DRAFT

Environmental Assessment

For

Homeporting of the Columbia-Class Submarine

At

Naval Base Kitsap-Bangor, Washington

May 2026

EAXX-007-17-USN-1764686364

EXECUTIVE SUMMARY

Introduction: The United States (U.S.) Fleet Forces Command, a Command of the U.S. Navy (Navy) proposes to replace eight Ohio-class submarines currently homeported at Naval Base Kitsap-Bangor (NBK-Bangor) with up to eight Columbia-class submarines, and demolish, construct, and renovate facilities and infrastructure at three upland sites (Upland Site-North, Keyport Annex, and Upland Site-South) and at Delta Pier (Pier Site) at NBK-Bangor. The Navy would also implement stormwater infrastructure upgrades and clear existing vegetation to create laydown/staging areas for materials and temporary parking. The Proposed Action would not require in-water work or any increase in total pier surface area for the Pier Site. There would be no overall changes in number of personnel stationed or number of submarines homeported at NBK-Bangor. Construction is anticipated to begin in July 2027, take approximately five years to complete, and would be phased to be completed prior to the anticipated arrival of the first Columbia-class submarine (see detailed Proposed Action description in Chapter 2). The Navy has prepared this Environmental Assessment (EA) in accordance with the National Environmental Policy Act (NEPA) and consistent with the Department of Defense (DoD) NEPA Implementing Procedures.

Purpose and Need: The purpose of the Proposed Action is to ensure the uninterrupted continuation of the Navy's Sea-Based Strategic Deterrence mission at NBK-Bangor by replacing the current Ohio-class fleet with technologically advanced Columbia-class submarines in the Pacific Fleet. The need for the Proposed Action is to ensure the U.S. can meet current and future threats with up-to-date submarine technology in support of national defense objectives and policies. In this regard, the Proposed Action furthers the Navy's execution of its congressionally mandated roles and responsibilities under Section 8062 of Title 10, United States Code (U.S.C.).

Alternatives: Consistent with NEPA, the Navy has studied, developed, and described technically and economically feasible alternatives to the Proposed Action that meet the Navy's purpose and need. In developing the range of alternatives, the Navy considered screening factors such as mission requirements, geographic needs, facility requirements for training and support, and existing infrastructure (see Section 2.2). Two alternatives, the No Action Alternative and the Proposed Action (Action Alternative), are carried forward for detailed analysis in the EA.

Impacts: Table ES-1 provides a general summary of reasonably foreseeable environmental impacts from the Proposed Action (Action Alternative) and the No Action Alternative. The Navy will complete all required consultations and comply with all required laws, regulations, and policies. The Navy does not anticipate any significant impacts from the Proposed Action.

Public Involvement: The NEPA process is intended to ensure the consideration of environmental impacts in agency decision-making and to inform the public of the proposed agency action. The public is invited to submit comments on the Draft EA during the public comment period from May 27, 2026, to June 25, 2026, by any of the following methods:

- electronically, via the project website (https://www.nepa.navy.mil/Columbia-West-Coast/)
- in writing, by mail to: Columbia-class EA Project Manager, Naval Facilities Engineering Systems Command Atlantic, Attn: Code EV22JS, 6506 Hampton Blvd, Norfolk, Virginia 23508
- during the public meeting on June 4, 2026

Section 1.8 and *Appendix D* provides additional information on the public involvement for this EA.

Table ES-1 Summary of Potential Impacts to Resource Areas

Resource Area	*No Action Alternative*	*Proposed Action (Action Alternative)*
Air Quality	No impact.	Emissions regulated under the National Ambient Air Quality Standards (NAAQS) from construction and operation would not cause a violation of the NAAQs or appreciably increase health risks to the public. Construction and operations would be within NBK-Bangor's allowable air quality permits. Construction would adhere to BMPs such as control of fugitive dust. There would be no significant impacts to air quality.
Water Resources	No impact.	Management, treatment, and discharge of stormwater would comply with applicable permits during construction and operation. No impacts to surface water, groundwater, or floodplains through adherence to BMPs and applicable permits. There would be no significant impacts to water resources.
Biological Resources	No impact.	Temporary airborne noise and human activity during construction may result in behavioral impacts to terrestrial wildlife, including birds protected under the Migratory Bird Treaty Act (MBTA), Bald and Golden Eagle Protection Act, and Endangered Species Act (ESA)-listed marbled murrelet *(Brachyramphus marmoratus)*. Removal of up to 10.9 acres of forest for laydown/staging areas and to support a substation and associated transmission lines may result in localized removal of habitat for wildlife but would not result in a loss of suitable nesting habitat for marbled murrelet as it is not present within the Region of Influence (ROI). Stormwater upgrades would comply with applicable permits and thus not result in significant impacts to aquatic species, including ESA-listed Puget Sound steelhead *(Oncorhynchus mykiss)*, Puget Sound steelhead designated critical habitat, Puget Sound Chinook (*Oncorhynchus tshawytscha)*, or Pacific Coast Salmon Essential Fish Habitat (EFH). The removal of vegetation is expected to result in a loss of canopy cover along up to 450 linear feet of Devil's Hole tributary and the loss of up to 1.5 acres of canopy cover in the 150-foot riparian buffer. The Navy is consulting with the U.S. Fish and Wildlife Service (USFWS) for marbled murrelet and the National Marine Fisheries Service (NMFS) for Puget Sound steelhead, Puget Sound steelhead designated critical habitat, and Puget Sound Chinook, as required by Section 7(a)(2) of the ESA. The Navy is also consulting with NMFS as required under the Magnuson-Stevens Fishery Conservation and Management Act (MSA) for impacts to Pacific Coast Salmon EFH. There would be no significant impacts to biological resources.
Cultural Resources	No impact.	No known archaeological resources are present in the project area, and no undiscovered archaeological resources are expected to be found in the area of potential effects (APE). No known traditional cultural places or tribal sacred places have been identified at NBK-Bangor. The Proposed Action is likely to adversely affect the following historic properties: Trident Training Facility (TTF), Delta Pier, and nine architectural resources with the potential to contribute to a proposed Cold War-era historic district. The Navy developed a Memorandum of Agreement (MOA) with the State Historic Preservation Office (SHPO), signed March 31, 2026. The Navy is currently consulting with the Washington SHPO to develop and execute a Programmatic Agreement to resolve adverse effects. The Navy has invited the following federally recognized tribes to consult under the National Historic Preservation Act (NHPA) Section 106 consultation process for potential effects to historic properties: the Jamestown S'Klallam Tribe, Lower Elwha Tribal Community, Port Gamble S'Klallam Tribe, Skokomish Indian Tribe, and Suquamish Indian Tribe of the Port Madison Reservation. The Navy does not anticipate significant impacts to cultural resources.

Resource Area	*No Action Alternative*	*Proposed Action (Action Alternative)*
American Indian Traditional Resources	No impact.	Tribal access to usual and accustomed (U&A) fishing grounds and stations as well as gathering rights near NBK-Bangor would be expected to remain similar to existing conditions. The Proposed Action does not include in-water work, there are no expected significant effects to water quality or marine habitat and species, and there are no expected changes in the port security barrier openings. The Proposed Action would remove approximately eight acres of second-growth forest on NBK-Bangor, likely including the felling of some cedar trees. Additionally, access to some cedar trees may be temporarily limited during periods of construction. The Navy will coordinate with the tribes to identify and evaluate potential measures to limit any impacts to accessing cedar bark, such as providing the tribes access to cedar bark from any felled trees. The Navy invited the Jamestown S'Klallam Tribe, Lower Elwha Tribal Community, Port Gamble S'Klallam Tribe, Skokomish Indian Tribe, and Suquamish Indian Tribe of the Port Madison Reservation to initiate government-to-government consultation on the Proposed Action. The Navy does not anticipate significant impacts to American Indian Traditional Resources.
Noise	No impact.	The nearest noise-sensitive location outside of NBK-Bangor, the residential housing located approximately 0.25 miles (1,400 feet) southeast of Upland Site-South, would experience construction noise that would periodically exceed ambient levels. Similarly, the noise-sensitive locations within NBK-Bangor (daycare facility, healthcare facilities, a school/learning facility, and a community park and playground) that are located less than 0.6 miles away from Upland Site-South would experience periods where construction noise may exceed ambient levels. The temporary noise would be compatible with Defense Noise Working Group (DNWG) and Kitsap County guidelines. There would be no significant impacts from noise.
Public Health and Safety	No impact.	Demolition, construction, and renovation activities may cause short-term increases in localized effects to public health and safety during construction. Operational impacts to public health and safety would be similar to existing operational activities at NBK-Bangor. Impacts would be minimized through BMPs and adherence to all required federal, state, and local laws and regulations. There would be no significant impacts to public health and safety.
Traffic and Transportation	No impact.	There would be an average of approximately four to five additional truck trips per workday (Monday through Friday) during the construction period, along with a maximum of 292 construction worker trips during the construction phase. There would be no changes to traffic post-construction during operations since there would be no increase in personnel under the Proposed Action. There would be no significant impacts to traffic and transportation.
Socioeconomics	No impact.	Under the Proposed Action, some construction workers may relocate to the area, which could result in negligible to minor increases in demand for housing and public services. Possible negligible to minor beneficial impact to employment and income and economic activity, including tax revenue during construction. No appreciable changes during operations. There would be no significant impacts to socioeconomics.

Table of Contents

EXECUTIVE SUMMARY ES-1

1. PURPOSE OF AND NEED FOR THE PROPOSED ACTION 1-1

1.1 Introduction 1-1
1.2 Background 1-1
1.3 Location 1-1
1.4 Purpose of and Need for the Proposed Action 1-1
1.5 Scope of Environmental Analysis 1-3
1.6 Key Documents 1-3
1.7 Relevant Laws and Regulations 1-4
1.8 Public and Agency Participation and Intergovernmental Coordination 1-4

2. PROPOSED ACTION AND ALTERNATIVES 2-1

2.1 Proposed Action 2-1
2.2 Screening Factors 2-1
2.3 Alternatives Carried Forward for Analysis 2-2
2.3.1 No Action Alternative 2-2
2.3.2 Proposed Action (Action Alternative) 2-2
2.4 Alternatives Considered but not Carried Forward for Detailed Analysis 2-13
2.4.1 Homeport at NBK-Bangor Using Existing Facilities – No New Construction 2-13
2.4.2 Homeport at Other West Coast Naval Base or Hawaii 2-13
2.4.3 Use of Leased Property Near NBK-Bangor 2-13
2.5 Best Management Practices 2-14

3. AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES 3-1

3.1 Reasonably Foreseeable Environmental Effects 3-3
3.1.1 Analytical Framework for Defining Scope of Effects 3-3
3.1.2 Application of the Framework to the Proposed Action 3-3
3.2 No Action Alternative for all Resources 3-5
3.3 Air Quality 3-5
3.3.1 Affected Environment 3-6
3.3.2 Environmental Consequences 3-7
3.4 Water Resources 3-10
3.4.1 Affected Environment 3-10
3.4.2 Environmental Consequences 3-13
3.5 Biological Resources 3-18
3.5.1 Affected Environment 3-18
3.5.2 Environmental Consequences 3-25
3.6 Cultural Resources 3-35
3.6.1 Affected Environment 3-35
3.6.2 Environmental Consequences 3-36
3.7 American Indian Traditional Resources 3-38
3.7.1 Affected Environment 3-38

3.7.2 Environmental Consequences 3-39
3.8 Noise 3-39
3.8.1 Affected Environment 3-40
3.8.2 Environmental Consequences 3-40
3.9 Public Health and Safety 3-41
3.9.1 Affected Environment 3-42
3.9.2 Environmental Consequences 3-44
3.10 Traffic and Transportation 3-46
3.10.1 Affected Environment 3-46
3.10.2 Environmental Consequences 3-47
3.11 Socioeconomics 3-49
3.11.1 Affected Environment 3-49
3.11.2 Environmental Consequences 3-50
3.12 Summary Statement 3-52

List of Figures

Figure 1.3-1 Naval Base Kitsap-Bangor Location Map 1-2
Figure 2.3-1 Project Locations on Naval Base Kitsap-Bangor 2-5
Figure 2.3-2 Proposed Stormwater Upgrades for Upland Site-North 2-6
Figure 2.3-3 Proposed Stormwater Upgrades for Upland Site-South 2-7
Figure 2.3-4 Upland Site-North Laydown Area 2-8
Figure 2.3-5 Pier Site Laydown Area 2-9
Figure 2.3-6 Upland Site-South Laydown Area 2-10
Figure 3.1-1 Other Navy Projects with Potential Additive Impacts B-1
Figure 3.3-1 Prevailing Wind Patterns and Sensitive Population Locations at NBK-Bangor B-2
Figure 3.4-1 Water Resources ROI B-3
Figure 3.4-2 Upland Site-North and Pier Site Waterbodies B-4
Figure 3.4-3 Upland Site-South and Keyport Annex Waterbodies B-5
Figure 3.5-1 Biological Resources ROI B-6
Figure 3.5-2 Biological Resources ROI – Upland Site-North and Pier Site B-7
Figure 3.5-3 Biological Resources ROI – Upland Site-South and Keyport Annex B-8
Figure 3.5-4 Location of Bald Eagle's Nest B-9
Figure 3.5-5 Marbled Murrelet Sightings in Hood Canal B-10
Figure 3.5-6 Marbled Murrelet Occupancy Surveys B-11

Figure 3.5-7 Probability of Nesting Habitat for Marbled Murrelet at Upland Site-North and Pier Site B-12

Figure 3.5-8 Probability of Nesting Habitat for Marbled Murrelet at Upland Site-South and Keyport Annex B-13

Figure 3.5-9 Canopy Height for Marbled Murrelet at Upland Site-North and Pier Site B-14

Figure 3.5-10 Canopy Height for Marbled Murrelet at Upland Site-South and Keyport Annex B-15

Figure 3.5-11 Puget Sound Steelhead Designated Critical Habitat B-16

Figure 3.9-1 NBK-Bangor Public Health and Safety B-17

Figure 3.11-1 Socioeconomics Region of Influence B-18

List of Tables

Table ES-1 Summary of Potential Impacts to Resource Areas E-2

Table 2.3-1 Proposed Action Building Components Associated with Homeporting Columbia-class Submarines 2-3

Table 3.1-1 Other Navy Projects with Potential Additive Impacts 3-4

Table 3.3-1 Regional Ambient Air Quality Design Values Compared to the NAAQS 3-7

Table 3.3-2 Estimated Emissions for Demolition, Construction and Renovation Activities at Upland Site-North, including Delta Pier area, and Upland Site-South in Tons/Year 3-8

Table 3.3-3 Estimated GHG Emissions for Demolition, Construction and Renovation Activities at Upland Site-North, including Delta Pier area, and Upland Site-South in Tons/Year 3-10

Table 3.9-1 Construction and Operation-Related Impacts Under Action Alternative 3-44

Table 3.10-1 LOS Operating Conditions 3-46

Table 3.11-1 Population in Kitsap County and the State of Washington 2010-2023 3-49

Table 3.4-1 Stormwater Management under the Proposed Action at NBK-Bangor B-19

Table 3.5-1 MBTA-Protected Bird Species Most Likely to Occur within Proposed Action Locations at NBK-Bangor B-20

Table 3.5-2 Summary of Marbled Murrelet Nesting Habitat Probability Model and Canopy Height in the ROI B-21

Table 3.5-3 Construction-Related Noise Attenuation B-24

List of Appendices

APPENDIX A ABBREVIATIONS AND ACRONYMS A-1
APPENDIX B CHAPTER 3 FIGURES AND TABLES FOR OTHER NAVY PROJECTS, AIR QUALITY, WATER RESOURCES, AND BIOLOGICAL RESOURCES B-1
APPENDIX C REGULATORY PROCESS CONSIDERATIONS C-1
APPENDIX D PUBLIC INVOLVEMENT D-1
APPENDIX E BEST MANAGEMENT PRACTICES E-1
APPENDIX F COASTAL CONSISTENCY DETERMINATION F-1
APPENDIX G AIR QUALITY METHODOLOGY AND CALCULATIONS G-1
APPENDIX H ENDANGERED SPECIES ACT AND ESSENTIAL FISH HABITAT DOCUMENTATION H-1
APPENDIX I NATIONAL HISTORIC PRESERVATION ACT SECTION 106 DOCUMENTATION I-1
APPENDIX J TRIBAL GOVERNMENT-TO-GOVERNMENT DOCUMENTATION J-1
APPENDIX K SUPPLEMENTAL SOUND TERMINOLOGY AND METHODOLOGY K-1
APPENDIX L LIST OF PREPARERS L-1
APPENDIX M REFERENCES M-1

1. Purpose of and Need for the Proposed Action

1.1 Introduction

The United States (U.S.) Fleet Forces Command, a Command of the U.S. Navy (Navy) proposes to replace eight Ohio-class submarines currently homeported at Naval Base Kitsap-Bangor (NBK-Bangor) with up to eight Columbia-class submarines, and demolish, construct, and renovate facilities and infrastructure at three upland sites (Upland Site-North, Keyport Annex, and Upland Site-South), and at Delta Pier (Pier Site) at NBK-Bangor. The Navy would also implement stormwater infrastructure upgrades and clear existing vegetation to create laydown/staging areas for materials and temporary parking. The Proposed Action would not require in-water work or any increase in total pier surface area for the Pier Site. There would be no overall changes in number of personnel or number of submarines homeported at NBK-Bangor. Construction is anticipated to begin in July 2027, take approximately five years to complete, and would be phased to be completed prior to the anticipated arrival of the first Columbia-class submarine (see detailed Proposed Action description in Chapter 2).

The Navy has prepared this Environmental Assessment (EA) in accordance with the National Environmental Policy Act (NEPA), 42 U.S. Code (U.S.C.) section 4321 et seq. and consistent with the Department of Defense (DoD) NEPA Implementing Procedures.

1.2 Background

The Navy currently fields four submarine classes; the Los Angeles, Seawolf, Ohio and Virginia-class submarines. The Navy's Ohio-class submarines are the largest in the fleet and first entered service in the mid-1970s. NBK-Bangor is the homeport on the U.S. West Coast for the Ohio-class submarines. The Navy intends to replace the Ohio-class submarines homeported at NBK-Bangor with Columbia-class submarines.

1.3 Location

NBK-Bangor is located approximately 20 miles west of Seattle, Washington, along Hood Canal and approximately 12 miles north of NBK-Bremerton (Figure 1.3-1). The installation encompasses approximately 7,000 acres including developed land (military, industrial, residential, commercial, and recreational uses), forested lands, and brush and shrub lands. NBK-Bangor occupies approximately 5 miles of shoreline on Hood Canal.

1.4 Purpose of and Need for the Proposed Action

The purpose of the Proposed Action is to ensure the uninterrupted continuation of the Navy's Sea-Based Strategic Deterrence mission at NBK-Bangor by replacing the current Ohio-class fleet with technologically advanced Columbia-class submarines in the Pacific Fleet.

The need for the Proposed Action is to ensure the U.S. can meet current and future threats with up-to-date submarine technology in support of national defense objectives and policies. In this regard, the Proposed Action furthers the Navy's execution of its congressionally mandated roles and responsibilities under Section 8062 of Title 10, U.S.C.

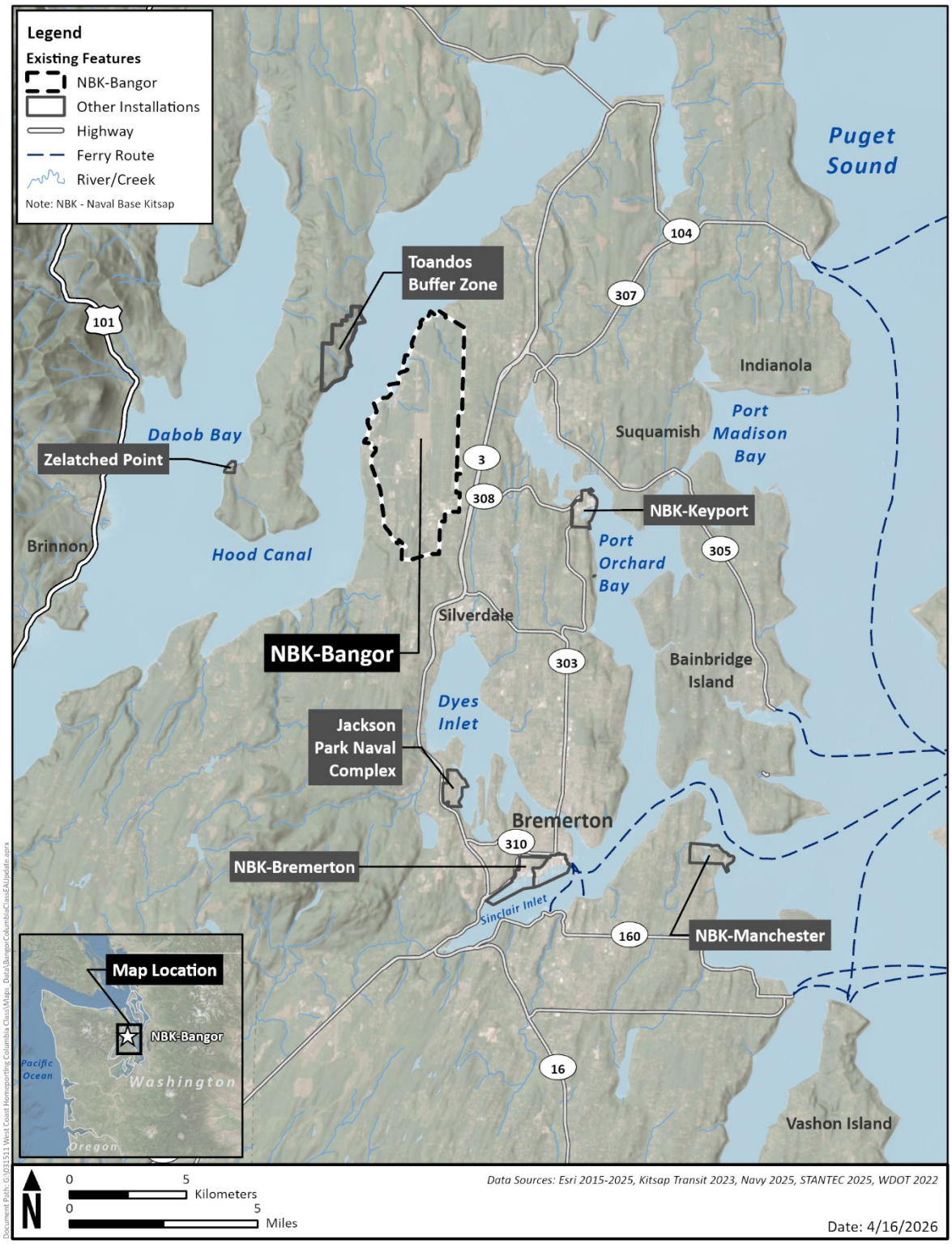


Figure 1.3-1 Naval Base Kitsap-Bangor Location Map

1.5 Scope of Environmental Analysis

This EA includes an analysis of potential environmental impacts associated with the Proposed Action. The scope of the analysis focuses on potential impacts from demolition, construction, and renovation of facilities and infrastructure associated with the homeporting of the Columbia-class submarines at NBK-Bangor. No other components of the Proposed Action are expected to result in environmental impacts, since this action does not involve a permanent increase in personnel at NBK-Bangor or an increase in the number of submarines. The Proposed Action would also not require any increase in maintenance or other operational support functions. Regional Navy vessel movements and other training or testing activities are not part of this Proposed Action and are evaluated in separate environmental analyses, as required.

The environmental resource areas analyzed in this EA include air quality, water resources, biological resources, cultural resources, American Indian Traditional Resources, noise, public health and safety, traffic and transportation, and socioeconomics.

Potential impacts to the following resource areas are negligible or non-existent so they were not analyzed in detail but are summarized at the beginning of Chapter 3, *Affected Environment and Environmental Consequences*: geological resources, land use, visual resources, utilities, infrastructure (with the exception of stormwater), and hazardous materials and waste.

1.6 Key Documents

Key documents are sources of information relevant to this EA. Documents are considered key because of similar actions, analyses, or impacts that may apply to or affect resources like the Proposed Action. The following documents are considered key documents and have been incorporated into this EA to the extent relevant:

- **Final Supplemental EIS/OEIS for Northwest Training and Testing** (Navy 2020, Record of Decision dated 23 September 2021). This Supplemental EIS/OEIS evaluated the potential environmental impacts of continuing military readiness activities in the Northwest Training and Testing study area. The Supplemental EIS/OEIS supported the issuance of marine mammal incidental take authorizations under the Marine Mammal Protection Act and incidental takes of threatened and endangered marine species under the Endangered Species Act (ESA). In addition to the at-sea range complexes, the study area also included regional Navy vessel movements to include operational movements, as well as training and testing activities within Puget Sound, the Strait of Juan de Fuca, and outer coastal waters. The study area included Navy pier side locations where sonar maintenance and testing occur as part of overhaul, modernization, maintenance, and repair activities at NBK-Bremerton, NBK-Bangor, and Naval Station Everett (Navy 2020). The Navy anticipates updating the EIS/OEIS by 2027, prior to the proposed arrival of the Columbia-class submarines to NBK-Bangor.
- **Integrated Natural Resources Management Plan (INRMP) for NBK** (September 2018). This management plan provides guidance regarding long-term planning of the natural resources of NBK, including NBK-Bangor. It supports the military mission while protecting and enhancing natural resources in alignment with legal requirements and stewardship. It was approved by the Navy, U.S. Fish and Wildlife Service (USFWS), Washington State Department of Fish and Wildlife (WDFW), and National Marine

Fisheries Service (NMFS). The Navy conducts an annual internal review of this management plan and coordinates 5-year reviews of the plan with the USFWS and WDFW (with an optional review by NMFS) as mandated by the Sikes Act. Annual and 5-year reviews have not resulted in any updates to the plan since 2018; however, an update is currently in progress.

1.7 Relevant Laws and Regulations

The Navy has prepared this EA in compliance with NEPA (42 U.S.C. section 4321 et seq.) and all applicable federal and state laws, regulations, and policies, and consistent with the DoD NEPA Implementing Procedures. Applicable federal and state laws, regulations, and policies are discussed in Chapter 3 within the resource sections and in *Appendix C, Regulatory Process Considerations.*

1.8 Public and Agency Participation and Intergovernmental Coordination

The Navy has prepared this EA to inform the public of the Proposed Action and foster informed decision-making.

The public is invited to submit comments on the Draft EA during the public comment period from May 27, 2026, to June 25, 2026, by any of the following methods:

- electronically, via the project website (https://www.nepa.navy.mil/Columbia-West-Coast/)
- in writing, by mail to: Columbia-class EA Project Manager, Naval Facilities Engineering Systems Command Atlantic, Attn: Code EV22JS, 6506 Hampton Blvd, Norfolk, Virginia 23508
- during the public meeting, on June 4, 2026

The Draft EA is available on the Navy's website, https://www.nepa.navy.mil/Columbia-West-Coast/ and at five local libraries (Silverdale, Poulsbo, Bremerton, Port Hadlock, and Seattle).

Appendix D, *Public Involvement,* contains additional details on the public involvement for this EA.

The Navy consulted with the U.S. Fish and Wildlife Service (USFWS), NMFS, and Washington State Historic Preservation Office (SHPO). A Coastal Consistency Determination was prepared in accordance with the Washington Coastal Zone Management Program and submitted to the Washington Department of Ecology (Ecology). Correspondence with agencies is presented in *Appendix F, Coastal Consistency Determination, Appendix H, Endangered Species Act and Essential Fish Habitat Documentation,* and *Appendix I, National Historic Preservation Act Section 106 Documentation.* Correspondence with federally recognized tribes is included in *Appendix J, Tribal Government-to-Government Documentation.*

2. Proposed Action and Alternatives

2.1 Proposed Action

The Navy proposes to replace eight Ohio-class submarines currently homeported at NBK-Bangor with up to eight Columbia-class submarines, and demolish, construct, and renovate facilities and infrastructure at three upland sites (Upland Site-North, Keyport Annex, and Upland Site-South) and Delta Pier (Pier Site) on NBK-Bangor. The Navy would also implement stormwater infrastructure upgrades and clear existing vegetation to create laydown/staging areas for materials and temporary parking. Construction is anticipated to begin in July 2027, take approximately five years to complete, and would be phased to be completed prior to the anticipated arrival of the first Columbia-class submarine (see also Section 2.3.2).

During the transition period from the Ohio-class to the Columbia-class submarines, each Ohio-class submarine would be replaced at a ratio of one to one, ensuring the total number of submarines homeported at NBK-Bangor does not increase during this period. Maintenance activities associated with Columbia-class submarines would occur at NBK-Bangor's dry dock, as is done for Ohio-class submarines, and pier side activities would continue for the transition between submarine classes. Existing in-water infrastructure including Delta Pier and north of Delta Pier at Explosive Handling Wharf 2 (EHW2) at NBK-Bangor would support the Columbia-class submarines; therefore, no in-water work or increase in total pier surface area of Delta Pier and EHW2 would be required under the Proposed Action. Modifications to Delta Pier would occur solely to the buildings on the surface of the pier, not to the pier itself. Pipe modifications to Delta Pier and EHW2 would be limited to an existing flushing water connection that would include upgrading the existing piping and would not result in impacts to resources. The Proposed Action is not expected to result in a change to the number of port security barrier openings at NBK-Bangor.

Crew and support personnel required for Columbia-class operations would replace outgoing Ohio-class crew and support personnel at NBK-Bangor. Overall personnel numbers for the Columbia-class submarines would be comparable to those of the Ohio-class, and the total number of personnel currently assigned to the installation to support the facilities and functions of the Columbia-class submarines is not expected to increase under the Proposed Action. Accordingly, the Proposed Action would not permanently change the number of total personnel at NBK-Bangor.

2.2 Screening Factors

NEPA requires federal agencies to evaluate a reasonable range of alternatives to the Proposed Action. These alternatives must be technically and economically feasible, while meeting the purpose of and need for the Proposed Action. In developing the range of alternatives that meet the purpose of and need for the Proposed Action and are technically and economically feasible, the Navy considered screening factors such as mission requirements, geographic needs, facility requirements for training and support, and existing infrastructure. Based on this review, the following factors were considered when exploring alternatives to the Proposed Action:

- Alternatives must ensure uninterrupted continuation of the Navy's Sea-Based Strategic Deterrence mission. This requires ship berthing space at a deep-water port on the West Coast[1] available prior to the arrival of the first Columbia-class submarine.
- Alternatives must provide an adequate power supply or be capable of completing necessary upgrades to support Columbia-class submarines prior to the arrival of the first scheduled Columbia-class submarine. The power supply must meet or, with improvements, be capable of meeting applicable energy requirements for maintenance activities.
- Alternatives must make effective and efficient use of existing infrastructure. Facility development should minimize demolition and disruption to existing operations.
- Alternatives must preserve and optimize operational readiness and efficiencies. The Navy considers a location within a designated Fleet Concentration Area (i.e., region where large numbers of Navy ships are concentrated), proximity to storage of ammunition/explosives with necessary capacity, and existing maintenance capabilities in proximity to ship berthing space to optimize operational readiness. Preserving and optimizing operational readiness and efficiencies also requires maximization of the use of existing organizations and manpower resources in maintenance, training, and support functions by geographical concentration of warfare communities.

2.3 Alternatives Carried Forward for Analysis

Based on the reasonable alternative screening factors, only one Action Alternative, the Proposed Action, was identified as meeting the purpose of and need for the project. Section 2.4, *Alternatives Considered but not Carried Forward for Detailed Analysis*, provides the rationale why other alternatives did not meet the purpose of and need for the project and were not carried forward in this EA. Accordingly, the Proposed Action is the only Action Alternative carried forward for analysis in this EA. This document evaluates the potential environmental impacts associated with the No Action Alternative and the Action Alternative.

2.3.1 No Action Alternative

Under the No Action Alternative, the Proposed Action would not occur. The Navy would not homeport Columbia-class submarines at NBK-Bangor or provide facilities and functions to support the Columbia-class submarines. The facilities/infrastructure upgrades necessary to accommodate Columbia-class homeporting would not occur. 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 to analyze the consequences of not undertaking the Proposed Action and establishes a comparative baseline for analysis.

2.3.2 Proposed Action (Action Alternative)

A detailed description of the construction portion of the Navy's Proposed Action (Action Alternative) is contained in the sections below, which include various demolition, construction,

[1] The Navy analyzed the replacement of the Ohio-class submarines with Columbia-class submarines on the East Coast in a separate NEPA document. The Proposed Action in this EA focuses on the West Coast to meet mission requirements as specified in Section 1.4, Purpose and Need for the Proposed Action.

and exterior renovation activities. Parts of the Proposed Action, specifically renovations to building interiors and modifications to existing water flushing connections at EHW2 and Delta Pier, are not discussed further in this EA because there would be no effect to any resources.

2.3.2.1 Demolition, Construction, and Renovation of Existing Facilities

Table 2.3-1 provides an overview of the proposed demolition, construction, and exterior renovation activities for proposed site locations. Project locations are shown on Figure 2.3-1, Figure 2.3-2, and Figure 2.3-3. Laydown areas are shown on Figure 2.3-4, Figure 2.3-5, and Figure 2.3-6.

Table 2.3-1 Proposed Action Building Components Associated with Homeporting Columbia-class Submarines

Site Location	*Facility Upgrade and Site Improvements Description*
Upland Site-North ***(November 2027-November 2031)***	
Trident Refit Facility (TRF)	Demolition of a 3,300 square-foot building and construction of two new additions on the north side of the existing building; one would be approximately 21,400 square feet and the other approximately 14,800 square feet (total of approximately 36,200 square feet). The additions would support an enclosed multi-storied paint and blast shop facility, covered storage facilities, shipping crate storage, and an enclosed multi-storied storage facility for various shops.
	An addition would also be constructed on the southwest corner of the TRF, along with adjacent stair and elevator tower improvements on the west and east sides of the TRF.
	A new Substation 4A and underground/aboveground electrical system connecting to Substation 4; dirt access road; and mechanical yard would be constructed. *Note*: The design for electrical Substation 4A and the utility corridor is still in progress but would be at two alternate locations (i.e., Options 1 and 2). The size of Substation 4A would be approximately 1.50 acres. Overall area is not expected to change drastically and a worst-case scenario is reflected in this EA. A few large trees may be affected in the utility corridor route but clearing of larger/older trees would be avoided to the maximum extent feasible. Additionally, clearing within the riparian buffer would be minimized to the maximum extent feasible. The maximum expected corridor width is 150 feet. Areas to be cleared for the utility corridor route are expected to be reseeded. A 12-foot dirt access road for truck access to each structure for maintenance would be constructed totaling 0.50-acres. Regular tree trimming and brush cutting for access to poles is required in the right-of-way access. However, this is not required within the entire right-of-way. It is anticipated stumps and the shrub story may be left in place within stream buffers. Overall, these components would result in approximately 7.10 acres of tree clearance. Horizontal directional drilling of the proposed ductbank may be required under the creek. However, there would be no impacts to the creek if horizonal directional drilling occurs. Site improvements include pavements, facility entrances, pedestrian sidewalks, utilities, and stormwater management (see Section 2.3.2.3).
Keyport Annex (on NBK-Bangor) ***(April-August 2028)***	
Keyport Annex	Construction of up to 600 square-foot open-air storage building at the Keyport Annex located on NBK-Bangor, north of Upland Site-South.

Site Location	*Facility Upgrade and Site Improvements Description*
Pier Site ***(April 2028-November 2031)***	
Delta Pier	Construction of three new approximately 3-story maintenance and interference storage facilities adjacent to existing buildings on the surface of Delta Pier; two facilities would be approximately 3,000 square feet and one would be approximately 7,200 square feet. These facilities would be built on top of the existing concrete/asphalt on the pier deck. There would be no increase in pier total surface area and no in-water work.
Upland Site-South ***(July 2027-January 2030)***	
Trident Training Facility (TTF) Expansion	Improvements for pedestrian walkways, utilities, and stormwater management to support building additions; new access drive with parking, fire truck access, and concrete ramps to the building; new access drive for a forklift.
	Construction of approximately 27,000 square-foot multi-story building addition on Site A for operational training.
	Construction of approximately 8,200 square-foot multi-story building addition on Site B for operational training.
	Demolition includes removal of pavement, landscaping, gates, fencing, and utilities associated with TTF expansion.

2.3.2.2 Laydown/Staging Areas

Upland Site-North

The proposed site for a laydown area supporting the Trident Refit Facility (TRF) Complex demolition and construction activities is currently forested. Approximately 3.60 acres of trees are proposed to be felled east of Archerfish and Greenling Road and would be cleared and grubbed of all vegetation (Figure 2.3-4). The site would then be leveled, graveled, and/or paved to create one laydown area.

Pier Site

The proposed site for a laydown area supporting construction activities at Delta Pier is currently forested. Approximately 0.20 acre of trees are proposed to be felled west of Dorado Road and would be cleared and grubbed of all vegetation for contractor trailer use (Figure 2.3-5). The site would then be leveled, graveled, and/or paved.

Upland Site-South

There are three laydown areas associated with the proposed TTF expansion located in currently developed areas. No new development or redeveloped impervious surfaces—such as pavement, concrete, or other hard-surfaced areas that prevent rainfall from infiltrating into the ground—are proposed at any of the laydown sites (Figure 2.3-6). The laydown/staging areas are expected to be established in July 2027.

