0.27
Alternative 3 Total Onroad Construction Emissions (tons)	3.92	0.42	2.40	0.01	0.20	0.17

Sources: SCAQMD, 2008a, 2008b.
Key: NO_x = nitrogen oxides; VOC = volatile organic compounds; CO = carbon monoxide; SO_2 = sulfur dioxide; PM_{10} = suspended particulate matter less than or equal to 10 microns in diameter.$PM_{2.5}$ = fine particulate matter less than or equal to 2.5 microns in diameter.
Notes: Emissions (tons) = emissions factor (pounds/hour) × total vehicle miles traveled × 1 ton/2,000 pounds, for each kind of equipment. Example: Alternative 1 Onroad NO_x emissions = [(1,199,650 mi × 0.0127 lb/mi) + (362,880 mi × 0.0004 lb/mi)] × 1 ton/2,000 pounds = 7.69 tons NO_x.

Table B-6 Emissions from Fugitive Dust Emissions during Construction

Calculation	*PM_{10}*	*$PM_{2.5}$*
Emissions factor (tons particulate matter/acre/month)	1.2	1.2
Fractional contents of particulate matter by size [1]	59.4%	21.2%
Estimated Total Fugitive Dust Emissions (tons) [2]	0.64	0.14

Sources: USEPA, 1996; SCAQMD, 2006.
Key: PM_{10} = suspended particulate matter less than or equal to 10 microns in diameter; $PM_{2.5}$ = fine particulate matter less than or equal to 2.5 microns in diameter.
Notes:
[1] PM_{10} is assumed to be 59.4 percent of total particulate emissions, and $PM_{2.5}$ is assumed to be 21.2 percent of PM_{10}.
[2] Emissions PM_{10} (tons) = 1.2 tons/acre/month × 0.594 × 0.3 acres × 1 month per reach × 15 reaches × (1 - 0.8); Emissions $PM_{2.5}$ (tons) = PM_{10} emissions in tons × 0.212.

Results and Conclusion

Total estimated emissions for the proposed seawall repair and restoration are shown in Table B-7. The total short-term construction emissions and long-term emissions from increased personnel and emergency generators represent minor, temporary increases in regional air emissions. These emissions would last only for the duration of construction, which would be approximately five years. Annual emissions would be well below applicable *de minimis* thresholds for the criteria pollutants for which the project area is designated as being in nonattainment. No significant impacts on air quality would occur.

Table B-7 Summary of Total Criteria Pollutant Emissions, All Alternatives

Activity	*NO_x*	*VOC*	*CO*	*SO_2*	*PM_{10}*	*$PM_{2.5}$*
Applicable *de minimis* thresholds	**100**	**50**	**—**	**100**	**—**	**—**
Alternative 1 (total tons)	9.16	0.97	5.39	0.03	1.09	0.52
Construction Phase: Nonroad (tons)	1.47	0.21	1.42	0.004	0.07	0.06
Construction Phase: Onroad (tons)	7.69	0.75	3.98	0.026	0.38	0.32
Construction Phase: Fugitive Dust (tons)	—	—	—	—	0.64	0.14
Alternative 2 (total tons)	7.95	0.86	4.89	0.03	1.03	0.47
Construction Phase: Nonroad (tons)	1.47	0.21	1.42	0.004	0.07	0.06
Construction Phase: Onroad (tons)	6.48	0.65	3.47	0.02	0.32	0.27
Construction Phase: Fugitive Dust (tons)	—	—	—	—	0. 64	0.14
Alternative 3 (total tons)	5.39	0.64	3.82	0.02	0.91	0.37
Construction Phase: Nonroad (tons)	1.47	0.21	1.42	0.004	0.07	0.06
Construction Phase: Onroad (tons)	3.92	0.42	2.40	0.01	0.20	0.17
Construction Phase: Fugitive Dust (tons)	—	—	—	—	0.64	0.14

Key: VOC = volatile organic compound; CO = carbon monoxide; NO_x = nitrogen oxides; SO_2 = sulfur dioxide; PM_{10} = suspended particulate matter less than or equal to 10 microns in diameter; $PM_{2.5}$ = fine particulate matter less than or equal to 2.5 microns in diameter.
Note: Emissions may not total precisely due to rounding.

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General Conformity Rule—Record of Non-Applicability (RONA) for Clean Air Act Conformity

Environmental Assessment for Seawall Repair and Restoration at Naval Support Activity Annapolis

Proposed Action

Action Proponent:	Naval Support Activity (NSA) Annapolis
Proposed Action Name:	Environmental Assessment for Seawall Repair and Restoration at NSA Annapolis
Location:	Anne Arundel County, Maryland
Project Construction Period:	10 to 20 years, likely beginning in the next few years
Proposed Action Point of Contact:	Ms. Jennifer Steele NAVFAC Washington 1314 Harwood Street SE Washington Navy Yard, DC 20374 navfacwashnepa@navy.mil
Proposed Action Summary:	The Proposed Action is to repair or restore approximately 19,334 linear feet of shoreline and seawalls along portions of the Lower Yard along the Severn River, College Creek, and Santee Basin; portions of the Upper Yard along the Severn River and College Creek; and portions of the North Severn area along the Severn River and Yard Patrol Basin at NSA Annapolis.