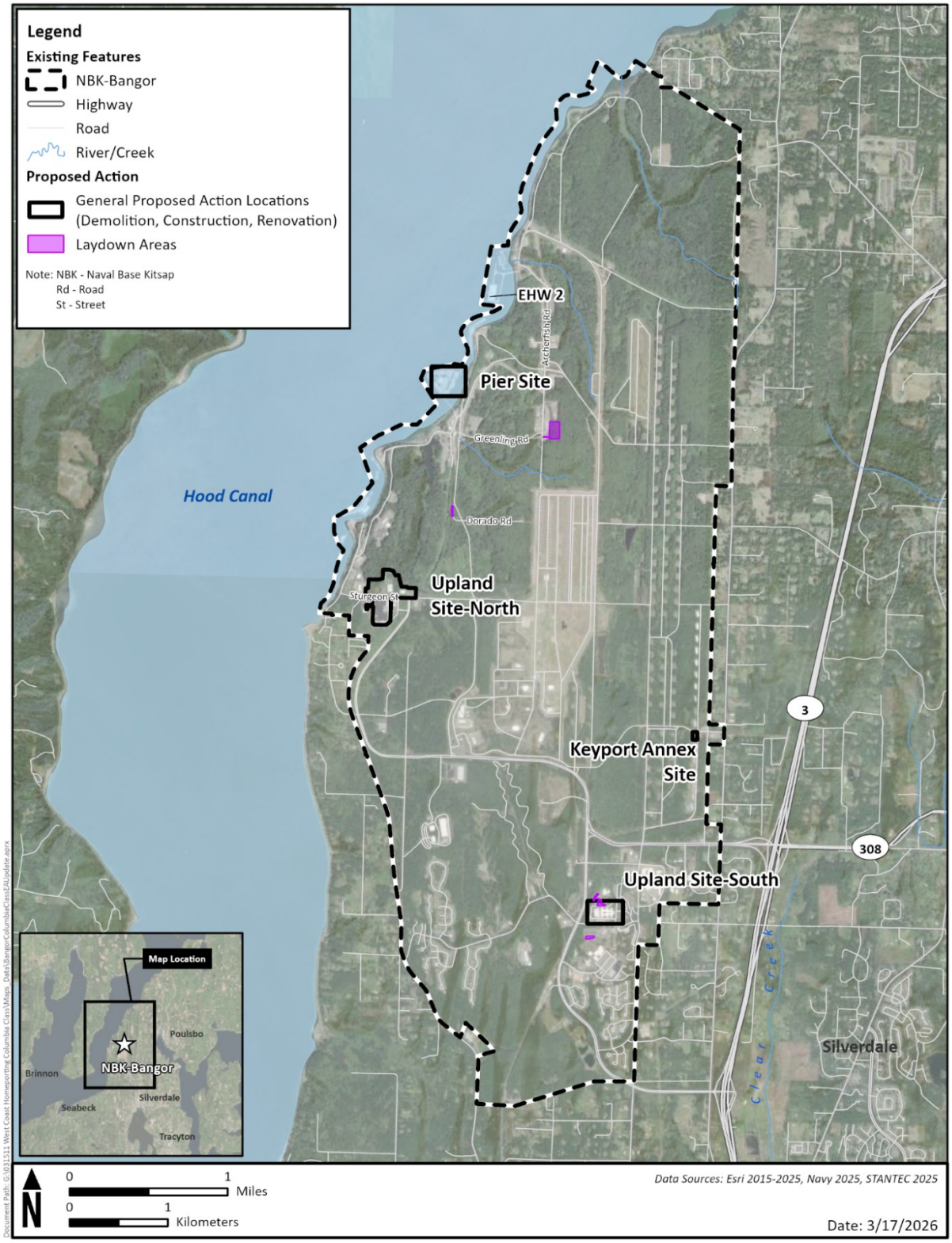


Figure 2.3-1 Project Locations on Naval Base Kitsap-Bangor

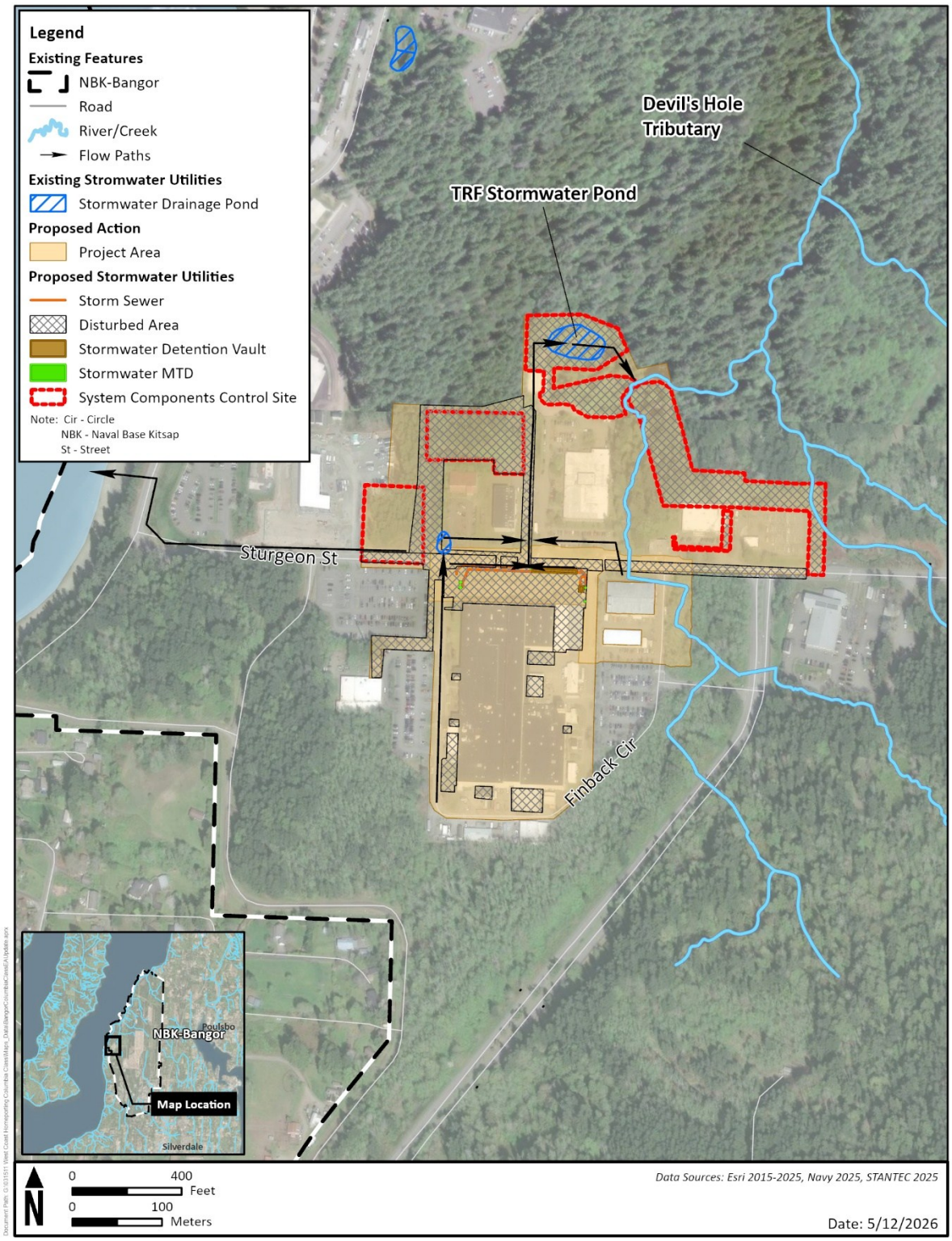


Figure 2.3-2 Proposed Stormwater Upgrades for Upland Site-North

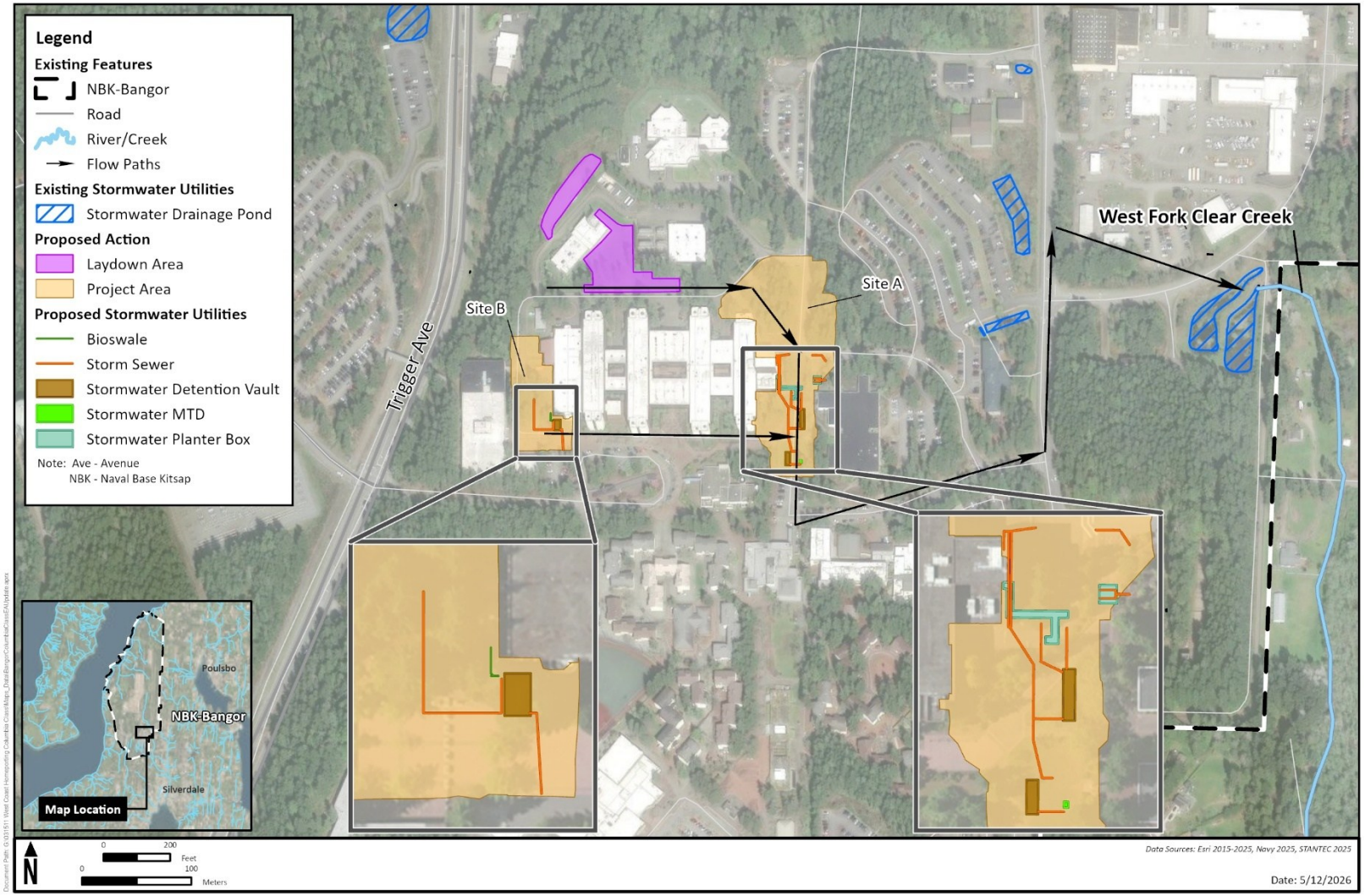


Figure 2.3-3 Proposed Stormwater Upgrades for Upland Site-South

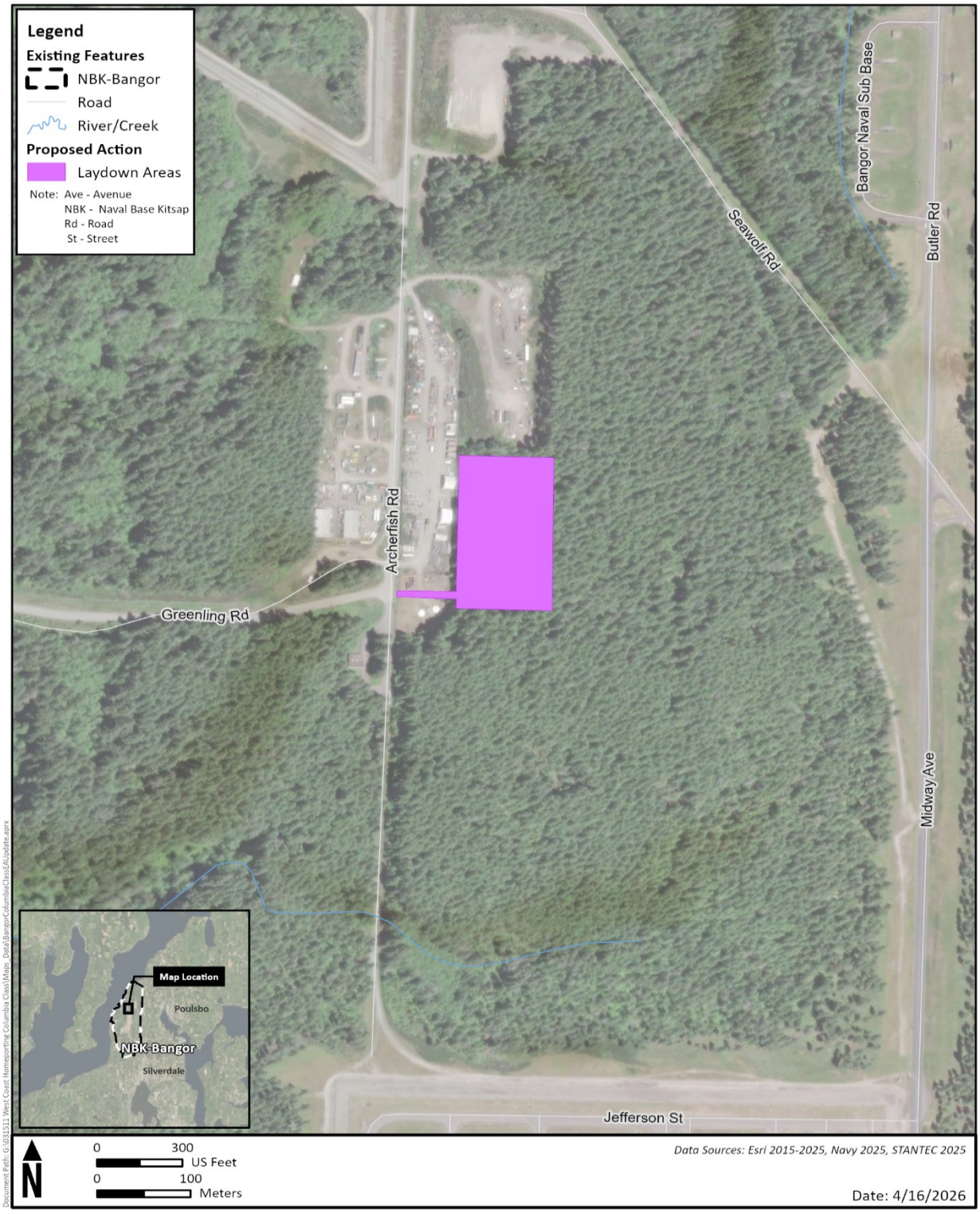


Figure 2.3-4 Upland Site-North Laydown Area

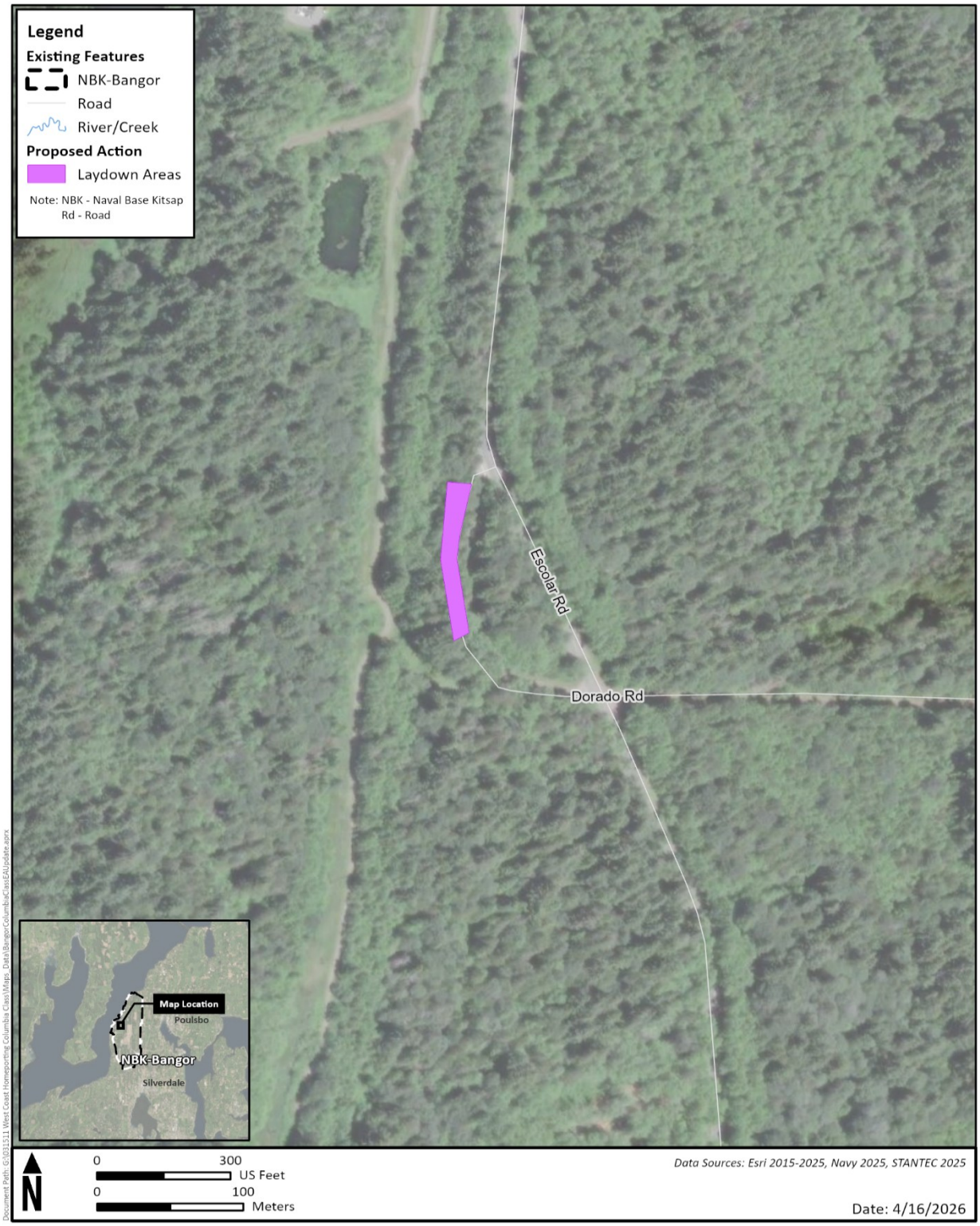


Figure 2.3-5 Pier Site Laydown Area

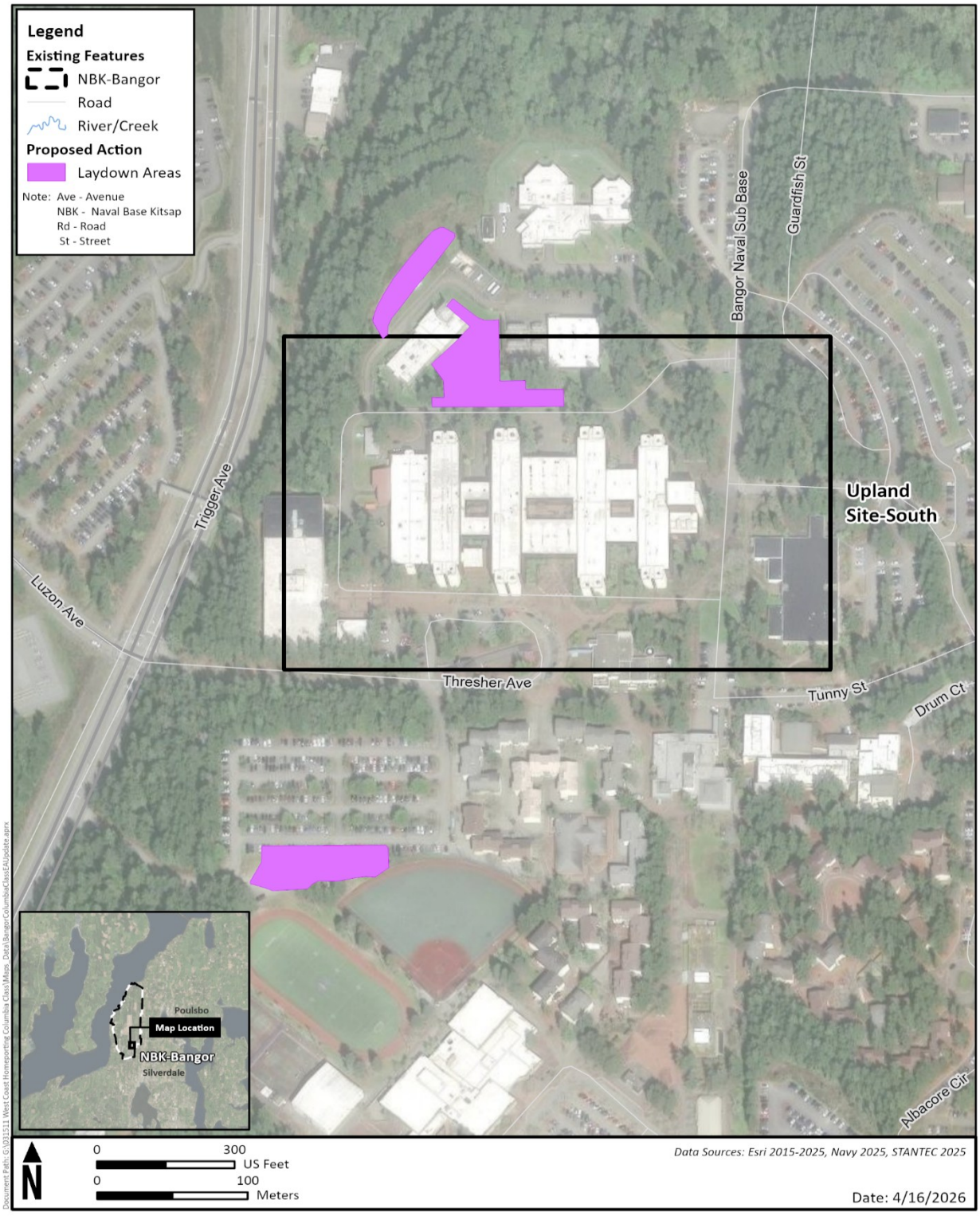


Figure 2.3-6 Upland Site-South Laydown Area

2.3.2.3 Stormwater Upgrades

Stormwater during operations would be managed in compliance with Unified Facilities Criteria (UFC) 3-210-10 Low Impact Development (LID); Energy Independence and Security Act (EISA) Section 438 (42 U.S.C. Section 17094); and the NBK-Bangor Municipal Separate Storm Sewer Systems (MS4) permit. LID and EISA Section 438 require maintaining or restoring pre-development hydrology of a site by managing the stormwater runoff on-site to the maximum extent technically feasible. The current MS4 permit requires compliance with the 2019 Ecology Stormwater Management Manual for Western Washington (SWMMWW) for stormwater quality and flow control[2]. The 2019 SWMMWW provides the following Minimum Requirements (MRs):

- MR1 – Preparation of Stormwater Site Plans
- MR2 – Construction Stormwater Pollution Prevention Plan
- MR3 – Source Control Pollution
- MR4 – Preservation of Natural Drainage Systems and Outfalls
- MR5 – On-Site Stormwater Management
- MR6 – Runoff Treatment
- MR7 – Flow Control
- MR8 – Wetlands Protection
- MR9 – Operation and Maintenance

Upland Site-North

Stormwater runoff from most of the TRF Complex project area would flow to the TRF stormwater pond; however, a small portion of the project area on the western edge would discharge toward Hood Canal (Figure 2.3-2). Stormwater management would meet UFC requirements and the MS4 permit and 2019 SWMMWW requirements. For this project, building upgrades/additions would comply with MR1-MR9. MR6 runoff treatment would be provided on-site using manufactured treatment devices (MTDs) and/or bioinfiltration swales before discharging to MR7 flow control facilities. MR7 flow control would be provided using facilities either on-site (e.g., stormwater detention vaults, bioinfiltration swales, and/or dispersion) or off-site at the TRF stormwater pond north of Sturgeon Street before being discharged to the Devil's Hole tributary (Figure 2.3-2).

The combined stormwater flow from the TRF Complex building improvements and areas west of the TRF Complex would cross Sturgeon Street with a 36-inch elliptical pipe to a junction box. Stormwater runoff would be conveyed to the TRF stormwater pond via a new 42-inch elliptical pipe. To accommodate and manage increased runoff, the TRF stormwater pond would be upgraded to meet MR7 for flow control as defined in the 2019 SWMMWW. Upgrades would

[2] NBK-Bangor's current MS4 permit, WAS026646, requires the Navy to comply with the provisions of Washington State's 2019 SWMMWW. The Navy is aware that Washington State published a new SWMMWW in 2024. The Navy has analyzed the 2024 SWMMWW and determined that any differences between it and the 2019 SWMMWW would not require the Navy to change its proposed project design. Therefore, in this EA, the Navy will reference the 2019 SWMWW as required by its current permit.

include modified flow control at the outflow of the pond, and the pond would be retrofitted as needed to add capacity. These upgrades would likely require some tree clearing for access. Upgrading the TRF stormwater pond could improve treatment for much of the existing stormwater from the TRF Complex area.

Stormwater runoff from the new laydown area near Archerfish Road currently drains west (Figure 2.3-1 and Figure 2.3-4). Stormwater from the new laydown area would meet 2019 SWMMWW treatment requirements by employing infiltration on-site.

Keyport Annex

The proposed construction of a covered storage facility and site improvements include asphalt concrete pavement. Since the proposed improvements do not impact a building, UFC LID is not required. Because less than 2,000 square feet of impervious surface would be new or replaced hard surface, only MR2 (Construction Stormwater Pollution Prevention Plan [SWPPP]) is required per the 2019 SWMMWW requirements.

Pier Site

There would be no change to the stormwater system at the Pier Site. Stormwater would continue to be collected by the existing stormwater sewer system, which pumps flow to two lift stations that discharge landside to an existing stormwater management pond. This stormwater management pond discharges to Devil's Hole Lake.

No in-water work would occur at the Pier Site and all alterations would be done to the surface of the pier. Per the 2019 SWMMWW Flow Chart for Determining Requirements for Redevelopment, it is anticipated that the Pier Site must comply with MR1-MR5. MR5 involves infiltration BMPs that are not feasible or applicable to a pier.

The new laydown area to support the proposed development at the Pier Site would drain west to the tributary to Devil's Hole (Figure 2.3-1 and Figure 2.3-5). The laydown area would be designed to meet treatment and flow control requirements of the 2019 SWMMWW.

Upland Site-South

Stormwater runoff for the Site A and Site B project sites flows to stormwater drainage ponds that then discharges to an unnamed tributary to the west fork of Clear Creek and then Dyes Inlet (Figure 1.3-1 and Figure 2.3-3). All stormwater management would meet UFC requirements and the 2019 SWMMWW requirements. For this project, building upgrades/additions must comply with MR1-MR9. The MR6 runoff treatment would be provided on-site using MTDs before discharging to on-site MR7 flow control facilities using stormwater detention vaults. For the building addition at Site A, treatment and flow control would be provided on-site within the paved service areas adjacent to the building addition. For the Site A parking area, treatment and flow control would be provided on-site within the parking lot. For the building addition at Site B, flow control would be provided on-site within a grass area adjacent to the building addition. Stormwater runoff from all locations at Upland Site-South would then be directed to stormwater ponds which then outfall to an unnamed tributary to the west fork of Clear Creek (Figure 2.3-3).

2.4 Alternatives Considered but not Carried Forward for Detailed Analysis

The following alternatives were considered but not carried forward for detailed analysis in this EA because they do not meet the purpose of and need for the Proposed Action or satisfy the reasonable alternative screening factors presented in Section 2.2.

2.4.1 Homeport at NBK-Bangor Using Existing Facilities – No New Construction

The Navy considered using existing Ohio-class facilities and infrastructure at NBK-Bangor for homeporting the Columbia-class submarines. There would be no demolition, construction, or renovation of facilities. This alternative was considered but is not being carried forward for detailed analysis in the EA because the existing facilities cannot provide the required Columbia-class submarine training space or technological demands and therefore require various upgrades in facility size, electrical and mechanical distribution systems, seismic retrofits, and increased training space. Without the upgrades and retrofits, this alternative would not allow for the Navy to continue the Sea-Based Strategic Deterrence mission. Therefore, this alternative was not carried forward for detailed analysis since it does not meet the purpose of and need for the Proposed Action.

2.4.2 Homeport at Other West Coast Naval Base or Hawaii

The Navy considered the establishment of a new Columbia-class homeport at a different West Coast installation, such as Naval Station Everett in Washington and Naval Base Coronado, Naval Base Point Loma, Naval Base San Diego, and Naval Base Ventura County in California. The Navy also considered Joint Base Pearl Harbor-Hickam in Hawaii.

Implementation of this alternative at a different Navy installation on the West Coast or in Hawaii would require the Navy to replicate existing maintenance and support facilities, instead of leveraging any of the Ohio-class infrastructure currently at NBK-Bangor. No other installation on the West Coast or Hawaii currently has all the facilities and functions necessary to support the Ohio-class submarines, including the relevant munitions, pier loading and drydock capacities, or upland facilities such as the TRF. Additionally, none of the installations considered had enough real estate to support the infrastructure development required to build out these necessary facilities. The Navy considered the acquisition of new real estate, but that would still require the replication of new facilities and would not ensure uninterrupted continuity of the mission, nor was it an effective and efficient use of existing infrastructure or a good use of taxpayer resources.

Since these locations do not have enough real estate to construct all the required facilities, they cannot provide the capabilities for manning, training, and equipping combat-ready naval forces capable of deploying worldwide. Therefore, this alternative was not carried forward for detailed analysis as it does not meet the purpose of and need for the Proposed Action.

2.4.3 Use of Leased Property Near NBK-Bangor

The Navy considered the use of leased property outside of but near NBK-Bangor for homeporting the Columbia-class submarines. This alternative is not viable due to security requirements inherent in the Navy's Sea-Based Strategic Deterrence mission. Co-locating the Columbia-class submarines at NBK-Bangor would ensure the safe movement of ammunition and explosives in a manner that would not provide risk to public health and safety, compared to a leased location outside the installation boundary. This alternative also does not meet the Navy's requirement to make effective and efficient use of existing facilities, as leased locations

would require extensive construction above and beyond what is needed under the Proposed Action to support the Columbia-class submarines and do not have the required power supply capability to meet energy requirements. Homeporting Columbia-class submarines on leased property off NBK-Bangor would not maximize the use of existing organizations, manpower, training resources, and local capabilities to maintain operational readiness and efficiency as personnel transit times could impact the mission. This includes consideration of proximity to, and capacity of, ammunition and explosives storage, as well as maintenance capabilities near ship berthing areas, which are critical to support the Columbia-class submarine mission. Therefore, this alternative was not carried forward for detailed analysis since it does not meet the purpose of and need for the Proposed Action.

2.5 Best Management Practices

Appendix E lists BMPs that the Navy will adopt as part of the Proposed Action to reduce potential environmental impacts. The types of BMPs include measures for general construction best practices, stormwater management and erosion control, dust control, energy efficiency, construction debris management, management of inadvertent discovery of archaeological resources, visual resource compatibility of new structures, construction safety, and contamination management. Some specific examples of BMPs include ensuring there is no discharge of fuel, oil, or chemicals to land or water during construction and during earth-moving activities, pre-applying and re-applying water as necessary to maintain soils in a damp condition, limiting the number of exposed areas through planning and timing of project phases, and covering temporarily exposed areas.

3. Affected Environment and Environmental Consequences

This chapter includes a description of the affected environment and analysis of potential reasonably foreseeable impacts to air quality, water resources, biological resources, cultural resources, American Indian Traditional Resources, noise, public health and safety, traffic and transportation, and socioeconomics. This chapter also considers other on-base projects within Navy control with the potential to have a meaningful interaction with the Proposed Action with regards to relevant resource areas (see Section 3.1).

All figures and select tables for this chapter are included in *Appendix B*. Regulatory process considerations for all resources evaluated in this EA are included in *Appendix C*.

The potential impacts to geological resources, land use, visual resources, utilities and infrastructure (except stormwater) and hazardous materials and waste are considered negligible or non-existent, so they were not analyzed in detail in this EA, as discussed below.

Geological Resources: Construction activities as described under the Proposed Action have the potential to affect geological resources (topography, geology, and soils) through demolition, construction, and renovation of new facilities; however, these activities would occur in previously disturbed areas and/or in areas that are relatively level that would not require slope stabilization. The proposed project area is in a seismically active region that is subject to periodic earthquake activity. As described in Section 2.3.2.1, several existing structures would undergo seismic retrofits, and all new buildings would be designed and constructed to comply with the seismic design criteria identified in the appropriate DoD UFC(s). Construction activities would disturb more than 1 acre and require compliance with the U.S. Environmental Protection Agency (EPA) Construction General Permit (See *Appendix E*). To minimize the short-term potential for increased erosion and sedimentation during construction, the Navy would implement appropriate erosion control BMPs in accordance with a project-specific construction SWPPP and in compliance with coverage provisions under the EPA Construction General Permit (see *Appendix E*). Therefore, there would be no adverse impacts to geological resources, and this resource is not addressed further in the EA.

Land Use: Effects to land use could result from changes in how land is developed and used, typically in terms of the types of activities allowed. The Proposed Action would result in a conversion of approximately 10.9 acres of forest landcover to development at NBK-Bangor, but would be consistent with, and not alter, the existing military operation and industrial land use and type of activities conducted in the project areas overall. No land use district designation changes would be required. There would be no impacts to recreation as none of the project areas support recreation. All demolition, construction, and renovation associated with the Proposed Action would be consistent with existing land use categories of the proposed site locations at NBK-Bangor in accordance with the NBK-Bangor Installation Appearance Plan and INRMP. The Proposed Action would not induce further land use changes that would significantly change the land use within the Proposed Action areas. The Proposed Action would also have negligible effects on coastal land uses within the coastal zone (refer to *Appendix F*, Coastal Consistency Determination). Therefore, there would be negligible effects to land use from implementation of the Proposed Action, and this resource is not addressed further in the EA.

Visual Resources: The visual aesthetics of the proposed site locations at NBK-Bangor would remain virtually unchanged from implementing the Proposed Action. The proposed project locations already contain various facilities and infrastructure that are necessary to support the Ohio-class submarines, and the changes to facilities and infrastructure to support the Columbia-class submarines would be consistent with existing facilities and infrastructure. Therefore, there would be no impact to visual resources, and this resource is not addressed further in the EA.

Utilities and Infrastructure: Utilities and infrastructure include electricity, potable water, wastewater, solid waste, stormwater conveyance, telecommunications, and related services. Stormwater upgrades are discussed as part of the Proposed Action and have been retained for analysis. Under the Proposed Action, upgrades for utilities and infrastructure other than stormwater would be implemented for services to improve efficiency and reliability, such as electricity. The existing Substation 4 has the electrical capacity to support demand and only needs the physical switchgear to make the new connections. The proposed substation and associated duct bank and feeders for the transmission lines is for redundancy and reliability at Upland Site-North. There would be no operational changes that would result in exceedance of available capacity of existing utilities. The water pipe upgrade to the existing flushing connection on Delta Pier and EHW2 would not change existing utility use or demand. Therefore, utilities and infrastructure (except for stormwater) are not addressed further in the EA as there would be negligible impacts to these resources.

Hazardous Materials and Waste: Demolition, construction, and renovation of facilities as described under the Proposed Action may result in temporary increases in the use, generation, and storage of hazardous materials in the project area, such as petroleum, oils, and lubricants used in the operations and maintenance of construction-related equipment and vehicles. However, these hazardous materials and wastes would be minimized, controlled, and managed in accordance with applicable regulations, the NBK-Bangor Hazardous Waste Management Plan (Navy 2021), and the use of standard best management practices. The Navy continuously monitors its operations to find ways to minimize the use and generation of hazardous materials and waste.

NBK-Bangor is an active military installation; hazardous materials and waste are stored, handled, and generated as a part of daily operations. Homeporting of the Columbia-class submarine is not expected to increase operational-related hazardous materials and waste as the Columbia-class submarine would operate under similar conditions as the Ohio-class submarine currently homeported at NBK-Bangor. Furthermore, operational-related impacts from hazardous materials and waste would be controlled through compliance with all applicable federal and state requirements and safety standards.

The Proposed Action would not induce further changes to hazardous materials and waste use, storage, and handling that would result in adverse impacts to the public and/or the environment during construction or operations. Therefore, there would be negligible effects to hazardous materials and wastes from the implementation of the Proposed Action.

3.1 Reasonably Foreseeable Environmental Effects

3.1.1 Analytical Framework for Defining Scope of Effects

The analysis in this EA focuses on the reasonably foreseeable environmental effects of the Proposed Action. In drawing a reasonable and manageable line to determine the limit of reasonably foreseeable effects, the Navy considered the extent to which there is a logically close causal relationship between the Proposed Action and the potential environmental effects. Thus, those effects that are the product of a weaker cause-and-effect link, unreasonably remote in time or geographic reach, or the environmental effects of actions that are outside of the Navy's authority, control, or responsibility are not analyzed in this EA. In accordance with the objectives of NEPA, the depth and breadth of the Navy's inquiry is fact-dependent and context-specific.

In drawing a reasonable and manageable line, the Navy's consideration of the indirect effects of separate actions under its control and responsibility focused on actions with the potential to have reasonably foreseeable additive environmental effects—such as actions within a reasonable distance of the study area and that will happen around the same time as the Proposed Action. Regarding third-party actions, the Navy focused on only those instances when the combined effects of the Proposed Action and the third-party action were such that the effects of the Proposed Action could not be fully understood outside the context of the other action.

3.1.2 Application of the Framework to the Proposed Action

As the primary effects of the Proposed Action are the result of construction activities that are inherently local in scope, the Navy first compiled a list of Navy actions occurring within NBK-Bangor with periods of implementation overlapping that of the Proposed Action. The Navy identified 25 actions, the last of which is projected to conclude in 2032. The Navy also identified five actions outside of its control and responsibility and outside the boundaries of NBK-Bangor, but within the local area and occurring within roughly the same time period, that could be relevant to the Navy's analysis and decision-making. Actions that would be completed before the construction phase of the Proposed Action were eliminated from further analysis but treated as part of the "baseline" against which the Proposed Action's effects would be compared. Eight actions occurring on board NBK-Bangor between 2027 and 2032 in reasonable proximity to the location of the Proposed Action were evaluated for possible additive contributions to the effects of the Proposed Action (Table 3.1-1). Independent Navy actions with no significant effects that were anticipated to be categorically excluded from further NEPA analysis were not considered unless the effects of those actions, although insignificant, could meaningfully contribute to the effects of the Proposed Action. The third-party actions occurring off the installation were also removed from consideration. Although some of these actions overlap in time, they would not occur in or near the Proposed Action's area of effects, are not within the Navy's authority, control, or responsibility, and would not be reasonably expected to affect the same resource areas as the Proposed Action.

Table 3.1-1 Other Navy Projects with Potential Additive Impacts

Corresponding Figure Location	*Other Navy Projects with Potential Additive Impacts*	*Time Frame*
A	CERCLA OU 1 Site A	2028
B	Equipment Processing Building	2026-2028
C	Regional Optics Repair Center	2027-2030
D	Warehouse and Parking Garage	2026-2028
E	Assembly Building 1	2027-2029
F	CERCLA OU 2 Site F	2032-2033
G	Forge Shop & Heat Treat Facility	2027-2029
H	Radio Hill Complex Laydown Expansion	2027-2029

Key: CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act; OU = Operating Unit

The projects considered for NBK-Bangor are summarized below and shown on Figure 3.1-1 in *Appendix B*. Project letters (A, B, etc.) correspond to points identified in Figure 3.1-1 in *Appendix B.*

CERCLA Operable Unit 1 Site A (Project A) (Remedy Construction to begin in 2028)

Operable Unit 1 Site A is a former ordnance disposal area. Cleanup actions include groundwater treatment. The existing groundwater treatment system may be replaced by a bioremediation approach. If approved, construction would begin in 2028 and could include biostimulation.

Equipment Processing Building (Project B) (2026-2028)

For this project, the Navy would construct a single-story equipment processing building, two new storage facilities, and a new parking lot. Site preparation would include tree removal, site clearing, earthwork, grading, and preparation for construction. Paving and site improvements would include driveways, asphalt, and concrete pavement. The Navy plans to construct this project in 2026–2028.

Regional Optics Repair Center (Project C) (2027-2029)

This project would provide a multi-story facility to include a periscope and optics clean room, a vault, vertical test stand (tower), hydro-test tank, building electrical and mechanical space, office, conference and training space, and personnel support spaces. Proposed construction is steel-frame, concrete foundation, and slab-on grade floor, including insulated metal siding and roofing and includes a high-bay area to accommodate a vertical test stand.

Warehouse and Parking Garage (Project D) (2026-2028)

The Navy proposes to construct a new warehouse and parking garage. The warehouse and parking garage will be constructed over existing parking lots. The Navy will construct new surface lots to the immediate west of the new warehouse footprint. The Navy plans to construct this project from 2026-2028.

Assembly Building 1 (Project E) (2027 – 2029)

Navy proposes to construct a single-story processing facility, with support facilities such as utilities and site improvements. The project would involve demolition of two existing buildings. The Navy plans to construct this project from 2027-2029.

CERCLA Operable Unit 2 Site F (Project F) (2032 -2033)

Operable Unit 2 Site F is a former ordnance washout lagoon with contaminated soils and groundwater. The existing groundwater treatment, which includes extraction and reinjection, may be replaced by a bioremediation approach. If approved, construction would begin in 2028 and could include biostimulation.

Forge Shop & Heat Treat Facility (Project G) (2027-2029)

The Navy would construct a new larger forge shop and associated parking area on NBK-Bangor on an undeveloped site. The number of employees would not increase but would relocate from Puget Sound Naval Shipyard. The new structure, parking areas, and storage lot would create new permanent impervious surface. The forge shop would include open storage and parking for up to 35 vehicles. A two-lane paved road would be constructed to access the new forge shop location.

Radio Hill Complex Laydown Expansion (Project H) (2027-2029)

Expansion of the Radio Hill Complex would include paving an existing gravel road, constructing new paved areas for storing and moving equipment and material, and extending utilities (water, sewer, electric, and telecommunications) to serve the existing and expanded area. The Radio Hill Complex expansion would be sized to accommodate functions that would be impacted by construction of the proposed multi-mission dry dock at NBK-Bremerton. Two new buildings with employee parking areas would be constructed (employee building and work building).

3.2 No Action Alternative for all Resources

Under the No Action Alternative, the Proposed Action (Action Alternative) would not be implemented. The Columbia-class submarines would not be homeported at NBK-Bangor and the facilities and functions would not be in place to support the replacement and sustainment requirements of the Columbia-class submarine. There would be no changes to baseline conditions for air quality, water resources, geological resources, biological resources, cultural resources, American Indian Traditional Resources, noise, public health and safety, traffic and transportation, and socioeconomics. However, without implementation of seismic retrofits to existing facilities at Upland Site-North or the Pier Site under the No Action Alternative, these facilities are expected to perform poorly in seismic events and would not meet mission requirements.

3.3 Air Quality

The discussion of air quality includes criteria pollutants, standards, sources, and permitting. The principal pollutants defining air quality, called criteria pollutants, include carbon monoxide (CO), sulfur dioxide (SO_2), nitrogen dioxide (NO_2), ozone (O_3), 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. Greenhouse gases (GHGs) are gas emissions that trap heat in the atmosphere. These emissions occur from natural processes and human activities. GHG emissions are often measured in carbon dioxide (CO_2) equivalent. To convert emissions of a gas into CO_2 equivalent, its emissions are multiplied by the gas's Global Warming Potential (GWP). CO_2, by definition, has a GWP of 1 regardless of the time period used, because it is the

gas being used as the reference. For this analysis, the GWP used for methane (CH_4) is 28 and for nitrous oxide (N_2O) is 273.

3.3.1 Affected Environment

3.3.1.1 Criteria Pollutants

The Region of Influence (ROI) for assessing air quality impacts is Kitsap County. Kitsap County is in the westernmost part of the Puget Sound Air Quality Control Region. This Region is a 6,500 square mile area comprised of King County, which includes the Seattle metropolitan area, Snohomish County, Pierce County, Kitsap County, and Puget Sound. Kitsap County is designated as an attainment area for all criteria pollutants.

The air quality assessment includes an additional focus on sensitive populations in the vicinity of the project areas that may experience either short- or long-term increases in air pollutant concentrations during proposed demolition, construction, renovation or operational activities. Locations with sensitive populations include, but are not limited to, hospitals, schools, child development centers, senior housing, and convalescent facilities. These are areas where occupants are more susceptible to the adverse effects of air pollution. Figure 3.3-1 in *Appendix B* identifies sensitive population locations within 0.6-mile of the project areas and the prevailing wind patterns for the area at NBK-Bangor. NBK-Bangor operates under a Synthetic Minor Permit (Registration No. 21323, NOC No. 5968) issued by Puget Sound Clean Air Agency (PSCAA).

PSCAA, along with Ecology, is responsible for implementing and enforcing state and federal air quality regulations in Washington. Ecology monitors for air pollutants including O_3, NO_2, CO, $PM_{2.5}$, and SO_2 through a network of air quality monitoring sites throughout the state, known as the Washington State Ambient Air Monitoring Network.

Table 3.3-1 presents published design values for the criteria pollutants based on the most current (2024) ambient monitoring levels for air quality monitoring stations closest to NBK-Bangor in the region as a percentage of the most stringent National Ambient Air Quality Standards (NAAQS). A design value is a statistic that describes the air quality status of a given location relative to NAAQS. Design values are computed and published annually by U.S. EPA Office of Air Quality Planning and Standards and reviewed in conjunction with the EPA Regional Offices (EPA 2025a). The current NAAQS table can be found in *Appendix G*. Lead has not been included in the table as there are no significant sources of lead emissions in the ROI nor are any associated with the Proposed Action.

Table 3.3-1 Regional Ambient Air Quality Design Values Compared to the NAAQS

Pollutant	*Maximum Design Values*	*National Ambient Air Quality Standards (NAAQS)*	*Percent of NAAQS*
O_3	0.048 ppm (8-hr)	0.070 ppm	68.6
CO	1.3 ppm (1-hr)	35.0 ppm	3.7
	1.0 ppm (8-hr)	9.0 ppm	11.1
NO_2	50 ppb (1-hr)	100 ppb	50.0
	14 ppb (Annual)	53 ppb	26.4
SO_2	3 ppb (1-hr)	75 ppb	4.0
	0 ppb (Annual)	10 ppb	0.0
PM_{10}	NA – The NAAQS metric for PM_{10} is the annual estimated number of exceedances, averaged over three consecutive years: 0.0 for 2022-2024	150 µg/m^3	-
$PM_{2.5}$	16 µg/m^3 (24-hr)	35 µg/m^3	45.7
	5.1 µg/m^3 (Annual)	9.0 µg/m^3	56.7

Key: µg/m^3 =microgram per cubic meter; CO = carbon monoxide; NAAQS = National Ambient Air Quality Standards; NO_2 = nitrogen dioxide; O_3 = ozone; $PM_{2.5}$ = particles with aerodynamic diameters less than or equal to 2.5 micrometers; PM_{10} = particles with aerodynamic diameters less than or equal to 10 micrometers; SO_2 = sulfur dioxide, ppm = parts per million; ppb = parts per billion.

Source: EPA 2025a.

All criteria pollutants are below the NAAQS limits. Ozone has the highest design value but is still less than 70 percent of the NAAQS limit, with all other pollutants at lower levels. Therefore, the region is not currently at risk of exceeding the NAAQS or being designated a nonattainment area.

3.3.2 Environmental Consequences

The primary emissions from the Proposed Action would result from burning fuels in mobile sources (e.g., on-road vehicles and construction equipment). For the purpose of evaluating air quality effects in this EA, emissions are considered significant if the Proposed Action would result in a violation of the NAAQS for any criteria pollutant or have impacts on sensitive populations. For attainment area criteria pollutants, the air quality analysis used the EPA's Prevention of Significant Deterioration (PSD) permitting threshold of 250 tons per year as an indicator of the local significance of potential impacts to air quality. The PSD permitting threshold represents the level below which a stationary source may acceptably emit without triggering the requirement to obtain a permit. Thus, if the intensity of any net emissions increase for a Proposed Action is below 250 tons per year, the indication is that the air quality impacts would not be significant for that pollutant.

Emission assumptions and calculations are provided in *Appendix G*. A complete list of new stationary equipment associated with the Proposed Action is currently unknown, although it is known that there would be a new paint/blast booth. Any such equipment, such as paint/blast

booths, boilers, and emergency generators, would undergo permit review before construction of the source.

3.3.2.1 Action Alternative

Table 3.3-2 presents the estimated annual emissions from the Action Alternative.

Table 3.3-2 Estimated Emissions for Demolition, Construction and Renovation Activities at Upland Site-North, including Delta Pier area, and Upland Site-South in Tons/Year

Year	Location	Site	Estimated Emissions (tons)					
			VOCs	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$
2027	On-site	Upland Site-North	0.12	0.57	1.27	0.00	0.52	0.13
		Upland Site-South	0.55	2.67	5.19	0.01	3.08	0.64
	Total Annual On-site		0.67	3.24	6.46	0.01	3.61	0.77
	Off-site	Upland Site-North	0.01	0.64	0.12	0.00	0.43	0.07
		Upland Site-South	0.06	5.87	0.27	0.00	3.91	0.59
	Total Annual Off-site		0.08	6.51	0.39	0.00	4.34	0.66
	2027 Total Emissions		0.74	9.75	6.85	0.01	7.95	1.43
2028	On-site	Upland Site-North	0.95	4.54	9.07	0.01	3.16	0.89
		Upland Site-South	0.55	2.67	5.19	0.01	3.08	0.64
	Total Annual On-site		1.50	7.21	14.26	0.02	6.24	1.53
	Off-site	Upland Site-North	0.06	4.16	0.43	0.00	2.77	0.43
		Upland Site-South	0.06	5.87	0.27	0.00	3.91	0.59
	Total Annual Off-site		0.13	10.04	0.70	0.01	6.68	1.02
	2028 Total Emissions		1.62	17.25	14.96	0.02	12.93	2.55
2029	On-site	Upland Site-North	1.05	5.06	9.97	0.01	3.54	1.00
		Upland Site-South	0.55	2.67	5.19	0.01	3.08	0.64
	Total Annual On-site		1.60	7.73	15.16	0.02	6.62	1.64
	Off-site	Upland Site-North	0.06	4.39	0.44	0.00	2.92	0.45
		Upland Site-South	0.06	5.87	0.27	0.00	3.91	0.59
	Total Annual Off-site		0.13	10.27	0.71	0.01	6.84	1.04
	2029 Total Emissions		1.72	18.00	15.86	0.02	13.46	2.68
2030	On-site	Upland Site-North	1.05	5.06	9.97	0.01	3.54	1.00
		Upland Site-South	0.55	2.67	5.19	0.01	3.08	0.64
	Total Annual On-site		1.60	7.73	15.16	0.02	6.62	1.64
	Off-site	Upland Site-North	0.06	4.39	0.44	0.00	2.92	0.45
		Upland Site-South	0.06	5.87	0.27	0.00	3.91	0.59
	Total Annual Off-site		0.13	10.27	0.71	0.01	6.84	1.04
	2030 Total Emissions		1.72	18.00	15.86	0.02	13.46	2.68

Year	Location	Site	Estimated Emissions (tons)					
			VOCs	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$
2031	On-site	Upland Site-North	1.03	4.96	9.79	0.01	3.46	0.97
		Upland Site-South	0.55	2.67	5.19	0.01	3.08	0.64
	Total Annual On-site		1.58	7.63	14.98	0.02	6.54	1.61
	Off-site	Upland Site-North	0.06	4.35	0.44	0.00	2.89	0.44
		Upland Site-South	0.06	5.87	0.27	0.00	3.91	0.59
	Total Annual Off-site		0.13	10.22	0.71	0.01	6.80	1.04
	2031 Total Emissions		1.70	17.85	15.68	0.02	13.35	2.65
2032	On-site	Upland Site-North	0.04	0.19	0.41	0.00	0.13	0.04
	Total Annual On-site		0.04	0.19	0.41	0.00	0.13	0.04
	Off-site	Upland Site-North	0.00	0.22	0.03	0.00	0.15	0.02
	Total Annual Off-site		0.00	0.22	0.03	0.00	0.15	0.02
	2032 Total Emissions		0.05	0.41	0.44	0.00	0.28	0.06

Key: VOC = volatile organic compounds; CO = carbon monoxide; NO_x = oxides of nitrogen; SO_2 = sulfur dioxide; PM_{10} = particulate matter with a diameter less than 10 microns; $PM_{2.5}$ = particulate matter with a diameter less than 2.5 microns

The annual emissions presented in Table 3.3-2 represent small increases over existing emissions at NBK-Bangor. As discussed in Section 3.3.1 and shown in Table 3.3-1, the regional air quality is not considered to be at risk of exceeding the NAAQS for any criteria pollutants as all criteria pollutant design values are well below the NAAQS. The maximum annual estimated emissions would occur in 2029 and 2030. Even during these years, all criteria pollutant emissions from the Proposed Action would be below the PSD comparative indicator threshold of 250 tons per year. Therefore, the small increases would not cause an exceedance of any NAAQS or otherwise significantly alter the ambient air quality profiles presented in Table 3.3-1.

The nearest locations of sensitive/public receptors at NBK-Bangor include the Lower Base Fitness Center, which is adjacent to the Upland Site-North area, as well as several parks, schools, daycares and medical facilities located within 0.6 miles of the Upland Site-South area. The ground level emissions are anticipated to be carried downwind quickly, dispersing over time depending on local wind conditions. No adverse effects on sensitive populations would be expected, as the prevailing winds are from the south and southwest, and there are no sensitive receptors within 0.6 miles north or northeast of the project area. Total emissions of all criteria pollutants would not be anticipated to elevate pollutant concentrations at any air quality monitoring stations or nearby sensitive receptors significantly above the existing background concentrations and would cease upon completion of the construction period. Once the demolition, construction, and renovation activities are completed, operational emissions would be consistent with the existing level of support and maintenance emissions, so there would be no known new impacts from homeporting the Columbia-class submarine. Therefore, implementation of the Action Alternative would not result in significant air quality impacts.

Greenhouse Gases

GHG emissions from demolition, renovation, and construction activities associated with the Action Alternative would result in a total increase in GHG emissions of 30,215 tons of carbon

dioxide equivalent (CO_2e). This is equivalent to the emissions from 3,681 homes' energy use for one year (EPA 2026a). Operational GHG emissions would be consistent with the existing level of support and maintenance emissions and would be less than significant, as the level of activity, and therefore associated emissions, would remain the same. Total estimated annual GHG emissions from demolition, renovation, and construction activities associated with the Action Alternative are presented in Table 3.3-3.

Table 3.3-3 Estimated GHG Emissions for Demolition, Construction and Renovation Activities at Upland Site-North, including Delta Pier area, and Upland Site-South in Tons/Year

Year	*tons*			
	CO_2	*CH_4*	*N_2O*	*CO_2e*
2027	3,217	0.06	0.02	3,225
2028	6,388	0.12	0.05	6,403
2029	6,819	0.13	0.05	6,836
2030	6,819	0.13	0.05	6,836
2031	6,732	0.13	0.05	6,749
2032	166	0.00	0.00	167

Key: CO_2 = carbon dioxide; CH_4 = methane; N_2O = nitrous oxide; CO_2e = carbon dioxide equivalent

Additive Emissions

In terms of potential additive effects, some of the other Navy projects identified in Section 3.1 could also include demolition, site clearing, earthwork, grading, paving, and construction activities. If the construction-related activities take place concurrently with the Proposed Action, these projects could have an additive impact with respect to additional criteria pollutant emissions. As stated in Section 3.3.1, *Affected Environment*, all criteria pollutants are well below the NAAQS limits for the region. In addition, the Proposed Action would have maximum annual emissions which fall below the PSD comparative indicator threshold of 250 tons per year, demonstrating that the Proposed Action would not cause or contribute to an exceedance of any NAAQS or otherwise significantly alter the ambient air quality profiles presented in Table 3.3-1. Therefore, the additional emissions from construction activity are not anticipated to cause a violation of the NAAQS or increase health risks to the public from additive air emissions.

3.4 Water Resources

Water resources include groundwater, surface water, and floodplains. Groundwater is water that exists underground in saturated zones of soil or rock. Surface water resources generally consist of wetlands, lakes, rivers, streams, and marine waters. Wetlands are areas where water covers the soil, or is present either at or near the surface of the soil all year or for varying periods of time during the year, including during the growing season (EPA 2026b). Floodplains are areas of low-level ground present along rivers, stream channels, large wetlands, or coastal waters.

3.4.1 Affected Environment

The ROI for water resources includes the areas where ground disturbance would occur during construction and any water resources located downstream or downgradient from these areas. The ROI is composed of four sites: Upland Site-North, Upland Site-South, Keyport Annex, and

Pier Site, as shown in Figure 3.4-1 in *Appendix B.* This section describes the existing conditions of the ROI for water resources at NBK-Bangor.

3.4.1.1 Groundwater

Three distinct aquifer systems have been identified at NBK-Bangor: perched, shallow, and sea level aquifers (NBK 2018). Groundwater moves from inland areas of higher elevation toward streams or nearshore areas of lower elevation with little influx from Hood Canal (NBK 2018). Groundwater at Upland Site-North was encountered during drilling at depths of approximately 7.5 feet below ground surface, but this may fluctuate by several feet seasonally and may vary during periods of high precipitation (Naval Facilities Engineering Systems Command [NAVFAC] Northwest [NW] 2025a). During geotechnical investigations at Upland Site-South for this project, soil borings were drilled to depths of 10 to 20 feet below ground surface; no groundwater was encountered during these drillings, indicating that depths to groundwater are expected to be greater than 10 feet in this area.

NBK-Bangor uses groundwater from sea level aquifers as a potable water source. The drinking water program is managed by the Public Works Department with direct oversight by NBK-Bangor Environmental staff. To protect the aquifer, NBK-Bangor maintains a Wellhead Protection Plan that limits activities within certain distances of the wells and establishes several wellhead protection areas around each well (NAVFAC NW 2025b). The Upland Site-North, Keyport Annex, Upland Site-South, and most laydown/staging areas are not located within any critical aquifer recharge areas (Kitsap County 2017). The proposed laydown/staging area to the east of the Pier Site is located in a Category I critical aquifer recharge area (i.e., those areas where the potential for certain land use activities to adversely affect groundwater is high) (Kitsap County 2017).

3.4.1.2 Surface Water

NBK-Bangor drainage consists of five small streams entering Hood Canal and two tributaries of Clear Creek and Strawberry Creek flowing southeast and emptying into Dyes Inlet. The Upland Site-North and associated laydown/staging area ROIs and the Pier Site laydown area ROI are located within the Devil's Hole watershed and drain to tributaries to Devil's Hole Creek entering a reservoir known as Bangor Lake or Devil's Hole Lake and then Hood Canal. The Pier Site ROI is located over Hood Canal. The Keyport Annex and Upland Site-South ROIs are located within the Clear Creek watershed that drains to Dyes Inlet (Kitsap County 2025). The Upland Site-South and associated laydown/staging areas drain to public works stormwater ponds, which serve as stormwater retention facilities to prevent large fluctuations in volume and speed of stormwater entering an unnamed tributary to the west fork of Clear Creek, which drains to Clear Creek then into Dyes Inlet. The Keyport Annex area also drains to an unnamed tributary to the west fork of Clear Creek.

Washington Administrative Code (WAC) 173-201A-612 has established designated uses for Hood Canal as follows: extraordinary (aquatic life uses); primary contact (recreation); shellfish harvesting; and wildlife habitat, commerce/navigation, boating, and aesthetics (miscellaneous uses). WAC 173-201A-602 has established the following designated uses for Clear Creek: aquatic life uses (core summer habitat), recreation (primary contact), water supply uses (all), and miscellaneous uses (all).

The 2018 Water Quality Assessment and 2014-2018 Clean Water Act (CWA) 303(d) list were approved by the EPA in 2022; the 2022 Assessment is pending EPA approval (Ecology 2025). The 2014-2018 303(d) list includes two grid segments along the NBK-Bangor waterfront impaired by low dissolved oxygen (DO) levels and two impaired by fecal coliforms. The two DO-impaired areas are adjacent to Marginal Wharf and Delta Pier and to the south of Service Pier (Ecology 2022). The two fecal coliform areas are between Devil's Hole shellfish beach and Keyport-Bangor dock and on the northern boundary of the base (Ecology 2022). The fecal coliform exceedances were detected in 2015 and 2016, respectively; Ecology and Department of Health have not documented exceedances since (Ecology 2022), and the two areas have been upgraded in the 2022 Assessment (pending EPA approval) to Category 4b: total maximum daily load not required because water quality standards are expected to be met through existing controls (Ecology 2025).

The 2014-2018 CWA 303(d) and 2022 Assessment (pending EPA approval) includes portions of Clear Creek listed as Category 5 (impaired) for DO and temperature for the designated use Aquatic Life—Core Summer Salmonid Habitat and fecal coliform for the designated use of Recreation—Primary Contact. A Category 5 listing indicates that the stream frequently exceeds the DO and temperature thresholds required to support healthy salmonid populations during peak summer months.

Stormwater discharges from urbanized, non-industrial areas at NBK-Bangor are covered under a Phase II MS4 permit, EPA permit WAS026646 (EPA Region 10 2020). Under the permit, the Navy must develop and implement a stormwater management program for covered facilities and include the following control measures: public education and outreach, public participation and involvement, illicit discharge detection and elimination, new development and redevelopment requirements, construction site runoff control, post-construction runoff control, pollution prevention, and good housekeeping.

Industrial stormwater discharges on NBK-Bangor are covered under EPA's 2021 Multi-Sector General Permit (MSGP) (EPA 2021). This permit requires preparation of a SWPPP (NAVFAC NW 2021) that identifies sources and potential sources of pollutants that may reasonably be expected to affect the quality of stormwater discharges associated with industrial activities at NBK-Bangor; defines practices and measures for minimizing and controlling pollutants in discharges; establishes a plan for implementing the practices and measures; establishes a mechanism for ensuring implementation; and establishes a plan for evaluating effectiveness of controlling and reducing pollution of stormwater discharges.

The EPA's 2021 MSGP requires water quality monitoring at outfalls within the ROI. The closest sampling locations to Upland Site-North are the Devil's Hole Lake outfall to the beach and the TRF stormwater pond outfall north of Sturgeon Street. The sampling location for Delta Pier is the stormwater pond outfall to Devil's Hole Lake. The sampling location at Upland Site-South is the public works ponds outfall that then discharges to the unnamed tributary to the west fork of Clear Creek.

Under the EPA 2021 MSGP, the Devil's Hole Lake outfall is sampled for fecal coliform during dry weather surveys and the results are always very low, less than 10 coliform units per 100 milliliters. In 2021 and 2022, for four quarters, the TRF stormwater pond outfall north of Sturgeon Street was monitored per the EPA 2021 MSGP for aluminum, copper, lead, zinc, and

nitrite/nitrate. All samples were below benchmarks, allowing halting of sampling for the remainder of the permit cycle until the beginning of the fourth year of coverage. At the end of 2024, the beginning of fourth year of sampling commenced and three quarters of sampling have all been below benchmarks. Chemical oxygen demand, Total Suspended Solids (TSS), polycyclic aromatic hydrocarbons (PAHs), and pH have also been sampled under different permit frequencies and have all been in acceptable ranges. PAH results have been below detectable limits. Additionally, qualitative observations of turbidity, or lack thereof, are recorded during inspections. The outflow of the TRF stormwater pond discharge is consistently clear with no visible turbidity.

NBK-Bangor monitors water quality at the Delta Pier Stormwater Pond outfall to Devil's Hole Lake, which is close to the Pier Site. In 2017, for four quarters, the outfall was monitored per the EPA 2015 MSGP for aluminum, iron, lead, zinc, and copper. Copper and zinc were sampled monthly where the others were quarterly. Samples were below benchmarks, allowing halting of sampling for the remainder of the permit cycle.

The public works ponds outfall at Upland Site-South was monitored for four quarters in 2021 and 2022 per the EPA 2021 MSGP for aluminum, lead, zinc, copper, chemical oxygen demand, TSS, nitrite/nitrate, pH, PAHs, and fecal coliform. All samples were below benchmarks, allowing halting of sampling for the remainder of the permit cycle. Chemical oxygen demand, pH, and TSS are sampled quarterly for the life of the permit for this permit cycle. TSS have been mostly below the detection limit with the highest value so far being 14.0 parts per million (ppm); pH has always been within normal ranges usually around 6.82 to 7.16 pH units. Chemical oxygen demand averages about 18 ppm. PAH results have always been less than detectable limits. Quarterly visual outfall assessments have always shown the outfall water to be clear and clean, with no odor, occasionally having a slight copper-colored tint due to vegetation tannins.

3.4.1.3 Wetlands and Streams

The Upland Site-North ROI includes jurisdictional streams (tributaries to Devil's Hole Creek) and adjacent jurisdictional wetlands. The TRF stormwater management pond located within the Upland Site-North ROI is identified as a non-jurisdictional wetland area. The proposed laydown/staging area along Dorado Road would be located to the north of and adjacent to an unnamed jurisdictional stream draining to Devil's Hole Lake and then Hood Canal (Figure 3.4-2 in *Appendix B*). There are no wetlands or streams within the ROIs for Keyport Annex, Upland Site-South, Pier Site, and the other laydown/staging areas (see Figures 3.4-2 and 3.4-3 in *Appendix B*).

3.4.1.4 Floodplains

The Pier Site is located in Zone VE, a Special Flood Hazard area with a Base Flood Elevation of 17 feet (Vertical Datum NAVD88) (FEMA 2017). There are no floodplains in the ROIs for Upland Site-North, Keyport Annex, Upland Site-South, or the laydown/staging areas (see Figures 3.4-2 and 3.4-3 in *Appendix B*) (FEMA 2017).

3.4.2 Environmental Consequences

The analysis of groundwater considers the potential for impacts to the quality, quantity, and accessibility of the water. The analysis of surface water quality considers the potential for impacts to beneficial uses and water levels and impacts that may change the water quality,

including both improvements and degradation of current water quality. The impact assessment of wetlands considers the potential for impacts that may 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 may impede the functions of floodplains in conveying floodwaters.

3.4.2.1 Action Alternative

Groundwater

Construction at Keyport Annex, Upland Site-South, Pier Site, and the laydown/staging areas is not expected to encounter groundwater during excavation. However, construction at Upland Site-North may encounter groundwater during excavations or drilling. If encountered during construction, groundwater would be managed in compliance with the EPA Construction General Permit. Any construction activities would be implemented in compliance with measures identified in the Wellhead Protection Plan (NAVFAC NW 2025), including any activities within established wellhead protection areas. Construction activities would include stormwater runoff protection measures, as identified in the EPA Construction General Permit (see *Appendix E*), which would also serve to protect groundwater quality.

Following construction, there would be no additional direct disturbance of groundwater. Compliance with the NBK-Bangor MS4 permit (EPA Region 10 2020), the EPA's 2021 MSGP (EPA 2021), and EISA Section 438 would limit a potential increase in stormwater pollutant loading and thus limit a potential increase in pollution loading to the underlying groundwater aquifers (see Surface Water section for additional details on stormwater management and treatment). Impacts to groundwater recharge in the ROI would be minimized through implementation of LID strategies that would accommodate a 10-year storm frequency and ensure pre-development hydrology is maintained.

With implementation of construction BMPs (see *Appendix E*) and compliance with applicable CWA permits and other regulatory requirements, short-term adverse effects to groundwater from construction and long-term adverse effects to groundwater from operations are not expected under the Proposed Action. Therefore, implementation of the Proposed Action would not result in significant impacts to groundwater.

Other Navy projects outside the scope of the Proposed Action, as summarized in Section 3.1, would comply with applicable CWA permits and other regulatory requirements for groundwater. As a result, there would be no meaningful additive impact from these projects to the Proposed Action.

Surface Water

Construction within the ROI (i.e., Upland Site-North, Keyport Annex, Pier Site, Upland Site-South, and associated laydown/staging areas) would disturb over 1 acre. Therefore, these projects would be implemented in compliance with the EPA Construction General Permit. This would include the preparation and implementation of a SWPPP and associated BMPs and other general construction measures (see *Appendix E*) to minimize impacts from discharges to surface and marine waters. Prior to construction, a construction SWPPP would be prepared that documents the erosion and sediment control BMPs. The construction SWPPP includes a

narrative and drawings with all construction BMPs referenced and marked. It is prepared and submitted by the construction contractor before construction.

As discussed in detail in Section 2.3.2.3, stormwater during operations would be managed in compliance with UFC 3-210-10 LID; EISA Section 438; and the NBK-Bangor MS4 permit. In addition, stormwater would be managed and monitored at outfalls in the ROI in compliance with the EPA's 2021 (or current) MSGP. The Proposed Action would result in a net increase of 4.91 acres of pollutant-generating impervious surfaces (PGIS), 2.21 acres of non-pollutant generating impervious surface (NPGIS), for a total of 7.12 acres of new impervious surfaces (refer to Table 3.4-1 in *Appendix B*). In accordance with UFC 3-210-10, LID and EISA Section 438, any increase in surface water runoff because of new impervious surfaces would be attenuated using permanent drainage management features. Under these requirements, federal facility projects with over 5,000 square feet of new impervious surface must maintain or restore, to the maximum extent technically feasible, the pre-development hydrology of the property regarding the temperature, rate, volume, and duration of flow. LID strategies would be implemented as required to accommodate runoff due to increased impervious surfaces.

This project is considered redevelopment under the 2019 SWMMWW (Ecology 2019). All nine MRs identified in the 2019 SWMMWW would be triggered. Specifically, MR6 runoff treatment would be provided on-site for stormwater runoff from PGIS using MTDs and/or bioinfiltration swales before discharging to MR7 flow control facilities. Stormwater runoff from NPGIS would be expected to have minimal amounts of pollutants and would not need water quality treatment before discharging to MR7 flow control facilities. MR7 flow control facilities would include stormwater detention vaults, upgraded stormwater management ponds, bioinfiltration swales, and/or dispersion.

Development of the TRF Complex at Upland Site-North would result in a net increase of 0.99 acres of PGIS and 1.74 acre of NPGIS (refer to Table 3.4-1 in *Appendix B*). The parking areas and roads are expected to produce typical chemical constituents of concern found in parking lot runoff. The pollutants anticipated from the initial first flush of site runoff are PAHs; trace metals with zinc, copper, and lead; TSS; and N (1,3 dimethylbutyl) N' phenyl p phenylenediamine (6PPD) and 6PPD quinone (6PPD-q). The MR6 runoff treatment for these pollutants would be provided on-site for stormwater runoff from PGIS using MTDs and/or bioinfiltration swales before discharging to MR7 flow control facilities. Materials used for the proposed building roofs, sidewalks, and the infrequently used dirt access road are considered NPGIS, so no water quality treatment is required before discharging to MR7 flow control facilities.

Development of the TRF Complex at Upland Site-North would result in a net increase in impervious area of 2.73 acres. Increases in stormwater runoff from increased impervious area associated with the parking area, roads, Electrical Substation 4A, mechanical yard, building roofs, and sidewalks would be managed in compliance with the 2019 SWMMWW. This would be achieved by utilizing the existing TRF stormwater pond north of Sturgeon Street and/or stormwater detention vaults before being discharged to a tributary to Devil's Hole Creek (Figure 2.3-2). To accommodate and manage increased runoff, the TRF stormwater pond would be upgraded to meet MR7 for flow control as defined in the 2019 SWMMWW. Upgrading the TRF stormwater pond is expected to improve treatment for much of the existing stormwater from

the TRF Complex area. Stormwater runoff from the dirt access road would be managed in compliance with the 2019 SWMMWW through bioinfiltration swales and/or dispersion.

The new laydown area to support the proposed development at Upland Site-North would be graveled and/or paved (see Section 2.3.2.2), resulting in 3.60 acres of new PGIS (refer to Table 3.4-1 in *Appendix B*). Runoff from this area currently drains west toward Archerfish Road (Figure 2.3-1). Stormwater management would meet 2019 SWMMWW treatment requirements by employing infiltration on-site.

Because less than 2,000 square feet of impervious surface would be new or replaced hard surface at the Keyport Annex location, only MR2 (Construction SWPPP) is required per the 2019 SWMMWW requirements.

The proposed development at the Pier Site would occur over 0.20 acre of existing PGIS. Of this, 0.10 acre would be converted to NPGIS, resulting in a net reduction of 0.10 acre of PGIS and no overall change to the total impervious area (refer to Table 3.4-1 in *Appendix B*). Due to site limitations and the minor modifications, no changes to stormwater treatment are planned at the Pier Site. However, the Proposed Action is expected to result in a small improvement to stormwater quality at the Pier Site by reducing PGIS. The new laydown area to support the proposed development at the Pier Site would be graveled and/or paved (see Section 2.3.2.2), resulting in 0.20 acre of new PGIS. The laydown area would drain west to the tributary to Devil's Hole Creek. The laydown area will be designed to meet treatment and flow control requirements of the 2019 SWMMWW.

The overall development at Upland Site-South (Figure 2.3-3) would result in a net increase of 0.22 acre of PGIS (from service area, sidewalk, utility pads, paver walkway, parking lot) and 0.37 acre of NPGIS (from building roofs) (refer to Table 3.4-1 in *Appendix B*). The pollutants anticipated from the initial first flush of site runoff from PGIS are PAHs; trace metals with zinc, copper, and lead; TSS; and 6PPD/6PPD-q. The MR6 runoff treatment for these pollutants would be provided on-site using MTDs before discharging to on-site MR7 flow control facilities. Materials used for the proposed building roofs would be NPGIS, so no treatment is required before discharging to the stormwater detention vaults. Development at Upland Site-South would result in a net increase in impervious area of 0.59 acre. To accommodate and manage increased runoff, stormwater detention vaults would provide MR7 for flow control as defined in the 2019 SWMMWW.

Proposed stormwater treatment systems are designed to treat and manage up to a 25-year storm event. For a storm larger than this, the runoff would exceed capacity and full treatment/flow control would not occur. However, in the Puget lowlands, all of the largest floods in western Washington have historically been caused by atmospheric rivers with prolonged heavy rain, rather than flash flood type events (Schick 2008). Therefore, the designed stormwater systems would likely only be overwhelmed after a prolonged weather event, and the Navy expects the system will treat the first flush runoff with the highest contaminant loads over the lifetime of the system, even during large flood events. Stormwater runoff that exceeds system capacity of the bioswales and MTDs would still be routed into the detention vaults and/or the stormwater pond, which are expected to provide some stormwater treatment. However, even if a small amount of stormwater does not get treated, contaminants

that enter the streams are anticipated to dissipate through dilution effects by the time they reach the marine environment.

With implementation of construction and operations BMPs (see *Appendix E*), compliance with applicable CWA permits, and the management, treatment, and discharge of stormwater in compliance with the NBK-Bangor MS4 permit and the EPA's 2021 MSGP, the Proposed Action is not anticipated to have significant short- or long-term effects to surface water.

Other Navy projects outside the scope of the Proposed Action as summarized in Section 3.1 would comply with the applicable NBK-Bangor MS4 permit, the EPA's 2021 MSGP, UFC requirements, and the 2019 SWMMWW. Compliance with these requirements would include implementation of construction and operations BMPs to manage, treat, and discharge of stormwater. The Navy would continue to manage and monitor runoff at outfalls in the ROI in compliance with the EPA's 2021 (or current) MSGP. If exceedance of an applicable benchmark were to occur, the Navy would take applicable corrective actions in compliance with the EPA's 2021 (or current) MSGP. As a result, any meaningful additive impacts from these projects to the Proposed Action would be addressed through ongoing compliance with these surface water protection requirements.

Wetlands and Streams

Construction activities associated with the aboveground electrical system connecting to the new Substation 4A to the existing Substation 4 and the dirt access road at Upland Site-North have the potential to impact the jurisdictional wetlands and tributaries to Devil's Hole Creek. However, the overhead poles and dirt access roads would be sited to avoid direct impacts to these wetlands and streams. Upgrades to the TRF stormwater pond would occur within a non-jurisdictional wetland and would therefore not be subject to CWA Section 404 requirements, but the effects to this wetland are analyzed here pursuant to NEPA. Upgrades would include modified flow control at the outflow of the pond, and the pond would be retrofitted as needed to add capacity, resulting in short-term disturbance to this wetland area. Once upgrades are completed, the wetland would function the same as under existing conditions.

Construction of the laydown/staging area along Dorado Road would avoid dredge or fill within the adjacent unnamed stream located to the south of the site (see Figure 3.4-2 in *Appendix B*). Measures to manage and treat stormwater runoff and minimize release of pollutants (see Surface Water section for additional details on stormwater management and treatment) from construction activities and operations would reduce indirect impacts to nearby wetlands and streams. Construction activities at Keyport Annex, Upland Site-South, Pier Site, and the other laydown/ staging areas would not occur in any wetlands or streams.