The Clean Air Act requires federal actions in air pollutant nonattainment or maintenance areas to conform to the applicable State Implementation Plan. The State Implementation Plan is designed to achieve or maintain an attainment designation of air pollutants as defined by the National Ambient Air Quality Standards. The regulations governing this requirement are found in 40 Code of Federal Regulations (CFR) part 93, also known as the "General Conformity Rule," which applies to federal actions occurring in regions designated as nonattainment or areas subject to maintenance plans. The threshold (*de minimis*) emission rates have been established for actions with the potential to have significant air quality impacts. A project/action in an area designated as nonattainment and exceeding the *de minimis* rates must have a general conformity determination prepared to address significant impacts.

NSA Annapolis is in Anne Arundel County, which is within the Metropolitan Baltimore Intrastate Air Quality Control Region (40 CFR 81.28). This area of Anne Arundel County is designated as being in moderate nonattainment for the 2008 standard and marginal nonattainment for the 2015 standard for 8-hour ozone and in nonattainment for the 2010 standard for sulfur dioxide. It is unclassified or in attainment for all other criteria pollutants, including the 1997 standard for particulate matter less than or equal 2.5 microns for which Anne Arundel County had been designated as a maintenance area when the standard was revoked in 2016. Thus, the *de minimis* thresholds for ozone precursors (nitrogen oxides [NO_x] and volatile organic compounds [VOCs]) and sulfur dioxide apply to the conformity applicability analysis. Because this region is also with the Ozone Transport Region, established by the 1990 Clean Air Act Amendments, the *de minimis* threshold for VOCs is further reduced.

Air Emissions Summary

Based on the maximum total project emission estimates identified in the table below, a general conformity determination is not required because the total maximum direct and indirect emissions for any of the alternatives for the Proposed Action are well below the *de minimis* thresholds. Actual construction emissions would be considerably smaller on a calendar year basis, varying with construction intensity and the specific design of each reach.

Supporting documentation and emissions estimates can be found in the Environmental Assessment in Section 3.1, Air Quality, and Appendix B, Air Quality Conformity Applicability Analysis.

Summary of Total Criteria Pollutant Emissions, All Alternatives, Compared to Applicable *de minimis* Thresholds

Activity	***NO_x***	***VOC***	***SO_2***
***de minimis* Thresholds (annual)**	**100**	**50**	**100**
Alternative 1 (total tons, over 10–20 years)	9.16	0.97	0.03
Exceeds *de minimis*?	no	no	no
Alternative 2 (total tons, over 10–20 years)	7.95	0.86	0.03
Exceeds *de minimis*?	no	no	no
Alternative 3 (total tons, over 10–20 years)	5.39	0.64	0.02
Exceeds *de minimis*?	no	no	no

Key: NO_x = nitrogen oxides; VOC = volatile organic compound; SO_2 = sulfur dioxide.

Date RONA Prepared: August 2019

RONA Prepared by: Naval Facilities Engineering Command Washington

RONA Approval

____

Signature Date

Appendix C
Noise Calculations

Distance Calculations for Construction Noise

$$dB1 - 10\ x\ a\ x\ Log10\left(\frac{R2}{R1}\right) = dB2$$

Where:
dB1 = noise level at construction site
dB2 = noise level at receptor (in dBA, or A-weighted decibels)
a = conventional drop-off rate coefficient
a = 2.0 for point source, no ground or atmospheric absorption
R1 = distance from referenced noise level
R2 = distance from receptor
{Log10 is base 10 logarithm}

Specific Calculations for Construction Noise

Construction site 100 feet from receptor; noise level is 74 dBA at construction site.

$$74 - 10\ x\ 2\ x\ Log10\left(\frac{100}{50}\right) = 67.98\ dBA$$

Construction site is 100 feet from receptor; noise level is 101 dBA at construction site.

$$101 - 10\ x\ 2\ x\ Log10\left(\frac{100}{50}\right) = 55.94\ dBA$$

Construction site is 400 feet from receptor; noise level is 74 dBA at construction site.

$$74 - 10\ x\ 2\ x\ Log10\left(\frac{400}{50}\right) = 55.94\ dBA$$

Construction site is 400 feet from receptor; noise level is 101 dBA at construction site.

$$101 - 10\ x\ 2\ x\ Log10\left(\frac{400}{50}\right) = 82.94\ dBA$$

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