With implementation of construction BMPs (see *Appendix E*) and compliance with applicable CWA permits and other regulatory requirements, short-term and long-term adverse effects to wetlands and streams during construction activities and operations are not expected under the Proposed Action. Therefore, implementation of the Proposed Action would not result in significant impacts to wetlands and streams.

Other Navy projects outside the scope of the Proposed Action as summarized in Section 3.1 would comply with applicable CWA permits and other regulatory requirements for wetlands and streams. Any project resulting in dredge or fill within jurisdictional wetlands and streams

would be subject to Section 404 permitting and may require compensatory mitigation. Compliance with these requirements would include implementation of construction and operations BMPs to manage, treat, and discharge of stormwater to wetlands and streams. Any effects to non-jurisdictional wetlands from other Navy projects would be limited because of the absence of a continuous connection to jurisdictional waters. The Navy would comply with all applicable requirements as to these wetlands. As a result, there would be no meaningful additive impact from these projects to the Proposed Action.

Floodplains

Construction activities at Upland Site-North, Keyport Annex, Upland Site-South, and the laydown/staging areas would not occur in or affect floodplains (see Figures 3.4-2 and 3.4-3 in *Appendix B*). Construction at the Pier Site would occur over Zone VE, a Special Flood Hazard area with a Base Flood Elevation of 17 feet (Vertical Datum NAVD88) (FEMA 2017); however, Delta Pier is at an elevation of 20 feet above the Base Flood Elevation.

Pre-development hydrology would be maintained at Upland Site-North, Keyport Annex, Upland Site-South, and the laydown areas through implementation of MR7 for flow control as defined in the 2019 SWMMWW and in compliance with LID and EISA Section 438. As a result, there would be no substantial increase in stormwater runoff or flooding potential. Adverse effects to floodplains are not expected and the Proposed Action would comply with Executive Order (EO) 11988 (refer to *Appendix C*). Therefore, implementation of the Proposed Action would not result in significant impacts to floodplains.

Other Navy projects outside the scope of the Proposed Action, as summarized in Section 3.1, would comply with EO 11988. Pre-development hydrology would be maintained for these projects through implementation of MR7 for flow control as defined in the 2019 SWMMWW and in compliance with LID and EISA Section 438. As a result, there would be no substantial increase in stormwater runoff or flooding potential. As a result, there would be no meaningful additive impact from these projects to the Proposed Action.

3.5 Biological Resources

Biological resources include living, native, or naturalized plants 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 supports a plant or animal.

Within this EA, biological resources are divided into four major categories: (1) terrestrial vegetation, (2) terrestrial wildlife, (3) ESA-listed species, and (4) Essential Fish Habitat (EFH). Although the Action Alternative does not involve in-water work, aquatic species that may occur within nearby streams and EFH are included due to potential impacts from stormwater runoff associated with stormwater infrastructure upgrades (see Section 2.3.2.3).

3.5.1 Affected Environment

The ROI for biological resources at NBK-Bangor is defined by the extent of airborne noise during construction and demolition activities and stormwater effects from facility operations post-construction to surface waters. The ROI is composed of four sites: Upland Site-North, Upland Site-South, Keyport Annex, and Pier Site (Figure 3.5-1 through Figure 3.5-3 in *Appendix B*). Due to dilution, effects from stormwater discharge into tributaries within the ROI are anticipated to

dissipate prior to reaching the marine environment, and, therefore, impacts to marine species and the marine environment in general, are not analyzed. This section describes the existing conditions of the ROI for vegetation, terrestrial wildlife, aquatic species (including ESA-listed species), and EFH at NBK-Bangor.

3.5.1.1 Vegetation

Besides those areas already cleared or disturbed as part of existing base operations, much of the upland area at NBK-Bangor is forested. Of its 6,155 acres, 2,093 acres are developed or disturbed lands; 3,754 acres are forested and include 54 acres of surface water and 254 acres of wetlands (NBK 2018). Common tree species include red alder (*Alnus rubra*), Douglas fir (*Pseudotsuga menziesii*), western hemlock (*Tsuga heterophylla*) and western red cedar (*Thuja plicata*), western white pine (*Pinus monticola*), lodgepole pine (*Pinus contorta*), and grand fir (*Abies grandis*) (NBK 2018).

3.5.1.2 Terrestrial Wildlife

Terrestrial wildlife that may be present at NBK-Bangor are those associated with Kitsap and Jefferson Counties, including species such as black bear (*Ursus americanus*), coyote (*Canis latrans*), opossum (*Didelphis virginiana*), raccoon (*Procyon lotor*), river otter (*Lutra canadensis*), and black-tailed deer (*Odocoileus hemionus*) (NBK 2018). Native amphibians such as Northwest salamanders (*Ambystoma gracile*), rough-skinned newts (*Taricha granulosa*), red-legged frogs (*Rana aurora*) and Pacific tree frogs (*Hyla regilla*) may readily be found within the vegetated areas of the installation.

Over 100 species of birds are likely to occur at NBK-Bangor and the majority are afforded protection under the Migratory Bird Treaty Act (MBTA). Species that are mostly likely to be present in the ROI are identified in Table 3.5-1 in *Appendix B*. The large variety of MBTA-protected birds associated

with the upland habitat present include passerines such as American robin (*Turdus migratorius*), house finch (*Haemorhous mexicanus*), and northwestern crow (*Corvus caurinus*) (NBK 2018). The installation also hosts numerous species of waterfowl, wading birds and raptors, including buffleheads (*Bucephala albeola*), mallards (*Anas platyrynchos*), great blue herons (*Ardea herodias*), gulls (*Larus* spp.), killdeer (*Charadrius vociferous*) and osprey (*Pandion haliaetus*). Dozens more bird species are known to occur seasonally. The Navy works with the U.S. Department of Agriculture, Animal & Plant Health Inspection Service to implement USFWS-approved control measures to reduce chronic problems with nesting birds and other nuisance wildlife (NBK 2018).

Bald eagles are protected under the Bald and Golden Eagle Protection Act (BGEPA; 16 U.S.C. Sections 668-668d), which prohibits take of eagles, their eggs, or their nests unless otherwise authorized. One active bald eagle nest is known at NBK-Bangor (Figure 3.5-4 in *Appendix B*) (NBK 2018). The nest is situated more than 660 feet from all proposed project footprints but within the ROI.

3.5.1.3 Aquatic Species

Tributaries of Devil's Hole and Clear Creek that are present on NBK-Bangor and within the ROI provide habitat for various fish species. Species found in these tributaries include coho salmon (*Oncorhynchus kisutch*), rainbow trout (*O. mykiss*), pink salmon (*O. gorbuscha*), cutthroat trout

(*O. clarkii*), three-spine stickleback *(Gasterosteus aculeatus*), and species of sculpin (family Cottidae) (NBK 2018). ESA-listed Puget Sound steelhead and Puget Sound Chinook may also occur and are discussed in more detail below.

3.5.1.4 ESA-listed Species

ESA-listed species that may be present within the ROI include marbled murrelet, Puget Sound steelhead, and Puget Sound Chinook. These species are discussed below.

Marbled Murrelet

The Washington, Oregon, and California population of the marbled murrelet was federally listed as threatened in 1992 by the USFWS (57 Federal Register [FR] 45328) and the species status was affirmed in 2010, following a petition to delist (75 FR 3424).

Critical habitat was designated for this species in 1996 (61 FR 26256), revised in 2011 (76 FR 61599), and affirmed in 2016 (81 FR 51348), and includes only upland forest areas. No critical habitat is designated within the ROI. The closest marbled murrelet critical habitat is located approximately 7 miles west of the ROI on the Olympic Peninsula. Critical habitat for marbled murrelet is not discussed further in this document.

Marbled murrelets typically forage in pairs and are highly vocal when above the surface (Strachan et al. 1995). On the water's surface, birds generally remain within approximately 100 feet (30 meters) of their partners during foraging bouts, and these vocalizations are believed to facilitate foraging efficiency (Strachan et al. 1995; Carter and Sealy 1990). Marbled murrelets have been documented exhibiting foraging behavior in the nearshore waters of Hood Canal adjacent to NBK-Bangor since 2001 (Kitsap Audubon Society 2008; Agness and Tannenbaum 2009; Navy 2009a; Tannenbaum et al. 2009, 2011; Pearson and Lance 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021; Pearson et al. 2022, 2023, 2024). WDFW has conducted at-sea surveys during the breeding season for nearly two decades, beginning with the 2007 study by Raphael et al., and for over a decade has conducted fall and winter surveys funded by the Navy, as summarized in the Pearson and Lance reports cited above. Within this sampling framework, the ROI is located in Stratum 3, which encompasses northern Hood Canal. Marbled murrelet at-sea abundance in Stratum 3 is highest in November and December, averaging approximately two individuals per square kilometer and around 0.5 individuals January through April and September through October (Pearson et al. 2022). During the breeding season, density estimates for northern Hood Canal and the San Juan Islands ranged between one and 2.5 individuals per square kilometer, on average (Pearson and Lance 2021).

Over the course of three years of monitoring between July 2012 and January 2015 during three in-water work windows during the construction of a wharf two miles north of the ROI, only a single individual was observed within 500 feet of the construction activities (Hart Crowser 2013, 2014, and 2015). Summarily, foraging murrelets are present in the NBK-Bangor adjacent waters, though are rarely observed close to active piers and mission areas, potentially due to the high levels of noise and vessel traffic in the areas. Agness et al. (2009) similarly concluded that vessel traffic caused significant declines in nearshore densities of Kittlitz's murrelets, a species closely related to marbled murrelets, in Glacier Bay, Alaska. Marbled murrelets would likely be present in deeper waters further out from the shoreline where the in-air noise zone of influence extends, but would be unlikely to be present within visual distance of the Proposed Action.

Figure 3.5-5 in *Appendix B* shows sightings of marbled murrelet in Hood Canal recorded over nearly two decades of surveys.

Marbled murrelets nest solitarily in coniferous old-growth forests, typically in stands 200 to 250 years old with a multi-layered canopy structure. Old-growth forest is the preferred nesting habitat, though the species is also known to nest in mature second-growth forest with trees as young as 180 years old (Hamer and Nelson 1995). Forest stand inventories on NBK-Bangor indicate that most stands are less than 110 years old; however, some relict old-growth trees occur near Devil's Hole, and a small old-growth stand is present at the northern portion of the base (International Forestry Consultants 2001; Jones, T., Pers. Comm. 2010). Potential nesting habitat is characterized by coniferous trees within 55 miles of marine waters that support at least one 4-inch diameter platform located at least 33 feet off the ground, with horizontal and vertical canopy cover. In general, nest trees are greater than 19 inches in diameter at breast height and over 98 feet tall (USFWS 2012, 2016; Navy 2023). In other areas where marbled murrelet nests are present, surrounding "buffer trees" may contribute to nest site suitability and protection from disturbance (USFWS 2016; 2020).

The eastern side of the proposed powerline route within Upland Site-North is currently forested. The forest's canopy is largely composed of second-growth conifers like Douglas fir (*Pseudotsuga menziesii*), western red cedar (*Thuja plicata*), and western hemlock (*Tsuga heterophylla*). Beneath them, the shrub and ground-cover layer is dominated by salmonberry (*Rubus spectabilis*) and sword fern *(Polystichum munitum*). Patches of first growth red alder (*Alnus rubra*) and Himalayan blackberry (*Rubus armeniacus*) are interspersed on the eastern side of the proposed powerline corridor. Large-diameter (greater than or equal to 32 inches diameter at breast height) Douglas firs are relatively uncommon within the proposed powerline corridor, and tree removal would primarily involve smaller diameter second-growth trees. The western side of the proposed powerline site would be routed along the forest edge and may result in clearing red alder and second-growth Douglas fir trees. The Navy surveyed the forested stand within the Upland Site-North portion of the ROI for the proposed powerline corridor to assess potential marbled murrelet habitat. Three trees with platforms at least four inches in size were observed. Two of these trees had a single platform in forked tops, and the platform lacked suitable cover and substrate for marbled murrelets and would therefore not be considered suitable nest trees. One large Douglas fir (approximately 42 inches diameter at breast height) had at least two branches that likely would provide four-inch platforms. However, the tree is a relic older tree and the canopy sticks above the rest of the canopy height, making these platforms very exposed, and therefore they lacked adequate cover. Additionally, the tree lacked adequate substrate on branches. Overall, the stand is not suitable for marbled murrelet nesting as it lacks adequate substrate and it is edge habitat adjacent to an industrial area.

Since 2016, occupancy surveys for marbled murrelet have been completed at NBK-Bangor (see Figure 3.5-6 in *Appendix B*). Recent occupancy surveys conducted in 2024 and 2025 included one area north of the Pier Site (outside of the ROI) and another overlapping the Upland Site-South portion of the ROI (Raedeke 2025a,b) (Figure 3.5-7 in *Appendix B*). No murrelets were detected over the course of 144 surveys conducted in 2024 and 2025 (Raedeke 2025a,b). Previously, occupancy surveys were conducted in 2016, 2017, and 2018 at NBK-Bangor,

overlapping the Upland Site-North and Dorado Road laydown areas portion of the ROI. In 2016, one marbled murrelet was observed flying well above the tree canopy in the vicinity of Upland Site-North. This sighting was not part of the survey results depicted in Figure 3.5-5 in *Appendix B* and is therefore not depicted in that figure. No marbled murrelets were detected during surveys in 2017 or 2018 (Hamer 2019) (Figure 3.5-6 in *Appendix B*). The closest documented observations of subcanopy behavior indicating occupied nesting habitat occurs approximately 7 miles away from the ROI on the Olympic Peninsula (WDFW 2022).

In addition to areas that have been previously assessed and surveyed for marbled murrelets, Figure 3.5-7 and Figure 3.5-8 in *Appendix B* illustrate the modeled probability of suitable murrelet nesting habitat within the ROI based on regional habitat characteristics (Lorenz et al. 2021). This model maps the probability of nesting habitat being present within a grid cell throughout the species' range based on forest covariates that describe forest composition, structure, and stand age (Lorenz et al. 2021). The model does not identify confirmed habitat, occupied sites, or nest locations, and does not incorporate site-specific factors such as forest patch size, edge effects, proximity to development, or human activity, which are known to influence marbled murrelet nesting suitability.

Modeled results indicate that habitat within the 110-yard buffer of the Proposed Action locations is generally categorized as "lower" or "moderate" probability nesting habitat as described by Lorenz et al. (2021); however, there are some areas where the habitat model indicates that it may be high probability of nesting habitat, such as the laydown/staging yard to the southeast of the Pier Site. These high-probability modeled areas are immediately adjacent to unforested areas or development, which likely precludes the site from being suitable habitat for nesting murrelets due to sensitivity to edge effects (USFWS 2016). Habitat between 110 yards and the outermost boundary of the ROI (i.e., 548 feet at the Keyport Annex, 1,044 feet for soft sites, and 7,062 feet for overwater noise at the Pier Site) is largely low to moderate, with some pockets of higher probability nesting habitat.

Canopy height can be used to review potential marbled murrelet habitat. Figures 3.5-9 and 3.5-10 in *Appendix B* illustrate canopy height models in relation to the Proposed Action footprint and ROI. During 170 occupancy surveys across multiple sites and multiple years at NBK-Bangor, no occupancy behaviors were detected. Table 3.5-2 in *Appendix B* provides a general description of modeled habitat and canopy heights within the ROI, by proposed site.

Puget Sound Steelhead Distinct Population Segment

The Puget Sound steelhead distinct population segment (DPS) was listed as threatened under the ESA in May 2007 (72 FR 26722; May 11, 2007). The DPS includes all naturally spawned anadromous winter-run and summer-run steelhead (*O. mykiss*) populations originating below natural and man-made impassible barriers from rivers flowing into Puget Sound from the Elwha River (inclusive) eastward, including rivers in Hood Canal, South Sound, North Sound and the Strait of Georgia. Six artificial propagation programs are also included in this DPS (81 FR 72759; December, 2020). The proposed recovery plan for this DPS was published and made available for public comment on December 13, 2018 and finalized in 2019 (83 FR 64110; December 13, 2018; December 30, 2019).

Though the data on their presence are limited, steelhead are occasionally recorded in East Kitsap streams, including detections in outmigrant smolt traps, indicating at least intermittent

use of freshwater habitats for juvenile outmigration (McWain et al. 2025). In the Devil's Hole watershed, one steelhead smolt was documented emigrating over the course of a two-year survey (Volkhardt et al. 2000). During that study, a fish trap was deployed in the fish ladder between early April and mid-June in 1999 and 2000 to capture emigrating fish, and the steelhead smolt was caught at that location. Volkhardt et al. (2000) also surveyed Devil's Hole Lake in September 1999 via electrofishing, baited traps, and gill netting.

Two subsequent survey efforts in Devil's Hole Lake and its tributaries (Bhuthimethee et al. 2009; Pelekai et al. 2024) did not document steelhead presence. These studies surveyed Devil's Hole Lake via similar methods to Volkhardt et al. (2000) in addition to adding hook and line surveys in June and August, respectively. Both studies electrofished Devil's Hole Creek during the same time frames. Spawner surveys in Devil's Hole Creek conducted between October and December in 2007, 2024, and 2025 (Bhuthimethee et al. 2009, *Navy unpublished data*) likewise did not document steelhead. Collectively, these survey results indicate that steelhead presence in the Devil's Hole watershed is very rare. Based on best available science, the Navy interprets Devil's Hole watershed as occasional foraging and rearing habitat rather than spawning habitat for steelhead, given the lack of adult observations and the absence of fry documentations in the system.

Outside of NBK-Bangor, spawning surveys conducted during March and April, between 1999 and 2001, resulted in three observations of adult steelhead in mainstem Clear Creek (ESA Associates and Suquamish Tribe 2020). Although there is no recent survey data available, steelhead may use Clear Creek for spawning but expected to be rare and not likely within tributaries located on NBK-Bangor.

Critical habitat has been designated for the Puget Sound steelhead in 2016 (81 FR 9252) that includes approximately 2,031 stream miles of freshwater and estuarine habitat within the occupied geographical range by this DPS. No marine areas and no freshwater systems at NBK-Bangor were designated. However, critical habitat is designated for Puget Sound steelhead within a section of Clear Creek, approximately two miles downstream of Upland Site-South and is within the water quality ROI (see Figure 3.5-11 in *Appendix B*). Physical and biological features (PBFs) of critical habitat are those habitat characteristics that are essential to the conservation of the species. These PBFs include the following:

1. Freshwater spawning sites with water quantity and quality conditions and substrate supporting spawning, incubation, and larval development.
2. Freshwater rearing sites with water quantity and floodplain connectivity to form and maintain physical habitat conditions and support juvenile growth and mobility; water quality and forage supporting juvenile development; and natural cover such as shade, submerged and overhanging large wood, log jams, and beaver dams, aquatic vegetation, large rock and boulders, side channels and undercut banks.
3. Freshwater migration corridors free of obstruction with water quantity and quality conditions and natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels, and undercut banks supporting juvenile and adult mobility and survival.

Puget Sound Chinook Salmon Evolutionarily Significant Unit

The Puget Sound Chinook salmon Evolutionarily Significant Unit (ESU) was listed as threatened under the ESA on March 24, 1999 (64 FR 14308). The 2016 5-year status review for all Pacific salmon and steelhead was published with no changes to listing status warranted for any of the listed salmon and steelhead (NMFS 2016). This ESU was updated on April 14, 2014 (79 FR 20802) to include all wild (natural spawned) populations of Chinook salmon from rivers and streams flowing into Puget Sound, including the Strait of Juan de Fuca from the Elwha River eastward and rivers and streams flowing into Hood Canal, South Sound, North Sound, and the Strait of Georgia in Washington, and 26 artificial propagation programs (81 FR72759).

Chinook salmon have not been documented in the Devil's Hole watershed over the course of multiple survey efforts described above for Puget Sound steelhead. However, juvenile Chinook have been documented utilizing non-natal coastal streams, such as Cattail Creek (at the northern tip of NBK-Bangor) for temporary refuge and saltwater acclimation. Fall-run Chinook are known to occur in Clear Creek and an unnamed tributary thereof; with the closest occupied stream is approximately 0.3-mile southeast of NBK-Bangor (WDFW 2025). Regional information from the West Sound Partners for Ecosystem Recovery (WSPER) East Kitsap watershed update provides additional context for Chinook occurrence in the broader West Sound/East Kitsap area. Chinook are commonly observed spawning in some larger streams in the WSPER Lead Entity area; however, the Puget Sound Technical Recovery Team concluded these were not independent populations under National Oceanic and Atmospheric Administration Fisheries criteria and likely did not occur in large numbers historically. Adult Chinook in the WSPER Lead Entity area are managed exclusively for hatchery production (WSPER 2025).

3.5.1.5 Essential Fish Habitat

The waters of the greater Puget Sound are designated EFH for Pacific Coast Groundfish, Coastal Pelagic Species, and Pacific Coast Salmon (Pacific Fishery Management Council [PFMC] 2025, 2024a, 2024b, respectively). Because the effects from stormwater runoff that enter the tributaries of Devil's Hole and Clear Creek within the ROI from facility operations are expected to dissipate due to dilution before entering the marine environment, there would be no effect to Pacific Coast Groundfish, Coastal Pelagic, or marine Pacific Coast Salmon EFH. Only designated freshwater Pacific Coast Salmon EFH is within the ROI and described below.

The *Pacific Coast Salmon Fishery Management Plan* identifies salmon stock and EFH managed under the Magnuson-Stevens Fishery Conservation and Management Act (MSA). These managed salmon include most of the Chinook salmon (*Oncorhynchus tshawytscha*) stocks and all the coho salmon (*Oncorhynchus kisutch*) stocks in Washington and pink salmon (*Oncorhynchus gorbuscha*) stocks originating from watersheds within Puget Sound. Since each species uses a variety of habitats, the management plan identifies watersheds rather than specific habitats that are essential to the species (PFMC 2024b).

Designated freshwater EFH for Pacific Coast salmon includes all streams, lakes, ponds, wetlands, and other currently viable bodies of freshwater and the substrates within those waterbodies accessible to Pacific Coast salmon (PFMC 1999). This includes tributaries of Devil's Hole and Clear Creek (see Figure 3.5-1 in *Appendix B*). No marine Pacific Coast Salmon EFH is present within the ROI.

Pacific Coast Salmon EFH is primarily affected by the loss of suitable spawning habitat, barriers to fish migration (habitat access), reduction in water and sediment quality, changes in estuarine hydrology, and decreases in prey food source. Freshwater EFH for Pacific Coast salmon includes four main components (PFMC 2024b):

- Spawning and incubation
- Juvenile rearing
- Juvenile migration corridors
- Adult migration corridors and holding habitat

Tributaries of Devil's Hole and Clear Creek are used by coho salmon for spawning and rearing (WDFW 2025). Tributaries, along with connected stream segments, provide migration corridors and seasonal holding areas that support other freshwater EFH functions for Pacific Coast Salmon. Coho typically rear in freshwater streams for roughly 18 months before migrating to marine environments (National Oceanic and Atmospheric Association Fisheries 2022). Chinook and pink salmon have not been detected in Devil's Hole Lake and its tributaries. Fall-run Chinook occur in Clear Creek.

Within the larger area of EFH for Pacific Coast salmon, the PFMC has designated five habitat areas of particular concern (HAPCs) that are of particular importance to salmon (PFMC 2024b). Three Pacific Coast Salmon HAPCs occur within the ROI and include complex channels and floodplain habitats, thermal refugia, and spawning habitat.

Designated HAPCs are regarded as essential for the protection of federally managed species. HAPCs may be more vulnerable to degradation than the more general EFH designated by the PFMC. HAPCs are designated based on four criteria: rarity of the habitat type, ecological importance to EFH species, sensitivity of the habitat to human-induced environmental degradation, and whether and to what extent development will stress the habitat type. Categorization as HAPC does not confer additional protection or restrictions to the designated area.

3.5.2 Environmental Consequences

3.5.2.1 Action Alternative

Vegetation

Under the Proposed Action, the Navy would demolish, construct, and renovate facilities at one waterfront and three upland locations on NBK-Bangor. To accommodate laydown areas at Archerfish and Dorado Road, the new Substation 4A and transmission lines at the Upland Site-North, up to 10.9 acres of vegetation, including second-growth forest, would be removed and annual vegetation management would be required along the proposed transmission line corridor. This would result in a permanent reduction of vegetation in the ROI, including reduced biodiversity and fragmentation from adjacent vegetated habitat. However, this reduction would be small in scale compared to overall vegetation present on NBK-Bangor. Therefore, the Proposed Action would not result in significant impacts to terrestrial vegetation.

Terrestrial Wildlife

Proposed construction, demolition, and staging activities have the potential to impact terrestrial wildlife. Removal of vegetation within two of the laydown areas and forest

associated with Upland Site-North would remove vegetation that may serve as habitat used by terrestrial species. This would result in a permanent loss of habitat, potentially creating competition with other terrestrial species for adjacent habitat that is already occupied. However, this reduction in habitat would be small in scale, localized, and not significant. Upland construction would temporarily increase human activity levels above baseline, which could potentially result in short-term visual disturbance to wildlife located within the ROI. The use of construction equipment would also temporarily increase noise levels above ambient levels. Following the completion of construction, the noise associated with Columbia-class submarine pier side support and maintenance activities would be consistent with existing conditions at NBK-Bangor (see Section 3.8, *Noise*). Therefore, the analysis of impacts on terrestrial wildlife focuses on temporary construction-related effects.

Terrestrial wildlife may respond to increased noise and physical disturbance from human activities through temporary habitat avoidance or, in the case of bird species, modification of calls or communication strategies to adapt to increased noise environments (Duquette et al. 2021). Other impacts from temporary noise include disturbance during nesting that can interrupt incubation or brooding. Noise may also increase the risk of predation if adults flush from the nest or reduce chick provisioning if adults are delayed or disrupted while foraging (USFWS 2020). Some bird species including bald eagles that nest or forage along the marine shoreline, are commonly exposed to the existing industrial activity of NBK-Bangor, which includes ongoing military operations, vessel traffic, personnel movements, and routine maintenance activities. These species may not react to noise and human activity in the same way as other species and would likely appear to be acclimated to their surrounding environment (Caltrans 2016). Noise effects to the ESA-listed marbled murrelet, have been researched and documented by SAIC 2012; USFWS 2013a,b; and USFWS 2020, and are analyzed separately from other bird species in the *ESA-listed Species* section.

Noise and physical disturbance from human activity to terrestrial wildlife would be limited to localized construction, demolition, and staging activities within the ROI. Construction noise would be intermittent and at varying noise levels throughout the day and within the project site portions of the ROI. All construction activities would conclude within five years.

Therefore, the Navy has determined that implementation of the Proposed Action would have no significant impacts on terrestrial wildlife.

Aquatic Species

The removal of vegetation associated with the Proposed Action is expected to result in a loss of canopy cover along up to 450 linear feet of Devil's Hole tributary and the loss of up to 1.5 acres of canopy cover in the 150-foot riparian buffer. Impacts from loss of shade can delay migration timing of juvenile fish, reduce food availability, result in a loss of thermal refuge, and increase water temperatures (Heaston et al. 2018). However, these negative impacts are expected to be at least partially mitigated by retaining shrub story in the riparian buffer, which would facilitate shade and food.

The Proposed Action also includes upgrades to stormwater systems at the sites in association with a resulting net increase in impervious surface area of 7.12 acres for the project. As discussed in Section 3.4, *Water Resources* and presented in Table 3.4-1 *in Appendix B*, there would be a net increase of 2.93 acres of impervious surface in the Devil's Hole watershed

(Figure 3.4-2 in *Appendix B*), and a net increase of 0.59 acre of impervious surface in the Clear Creek watershed (Figure 3.4-3 in *Appendix B*). Stormwater runoff from 3.60 acres of impervious surface at the TRF Complex Laydown Area is expected to be managed on-site and completely infiltrate into the ground, and would not discharge to surface waters. As a result, stormwater runoff from this laydown area would have no effect to aquatic species and is therefore not discussed further in this document. Increase in impervious surfaces may result in increases in stormwater discharge volume and the potential for increases in chemicals constituents to be discharged into surface waters. Flow control requirements in the 2019 SWMMWW stipulate stormwater runoff from a site must be equivalent to the runoff from a fully forested site, which would be implemented for the Proposed Action. Flow control devices such as upgraded T-outlet at the TRF stormwater pond and detention vaults would result in consistent, slow runoff from new impervious surfaces at the project sites. No significant impacts to aquatic species habitat from increased flow, of which a majority would be captured, from the project site during runoff events is anticipated.

Potential impacts to water quality within the tributaries of Devil's Hole and Clear Creek present within the ROI and utilized by aquatic species could occur from stormwater runoff. Decreases in water quality, including increased turbidity and increases of chemical constituents may impact aquatic species. Chemical constituents of concern including PAHs, zinc, and copper have well-documented negative effects on salmonids, for example, particularly during spawning and juvenile stages (Dunagan 2021; Tian et al. 2021; Flores 2023; NMFS 2024). In addition, an antioxidant used in tires to prevent cracking and extend their lifespan and its byproduct are emerging contaminants of concern from roadway and parking lot runoff: 6PPD and 6PPD-q (Navickis-Brasch et al. 2022). Sensitivity to 6PPD-q concentrations widely varies by species and does not have an established phylogenetic relationship, meaning closely related species do not necessarily have similar sensitivities (Brinkmann et al. 2022; French et al. 2022).

As discussed in Section 3.4, there would be a net increase of impervious surface area. However, the Proposed Action would provide additional treatment and flow control for stormwater runoff to the Devil's Hole and Clear Creek tributaries. In accordance with the NBK MS4 permit, new and redevelopment would comply with the 2019 SWMMWW and runoff from the site would be required to meet EPA water quality standards. As described in Section 3.4, the Navy has repeatedly monitored outfalls at various locations of the base, including during initial runoff events and large runoff events, and discharge has always been below the EPA limits for aquatic life for trace metals, PAHs, and TSS. Stormwater runoff water quality into the Devil's Hole Lake and Clear Creek tributaries is expected to remain similar to the Proposed Action.

Given NBK-Bangor has not yet completed 6PPD or 6PPD-q monitoring on the installation due to the quickly evolving regulatory requirements and limited commercial laboratory availability, the Navy proposes to utilize historic turbidity levels from the TRF stormwater pond discharge as an indicator for effectiveness in managing 6PPD-q. Jaeger et al. (2025) found 6PPD-q concentrations were positively correlated with TSS levels during a storm, though the correlation ratio varied across different watersheds, likely due to different sized watersheds and different stormwater runoff inputs. Turbidity can be assessed by measuring either TSS or Nephelometric Turbidity Units (NTUs): TSS measures the mass of solid particles in a sample (parts per million or milligrams per liter) and analysis must be performed in a lab whereas NTUs measure how much

light is scattered by particles and is often a quicker field measurement. Jaeger et al. (2024) compared 6PPD-q levels to turbidity (NTUs) and found that as turbidity levels increased, 6PPD-q levels generally increased in runoff and as turbidity levels decreased, 6PPD-q levels generally decreased across time and space.

Additionally, Ecology concluded 6PPD and 6PPD-q binds to soil and organic matter (Navickis-Brasch et al. 2022). As summarized in Section 3.4, the stormwater outfalls have repeatedly been sampled since 2021 to comply with the MS4 permit, and TSS was always below the EPA threshold of 30 parts per million. Under existing conditions, the detention pond and catchment basins provide adequate treatment for TSS to meet EPA water quality standards. Research suggests the existing system provides treatment for 6PPD-q as well. Because Jaeger et al. (2025) found that 6PPD-q concentrations were positively correlated with TSS levels during a storm, and because existing conditions at the catchment basins and detention pond provide adequate treatment for TSS to meet EPA water quality standards, the Navy concludes that the existing system provides a similarly correlative treatment of 6PPD-q as well. Additionally, the outflow of the TRF stormwater pond discharge was consistently clear with no visible turbidity during observations at time of sampling events.

Ecology assessed effectiveness in treating 6PPD-q of various stormwater treatment and flow control BMPs (Navickis-Brasch et al. 2022). The effectiveness of biofiltration swales and media filter drains rated “High,” though some devices are rated “Medium,” dependent on the manufacturer and treatment system (Navickis-Brasch et al. 2022). The stormwater runoff would be directed to detention vaults, which provide medium treatment for TSS, and therefore similarly correlative treatment of 6PPD-q. From there, the stormwater would be directed to stormwater ponds, which also provide medium treatment for TSS, and therefore similarly correlative treatment of 6PPD-q. The Navy anticipates that implementation of medium- to high-level stormwater treatment for TSS, and therefore similarly correlative treatment of 6PPD-q and other stormwater-related contaminants would result in water quality discharging into the tributaries of Devil’s Hole and Clear Creek being maintained at levels comparable to existing conditions. This is further supported by past monitoring data as summarized in Section 3.4, lack of observation of turbidity from the stormwater discharge over time including during initial heavy runoff events, and anticipated improved conditions on-site, as discussed above.

During large storm events that exceed system capacity, the initial flush of site runoff is expected to contain the preponderance of PAHs, trace metals, and TSS and would still be routed into the detention vaults and/or the stormwater pond, which are expected to provide some stormwater treatment. Concentrations of these chemical constituents in parking lot stormwater runoff after approximately 15 minutes were found to be low or baseline concentrations (Tiefenthaler et al. 2001). Though the science on 6PPD and 6PPD-q is quickly evolving, recent studies suggest 6PPD-q behaves similarly in stormwater runoff and exhibits a first-flush dynamic, where 6PPD-q concentrations in streams increased rapidly following an initial increase in discharge and reached maximum concentrations prior to the peak discharge capturing the highest concentrations of 6PPD (King et al. 2025). The designed stormwater systems would likely only be overwhelmed after a prolonged weather event, and the Navy expects the system will treat the first flush runoff with the highest contaminant loads over the lifetime of the system, even during 25-year storm events.

Recent studies suggest 6PPD-q generally decreases in concentration in waterways as the contaminants travel downstream after a pollutant source input, when controlling for additional inputs (King et al. 2025; Jaeger et al. 2024). This could be due to a number of factors including dilution from other non-contaminated water sources, sorption and desorption processes, and chemical degradation removing 6PPD-q from the aqueous phase (Jaeger et al. 2024). As contaminants from stormwater discharge into tributaries, dilution effects would be expected to dissipate levels to the point of likely undetectable levels by the time they reach Hood Canal and Dye's Inlet. The Navy's history of monitoring these outfalls (as summarized in Section 3.4) and lack of turbidity in the discharge also supports this determination.

By complying with the NBK MS4 permit, the Navy will demonstrate continued compliance over time by maintaining water quality within current EPA standards for aquatic life. Given the implementation of stormwater treatment and flow control at the project sites, water quality conditions are expected to be maintained at levels comparable to existing conditions, and implementation of the Proposed Action would not result in significant impacts to aquatic species.

ESA-Listed Species

Marbled Murrelet

Elevated terrestrial noise can affect marbled murrelets through behavioral and physiological responses, including temporary reductions in hearing sensitivity, habitat avoidance, disruption of nesting behavior, and reduced foraging efficiency (Dooling and Popper 2007; USFWS 2020). Noise disturbance occurring in close proximity to an active nest, particularly within the line-of-sight of a nesting murrelet, has the greatest potential to disrupt nesting behaviors by causing adults to flush from nests, interrupt incubation or chick provisioning, or increase the risk of predation on eggs or chicks (USFWS 2020). Disturbance during foraging or prey delivery may also interrupt feeding attempts or reduce provisioning to chicks if nesting occurs nearby.

Noise may additionally mask vocalizations and other biologically relevant sounds used by marbled murrelets to maintain pair communication, detect predators, and support foraging behavior (Dooling and Popper 2007; Strachan et al. 1995; Carter and Sealy 1990). While masking and temporary reductions in hearing sensitivity are considered potential effects, disturbance to nesting and foraging behavior represents the primary mechanism of concern for marbled murrelets.

The USFWS Programmatic Forest Management Activities on Olympic National Forest Biological Opinion established specific criteria for analyzing impacts to marbled murrelets in forested habitats that may provide nesting habitat or behavioral use for the species. The Proposed Action could result in temporary behavioral disturbance from elevated noise levels associated with equipment used for demolition, construction, and renovation activities, as well as removal of forested areas that may provide suitable nesting habitat for marbled murrelets. Analysis of impacts were evaluated in the context of criteria established in past USFWS Biological Opinions and research publications that analyzed disturbance in suitable nesting habitat and masking effects on foraging marbled murrelets resulting from elevated airborne noise during similar activities (SAIC 2011, 2012; USFWS 2013a;b, 2020, 2023). Masking occurs when marbled murrelets are exposed to loud sound levels for long periods, which could result in take of the

species by blocking communication between pairs, disrupting foraging or causing disorientation and/or injury.

Ambient background noise levels were estimated at 55 A-weighted decibels (dBA) at Upland Site-North, Keyport Annex, Upland Site-South, and ranging from 55 to 85 dBA at the Pier Site. This ambient baseline is based on noise levels measured during an on-site noise monitoring study conducted at NBK-Bangor (Illingworth and Rodkin 2012).

Noise levels for the proposed activities would temporarily exceed the ambient sound level within the ROI. Heavy equipment would be used for demolition, construction, renovation, and tree clearing. The three construction noise sources with the highest maximum value of a noise level (maximum sound level [L_{max}] measured at 50 feet) from a single event are assumed to be shears (on backhoe) (96 dBA at 50 feet) for felling trees or cutting metal, a jack hammer (88 dBA at 50 feet), and a concrete paver and slip former (91 dBA at 50 feet) (Washington State Department of Transportation [WSDOT] 2025a). In the case that all three pieces of equipment were running at the same time (which would be highly unlikely), the maximum in-air noise is estimated at 98 dBA measured at 50 feet for each site, except for Keyport Annex site, where jack hammering is estimated at 88 dBA at 50 feet (WSDOT 2025a).

Construction noise is considered a point source. Attenuation of noise across a landscape differs based on natural features of the landscape, such as topography, vegetation, development, and temperature.

Hard site conditions occur where the surrounding area consists primarily of water, hard-packed earth, or concrete, and noise from a point source decreases by approximately 6 dBA per doubling of distance (WSDOT 2025a). Soft site conditions occur where the surrounding landscape is predominantly vegetated or consists of unpacked soil, and noise decreases by approximately 7.5 dBA per doubling of distance (WSDOT 2025a). For the soft site conditions with dense intervening vegetation (e.g., trees and shrubs between the noise source and the receptor) an additional initial reduction of approximately 10 dBA may occur (WSDOT 2025a).

At the Pier Site, hard site conditions were assumed for sound propagation across Hood Canal due to the open-water environment, whereas soft site conditions were assumed for sound propagation on the terrestrial side of the Pier Site where vegetated upland areas are present. Soft site conditions were assumed for Upland Site-North, Keyport Annex, Upland Site-South, the terrestrial side of the Pier Site, and the laydown/staging areas, which are characterized by forested and grass-covered areas.

Table 3.5-3 in *Appendix B* shows the noise reduction factors for a given distance from the construction equipment until sound levels attenuate to ambient terrestrial level of 55 dBA, which represents typical background conditions at NBK-Bangor in the absence of construction activities (see Section 3.8, *Noise*). Since all project activities would occur on land, no noise would be generated directly within the water. Airborne noise generated from terrestrial sources is not expected to enter the water column because a sound wave propagating from any source must enter the water at an angle of incidence of about 13 to 14 degrees or less from the vertical for the soundwave to continue propagating under the water's surface. At greater angles of incidence, the water surface acts as an effective reflector of the sound wave and allows very little penetration of the wave below the water (Richardson et al. 1995; Navy 2025b).

Based on the noise attenuation assumptions detailed in Table 3.5-3 in *Appendix B*, project construction noise is estimated to attenuate to ambient sound levels (55 dBA) 1,044 feet away from the upland sites and laydown areas, 548 feet from Keyport Annex, and 7,062 feet away where construction noise extends overwater (see Figure 3.5.1 in *Appendix B*).

As described in Section 3.5.1, marbled murrelets typically perform foraging dives in pairs and may be vocal above the water's surface, generally remaining within 100 feet (30 meters) of their partners during foraging bouts (Strachan et al. 1995). Foraging behavior in murrelets relies on close coordination and may be sensitive to disturbance from elevated noise levels. Potential responses to airborne noise include temporary avoidance of affected areas, altered surfacing or diving behavior, disruption of pair coordination, startle responses, or short-term displacement from foraging locations. Masking of vocalizations represents one possible response pathway; however, behavioral disturbance more broadly—including interruption of foraging activity or prey delivery—may reduce foraging efficiency if disturbance occurs repeatedly or over a sufficiently large area (Strachan et al. 1995; Carter and Sealy 1990). Given the limited intensity and short duration of construction noise and the distances at which noise attenuates to ambient levels, any behavioral responses are expected to be temporary and localized.

No impact pile driving is proposed for the project, which is typically the only construction activity analyzed for masking effects to foraging marbled murrelets (SAIC 2012). Micro-pile installation is proposed at Upland Site-North for foundation support. Micro-pile installation would utilize duplex drilling rather than louder impact or vibratory methods, and associated noise levels are expected to be similar to auger drilling or rock drilling (84 dB at 50 feet), depending upon the substrate material. Noise levels produced from micro-pile installation are expected to be lower than noise produced from the activities modeled in Table 3.5-3 in *Appendix B*.

As discussed in Section 3.5.1, murrelets are not typically observed close to the shoreline near the NBK-Bangor industrial waterfront and have generally been documented further offshore (see Figure 3.5-5 in Appendix B). The one murrelet observed in 2016 was flying well above the forest canopy and did not exhibit subcanopy behavior indicative of nesting or foraging, and no additional marbled murrelet observations have occurred in or adjacent to the Project Area between 2008 and 2024 (see Figure 3.5-5 in Appendix B). While it is possible that individual murrelets could transit through nearshore waters, observations indicate that regular use of nearshore waters within the portions of the ROI is unlikely.

Elevated noise may result in short-term behavioral responses from murrelets, including avoidance of the ROI; however, noise would not be loud enough to mask vocalizations. Therefore, construction noise impacts to foraging individuals are expected to be discountable and insignificant. Because murrelets are unlikely to be near industrial areas, there would be no visual disturbance to foraging marbled murrelets.

Regarding potential effects to nesting murrelets, behavioral responses of concern include adults flushing from nests or perches associated with nest sites, delay or avoidance in nest establishment, interruption of chick provisioning, and disturbance during prey delivery that could result in delayed or missed feedings (USFWS 2020). The Programmatic Forest Management Activities on Olympic National Forest Biological Opinion (USFWS 2020), which synthesizes the best available science on marbled murrelet behavioral responses to disturbance (Raphael et al. 2007), developed distance-based thresholds for evaluating disturbance in

unsurveyed but suitable nesting habitat for forest management activities. That analysis identified a disturbance zone closest to the activity, a broader zone where disturbance effects were less likely, and a distance beyond which no nesting disturbance was anticipated; the disruption (harassment) threshold would be less than or equal to 110 yards (likely to adversely affect); the 'may affect' disturbance distance would be between 110 yards and 0.25 mile (not likely to adversely affect); and there would be no effect on nesting behavior to murrelets in habitat more than 0.25 mile away (USFWS 2020).

Conditions at NBK-Bangor differ substantially from the forested, relatively undeveloped conditions in the Olympic National Forest Biological Opinion, including differences in land use, forest configuration, edge conditions, and the nature of construction activities. For this reason, the distance thresholds from USFWS 2020 are not applied here as regulatory determinations, but they are used cautiously as contextual information to inform a conservative evaluation of potential disturbance distance. Visual disturbance and land use context were considered alongside noise levels in assessing potential effects.

Terrestrial surveys conducted at NBK-Bangor indicate that suitable marbled murrelet nesting habitat is largely absent within the ROI and that forest stands evaluated are not occupied, as discussed in Section 3.5.1 and illustrated in Figure 3.5-6 in *Appendix B*. The nearest documented occupancy is located approximately seven miles away on the Olympic Peninsula. Second-growth forest within the Upland Site-North portion of the ROI does not constitute suitable nesting habitat due to limited platform substrate, high edge influence, and proximity to industrial development. Although some unsurveyed forested areas are located within distances comparable to the disturbance context evaluated in USFWS 2020, construction noise within these areas would be intermittent, short-term, and of lower intensity than the noise sources evaluated in that biological opinion.

Considering the absence of occupied nesting habitat near the Proposed Action, the limited suitability of nearby forested stands, the temporary and localized nature of construction noise, the distance from foraging sites, and the implementation of BMPs outlined in *Appendix E,* no significant impacts to marbled murrelets are anticipated from the Proposed Action. The Navy is consulting with USFWS under the ESA regarding potential effects to marbled murrelet from the Proposed Action.

Puget Sound Steelhead DPS and Puget Sound Chinook ESU

Puget Sound steelhead and Puget Sound Chinook occur throughout the Hood Canal and its tributaries; however, neither species has been detected in freshwater tributaries on NBK-Bangor. Available survey data indicate that the closest known observation of steelhead and Chinook occurred off-installation in downstream reaches of receiving waters. One unnamed tributary located adjacent to the Proposed Action footprint flows away from the site and connects to off-installation habitat farther downstream.

As discussed under *Aquatic Species*, potential project-related stressors relevant to ESA-listed fish include changes in riparian shade, increased turbidity, and exposure to stormwater-associated chemical constituents. If present within the ROI, Puget Sound steelhead and Puget Sound Chinook could be affected by these stressors; however, the likelihood and magnitude of

such effects are constrained by species occurrence, stormwater management practices, and site-specific hydrologic conditions.

By complying with the NBK MS4 permit, the Navy will demonstrate continued compliance over time by maintaining stormwater discharges within current EPA water quality standards for aquatic life. As discussed in Section 3.5.1.4, best available science indicates that steelhead presence in the Devil's Hole and Clear Creek tributaries is rare. Devil's Hole tributaries likely function primarily as downstream foraging or rearing habitat rather than spawning habitat. Steelhead may use portions of Clear Creek for spawning; however, such use is expected to be rare and is not likely within tributaries located on NBK-Bangor.

Subadult and, less frequently, adult steelhead or Chinook could potentially be exposed to stormwater-associated constituents during storm events over the 40-year operational life of the structure. Exposure during large storm events that temporarily exceed treatment system capacity was considered. During such events, stormwater management infrastructure provides flow attenuation, detention, and dilution, which collectively limit the magnitude, duration, and frequency of untreated discharges. The primary constituents of concern include trace metals (e.g., copper and zinc), PAHs, TSS, and emerging contaminants such as 6PPD-q. The Navy has not directly monitored 6PPD-q; however, available studies indicate that 6PPD-q concentrations in runoff are strongly correlated with TSS during storm events as discussed in *Aquatic Species*. Because the NBK stormwater system consistently maintains TSS below EPA aquatic life criteria, 6PPD-q concentrations are expected to be correspondingly low.

Anticipated concentrations of these constituents at discharge points are expected to remain well below thresholds known to cause sublethal, behavioral, or physiological effects in Puget Sound steelhead or Puget Sound Chinook. Based on stormwater system performance, treatment efficiency, and drainage basin controls, the Proposed Action would not result in exposure pathways capable of adversely affecting these species. This conclusion is independent of species occurrence and is based on the magnitude of the discharge relative to established toxicity benchmarks.

Implementation of the stormwater upgrades, compliance with applicable permits, and the impact avoidance and minimization measures identified in *Appendix E* would avoid sediment mobilization, limit contaminant loading, and minimize erosive flows to receiving waters. These upgrades would minimize impacts to water quantity and quality conditions for spawning and larval development, as well as water quality for juvenile foraging and development PBFs. Therefore, these measures directly support protection of Puget Sound steelhead designated critical habitat by maintaining water quality and hydrologic conditions necessary to support spawning, rearing, and migration. No changes to flow regimes, pollutant concentrations, or physical habitat conditions are anticipated that would impair the conservation value or function of designated critical habitat.

Therefore, with the implementation of BMPs outlined in *Appendix E* and continued compliance with stormwater permits, no significant impacts to Puget Sound steelhead, their designated critical habitat, or to Puget Sound Chinook are anticipated from the Proposed Action. The Navy is consulting with NMFS under the ESA regarding potential effects to Puget Sound steelhead and designated critical habitat and Puget Sound Chinook from the Proposed Action.

EFH

The Proposed Action may potentially impact EFH in the ROI through long-term removal of trees that would reduce riparian shade along a tributary of Devil's Hole and through operational stormwater runoff that, if not effectively managed, may cause direct or indirect chemical or biological alteration of the water and habitats in adjacent creeks. As discussed under *Aquatic Species*, loss of riparian shade can delay juvenile fish migration timing (including coho salmon), reduce food availability, eliminate thermal refuge, and increase water temperatures (Heaston et al. 2018).

With respect to stormwater runoff, untreated or poorly controlled roadway runoff has been shown to contain contaminants, including the chemical 6PPD-q, that has been shown to be highly toxic to juvenile coho salmon and to adults migrating to urban creeks to reproduce (Tian et al. 2021; Flores 2023; Dunagan 2021). However, stormwater associated with the Proposed Action would be managed in accordance with the NBK MS4 permit and the Stormwater Manual for Western Washington, including implementation of treatment and flow control BMPs designed to reduce sediment and contaminant loading prior to discharge. As discussed previously, the proposed project is expected to maintain water quality at levels comparable to baseline conditions, although stormwater runoff would continue to be discharged to freshwater aquatic habitat. Therefore, while stormwater runoff represents a conceptual pathway for EFH effects, effective treatment and control measures would avoid or minimize degradation of EFH, and adverse effects to EFH from stormwater runoff are not anticipated. The Proposed Action would not result in significant impacts to EFH. Because the Proposed Action has the potential to adversely affect Pacific Coast salmon EFH, the Navy is consulting with NMFS under the MSA.

In summary, impacts to both terrestrial and aquatic species within the portions of the ROI would be limited primarily to construction-related disturbance and long-term stormwater management in the ROI and would be minimized through implementation of BMPs. Airborne noise generated during demolition, construction, and renovation would be localized and temporary at levels above ambient conditions. Stormwater runoff would continue post-construction but would be managed through permitted infrastructure and controls designed to limit erosion, sedimentation, and contaminant transport.

Other Navy projects, as summarized in Section 3.1, would similarly contribute small incremental effects to native vegetation, wildlife, and ESA-listed species on the installation through temporary noise, minor increases in human activity, vegetation clearing for laydown/staging areas associated with projects, and modest increases in stormwater runoff. Potential effects, including increased sedimentation, pollutant transport, and reduced riparian shading, would be managed under applicable CWA requirements, including EPA Construction General Permit, through implementation of erosion and sediment controls and operational stormwater BMPs, and by retaining shrub story in the riparian buffer. These measures would not result in a meaningful additive impact to aquatic resources or EFH when considered in the context of other ongoing projects.

Accordingly, implementation of the Proposed Action would not result in significant impacts to biological resources and would not result in take of birds protected under the MBTA and BGEPA. Additionally, the Navy is consulting with USFWS and NMFS for the marbled murrelet, Puget Sound steelhead and Puget Sound steelhead designated critical habitat, and Puget Sound

Chinook, respectively, as required by Section 7(a)(2) of the ESA and consulting with NMFS as required under the MSA for impacts to EFH.

3.6 Cultural Resources

Pursuant to NHPA, cultural resources include 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 are locations where human activity measurably altered the earth or left deposits of physical remains.
- Architectural resources include standing buildings, structures, landscapes, historic districts, and other built-environment resources of historic or aesthetic significance.
- Traditional cultural places are buildings, structures, objects, sites, or districts that are significant to a living community because of its association with cultural beliefs, customs, or practices that are rooted in the community's history and that are important in maintaining the community's cultural identity.

Native American Graves Protection and Repatriation Act (NAGPRA) resources include human remains, funerary objects, sacred objects, and objects of cultural patrimony that are protected under federal law. NAGPRA establishes specific requirements for the treatment, custody, and repatriation of these materials when they are encountered on federal or tribal lands, and it mandates consultation with lineal descendants, federally recognized tribes, and Native Hawaiian organizations regarding their identification and disposition.

3.6.1 Affected Environment

The area of potential effects (APE) was determined in accordance with the definition set forth in 36 Code of Federal Regulations [CFR] 800.16(d). For this Proposed Action, the Navy determined that the APE encompasses the areas where ground disturbing activities would occur, including new construction, building demolitions and renovation, and associated laydown/staging areas. The Navy is consulting with the Washington SHPO to request an agreement with the extent of the APE. Correspondence with the Washington SHPO will be included in *Appendix I* of the Final EA, *Agency Consultation*. The Navy also invited the Jamestown S'Klallam Tribe, Lower Elwha Tribal Community, Port Gamble S'Klallam Tribe, Skokomish Indian Tribe, and Suquamish Indian Tribe of the Port Madison Reservation to consult during the NHPA Section 106 consultation process. Navy correspondence with the tribal governments on NHPA section 106 consultation will be included in *Appendix I* of the Final EA.

3.6.1.1 Archaeological Resources

Previously conducted archaeological surveys have been completed within the Keyport Annex located at NBK-Bangor, Pier Site, Upland Site-North (Parrish et al. 2013; Stell and Cardno TEC 2013 [DAHP 2024-12-09067]; Grund et al. 2025 [DAHP 2025-12-07709]), Upland Site-South (Grund et al. 2025 [DAHP 2025-12-07709]), the laydown/staging areas (not located on pavement), and the proposed stormwater utilities at Upland Site-North and Upland Site-South. No archaeological sites have been determined eligible for listing in the National Register of Historic Places (NRHP) within these locations.

3.6.1.2 Architectural Resources

There are two NRHP-eligible architectural resources within the APE of the Action Alternative: Trident Training Facility (TTF) and Delta Pier.

Constructed in 1976, TTF is a large, three-story structure made of concrete, metal, and glass, featuring four distinct wings. During the 1980s, the Navy utilized the facility to train future Trident I missile crews, playing a key role in Cold War-era defense strategies. In recognition of its architectural design, the facility received an Award of Merit in 1978 through the Naval Facilities Engineering Command (NAVFAC) and American Institute of Architects Biennial Awards Program for Distinguished Architectural Achievement. In consultation with the Washington SHPO, the Navy made the determination that TTF is individually eligible for listing in the NRHP under Criterion A for its historical association with the Trident program and its significance to Cold War military strategy, and under Criteria Consideration G, as a property achieving significance within the past 50 years (Hampton and Gissendanner 2010).

Delta Pier, which was constructed in 1978, is a large, triangular concrete pier located along the northern shoreline of NBK-Bangor. The building includes several associated structures and was specifically designed to support the refit requirements of the Strategic Weapons Facility Pacific (SWFPAC). Its configuration allows submarines to dock on either side of the triangular pier, enhancing operational efficiency. As one of only three similar piers on the West Coast, the Delta Pier holds significant historical and engineering value. It is individually eligible for listing in the NRHP under Criterion A, for its association with the SWFPAC program; under Criterion C, for its distinctive engineering and design; and under Criteria Consideration G, as a property of exceptional importance less than 50 years old (Sackett 2010).

An additional nine architectural resources are included within the APE of the Action Alternative. These resources were constructed to support strategic deterrence during the Cold War and have the potential to contribute to a Cold War-era historic district that the Navy has identified at NBK-Bangor. In consultation with the Washinton SHPO, the Navy developed a Memorandum of Agreement (MOA), which was signed by the Washington SHPO on March 31, 2026, to define the district's boundaries and contributing resources. The proposed district has a period of significance spanning from 1964, when the first buildings and structures associated with the Polaris Program were completed, to 1991, marking the end of the Cold War.

3.6.1.3 Traditional Cultural Places

No known traditional cultural places or tribal sacred places have been identified at NBK-Bangor. The Navy invited federally recognized tribes (Jamestown S'Klallam Tribe, Lower Elwha Tribal Community, Port Gamble S'Klallam Tribe, Skokomish Indian Tribe, and Suquamish Indian Tribe of the Port Madison Reservation) to consult regarding the presence of traditional cultural places or sacred sites (see *Appendix J*).

3.6.2 Environmental Consequences

Analysis of potential impacts on cultural resources considers both direct and indirect impacts in accordance with 36 CFR 800.5. Direct impacts may occur by: 1) physically altering, damaging, or destroying all or part of a resource; 2) altering characteristics of the surrounding environment that contribute to resource significance; 3) introducing visual, audible, or atmospheric elements that are out of character with the property or alter its setting; or 4) neglecting the resource to

the extent that it deteriorates or is destroyed. Direct impacts can be assessed by identifying the type and location of the Action Alternative and by determining the exact locations of cultural resources that could be affected. Indirect impacts primarily result from the effects that are farther removed from the immediate project area, including visual, audible (noise), or atmospheric changes due to project implementation and are harder to quantify.

3.6.2.1 Action Alternative

Archaeological Resources

No undiscovered archaeological resources are expected to be found in the APE. The APE has been previously surveyed, and no NRHP-eligible or listed sites have been identified. In addition, previous construction projects have likely destroyed any archaeological integrity. However, in the event of an inadvertent discovery during ground disturbing operations, the Navy would follow the post-review discovery provisions outlined in 36 CFR section 800.13. In the event that Native American human remains or cultural items subject to NAGPRA are encountered, the Navy would develop and implement a plan of action in accordance with applicable regulations. Therefore, implementation of the Action Alternative would not result in significant impacts to known archaeological resources.

Architectural Resources

Implementation of the Action Alternative would include construction of three new facilities on the NRHP-eligible Delta Pier. Although Delta Pier remains in active operational use, its NRHP eligibility is derived in part from its distinctive triangular configuration and specialized engineering design associated with the SWFPAC mission. The introduction of new facilities would alter the spatial organization, design, and visual character of the resource, diminishing the integrity of features that convey its significance. Therefore, the Proposed Action would result in an adverse effect to Delta Pier. The Proposed Action also includes improvements, additions, and new construction to TTF. These improvements would likely alter key aspects of the building's character-defining features, which contribute to its listing in the NRHP, and would therefore result in an adverse effect to historic properties. The Proposed Action also includes interior renovations, additions, and new construction for nine additional architectural resources, which are potential contributors to the Cold War-era historic district. The Navy developed an MOA with the Washington SHPO, signed on March 31, 2026, to establish the boundaries and contributing resources of the historic district. To resolve adverse effects in accordance with 36 CFR 800.6(c) and reduce impacts to a less than significant level, the Navy is currently consulting with the Washington SHPO to develop and execute a Programmatic Agreement that outlines mitigation measures for adverse effects to historic properties.

Traditional Cultural Places

No traditional cultural places have been identified at NBK-Bangor. Section 106 consultation invitation letters between the Navy and the Jamestown S'Klallam Tribe, Lower Elwha Tribal Community, Port Gamble S'Klallam Tribe, Skokomish Indian Tribe, and Suquamish Indian Tribe of the Port Madison Reservation have been sent. The Navy sent correspondence letters to representatives from the following tribes to invite them to initiate government-to-government consultation on the Proposed Action: Jamestown S'Klallam Tribe, Lower Elwha Tribal Community, Port Gamble S'Klallam Tribe, Skokomish Indian Tribe, and Suquamish Indian Tribe

of the Port Madison Reservation. Navy correspondence with tribal governments will be included in the Final EA.

Other Navy projects as summarized in Section 3.1 would also be expected to comply with required laws, regulations, and policies for cultural resources. As a result, there would be no meaningful additive impact from these projects to the Proposed Action.

3.7 American Indian Traditional Resources

This analysis addresses potential impacts from the Proposed Action and alternatives on federally recognized American Indian protected tribal resources, as defined in DoD Instruction 4710.02*, DoD Interactions with Federally Recognized Tribes* (DoD 2018): "those natural resources and properties of traditional or customary religious or cultural importance, either on or off Indian lands, retained by or reserved by or for Indian tribes through treaties, statutes, judicial decisions, or EOs, including tribal trust resources." These resources may include plants, animals, and locations associated with hunting, fishing, and gathering activities. For the purposes of this section, the term "traditional resources" will be used to encompass protected tribal resources.

3.7.1 Affected Environment

Five federally recognized tribes have reserved off-reservation fishing rights at their usual and accustomed (U&A) fishing grounds and stations as well as gathering rights located within the vicinity of NBK-Bangor secured by the 1855 Treaty of Point No Point and Treaty of Point Elliott: Skokomish Indian Tribe, Jamestown S'Klallam Tribe, Lower Elwha Tribal Community, Port Gamble S'Klallam Tribe, and the Suquamish Indian Tribe of the Port Madison Reservation.

Many of the marine species found within the vicinity of NBK-Bangor are culturally significant to the tribes. The tribes harvest traditional resources for ceremonial and subsistence uses as well as for commercial enterprises (i.e., tribal fisheries). Tribal fisheries are place oriented and, in some cases, limited to the adjudicated U&A fishing grounds. For this reason, the availability and health of marine resources and supporting habitats is a concern for tribes in this area.

Procurement of traditional resources is based on applicable geographical areas (e.g., U&A fishing grounds and stations), fishing methods, season, and species limits per day or per size.

Cedar bark gathering is a long-standing cultural practice for the federally recognized tribes in the Pacific Northwest, and its presence within the affected environment reflects both ecological conditions and ongoing cultural use. Western red cedar stands occur throughout low- to mid-elevation forests in the region, often in moist, shaded environments that support healthy bark and bough growth. These areas provide materials essential for cultural, ceremonial, and subsistence purposes, including bark for weaving and boughs for ceremonial use. Tribal members typically gather cedar in a manner that emphasizes sustainability, using selective bark-stripping techniques that allow trees to remain viable and continue growing. Within the project area, cedar resources may overlap with U&A gathering locations where tribal communities have historically accessed these materials. The availability, health, and accessibility of cedar stands therefore form an important component of the affected environment.

In accordance with federal and DoD policy, the Navy conducts government-to-government consultation with federally recognized American Indian tribes whenever proposing an action

that may have the potential to significantly affect protected tribal resources, tribal rights, or Indian lands. The Navy has invited five tribes to initiate consultation on the Proposed Action.

3.7.2 Environmental Consequences

The evaluation of impacts on traditional resources considers whether the resource itself is affected or if there is a change in access to the resource. The Navy will also carefully consider and evaluate any input provided by the tribes during consultation.

3.7.2.1 Action Alternative

The Action Alternative does not include in-water work, there are no expected significant effects to water quality or marine habitat and species, and there are no expected changes in the port security barrier openings (see Sections 3.4.2, *Water Resources* and 3.5.2, *Biological Resources*). tribal access to U&A fishing grounds and stations near NBK-Bangor would be expected to remain similar to existing conditions. Construction actions may require the felling of some cedar trees. Additionally, access to some cedar trees may be temporarily limited during periods of construction. The Navy will coordinate with the tribes to identify and evaluate potential measures to limit any impacts to accessing the resource, such as providing the tribes access to cedar bark from any felled trees. The Navy has invited consultation with affected tribes to further assess potential impacts to traditional resources. The Navy does not anticipate significant impacts to American Indian Traditional Resources. Other Navy projects as summarized in Section 3.1 would also be expected to comply with required laws, regulations, and policies for American Indian Traditional Resources. As a result, the Navy does not anticipate any meaningful additive impact from these projects to the Proposed Action.

3.8 Noise

Noise is generally defined as unwanted sound that can interfere with normal activities and/or otherwise diminishes the quality of the natural environment. Noise may be intermittent or continuous, steady or impulsive, and the source may be stationary or transient. Stationary sources are normally related to specific land uses, such as an amusement park or industrial plant. Transient noise sources move through the environment, either along relatively established paths (e.g., highways, railroads, and aircraft flight tracks around airports), or randomly. Responses to noise vary according to the type of noise and the characteristics of the sound source, the sensitivity and expectations of the receptor, the time of day, and the distance between the noise source (e.g., an aircraft) and the receptor (e.g., a person or animal). This section analyzes effects to human receptors; effects to wildlife are addressed in Section 3.5, *Biological Resources*. Additional details on the physical characteristics of noise is available in *Appendix K.*

Sound can be described with either single-event metrics like L_{max} (defined as the highest sound level measured over a specified duration, which is often defined as one-eighth of a second) or cumulative metrics like the day-night average sound level (DNL) that averages noise events over a 24-hour period. Federal guidelines recommend DNL for the assessment of impacts from long-term noise levels because DNL measures community annoyance and effects on land use compatibility most applicable to aircraft, road, and rail noise sources. The noise analysis in this EA focuses on L_{max} from the proposed construction activity because the Proposed Action would

not change the long-term noise environment and involves specific types of construction equipment.

The Kitsap County Administrative Code section 10.28.070 prescribes the county's maximum permissible environmental noise levels by property class type (A, B, C) and restricts allowable construction noise to 7 a.m. to 10 p.m. except for exemptions specified in WAC173-60-050, which includes *"Sounds originating from temporary construction sites as a result of construction activity.*" This exemption does not apply to noise within Class A Environmental Designations for Noise Abatement between 10 p.m. and 7 a.m.

3.8.1 Affected Environment

The ROI for noise at NBK-Bangor includes the project footprint, as shown in Figure 2.3-1, and the extent of airborne noise during construction and demolition activities. This section describes the nearest noise-sensitive receptors in the ROI and the existing noise environment. Potential noise-sensitive biological resources are presented in Section 3.6, *Biological Resources*.

Noise-sensitive land uses are defined as locations where noise interferes with normal activities associated with their use. Common noise-sensitive land uses include residential, educational, health, and religious structures.

Noise-sensitive receptors within NBK-Bangor include a daycare facility, healthcare facilities, a school/learning facility, and a community park and playground located within 0.6 miles of the Upland Site-South area where existing noise exposure is typical of military installations. The nearest noise-sensitive area outside of NBK-Bangor is located approximately 0.25 miles southeast of the Upland Site-South, which contains a residential area. No noise-sensitive areas are located within the project footprint.

The existing noise environment in the vicinity of the proposed project sites experiences noise from security rounds via vehicles, klaxon, automated voice warnings, and vehicle traffic from the nearby roadways and parking lots. Ambient background noise levels were estimated at 55 dBA at Upland Site-North, Keyport Annex, Upland Site-South, and ranging from 55 to 85 dBA at the Pier Site. This estimate is based on noise levels measured during an on-site noise monitoring study conducted at NBK-Bangor, which serves as the baseline condition for this analysis (Illingworth and Rodkin 2012).

3.8.2 Environmental Consequences

Analysis of potential noise effects includes assessing noise levels that would occur from the Proposed Action and determining their potential effects to noise-sensitive receptors. The analysis identifies noise source levels for the proposed activities, such as construction equipment operation, and applicable attenuation factors applied to determine the estimated noise levels that would occur at noise-sensitive locations.

3.8.2.1 Action Alternative

Proposed construction activity would utilize various types of equipment. With the goal of providing a conservative noise assessment, the analysis identified the potential noise sources with the highest single event maximum value measured at 50 feet: shears on backhoe for felling trees or cutting metal (L_{max} of 96 dBA at 50 feet), jack hammer (L_{max} of 88 dBA at 50 feet), and a concrete paver and slip former (L_{max} of 91 dBA at 50 feet) (WSDOT 2025a). The maximum noise expected to be produced by the Proposed Action would occur if all three pieces of

equipment operate concurrently at either of the two upland sites, which would generate an L_{max} of 98 dB measured at 50 feet, as calculated with the WSDOT guidelines for decibel addition (WSDOT 2025a). Table 3.5-3 in *Appendix B* tabulates the resulting L_{max} propagated out to various distances either over acoustically 'soft' or 'hard' terrain each with different attenuation factors. Micro-pile installation is proposed at Upland Site-North for foundation support. As discussed in Section 3.5, micro-piles differ from conventional piles because they utilize duplex drilling instead of impact or vibratory drilling. Duplex drilling would produce noise levels similar to auger or rock drilling, depending upon the substrate material, and would be substantially lower than noise levels produced during impact drilling. For reference, the L_{max} of an auger or rock drill measured 50 feet away is approximately 84 dB. Therefore, the estimated noise levels due to micro-pile installation would be less than presented in Table 3.5-3 in *Appendix B*.

The nearest noise-sensitive location outside of NBK-Bangor, the residential housing located approximately 0.25 miles (1,400 feet) southeast of Upland Site-South, would experience construction noise that would periodically exceed ambient levels. In the loudest condition if multiple pieces of construction equipment operate at Upland Site-South at the same time, the L_{max} experienced in that residential area could be up to 68 dB, which would equate to the sound level from a conversation experienced at 3 feet from the person speaking. During other periods, the construction noise levels experienced at these residences would be less and may not exceed ambient noise levels. Similarly, the noise-sensitive locations within NBK-Bangor (daycare facility, healthcare facilities, a school/learning facility, on-base housing, and a community park and playground) that are located less than 0.6 miles away from proposed project sites would experience periods where construction noise may exceed ambient levels. As described in *Appendix C – Regulatory Framework*, Defense Noise Working Group (DNWG) guidelines for assessment of classroom impacts specifies a screening threshold of 60 dB L_{eq8hr} based upon long-term noise. The Proposed Action would not affect long-term Leq8hr and, as detailed in Table 3.5-3 in *Appendix B*, temporary single-event L_{max} from proposed construction at Upland Site-South would not reach 60 dB so impacts at schools would not be significant.

The construction noise experienced at the residential area near Upland Site-South and at noise-sensitive locations within NBK-Bangor, such as the nearest school, would be temporary and would be consistent with DNWG guidelines. After construction, operational noise levels would be similar to baseline conditions. Therefore, the Proposed Action would not result in significant noise impacts. Other Navy projects as summarized in Section 3.1 would result in temporary noise during construction, but impacts would be intermittent and would adhere to DNWG guidelines. As a result, there would be no meaningful additive impact from these projects to the Proposed Action.

3.9 Public Health and Safety

Environmental health and safety risks generally include physical, biological, chemical, and environmental risks which can impact safety and health of those exposed to the risks. These risks may include, but are not limited to, emissions, noise, light, and traffic. Children have the potential to be more significantly affected than adults because of their greater susceptibility to development impacts, which makes them more sensitive receptors. EO 13045, *Protection of Children from Environmental Health Risks and Safety* Risks defines the environmental health

and safety risks to children as those that are products and/or substances a child may encounter or ingest. These may include, but are not limited to, air, food, water, and soil (EPA 2025b).

3.9.1 Affected Environment

The ROI for the public health and safety analysis includes NBK-Bangor (Figure 3.9-1 in *Appendix B*). The ROI includes the transportation networks used for the movement of materials and workers, where public health and safety could be affected by traffic, noise, and emissions. Additionally, the ROI includes any nearby residential areas where people are present at all times of the day and night. NBK-Bangor is a secure military installation and access is limited to military personnel, civilian employees, contractors, and military families. Although there are parks and communal outdoor spaces close to the Proposed Action locations, these areas are primarily used by adult sailors, with limited access by others. However, It is reasonable to assume that any children in the area would be accompanied by their family and would not be unsupervised. The public is allowed installation access under specific circumstances by following installation security procedures.

3.9.1.1 Air Quality

Air quality is the discussion of pollutants, standards, sources, and permitting that affect public health and safety. NBK-Bangor submits an air emissions inventory to the PSCAA annually; in 2024, the facility only had reportable quantities of volatile organic compounds (VOCs); all other criteria pollutants were below reporting thresholds. A detailed description of the existing conditions for air quality can be found in Section 3.3.

3.9.1.2 Emergency Services

Emergency services, including fire, medical, and police are provided by the trained military and civilian staff at NBK-Bangor. Hospitals offering emergency services near NBK-Bangor are the Saint Michael Medical Center and Kaiser Permanente Medical Center in Silverdale as seen in Figure 3.9-1 in *Appendix B*.

3.9.1.3 Light Pollution

Light pollution is a form of energy that can cause adverse health effects and degrade environmental quality. NBK-Bangor is an active military installation; therefore, exterior lighting is provided from dusk until dawn for safety and security throughout the installation. The proposed project area may require additional short-term illumination as needed to comply with safety and security measures during construction. New long-term lighting included under the Proposed Action would be in keeping with current conditions on-installation and would not be expected to increase light pollution off-installation.

3.9.1.4 Noise

Activities at NBK-Bangor responsible for creating the existing noise environment include industrial activities, ship operations, and vehicle traffic. Additional ambient noise in the local area not derived from activities at NBK-Bangor includes vehicle traffic, marine traffic operations, and aircraft noise from overflights. Common noise-sensitive land uses include residential, educational, health, and religious structures.

A detailed description of the existing conditions for noise can be found in Section 3.8. The existing noise environment in the vicinity of the Proposed Action sites experience noise commonly found on similar active military installations.

3.9.1.5 Contaminants of Concern

Contaminants of Concern (COCs) are hazardous substances that are derived from both natural and man-made sources that contaminate the environment. Sources of COCs include emissions from combustion engines, and may include polychlorinated biphenyl, heavy metals, arsenic, PAHs, trichloroethylene, and pesticides, etc. that are released into the air, soil and water. Public health and safety can be affected by COCs when contaminated materials are ingested, as they interfere with the body's normal functions, potentially leading to human diseases. The Pier Site is located within an area identified as a Potential Contamination Site and Installation Restoration Program Site. Potential Contamination Sites may include hazardous materials and waste such as Unexploded Ordnance and Munitions and Explosives of Concern. Installation Restoration Program Sites consist of areas that may contain soil with COCs. These sites were previously identified as having legacy contamination from past activities and have undergone and/or are currently in the process of undergoing remediation. Analysis of COCs is included in public health and safety because of their potential to create serious impacts to human health and the environment.

3.9.1.6 Occupational Health and Safety

For Navy personnel, Commander Navy Installations Command (CNIC) has implemented the Enterprise Safety Application Management System (ESAMS), a safety management software program, at installations under its command for safety and occupation health data management of mishap reports, training, direct and indirect costs, medical surveillance, and hazard analysis. ESAMS provides a means to manage all facets of the Navy's safety and health programs. ESAMS enable CNIC to fully comply with all current Occupational Safety and Health Administration (OSHA) regulations and CNIC's own occupational safety and health standards (Command Navy Region Northwest 2021).

Construction and construction support personnel that have been contracted to perform work on the Proposed Action but who are not Navy employees are subject to health and safety requirements set forth by the contractor in compliance with applicable health and safety standards for conducting work at NBK-Bangor.

3.9.1.7 Traffic

Traffic is included in public health and safety because an increase in traffic could have an impact on traffic accidents and traffic-related injuries. Traffic, transit, and non-vehicle movement are generally well-managed on the installation other than some delays at the gates during peak hours and peak periods. A detailed description of the existing conditions for traffic and transportation can be found in Section 3.10.

3.9.1.8 Security and Anti-Terrorism/Force Protection

NBK-Bangor is responsible for ensuring the security and safety of the installation. Base security is accomplished through the planned and integrated application of law enforcement, anti-terrorism activities, training, physical security, and operations security in accordance with the

January 2009 revised guidance for the Navy Physical Security and Law Enforcement Program (Navy 2009b).

3.9.1.9 Flood Zones

The Proposed Action would occur in the seismically active area that has experienced earthquakes in the past. Floodplains are found at the Pier Site (FEMA 2017). The Upland Site-North and Upland Site-South are located at elevations above approximately 300 feet, outside of the tsunami inundation zone and any floodplain (U.S. Geological Survey 2020). The Navy manages stormwater discharge in accordance with all applicable federal and state policies and requirements. Stormwater discharges from urbanized, non-industrial areas are covered under a Phase II MS4 permit, EPA permit WAS026646 (EPA Region 10 2020). A detailed description of the existing conditions for stormwater can be found in Section 3.4.

3.9.2 Environmental Consequences

This section analyzes the potential impacts to public health and safety from implementation of the Proposed Action. The effects analysis evaluated the potential for beneficial or adverse impacts with implementation of the BMPs listed in *Appendix E*. There would be no significant impacts and no increased risk to public health and safety from the Action Alternative.

3.9.2.1 Action Alternative

Under the Action Alternative, demolition, construction, and renovation activities may cause short-term increases in localized effects to public health and safety for the duration of the activities as identified in Table 3.9-1. However, these effects would be at similar levels and conditions to those currently present at NBK-Bangor. The construction sites would follow all required safety protocols for fencing, security, and management. The Proposed Action activities would be further minimized and managed through the implementation of BMPs identified in *Appendix E*. Because of these measures, there would be no disproportionate impacts on the health or safety of children.

NBK-Bangor is an active military installation; impacts from noise, light, air quality, and traffic occur as part of daily operational activities. However, the effects from operational-related impacts as described under the Proposed Action are not expected to create significant long-term increases to the effects currently occurring at NBK-Bangor as identified in Table 3.9-1. Operational-related impacts would continue to be mitigated and managed through BMPs identified in *Appendix E*. Therefore, construction and operation-related impacts to public health and safety (including children) would be similar to the impacts currently occurring on-base. Other Navy projects, as summarized in Section 3.1, would result in similar impacts to public health and safety as the Proposed Action, but would be managed through BMPs. As a result, there would be no meaningful additive impact from these projects to the Proposed Action.

Table 3.9-1 Construction and Operation-Related Impacts Under Action Alternative

Public Health and Safety Topic	*Description of Potential Impacts*
Air Quality	Under the Action Alternative, emissions would be generated from construction and operation-related activities (see Section 3.3 for a full analysis of air quality from the implementation of the Proposed Action). Effects from air quality to public health and safety would be managed through the implementation of all applicable federal and state policies and regulations, and implementation of BMPs identified in *Appendix E*. Therefore, impacts

Public Health and Safety Topic	*Description of Potential Impacts*
	to air quality from construction and operation-related activities under the Proposed Action would not significantly impact public health and safety.
Noise	Under the Action Alternative, additional noise would be generated from the construction activities (see Section 3.8 for a full analysis of noise from the implementation of the Proposed Action). The Proposed Action would include the use of multiple different pieces of construction equipment that would generate noise. The construction noise that would be generated would be temporary. Operational noise levels would be at a similar level to current baseline conditions. Additionally, effects from noise to public health and safety would be managed through the adherence to all applicable federal and state policies and regulations, and implementation of BMPs identified in *Appendix E*. Therefore, impacts to noise from construction and operation-related activities under the Proposed Action would not significantly impact public health and safety.
COCs	Under the Action Alternative, soil and man-made materials containing contaminants may become disturbed and be spread into adjacent areas. However, the generation and potential distribution of materials containing COCs is expected to remain at levels that are similar to conditions that are currently present at the project area. Additionally, impacts from construction would be mitigated and managed through the proper management of soils, sediment, groundwater, stormwater, construction materials, and other project wastes following applicable federal and state policies. Furthermore, the implementation of BMPs identified in *Appendix E* would further minimize potential impacts of COCs to public health and safety. Therefore, impacts to COCs from construction and operation-related activities under the Proposed Action would not significantly impact public health and safety.
Emergency Services	Under the Action Alternative, a short-term minimal increase in demand for emergency services may result from the addition of construction personnel. However, these additional demands would be small and likely not exceed the current capacity of emergency services in the Proposed Action areas. Therefore, impacts to emergency services from construction and operation-related activities under the Proposed Action would not significantly impact public health and safety.
Light Pollution	Under the Action Alternative, a short-term increase in artificial lighting sources may be required by construction personnel. NBK-Bangor is an active military installation and is always illuminated. Additional lighting may be necessary during periods of darkness and would temporarily increase the level of nighttime light at the Proposed Action sites. Operational lighting at night and/or periods of darkness may be visible to adjacent residential areas, but the nearest location is 0.25 miles. Upon completion of construction activities, illumination at the Proposed Action areas are expected to be similar to pre-project conditions. Therefore, impacts to light pollution from construction and operation-related activities under the Proposed Action would not significantly impact public health and safety.
Occupational Health and Safety	Under the Action Alternative, occupational health and safety would be managed through the adherence to all applicable federal and state policies and regulations, and implementation of BMPs identified in *Appendix E*. There would be no impacts to occupational health and safety from construction and operation-related activities under the Proposed Action and therefore the Proposed Action would not significantly impact public health and safety.
Traffic	Under the Action Alternative, a temporary increase in delays at the installation gates during peak traffic periods may occur during the construction-related activities. Operation-related impacts would not occur as there would be no change in number of personnel assigned to NBK-Bangor under the Proposed Action; for additional analysis of traffic and transportation see Section 3.10. Additionally, effects from traffic to public health and safety would be

Public Health and Safety Topic	*Description of Potential Impacts*
	managed through the adherence to all applicable federal and state policies and regulations. Therefore, impacts to traffic from construction and operation-related activities under the Proposed Action would not significantly impact public health and safety.
Security and Anti-Terrorism/Force Protection	Under the Action Alternative, security and force protection measures currently in place at NBK-Bangor would not require any changes and/or modifications during construction and operation-related activities and would be carried out in a similar manner to current protection measures. Therefore, impacts to security and anti-terrorism/force protection from construction and operation-related activities under the Proposed Action would not significantly impact public health and safety.
Flood Zones	Under the Action Alternative, there would not be any significant impacts to flood zones and therefore no expected impacts to public health and safety; for additional analysis of flood zones see Section 3.4. Additionally, effects on flood zones would be managed through the adherence to all applicable federal and state policies and regulations, and implementation of BMPs identified in *Appendix E*. Therefore, impacts on flood zones from construction and operation-related activities under the Proposed Action would not significantly impact public health and safety.

Key: BMPs = Best Management Practice, COCs = Contaminant of Concern, NBK- = Naval Base Kitsap

3.10 Traffic and Transportation

Transportation resources include roads, public transit, railroads, waterways, and non-motorized travel. The transportation setting for transportation applicable to the Proposed Action includes those streets and intersections that would be used by both automobile and truck traffic to gain access to and from a proposed project site. 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 operating conditions of a roadway segment or intersection. The LOS is defined on a scale of A to F as shown in Table 3.10-1. Any overall changes that would result in LOS F would be considered a significant impact.

Table 3.10-1 LOS Operating Conditions

LOS Operating Condition	*Description*
A – B	Free flow travel
C	Stable traffic flow
D	Beginning of traffic congestion
E	Nearing traffic breakdown conditions
F	Stop-and-go traffic / unacceptable congestion and delay

Key: LOS = Level of Service

3.10.1 Affected Environment

The ROI for traffic and transportation is NBK-Bangor and the surrounding roadway system providing access to the installation. The primary access to NBK-Bangor is State Route (SR)-3, which is the major roadway serving Bremerton, Poulsbo, Silverdale, and the Hood Canal Bridge. SR-3 connects with SR-305 near Poulsbo providing access from NBK-Bangor to Bainbridge Island and the Seattle ferry. Travel time is approximately 1 hour and 15 minutes from Seattle. Travel time by highway from Tacoma is less than 1 hour (Navy 2023). There is very little traffic coming

to NBK-Bangor from the north and west of the installation due to the presence of the Olympic National Park, Olympic National Forest, and the Pacific Ocean.

There are two entrance routes to NBK-Bangor from SR-3, either NW Trigger Avenue or NW Luoto Road at the Main Gate (referred to as Trident Boulevard inside of the installation boundaries). All commercial traffic must enter through the Main Gate (Navy 2023). On weekdays, the peak periods are generally 5:30 a.m. to 7:30 a.m. and 2:00 p.m. to 4:00 p.m. and the peak hours are generally 5:30 a.m. to 6:30 a.m. and 2:15 p.m. to 3:15 p.m. (Navy 2025c).

The internal NBK-Bangor road system is composed of two- and four-lane paved roads that provide access to Naval and commercial facilities, housing, and the waterfront area. Traffic lights and signals have been installed where needed near the commercial area and gates. Other intersections are controlled by four-way or two-way stop signs (Navy 2023). Internal roads are improved and maintained by the Navy. The Operational Area Gate on Trigger Avenue separates the upper base, which includes administrative, commercial and residential areas, from the lower base, which includes various industrial and mission areas including the waterfront area. Traffic delays occur at this gate during morning and afternoon peak hours (Navy 2023).

3.10.1.1 Traffic Volumes and Parking

NBK-Bangor is rural and low density in character. Traffic, transit, and non-vehicle movement are generally well-managed on the installation. Historically, parking has generally been plentiful on upper base with more limited options on lower base; however, with the return-to-work beginning in early 2025, parking overall on the base has become more limited.

With the exception of peak hours, traffic from NBK-Bangor generally does not cause congestion problems outside the base. During morning and afternoon peak hours, however, both the Trident/Luoto and Trigger gates experience backups and delays. These delays can affect traffic flow on SR-3 (morning only) and at the intersection of Trigger Boulevard and Frontier Road (Navy 2016). Kitsap County does not have a minimum LOS standard for roadways, but the Kitsap County Comprehensive Plan 2016-2036 has a goal to “develop and adopt intersection LOS standards” (Kitsap County 2016).

There is limited available recent quantified information on LOS of internal roadway intersections throughout NBK-Bangor. A 2025 Traffic Study conducted in the vicinity of the proposed Upland Site-North activities found that existing intersections servicing that general area are operating at LOS C or better, meaning there is stable traffic flow (Navy 2025c). A separate 2012 Traffic Study conducted for the EA for the Transit Protection Program Pier and Support Facilities at NBK-Bangor found that roadways and intersections near the proposed waterfront activities (which are also near the Pier Site for the Proposed Action evaluated in this EA) that would be used by the Transit Protection Program Pier construction and operational traffic were operating at LOS A or B, except for the two-lane roadways which were LOS C, indicating stable traffic flow and no significant congestion as part of baseline conditions.

3.10.2 Environmental Consequences

3.10.2.1 Action Alternative

During the construction period, there would be an average increase of approximately four to five truck trips per workday (Monday through Friday) over a construction period of approximately five years. There would likely be periods of increased truck trips followed by

periods of decreased truck trips, depending on the work that is scheduled and the phasing of Proposed Action activities as described in Section 2. Construction vehicles would access the sites from SR-3 entering the base at the Main Gate on Trident Avenue.

In addition to the estimated number of truck trips, the following maximum construction worker trips per day could be expected (assuming single-occupancy in vehicles): 111 worker trips per day for Upland Site-North (including Keyport Annex), 25 worker trips per day for the Pier Site and 156 worker trips per day for Upland Site-South for a total of 292 worker trips. Over the 5-year construction period, these worker trips would be added to the existing daily weekday traffic to and from NBK-Bangor but would occur at different times based on the phasing of the Proposed Action activities. For example, although the Pier Site is expected to generate approximately 25 worker trips per day, it would be for approximately three of the five years for the estimated overall construction timeline. Construction schedules would be adjusted to the extent feasible to manage traffic flows. Some construction workers may carpool, which could reduce the overall number of daily individual trips.

The additional construction vehicle and construction worker traffic would occur during the construction period only. With regard to localized traffic impacts along State Route 3 (SR3), the estimated maximum construction worker trips of 292 trips per day would account for less than 1 percent of the 42,000 annual average daily traffic (AADT) trips along SR3 near NBK-Bangor (WSDOT 2025b). Worker trips would also account for less than 5 percent of the 6,600 AADT trips along NW Luoto Road outside of the installation (WSDOT 2025b). Therefore, the temporary and minor increase in construction traffic with implementation of the Proposed Action would not result in significant impacts to traffic and transportation.

There would be no permanent increases in personnel at NBK-Bangor under the Proposed Action and therefore no expected changes to traffic and transportation from operations internally at NBK-Bangor or on local external roadways. Laydown/staging areas for the Proposed Action would potentially be converted to permanent parking after construction is complete. This could further improve longer-term parking conditions on the installation. There would be no significant impacts to transportation and traffic from operations under the Proposed Action. Other Navy projects, as summarized in Section 3.1, would also be expected to contribute to existing traffic and transportation conditions at NBK-Bangor and the local roadway network. Given the phased approach to construction, there could be fluctuations in traffic and parking, with periods of heavier traffic and parking limitations as well as periods with lighter traffic and more parking availability.

A 2025 Traffic Study at NBK-Bangor assessed baseline and projected future traffic conditions in the vicinity Upland Site-North to assess potential traffic impacts associated with these activities. The study found that future build conditions would result in intersections in this area operating at LOS D or better (LOS D is the beginning of traffic congestion, see Table 3.10-1). The study also found that there would be a net increase of 81 parking spaces in this area (Navy 2025c). Considering the traffic expected to be generated by the Proposed Action and the overall lack of existing congestion on affected roadways, it would represent a minor contribution to additive traffic impacts both on and off NBK-Bangor. Construction-related traffic under the Proposed Action could contribute additively in terms of delays at the installation gates during peak traffic periods. Operations under the Proposed Action would not significantly increase vehicle traffic

as there would be no new personnel assigned to NBK-Bangor. Therefore, the Proposed Action would not result in a significant impact to traffic and transportation when considered with other Navy projects at NBK-Bangor since the increases in construction truck trips and worker trips would be temporary and there would be no permanent operational impacts to traffic and transportation.

3.11 Socioeconomics

This section discusses population demographics, employment characteristics, schools, housing occupancy status, economic activity, tax revenue, and related data providing key insights into the socioeconomic conditions that might be affected by the Proposed Action.

3.11.1 Affected Environment

The ROI for socioeconomics consists of Kitsap County (Figure 3.11-1 in *Appendix B*). Local spending and hiring tend to ripple into the surrounding community and region, which makes the county an appropriate ROI. Socioeconomic data provided in this section is presented for the U.S. Census-defined geographical areas of Kitsap County and the State of Washington. This data was used to characterize baseline socioeconomic conditions, which were then used to gauge the level of impacts that are associated with project activities. Data was collected from documents published by federal, state, and local agencies as well as from state and national databases (e.g., U.S. Census Bureau and U.S. Bureau of Labor Statistics).

3.11.1.1 Existing Conditions

Existing conditions in the ROI are described in terms of population, schools, housing, employment and income, overall economic activity, and state and local tax revenues.

Population

According to the U.S. Census Bureau, the total 2023 population for Kitsap County was 276,581, (U.S. Census Bureau 2023). Table 3.11-1 shows that Kitsap County and the State of Washington experienced population gains from 2010 to 2023 (U.S. Census Bureau 2010, 2023). Population growth in Kitsap County, however, was slower than in the state of Washington as a whole.

Table 3.11-1 Population in Kitsap County and the State of Washington 2010-2023

Year	*Kitsap County*	*State of Washington*
2010	251,133	6,724,540
2023	276,581	7,740,984
Percentage Change (2010-2023)	10.1 percent	15.1 percent

Source: U.S. Census Bureau 2010, 2023

Schools

During the 2023-2024 school year, Kitsap County included a total of 77 public schools with 34,402 students. Private school data was available for the 2021-2022 school year when there were 24 private schools with 2,671 students. In total, Kitsap County has 101 schools and 37,073 students (National Center for Education Statistics 2022, 2024).

Housing

The total number of housing units in Kitsap County in 2023 was 115,329. Vacant housing units totaled 8,065 in the county, an approximately 7.0 percent vacancy rate (U.S. Census Bureau 2023).

Employment and Income

According to the U.S. Bureau of Labor Statistics for Kitsap County, there were an average of 121,982 people in the labor force in 2024, with 5,497 unemployed, resulting in an unemployment rate of 4.5 percent (U.S. Bureau of Labor Statistics 2024). This is a higher rate of unemployment than for the state of Washington as a whole, which was 4.2 percent (U.S. Bureau of Labor Statistics 2025).

The education services, health care, and social assistance sector was the largest civilian employment industry in Kitsap County with 24,203 employees (20.0 percent), while the professional, scientific, management, administrative, and waste management services sector accounted for 15,300 employees (12.6 percent) and was the second largest industry in the county (U.S. Census Bureau 2023). Educational services, health care, and social assistance comprised the largest employment industry in the state of Washington as well, accounting for 21.4 percent of employment (810,352 employees) (U.S. Census Bureau 2023).

According to the U.S. Census Bureau (2023), median household income in Kitsap County was $98,546 in 2023, mean household income was $125,517, and per capita income was $50,367. Median household income was higher in Kitsap County than in the state of Washington, but mean household income, median earnings for workers, and per capita income were all higher in the state (U.S. Census Bureau 2023).

Economic Activity

Gross product is the total value of all the goods and services produced in a particular year. Total gross county product for Kitsap County and gross state product for the state of Washington were roughly $13.4 billion and $667.6 billion, respectively. The largest contributor to gross state product in the state of Washington is the information industry, which contributes roughly $111.4 billion in economic output. Government and government enterprises comprise the largest contributing industry in Kitsap County, contributing $5.6 billion (Bureau of Economic Analysis 2020, 2021).

State and Local Tax Revenues

The largest sources of tax revenues at the state and county level are the property tax and the sales tax. Specifically, the largest source of tax revenue for the county is property taxes and the largest source of tax revenue at the state level is the sales tax. Total tax revenues for Kitsap County were approximately $140.6 million in 2020 (U.S. Census Bureau 2019; Kitsap County 2022).

3.11.2 Environmental Consequences

Analysis of impacts to socioeconomics focuses on the effects of the alternatives on population, schools, housing, employment and income, economic activity, and state and local tax revenue.

3.11.2.1 Action Alternative

Construction-related Impacts

Population

The Proposed Action would require a maximum of 292 construction worker trips to and from NBK-Bangor during the peak of the construction phases, although a small percentage may carpool. During construction, workers would likely come from dispersed locations but large population centers in Seattle and Tacoma that could supply construction workers would be within commuting distance of the project area. The temporary nature of construction makes it less likely that workers would relocate permanently to the ROI although the duration of the Proposed Action of five years may encourage some construction workers to relocate. The increase in numbers of some relocating workers and their families could increase demands on housing and public services such as schools, health and safety services, and roads which could result in adverse impacts. Relocating workers and their families could stimulate economic activity and increase tax revenues through income and spending. Due to the temporary and small number of personnel, there would be no significant impacts to population.

Housing

Any relocating workers may increase the demand for housing and reduce the amount of available housing which could contribute to an increase in housing prices and rental rates. The temporary nature of construction makes it less likely that workers would relocate permanently to the ROI; although the duration of the Proposed Action of five years may encourage some construction workers to relocate. However, any relocating workers would not be anticipated to move in numbers large enough to significantly impact existing housing demand or vacancy rates. Due to the temporary and small number of personnel, there would be no significant impacts to housing.

Employment and Income

The Proposed Action would require an on-site workforce, with a maximum of 292 construction workers during the peak of the construction phases, although a small percentage may carpool. As indicated above, some workers may relocate to the area due to the duration of the Proposed Action. In addition, local businesses may hire more workers to support the construction effort or provide services to construction workers that have relocated or for those commuting. Labor income supported by construction activities would likely last for the duration of the approximately 5-year construction period. The increased jobs and labor income in the ROI could be a temporary beneficial impact. Due to the temporary and small number of personnel, there would be no significant impacts to employment and income.

Economic Activity

Construction spending and hiring in the ROI would increase the total gross product in the county during the approximately 5-year construction period. The stimulated economy would be temporary beneficial impact. Due to the temporary and small number of personnel, there would be no significant impacts to economic activity.

State and Local Taxes

Spending in the ROI would stimulate tax revenues during the approximately 5-year construction period. The increased tax revenues for Kitsap County and the State of Washington would be a temporary beneficial impact. Due to the temporary and small number of personnel, there would be no significant impacts to state and local taxes.

Operation-related Impacts

Operational employment and local expenditures within Kitsap County are expected to remain similar to current levels because the Ohio-class submarines at NBK-Bangor would be replaced with the Columbia-class at a one-for-one or fewer, ensuring the total number of homeported submarines and number of personnel needed to support the Columbia-class submarines at NBK-Bangor does not increase. Therefore, there would be no significant impacts to socioeconomics during operations.

Other Navy projects, as summarized in Section 3.1, would result in incremental impacts to socioeconomics similar to the Proposed Action due to the similar nature of the types of projects. Due to the size and duration of the listed projects, impacts are anticipated to be less than significant. As a result, there would not be significant additive impacts from these projects to the Proposed Action.

3.12 Summary Statement

Based on the analysis presented here in this EA, which has been prepared in accordance with NEPA and the DoD NEPA Implementing Procedures, the Navy anticipates the Proposed Action would not significantly impact the quality of the human environment. Consultations with regulatory agencies are ongoing and findings will be documented in the Final EA.

Comments received during the 30-day public commenting period from May 27, 2026, through June 25, 2026, will be considered in preparation for the Final EA anticipated for public release in Spring 2027. A copy of the Draft EA may be downloaded from the project website: www.nepa.navy.mil/Columbia-West-Coast/. Electronic copies may be obtained by written request to: Environmental Planning (EV22JS) Naval Facilities Engineering Systems Command Atlantic, 6506 Hampton Boulevard, Norfolk, Virginia 23508.

Appendix A
Abbreviations and Acronyms

This page intentionally left blank.

Appendix A
Abbreviations and Acronyms

Acronym	Definition
APE	Area of Potential Effects
BGEPA	Bald and Golden Eagle Protection Act
BMPs	Best Management Practices
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CNIC	Commander Navy Installations Command
CO	Carbon Monoxide
CO2e	Carbon Dioxide Equivalent
COC	Contaminants of Concern
CWA	Clean Water Act
dB	Decibel
dBA	A-weighted decibel
DNL (L_{dn})	Day-night average sound level
DNWG	Defense Noise Working Group
DO	Dissolved Oxygen
DoD	Department of Defense
DPS	Distinct Population Segment
EA	Environmental Assessment
Ecology	Washington Department of Ecology
EFH	Essential Fish Habitat
EHW2	Explosive Handling Wharf 2
EIS	Environmental Impact Statement
EISA	Energy Independence and Security Act
EO	Executive Order
ESA	Endangered Species Act
ESAMS	Enterprise Safety Application Management System
ESU	Evolutionarily Significant Unit
FPPA	Farmland Protection and Policy Act

Acronym	Definition
FR	Federal Register
GHG	Greenhouse Gases
HAP	Hazardous Air Pollutants
HAPC	Habitat Areas of Particular Concern
INRMP	Integrated Natural Resources Management Plan
LID	Low Impact Development
L_{max}	Maximum Sound Level
LOS	Level of Service
MBTA	Migratory Bird Treaty Act
MMPA	Marine Mammal Protection Act
MOA	Memorandum of Agreement
MR	Minimum Requirements
MSA	Magnuson-Stevens Fishery Conservation and Management Act
MS4	Municipal Separate Storm Sewer Systems
MSGP	Multi-Sector General Permit for Stormwater Discharges associated with Industrial Activities
MTD	Manufactured Treatment Devices
NAAQS	National Ambient Air Quality Standards
NAGPRA	Native American Graves Protection and Repatriation Act
NAVBASE	Naval Base
NAVFAC	Naval Facilities Engineering Systems Command
NBK	Naval Base Kitsap
NEPA	National Environmental Policy Act
NPGIS	non-pollutant-generating impervious surfaces

Acronym	Definition
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NO_2	Nitrogen Dioxide
NO_x	Nitrogen Oxides
NPDES	National Pollutant Discharge Elimination System
NRHP	National Register of Historic Places
O_3	Ozone
OEIS	Overseas Environmental Impact Statement
OSHA	Occupational Safety and Health Administration
PAH	Polycyclic Aromatic Hydrocarbons
PCB	Polychlorinated Biphenyl
PFMC	Pacific Fisheries Management Council
PGIS	pollutant-generating impervious surfaces
$PM_{2.5}$	Particulate matter less than or equal to 2.5 microns in diameter
PM_{10}	Particulate matter less than or equal to 10 microns in diameter
PSCAA	Puget Sound Clean Air Agency
RCRA	Resource Conservation and Recovery Act
RFFA	Reasonably Foreseeable Future Action
ROI	Region of Influence
SHPO	State Historic Preservation Office/Officer
SO_2	Sulfur Dioxide
STIP	Statewide Transportation Improvement Program
SWFPAC	Strategic Weapons Facility Pacific
SWMMWW	Stormwater Management Manual for Western Washington
SWPPP	Stormwater Pollution Prevention Plan
U&A	Usual and Accustomed
U.S.	United States
UFC	Unified Facilities Criteria
U.S.C.	United States Code
EPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
VOC	Volatile Organic Compounds
WAC	Washington Administrative Code
WDFW	Washington Department of Fish and Wildlife
WSDOT	Washington State Department of Transportation

Appendix B
Chapter 3 Figures and Tables for Other Navy Projects, Air Quality, Water Resources, and Biological Resources

This page intentionally left blank.

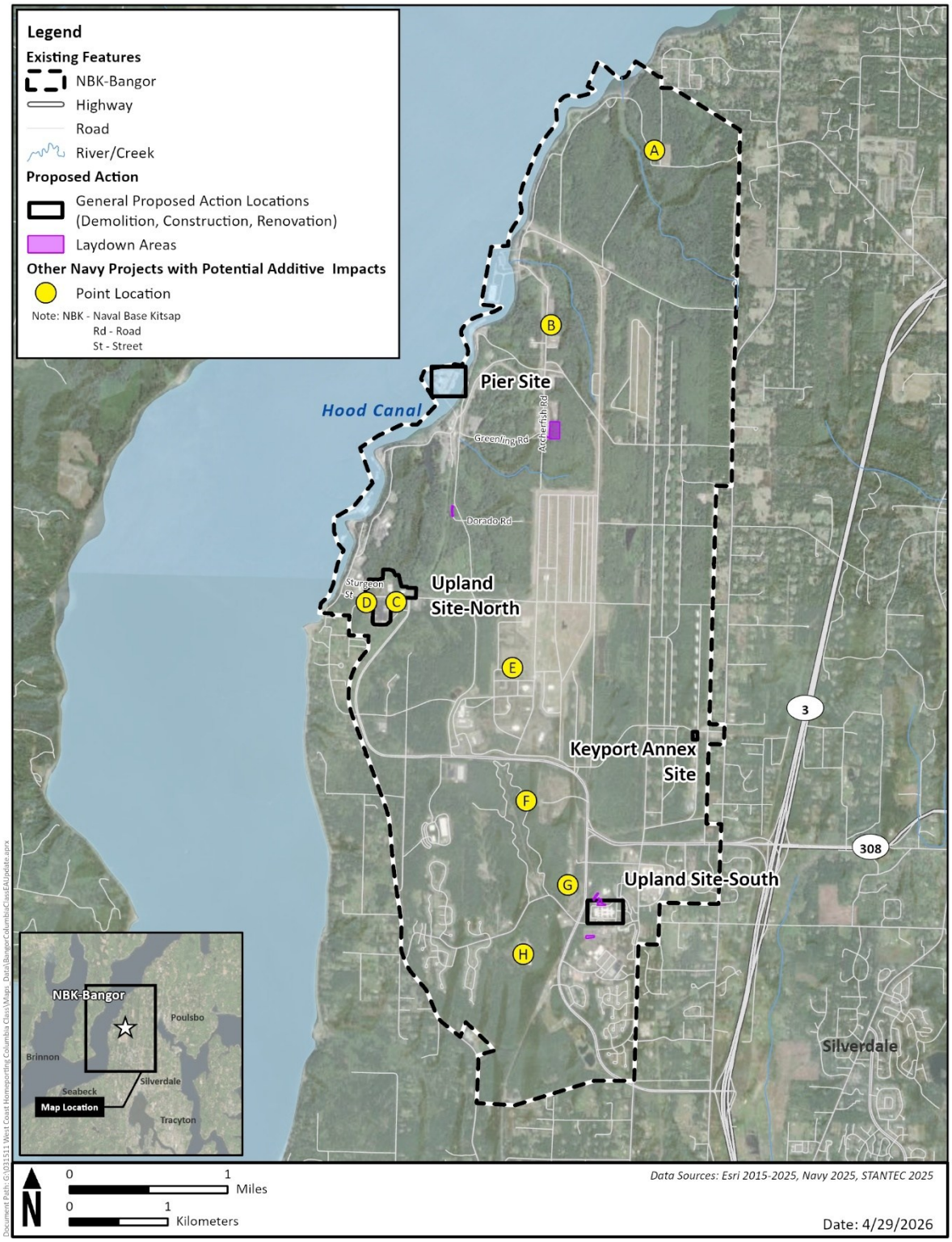


Figure 3.1-1 Other Navy Projects with Potential Additive Impacts

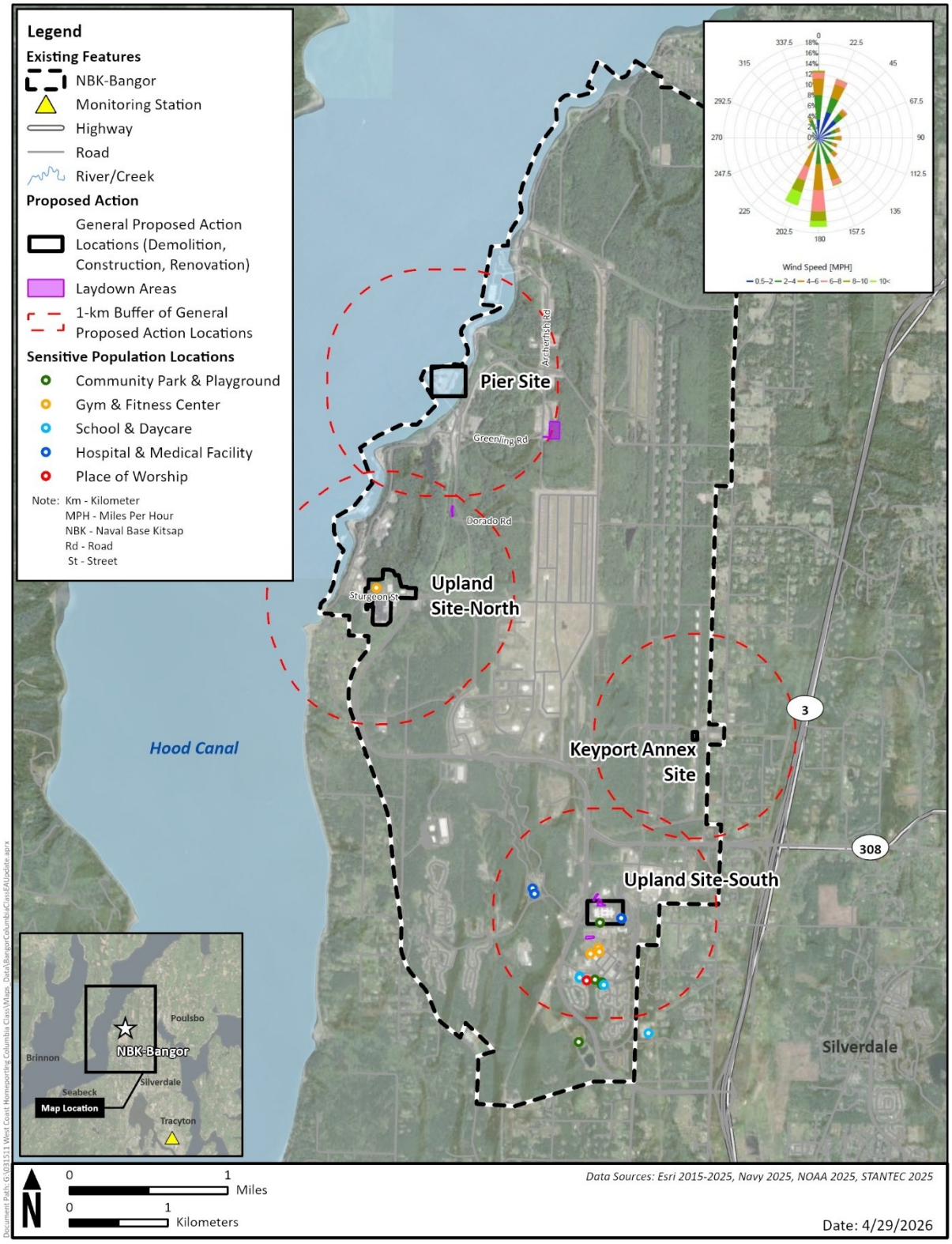


Figure 3.3-1 Prevailing Wind Patterns and Sensitive Population Locations at NBK-Bangor

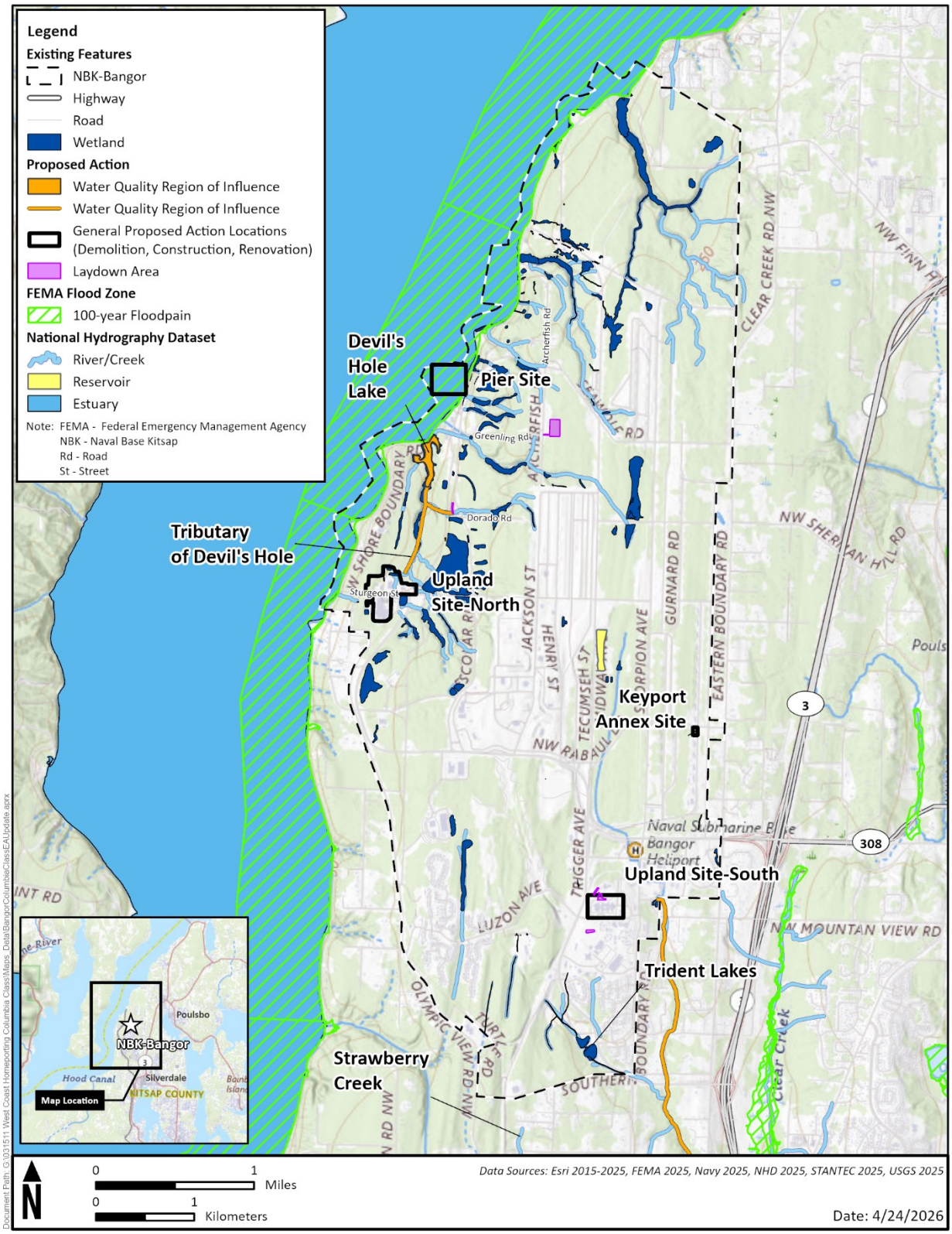


Figure 3.4-1 Water Resources ROI

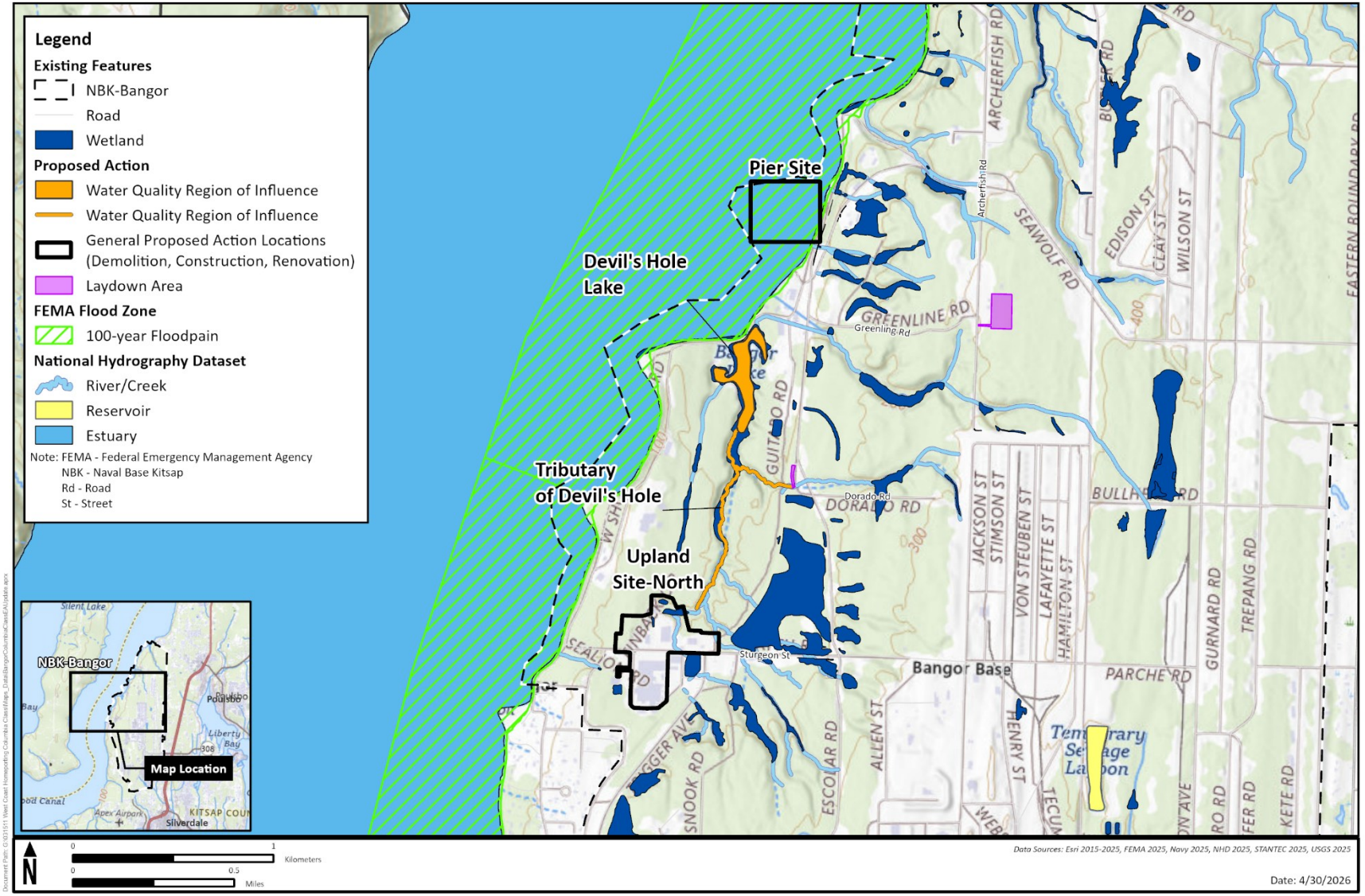


Figure 3.4-2 Upland Site-North and Pier Site Waterbodies

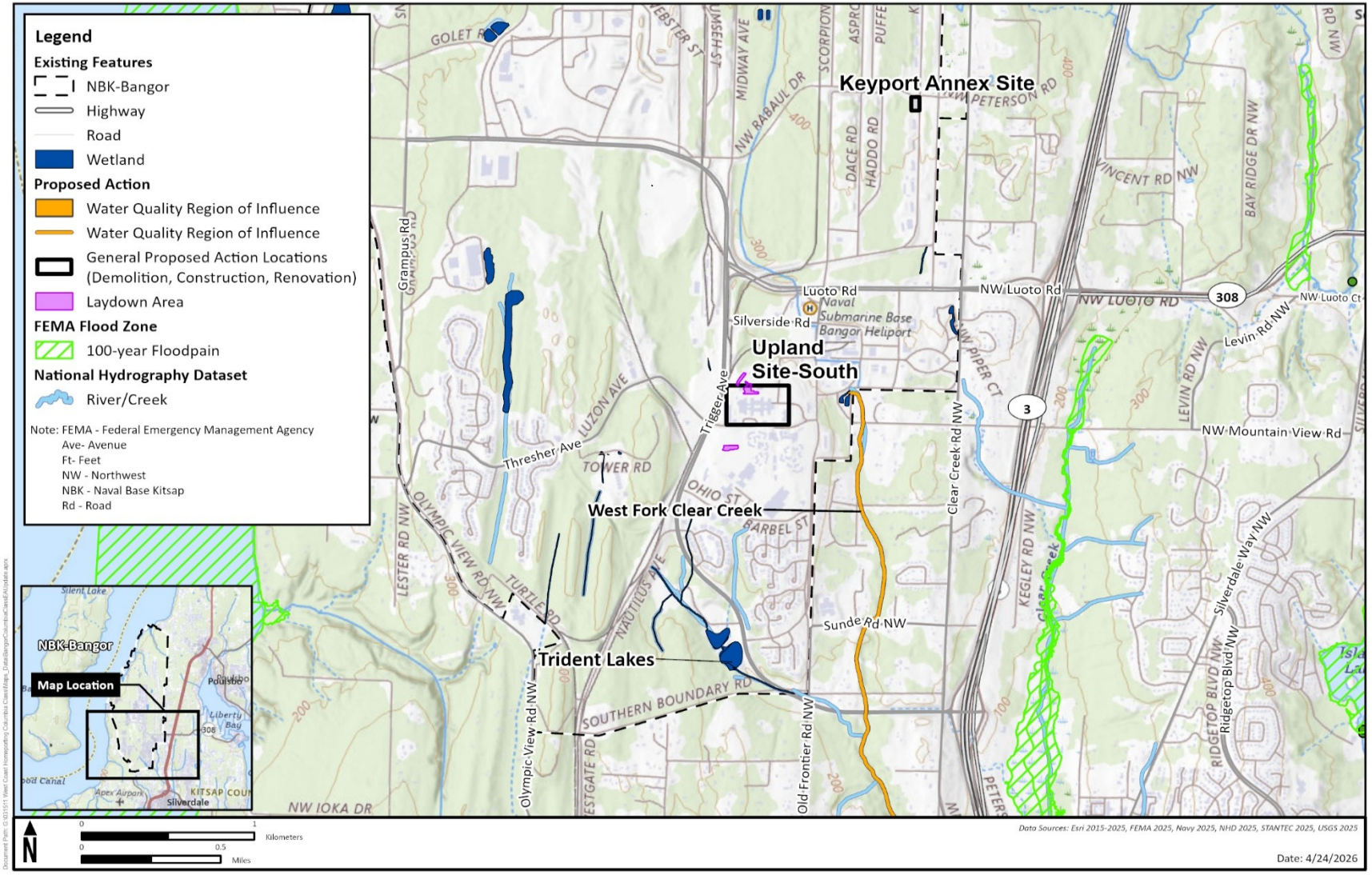


Figure 3.4-3 Upland Site-South and Keyport Annex Waterbodies

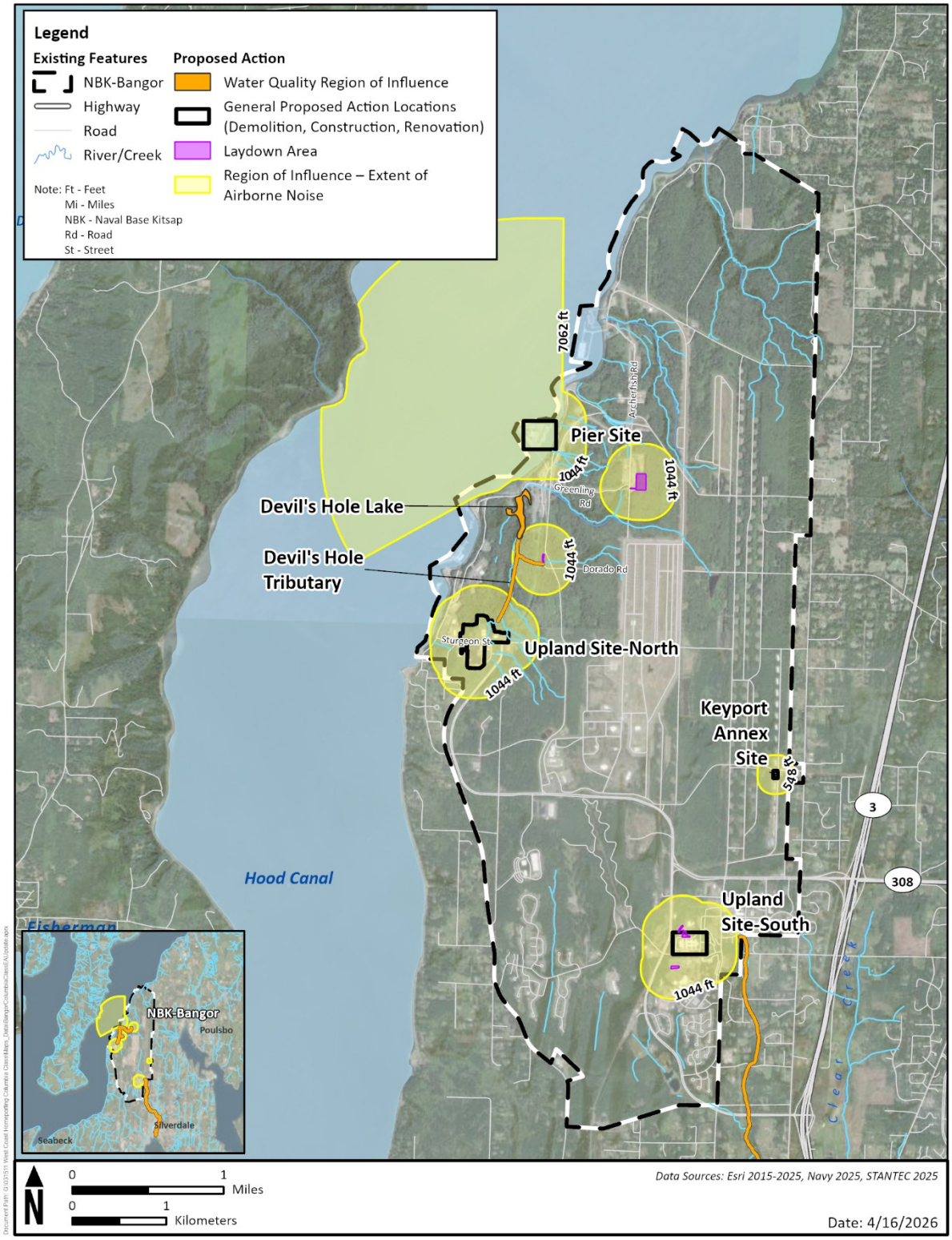


Figure 3.5-1 Biological Resources ROI

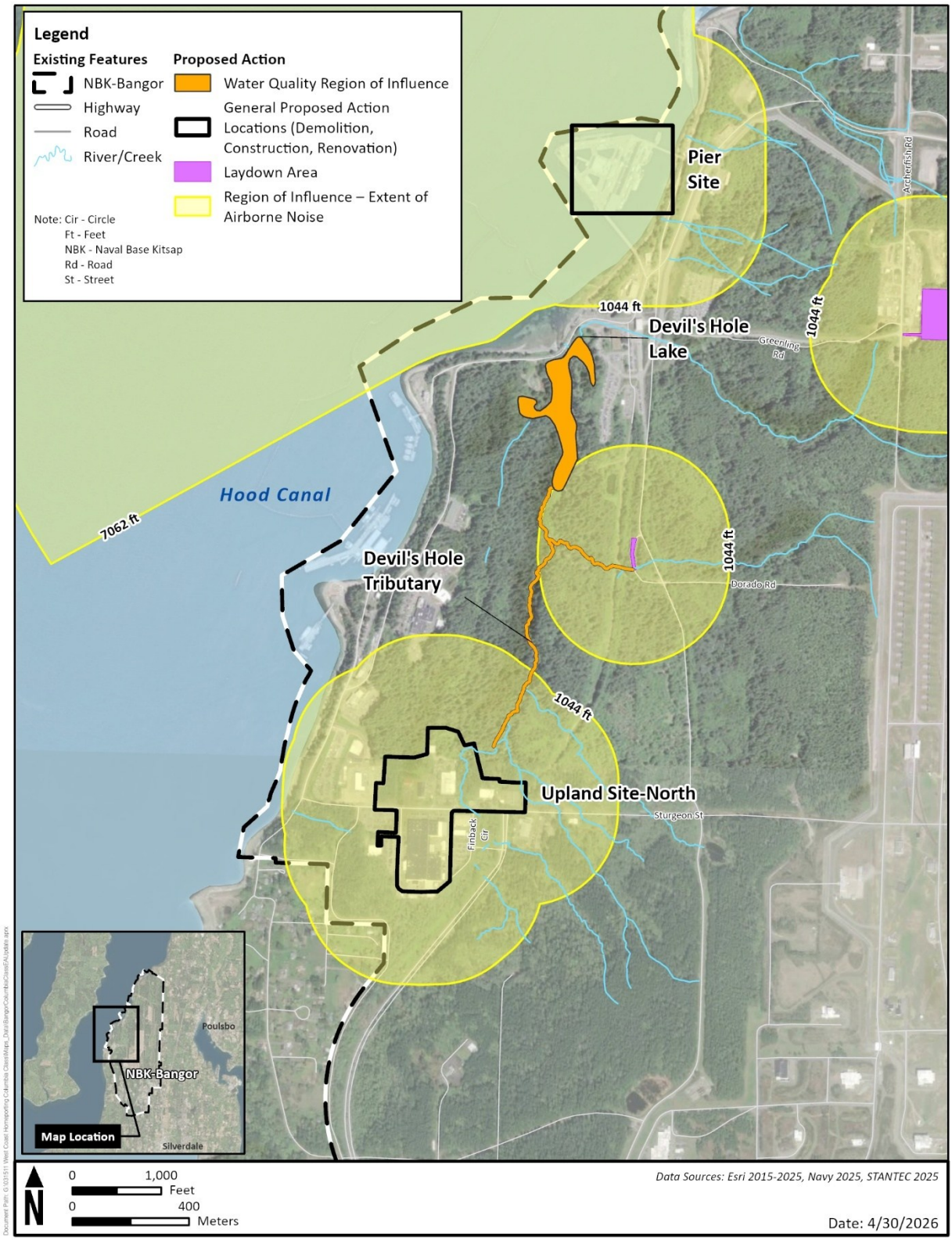


Figure 3.5-2 Biological Resources ROI – Upland Site-North and Pier Site

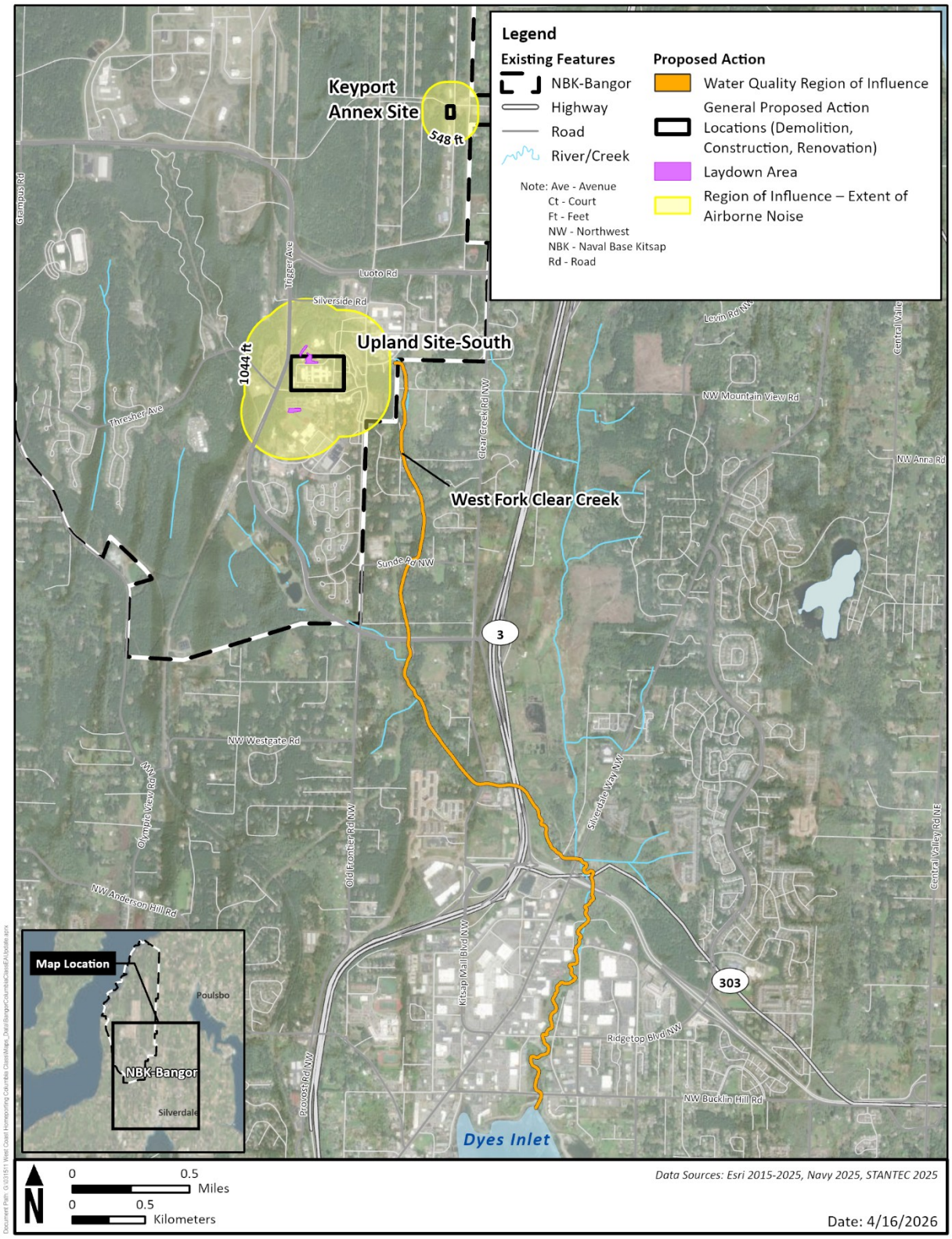


Figure 3.5-3 Biological Resources ROI – Upland Site-South and Keyport Annex

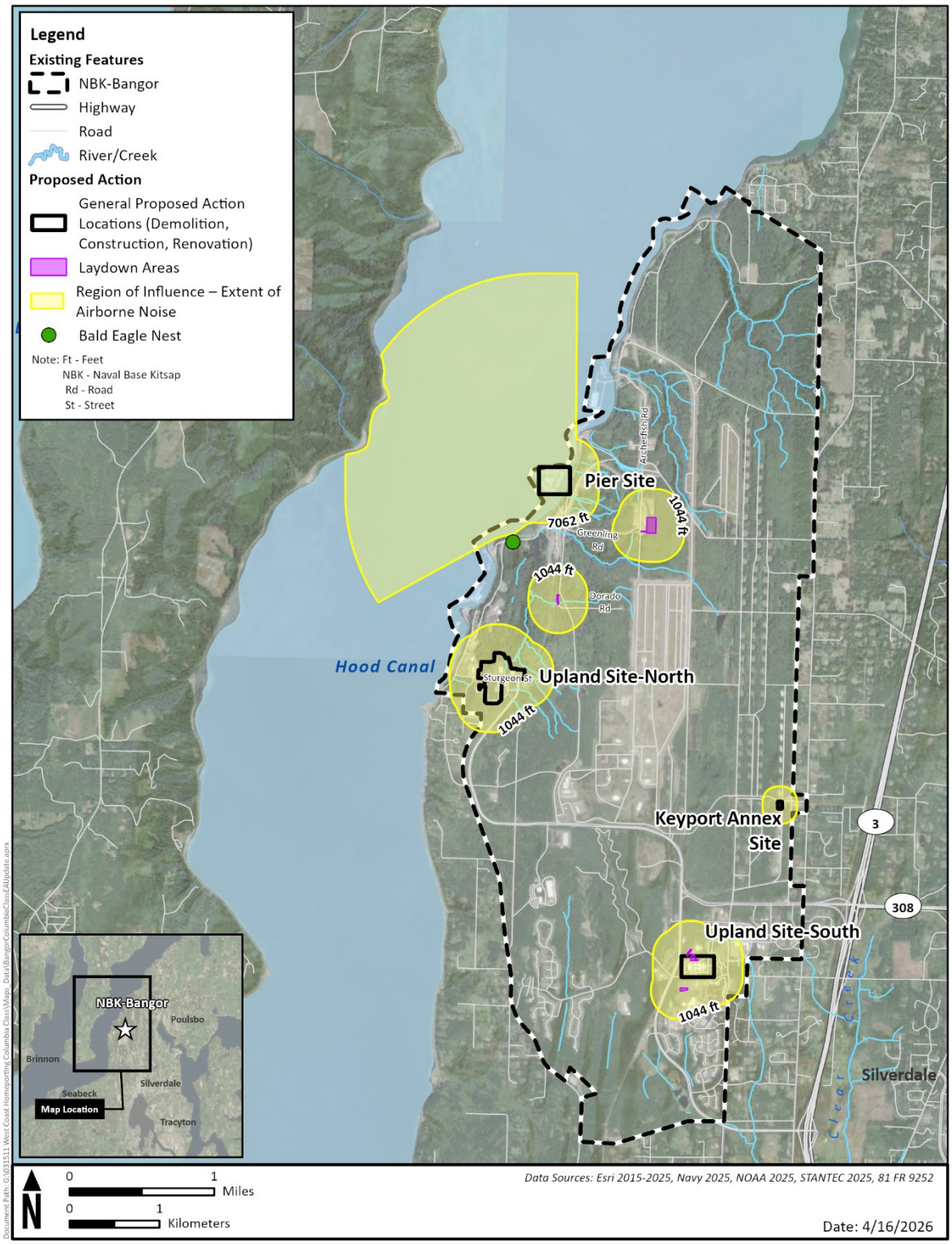


Figure 3.5-4 Location of Bald Eagle's Nest

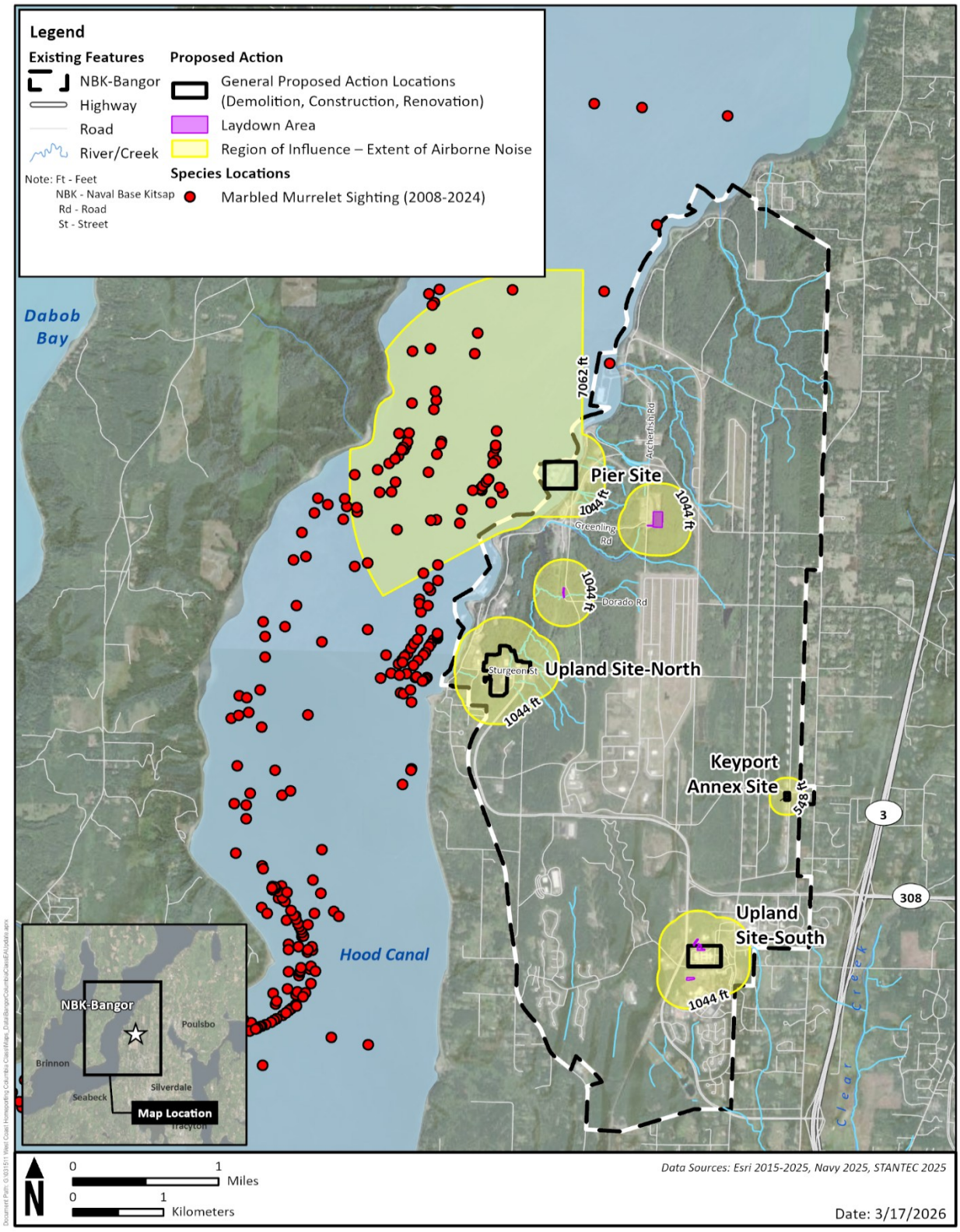


Figure 3.5-5 Marbled Murrelet Sightings in Hood Canal

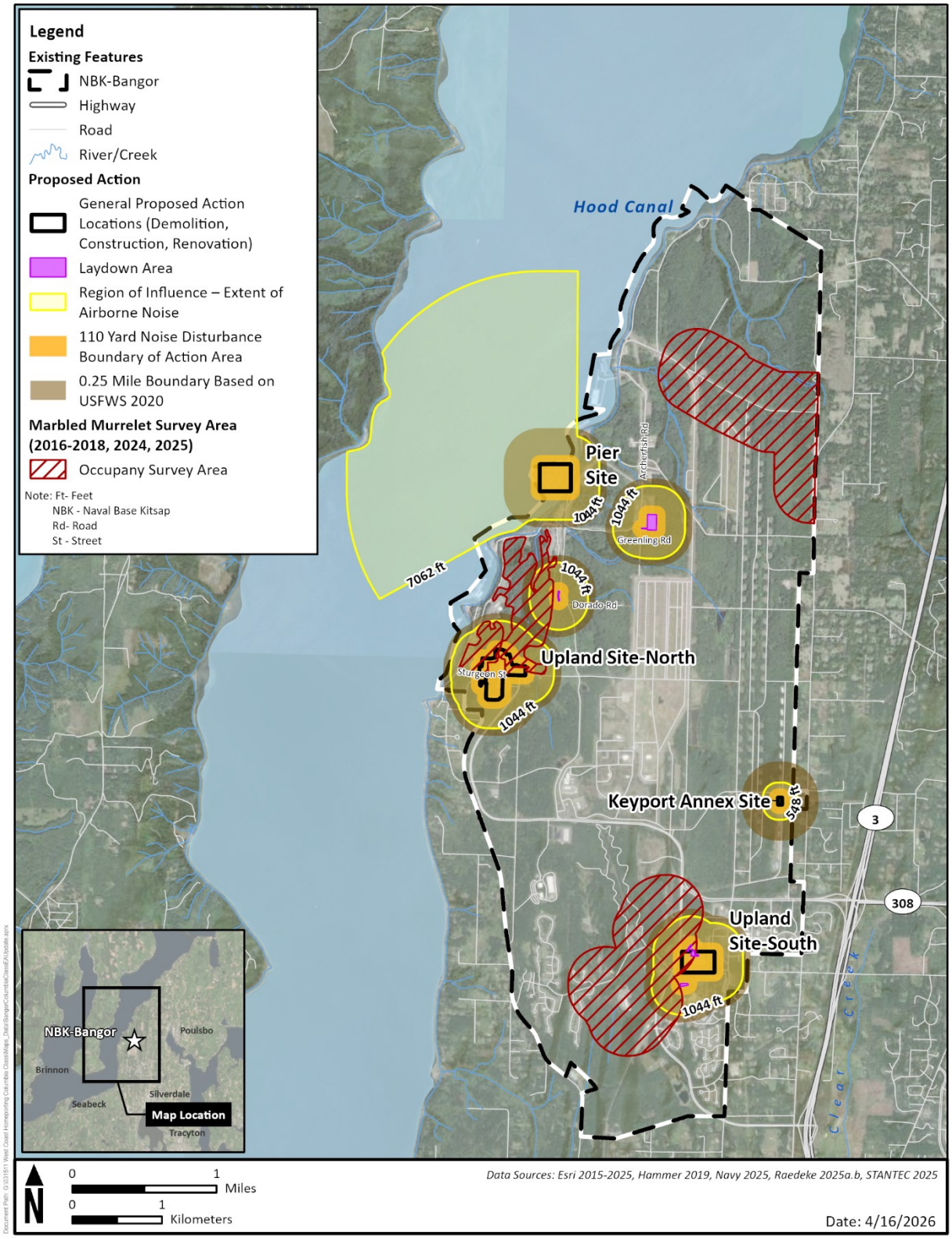


Figure 3.5-6 Marbled Murrelet Occupancy Surveys

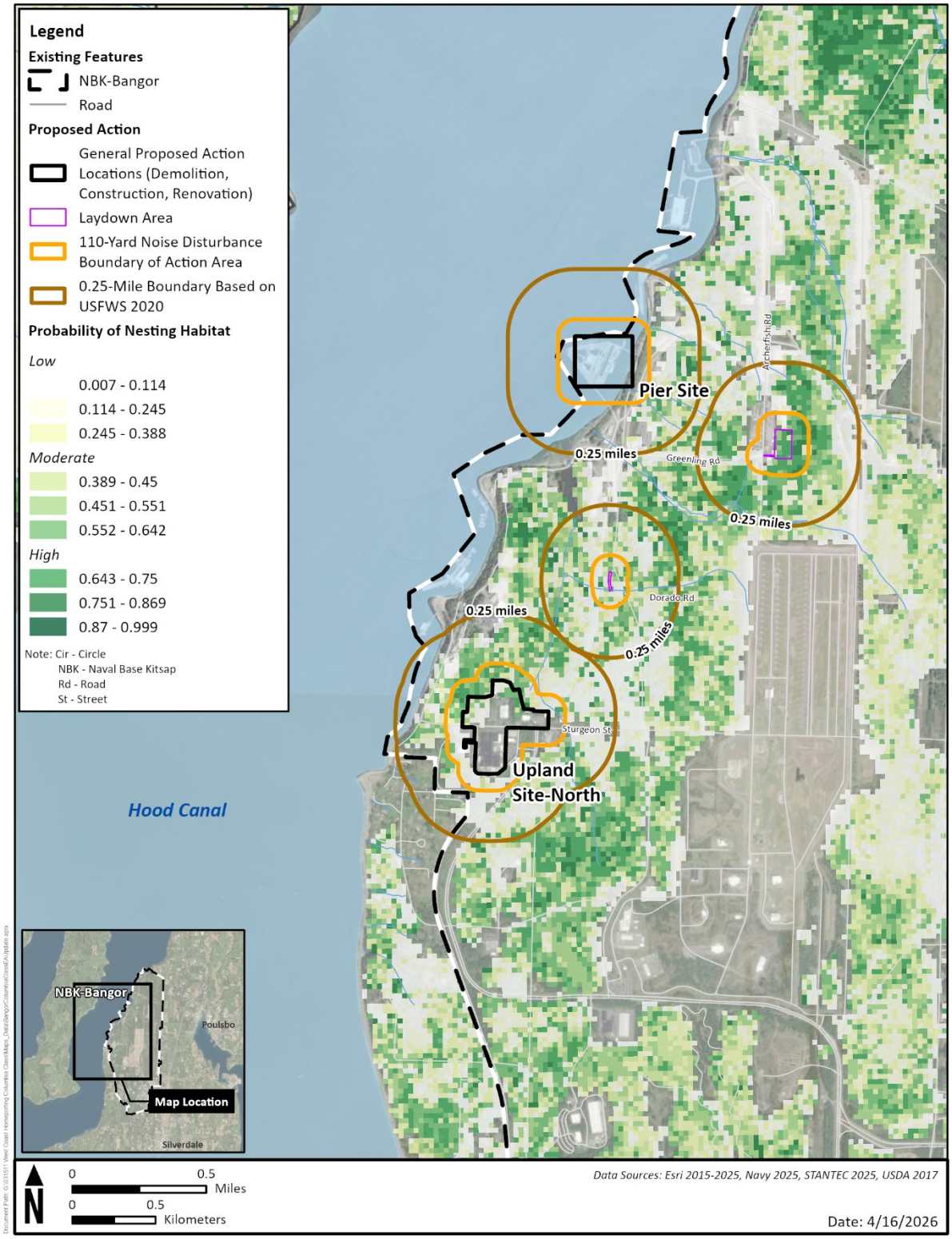


Figure 3.5-7 Probability of Nesting Habitat for Marbled Murrelet at Upland Site-North and Pier Site

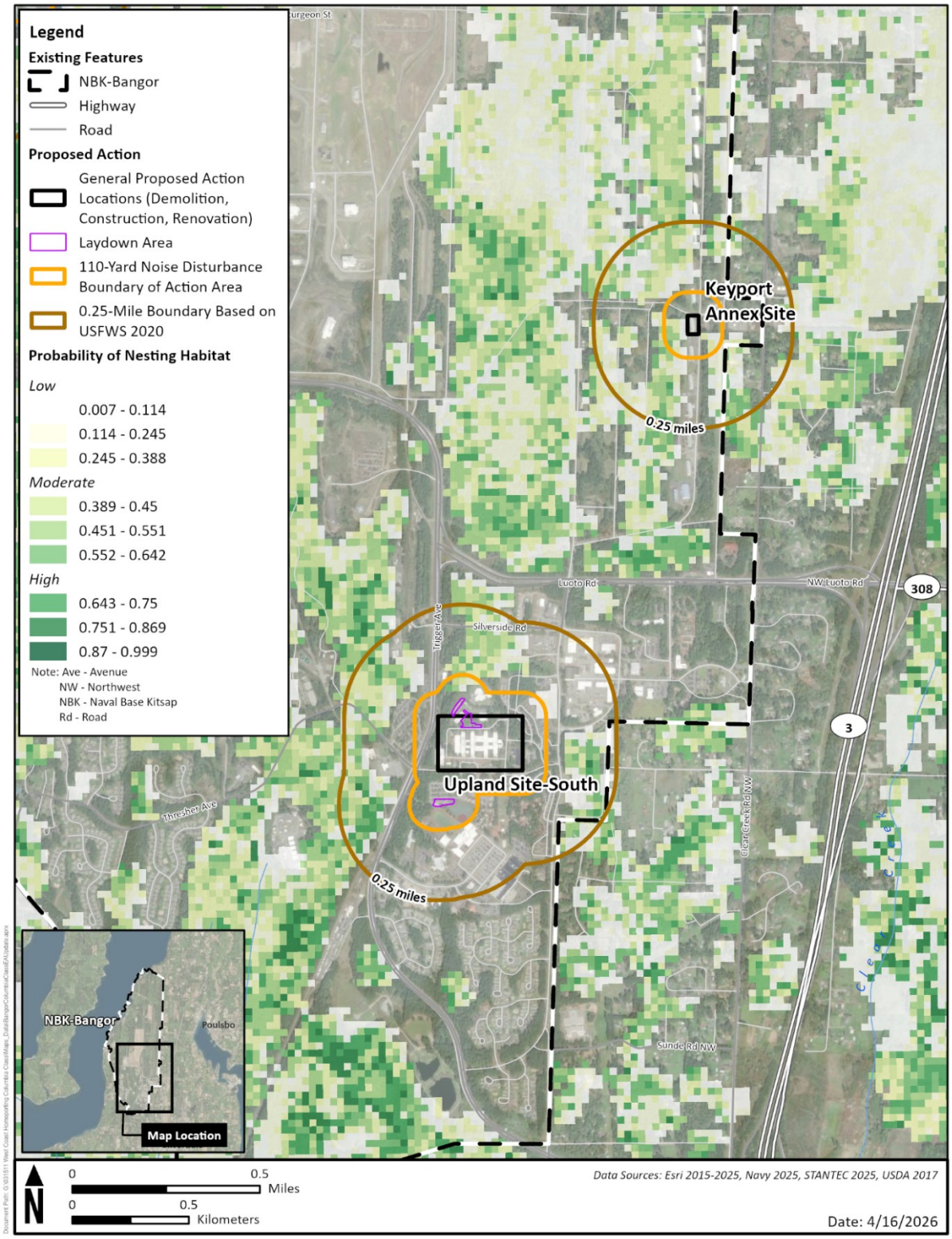


Figure 3.5-8 Probability of Nesting Habitat for Marbled Murrelet at Upland Site-South and Keyport Annex

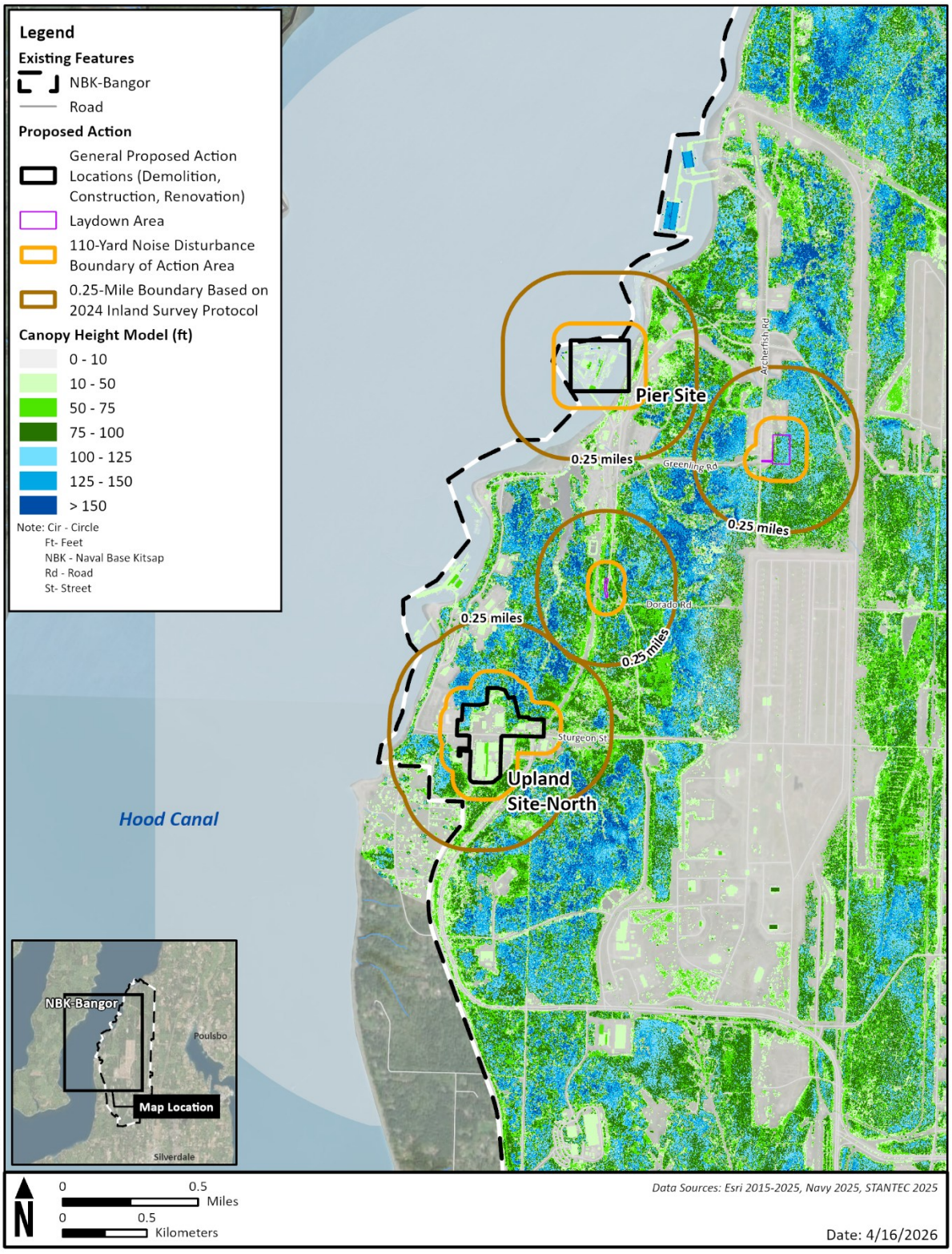


Figure 3.5-9 Canopy Height for Marbled Murrelet at Upland Site-North and Pier Site

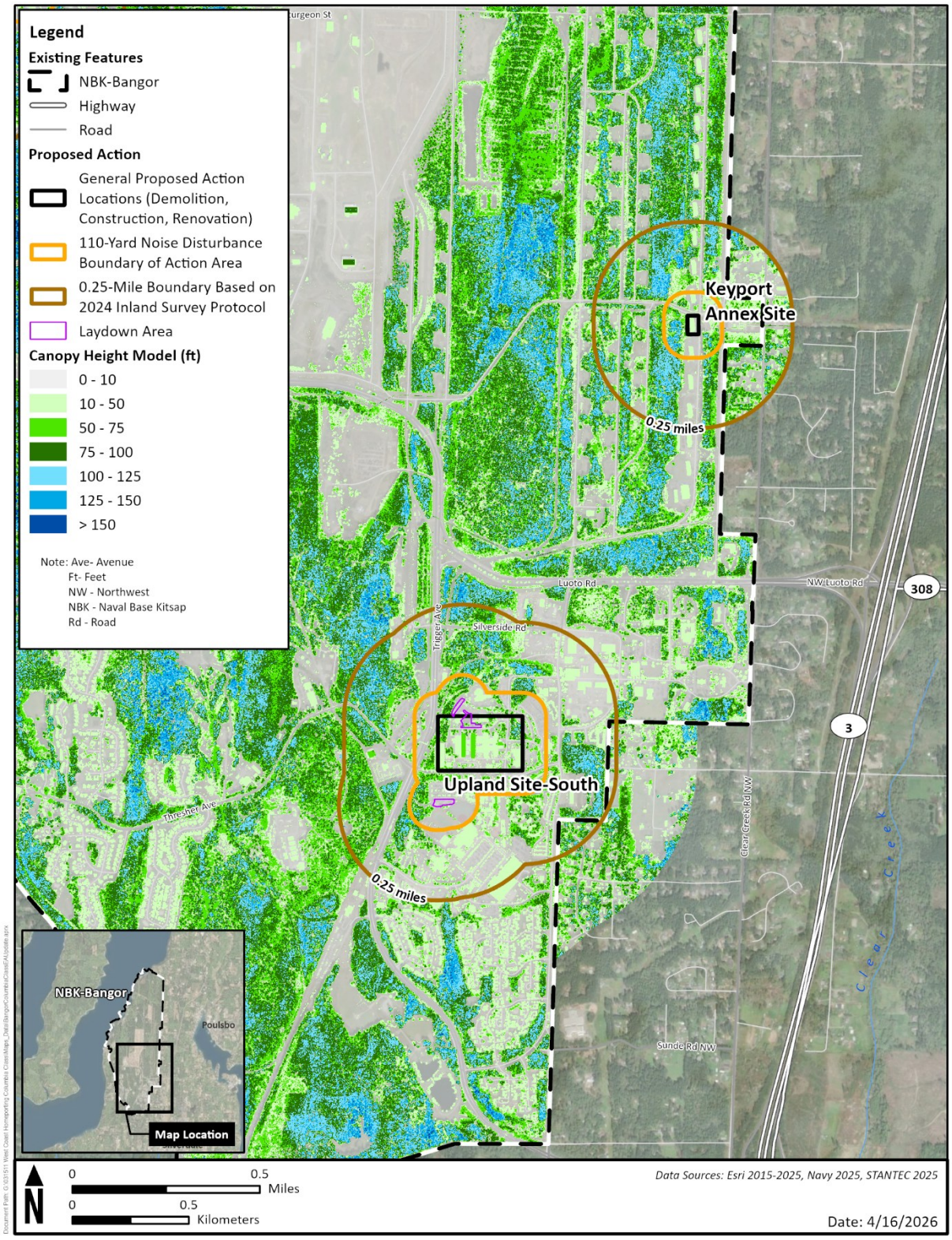


Figure 3.5-10 Canopy Height for Marbled Murrelet at Upland Site-South and Keyport Annex

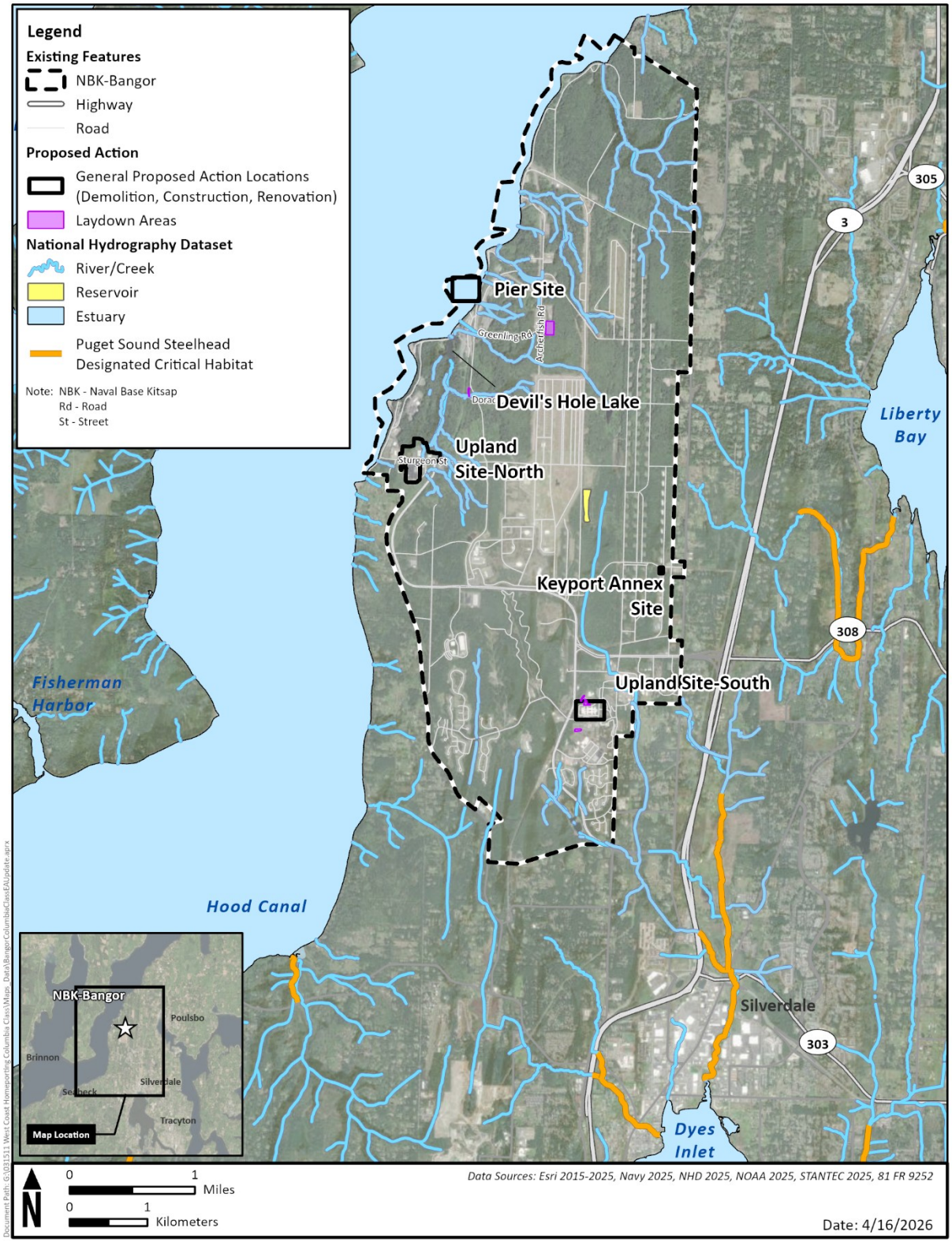


Figure 3.5-11 Puget Sound Steelhead Designated Critical Habitat

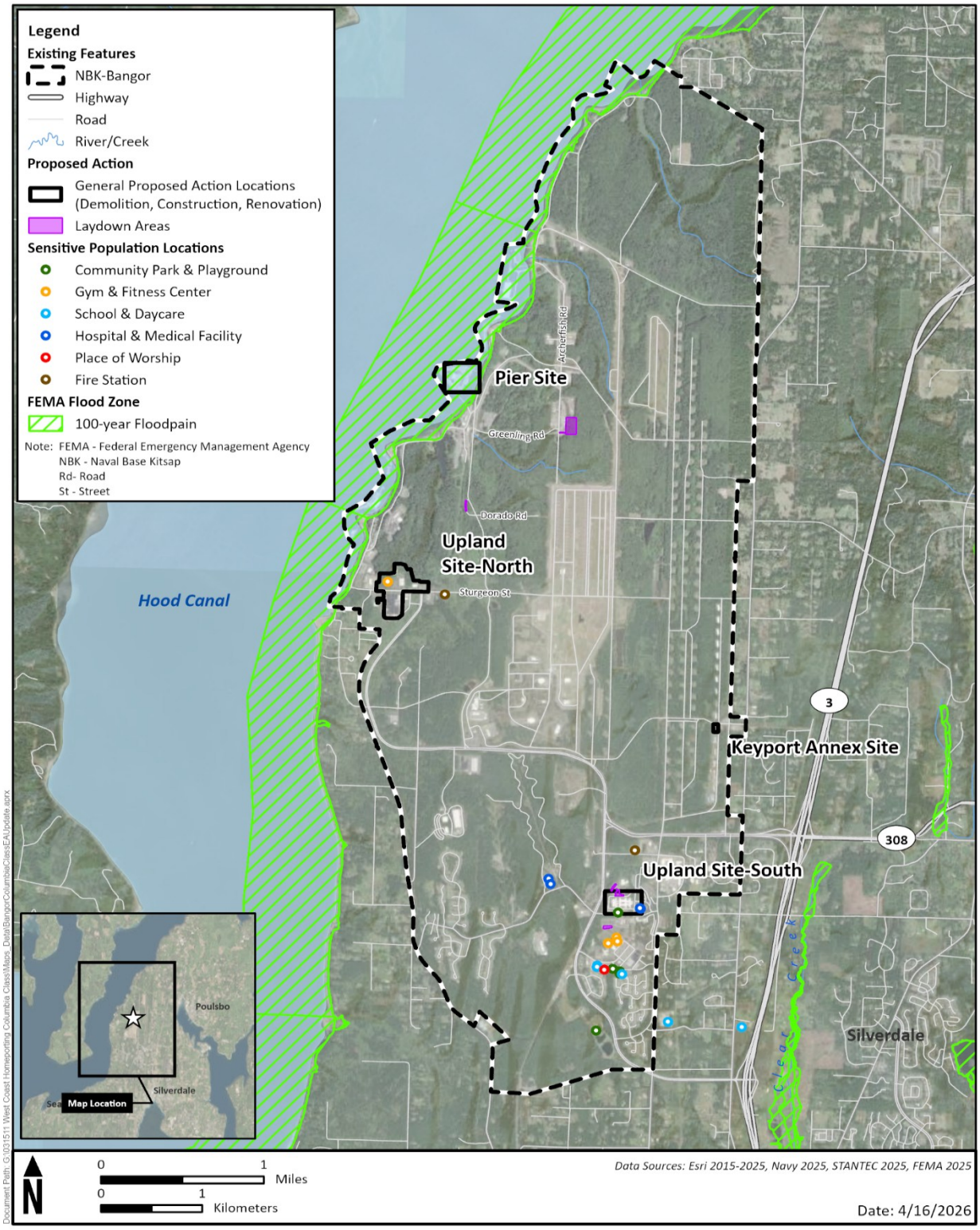


Figure 3.9-1 NBK-Bangor Public Health and Safety

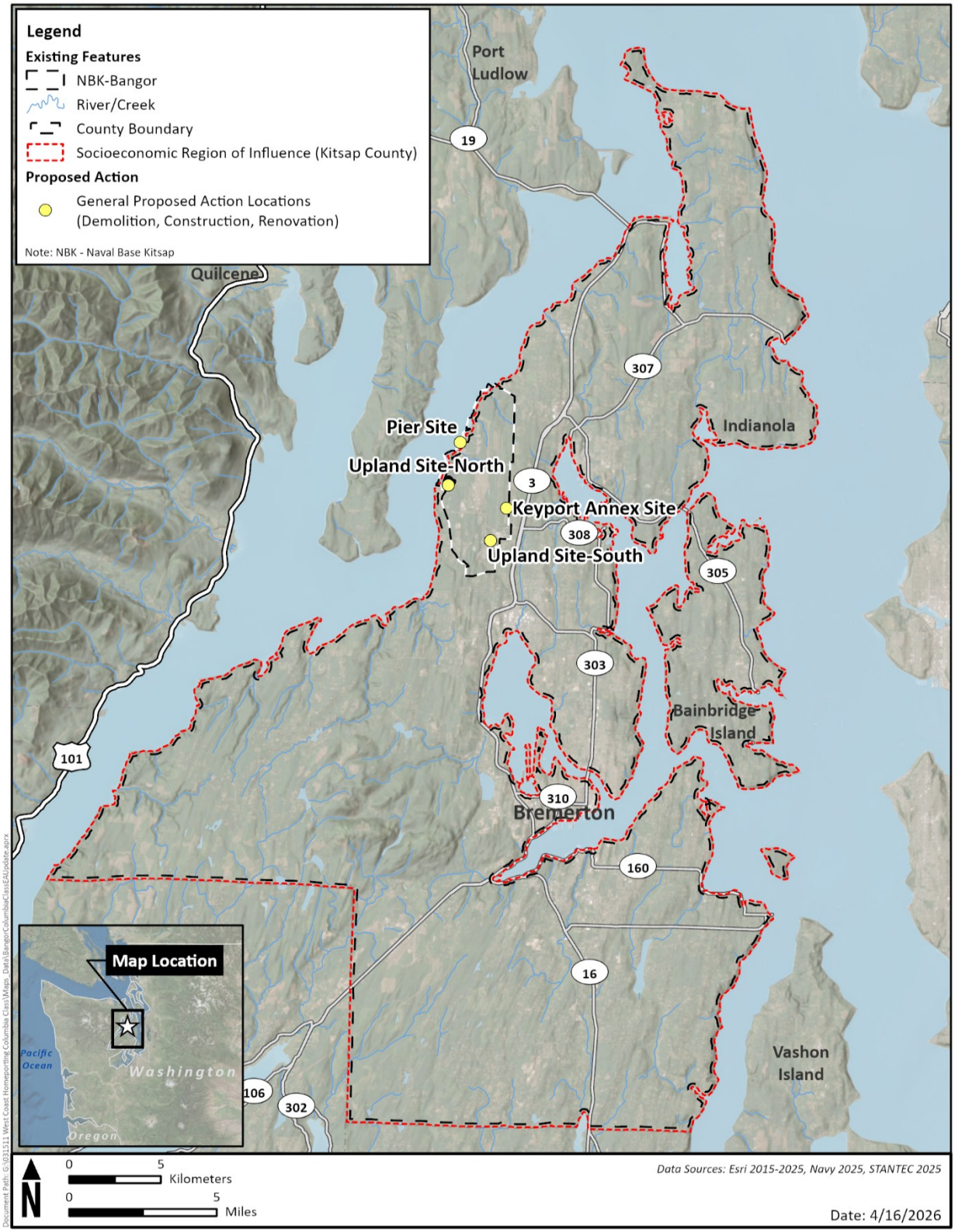


Figure 3.11-1 Socioeconomics Region of Influence

Table 3.4-1 Stormwater Management under the Proposed Action at NBK-Bangor

Project Area	Components	Impervious Surface Type	New Area (acres)	MR6 Water Quality Treatment	MR7 Flow Control Treatment
Upland Site-North					
TRF Complex	Roads/Parking Areas; Substation 4A Option 1 or Option 2; and Mechanical Yard	PGIS	0.99	MTDs and/or Bioinfiltration Swales	TRF Stormwater Pond Upgrades and/or Stormwater Detention Vaults
	Building Roofs, Sidewalks	NPGIS	1.24	N/A	
	Dirt Road (12' Maintenance Access)	NPGIS	0.50	N/A	Bioinfiltration swale and/or dispersion
TRF Complex Laydown Area	Graveled/Paved	PGIS	3.60	Infiltration On-site	Infiltration On-site
Keyport Annex (on NBK-Bangor)					
Keyport Annex	Roadway	PGIS	No Change	None Needed	None Needed
Pier Site					
Delta Pier	Roads	PGIS	-0.10	MTDs and Sump Pumps	Off-site
	Building Roofs	NPGIS	0.10	None Needed	
Pier Site Laydown Area	Graveled/Paved	PGIS	**0.20**	Infiltration/Dispersion On-site	Infiltration/Dispersion On-site
Upland Site-South					
Site A Building Addition and Parking Area, and Site B, Building Addition	Service Area, Sidewalk, Utility Pads, Paver Walkway, Parking Lot	PGIS	0.22	MTDs and/or Bioinfiltration Swales	Stormwater Detention Vaults
	Building Roofs	NPGIS	0.37	None Needed	
Total PGIS			**4.91**		
Total NPGIS			**2.21**		
Total Impervious Surface			**7.12**		

Table 3.5-1 MBTA-Protected Bird Species Most Likely to Occur within Proposed Action Locations at NBK-Bangor

Avian Group	*Members*	*Season(s) of Occurrence*	*Preferred Habitats*	*Preferred Prey*
Upland game birds (Order Galliformes)	California quail, ruffed grouse	Year round	Open grasslands to wooded areas with dense brush	Mainly herbivorous to insectivorous
Hummingbirds (O. Apodiformes)	Anna's hummingbird, Rufous hummingbird	Rufous hummingbird: Spring and Summer; Anna's hummingbird: year round	Anywhere with an abundance of flowers	Nectar and small insects
Perching birds (Order Passeriformes)	Black-capped and chestnut-backed chickadee, ruby-crowned and golden-crowned kinglet, red-breasted nuthatch, brown creeper, Pacific and Bewick's wren, American robin, varied thrush, purple finch, pine siskin, dark-eyed junco, white-crowned sparrow, song sparrow, spotted towhee, orange-crowned warbler Steller's jay, American crow, common raven	Most species occur year round, except orange-crowned warbler which primarily occurs during the breeding season (late spring to early summer)	A wide variety, including grasslands, urbanized areas, woodlands and forests	Diet generally consists of seeds, fruit, and insects Corvids: omnivorous generalists
Birds of prey (multiple orders and families)	Sharp-shinned and Cooper's hawk, bald eagle, red-tailed hawk Owls (American barn owl, great horned owl, northern Pygmy owl, and barred owl)	Year round	A wide variety, from grasslands and chaparrals to mixed woodland, old-growth forests, and urban areas	Carnivorous: small to medium mammals, fish, and/ or other birds Small birds and mammals
Woodpeckers (O. Piciformes)	Red-breasted sapsucker, downy woodpecker, hairy woodpecker, and pileated woodpecker	Year round	A wide variety, including grasslands, woodlands and forests, chaparral, deserts and mountains	Terrestrial arthropods, fruit, and nuts

Sources: Sibley 2003; NBK 2018; Raedeke 2025a,b; USFWS 2025

Table 3.5-2 Summary of Marbled Murrelet Nesting Habitat Probability Model and Canopy Height in the ROI

Site	*Within 110 yards*		*110 yards to 0.25 mile*		*Summary of Field Assessments and Surveys*
	Habitat Model	*Canopy*	*Habitat Model*	*Canopy*	
Pier Site	No habitat present.	No canopy present.	Low to moderate nesting habitat probability.	Canopy height less than ~75 feet to northeast, and 50- 125 feet to southeast.	No field assessments or occupancy surveys conducted within 0.25 mile of the Pier Site.
Upland Site-North	Low habitat probability.	Most of buffer is not forested. Forested areas canopy ranges between 10 and 100 feet.	Low to moderate nesting habitat probability to the SE, with some pixels of high probability. Areas to north have moderate nesting habitat probability with some areas of high probability. Area previously assessed in the field.	Several areas within 0.25 mile are unforested. Stands in SE quadrant up to 125 feet. Areas immediately to north and northeast are unforested. Forested stands further north are up to 125 feet.	Habitat assessment and occupancy surveys conducted north of Upland Site-North within 0.25 mile between 2016 and 2018. Potential marbled murrelet habitat was identified in the survey area. No occupancy behaviors were observed. One above canopy visual detection of marbled murrelet was recorded in 2016 during this occupancy survey. No murrelets were detected in 2017 and 2018.
Laydown Area - SE of Pier Site	Probability of nesting habitat indicates that forested areas may be high within 110 yards; however, areas are immediately adjacent to developed roads and unforested areas.	Canopy heights vary between 75 and 125 feet. The site is immediately adjacent to unforested areas.	Areas to north and SW indicate high probability of nesting habitat. Areas are adjacent to developed roads and unforested areas.	Canopy height is up to 100 feet to NE and SW, and less than 100 feet to SE. Not forested immediately to north and west.	No field assessments or occupancy surveys conducted within 0.25 mile of this laydown/staging area. During 2024/2025 surveys (total of 120) conducted within approximately 1 mile NE of laydown/staging area,

Site	Within 110 yards		110 yards to 0.25 mile		Summary of Field Assessments and Surveys
	Habitat Model	Canopy	Habitat Model	Canopy	
					no murrelets were observed.
Laydown Area - NE of Upland Site-North	Low to moderate nesting habitat probability. Portion has been assessed previously in the field.	Canopy height is 75 to 100 feet, with developed roads to south and east.	Surrounding areas is mostly low to moderate nesting habitat probability. In NE, there are small areas of high habitat probability.	Canopy height to NE is generally between 75 and 150, with some inclusions over 150.	Habitat assessment and occupancy surveys conducted west of this laydown/staging area within 0.25 mile between 2016 and 2018. Potential marbled murrelet habitat was identified in the survey area. One above canopy visual detection of marbled murrelet was recorded in 2016 during this occupancy survey. No murrelets were detected in 2017 and 2018.
Upland Site-South (including laydown/staging areas)	Very little modeled habitat within 100 yards.	Mostly unforested with some areas 75 to 100 feet to northwest.	No modeled habitat to the south and west. Large areas of no habitat within 0.25-mile buffer. Patches of forested areas with low to moderate nesting habitat probability to the north and east. Forested habitat to NW has high habitat probability scores, and has been assessed and surveyed previously.	Mostly unforested areas. Areas of canopy height 125 to 150 feet to north, NW, and E.	Habitat assessment and occupancy surveys conducted west of this Upland Site-South and within 0.25 mile between 2016 and 2018. Approximately 1,105 potential nesting platforms were mapped during habitat assessments in the occupancy survey area, which includes more area than the ROI for this analysis. During 2024 and 2025 surveys, no murrelets were detected.

Site	*Within 110 yards*		*110 yards to 0.25 mile*		*Summary of Field Assessments and Surveys*
	Habitat Model	*Canopy*	*Habitat Model*	*Canopy*	
Keyport Annex	Most of buffer is not habitat. In SW, low to moderate habitat probability adjacent to developed areas.	Mostly unforested immediately adjacent to project footprint. To west and SW, canopies 125 to 150 feet. To SE, 50 to 125 feet.	Most of buffer is not habitat. In the western and SE portion, habitat probability is low to moderate.	Mostly unforested. Patches of areas with canopies 125 to 150 feet in western portion of buffer and patches with canopies between 50 and 125 feet to the east and SE.	No field assessments or occupancy surveys conducted within 0.25 mile of Keyport Annex.

Legend: N=north; E=east; NE=northeast, SE=southeast, SW=southwest, NW=northwest.
Source: Lorenz et al. 2021, Navy 2025a

Table 3.5-3 Construction-Related Noise Attenuation

Distance from Proposed Action Location (feet)	*Upland Sites North, South, and Laydown Areas (Tree Clearing) Main Construction Noise (dBA) (Point Source, Soft Site)*[a,c]	*Upland Site-North and Pier Site Main Construction Noise (dBA) (Point Source, Hard site, Pavement/Water)*[b]	*Keyport Annex construction noise(dBA) (Point Source) (Soft Site, Dense Forest Vegetation*)[c]
50	88	98	78
100	80.5	92	70.5
200	73	86	63
400	65.5	80	55.5
548	62	77	**55 (Background)**
800	58	74	N/A
1,044	**55 (Background)**[d]	73	N/A
1600	N/A	68	N/A
3200	N/A	62	N/A
7,062	N/A	**55 (Background)**	N/A

Notes: [a]-Decrease of 7.5 dBA per doubling of distance.
[b]-Decrease of 6 dBA per doubling of distance.
[c]-Decrease of 10 dBA of maximum noise due to interposing dense vegetation between noise sources and receptors.
[d]-Exact distances at which noise attenuates to background for each site condition and point was calculated using the following equation. D = D0 * 10((Construction Noise – Ambient Sound Level in dBA)/α); NA indicates distances at corresponding sites that are not referenced in the analysis.

Key: dBA = A-weighted decibel

Source: WSDOT 2025a

Appendix C
Regulatory Process Considerations

This page intentionally left blank.

Appendix C
Regulatory Process Considerations

The Navy has prepared this EA based upon federal and state laws and regulations, and policies pertinent to the implementation of the Proposed Action (Action Alternative). This appendix summarizes the applicable principal federal, state, and local laws and regulations to the relevant resources from the EA.

Air Quality

Criteria Pollutants

Under the Clean Air Act, the U.S. Environmental Protection Agency (EPA) has established National Ambient Air Quality Standards (NAAQS) (40 Code of Federal Regulations [CFR] part 50) for these pollutants. Washington State has adopted the NAAQS for its state ambient air quality standards (Washington Administrative Code [WAC] Title 173, Chapter 476). Areas in compliance with the NAAQS are designated as attainment areas. Kitsap County is in attainment for all criteria pollutants (EPA 2025). At the time of this applicability analysis, air emissions generated by homeporting of the new Columbia-class submarines at NBK-Bangor would not occur within a Federal Clean Air Act designated nonattainment and/or maintenance area. Therefore, the action is not subject to the General Conformity Rule.

Hazardous Air Pollutants

National standards also exist for hazardous air pollutants (HAPs) for specific source categories regulated under Section 112 of the 1990 Clean Air Act amendments. The WAC Chapter 173, Section 460 also limits ambient air concentrations of approximately 400 toxic air pollutants for stationary sources subject to air permitting, and Regulation III of the Puget Sound Clean Air Agency (PSCAA) regulates sources of toxic air pollutants. Due to the limited activity stretched across a multi-year period, the emission of HAPs would be very low, including during the individual periods of construction activity when diesel-fueled equipment would be operating in the area. These emissions are not estimated to increase substantially above the emission levels that exist currently from diesel-powered operations at the installation. None of these activities or other sources of HAPs are anticipated to be significant emission contributors associated with the Action Alternative and so HAPs are not further evaluated in the analysis.

Greenhouse Gases

GHG reporting requirements for facilities that emit 10,000 metric tons per year of GHG reported as carbon dioxide equivalent (CO2e) (11,023 tons per year) or more have been in place in Washington since 2012 (WAC Title 173, Chapter 441). NBK-Bangor is required to report GHG emissions annually. GHG emission become part of the larger global atmosphere, so effects to local areas from GHG emissions cannot be estimated with any degree of reliable scientific certainty. See Table 3.3-1 for estimates of the Proposed Action's GHG emissions.

Water Resources

Various Federal, state, and local laws and regulations govern water resources in the state of Washington. Federally, water resources are protected under the CWA 1972. The CWA 1972 regulates pollutant discharge into waters of the U.S. through the National Pollutant Discharge Elimination System (NPDES) program, 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 non-point sources (i.e., stormwater) of water pollution. The EPA administers the NPDES program for federal facilities within the state of Washington and has general permitting authority. Federal facilities in the state of Washington are eligible for coverage under an individual NPDES permit or EPA general permits.

Construction activities that disturb one or more total acres of land at federal facilities are eligible for coverage under EPA's construction general permit (Navy 2021a). Compliance with the construction general permit requires development of a construction site-specific stormwater pollution prevention plan (SWPPP).

Surface water quality standards contained in WAC 173-210A provide the basis for protecting and regulating the quality of surface waters in the state of Washington.

Section 438 of the Energy Independence and Security Act (EISA) establishes stormwater design requirements for development and redevelopment projects. United Facilities Criteria (UFC) 3-210-10 Low Impact Development (DoD 2023) provides technical criteria, technical requirements, and references for the planning and design of applicable DoD projects to comply with stormwater requirements under Section 438 of the EISA.

Requirements and policies regarding stormwater discharges for Navy facilities must comply with all substantive and procedural requirements applicable to point and non-point sources of pollution as required by Executive Order (EO) 12088, *Federal Compliance with Pollution Control Standards*, Department of the Navy's Environmental Readiness Program Manual, OPNAV M-5090.1, and the CWA (Navy 2021b).

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.

Biological Resources

Special-status species, for the purposes of this assessment, are those species listed as threatened or endangered under the ESA and species afforded federal protection under the Marine Mammal Protection Act (MMPA), the Migratory Bird Treaty Act (MBTA), or the BGEPA. In addition, EFH is regulated under the Magnuson-Stevens Fishery Conservation and Management Act (MSA).

The purpose of the ESA is to conserve the ecosystems upon which threatened and endangered species depend and to conserve and recover listed species. Section 7(a)(2) of the ESA requires federal action proponents to consult with the U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) 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 (INRMP) has been developed that, as determined by the Secretary of the Interior or Secretary of Commerce, provides a benefit to the

species subject to critical habitat designation. *Appendix H* will include completed ESA consultation documentation from USFWS and NMFS.

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

Both migratory birds and most native-resident bird species are protected under the MBTA, and their conservation by federal agencies is mandated by EO 13186, Migratory Bird Conservation. Under the MBTA 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. Bald eagles (Haliaeetus leucocephalus) and golden eagles (Aquila chrysaetos) are protected by the BGEPA. This act prohibits anyone, including the federal government, from taking eagles, including their parts, nests, or eggs without first obtaining a permit issued by the Secretary of the Interior. The Act defines "take" as "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest, or disturb."

The MSA, as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-297) led to the formation of eight Fishery Management Councils that share authority with NMFS to help regulate and oversee fishery management in federal waters (NMFS, 2022). The MSA, defines EFH as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity" of certain managed fisheries species (16 United States Code (U.S.C.) section 1802[10]). EFH designations include descriptions of the physical and biological environment and the location of all necessary habitats.

Cultural Resources

Cultural resources are governed by various federal laws and EOs, including the National Historic Preservation Act (NHPA), Archaeological and Historic Preservation Act, American Indian Religious Freedom Act, Archaeological Resources Protection Act of 1979, the Native American Graves Protection and Repatriation Act (NAGPRA) of 1990, and EO 13007, Indian Sacred Sites.

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.

American Indian Traditional Resources

DoD policy for interactions with federally recognized American Indian tribes is detailed in DoD Instruction 4710.02, DoD Interactions with federally recognized tribes (DoD 2018), which requires organizational entities within the DoD (i.e., DoD Components) to consult with federally recognized tribes whenever proposing an action that may have the potential to significantly affect protected tribal resources, tribal rights, or tribal lands. Protected tribal resources, as defined in DoD Instruction 4710.02 are "those natural resources and properties of traditional or customary religious or cultural importance, either on or off Indian lands, retained by or reserved by or for Indian tribes through treaties, statutes, judicial decisions, or EOs, including

Tribal trust resources." These resources may include plants, animals, and locations associated with hunting, fishing, and gathering activities. For the purposes of this section, the term "traditional resources" will be used to encompass protected tribal resources.

The Navy conducts government-to-government consultation in accordance with Secretary of the Navy Instruction 11010.14B, Department of the Navy Policy for Consultation with federally recognized Indian tribes, Alaska Native Tribal Entities, and Native Hawaiian organizations; and Commander, and Navy Region Northwest Instruction 11010.14B, Policy for Consultation with Federally Recognized American Indian and Alaska Native Tribes (May 2025).

Other federal laws, EOs, and memoranda include policies requiring consultation with federally recognized tribes. These include the following: EO 13175, Consultation and Coordination with Indian Tribal governments; the Presidential Memorandum dated November 5, 2009, emphasizing agency needs to comply with EO 13175; EO 13007, Indian Sacred Sites; and the presidential memorandum dated April 29, 1994, Government-to-Government Relations with Native American Governments.

Noise

The Noise Control Act of 1972 (42 United States Code [U.S.C.] section 4901 et seq.) directs federal agencies to comply with applicable federal, state, and local noise requirements with respect to the control and abatement of environmental noise unless the activity is specifically exempted. The Defense Noise Working Group (DNWG) recommends the exterior 60 dB A-weighted equivalent sound level (Leq) as an initial screening criterion for long-term sources of military noise, such as aircraft, to identify schools with the potential for impacts to classroom learning due to noise (DNWG, 2013). Leq is an average sound level, typically over an 8-hour duration representing a typical school day period. DNWG further defines the number of interfering noise events per school period (or per hour) and the total duration of time that would exceed an L_{max} (maximum sound level) of 75 dB as the criteria to calculate the potential for classroom impacts (DNWG, 2013).

Public Health and Safety

Construction site safety regulatory requirements are followed to ensure the safety of the workers and other individuals proximate to a construction site. These requirements implement the practices necessary to anticipate and prevent the risks of illness, injury, and death. Regulatory requirements also implement practices to avoid property damage. Industrial hygiene programs cover exposure to hazardous materials (HAZMATs), use of personal protective equipment, and the availability of Safety Data Sheets (formerly Material Safety Data Sheets). DoD and Navy regulations that protect the health and safety of on-site and civilian workers comply with the standards developed by the Occupational Safety and Health Administration (OSHA) and EPA. These standards establish the proper and required amount of training for industrial workers, the use of personal protective equipment and protective clothing, engineering controls, and the maximum exposure limits for workplace stressors (DoN, 2013b).

Federal, state, and local health and safety policies (including those identified by DoD, Navy, OSHA, and EPA) are applicable at all Navy installations. It is a Navy policy to "observe every

possible precaution in the planning and execution of all operations that occur onshore or offshore to prevent injury to people or damage to property" (DoN, 2013b).

EO 13045, Protection of Children from Environmental Health Risks and Safety Risks, requires a federal agency to "make it a high priority to identify and assess environmental health and safety risks that may disproportionately affect children and shall ensure that its policies, programs, activities, and standards address disproportionate risks to children that result from environmental health risks or safety risks."

Traffic and Transportation

The Washington State Department of Transportation (WSDOT) is responsible for building, maintaining, and operating the state highway system and the state ferry system. WSDOT is also responsible for developing the Statewide Transportation Improvement Program (STIP) in coordination with regional and local partners. The STIP includes projects such as pavement overlays, roadway widening, bridge replacement or repair, signal systems, safety enhancements, bicycle and pedestrian facilities, and transit improvements. The STIP includes projects from transportation improvement programs developed by each Metropolitan Planning Organization. A transportation project must be included in the STIP to be eligible for federal funds, although projects are typically funded by a combination of federal, state, and local sources.

Relevant state regulations and policies include:

- RCW 36.70A: The 1990 Growth Management Act was enacted to promote planned and coordinated development. The legislation requires that LOS standards be established for all arterials and transit routes, and provide a means to identify how proposed development would affect the transportation system. Local jurisdictions must adopt LOS standards as part of their general plan. Ordinances must be put in place that prohibit approval of development that results in the LOS of local transportation facilities to fall below set standards.
- RCW 47.06.140: WSDOT must work in coordination with local governments to set LOS standards for highways of statewide significance.
- RCW 46.44.091: A special permit must be obtained from WSDOT for oversize or overweight vehicles that would be operated on state highways.

Socioeconomics

Socioeconomic data are presented at the U.S. Census Bureau city, county, state, and national levels to characterize baseline socioeconomic conditions in the context of regional, state, and national trends. Data have been collected from previously published documents issued by federal, state, and local agencies and from state and national databases (e.g., the U.S. Census Bureau; the U.S. Bureau of Economic Analysis [BEA]).

Appendix D
Public and Agency Participation

This page intentionally left blank.

Appendix D

Public and Agency Participation

Public Involvement

The Navy published a Notice of Availability for the Draft EA in the *Kitsap Daily News, Kitsap Sun, and the Seattle Times,* which included information about where the Draft EA is available for review, and the announcement of a 30-day public comment period. The notice was also mailed to local and state elected officials; federal, state, and local agencies; and community groups and organizations. Naval Base Kitsap posted the notice on social media.

The public is invited to submit comments on the Draft EA during the public comment period from May 27, 2026, to June 25, 2026. The Navy will consider substantive comments received during the public comment period in the preparation of the Final EA, as appropriate. The public may provide comments on the Draft EA by any of the following methods:

- electronically, via the project website (https://www.nepa.navy.mil/Columbia-West-Coast/)
- in writing, by mail to: Columbia-class EA Project Manager, Naval Facilities Engineering Systems Command Atlantic, Attn: Code EV22JS, 6506 Hampton Blvd, Norfolk, Virginia 23508
- during the public meeting, on June 4, 2026

During the public meeting, project team members will be available at information stations to answer questions. The public may arrive at any time during the specified hours. There will not be a formal presentation. The public meeting will be held at the following time and location:

June 4, 2026, 4:00 to 6:00 p.m.

BEST WESTERN PLUS SILVERDALE

3073 NW Bucklin Hill Rd., Silverdale, WA 98383

Copies of the Draft EA may also be viewed at the following local libraries during the public comment period: Silverdale, Poulsbo, Bremerton, Port Hadlock, and Seattle.

Consultations

Based on potential impacts to resource areas and as required by applicable federal environmental laws and regulations, the Navy initiated consultation with the following agencies:

- USFWS
- NMFS
- Washington Department of Ecology (Ecology)
- WA State Historic Preservation Office/Officer (SHPO)

Government-to-Government Consultation

The Navy sent letters to the following federally recognized tribes notifying them of the Proposed Action and invited them to initiate government-to-government consultation (see *Appendix J*). The Navy is also consulting with these tribes under Section 106 of the National

Historic Preservation Act (NHPA) for potential adverse effects to historic properties (see *Appendix I*). Navy correspondence with tribal governments will be included in the Final EA.

- Jamestown S'Klallam Tribe
- Lower Elwha Tribal Community
- Port Gamble S'Klallam Tribe
- Skokomish Indian Tribe
- Suquamish Indian Tribe of the Port Madison Reservation

Distribution List

[To be included in the Final EA**]**

This EA was distributed to the following agencies, Tribes, and stakeholders.

Federal Agencies

State Agencies

Tribes

Stakeholders

Appendix E
Best Management Practices

This page intentionally left blank.

Appendix E
Best Management Practices

This section presents an overview of the best management practices (BMPs) that are incorporated into the Action Alternative in this document (Table E-1). 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 avoid, minimize or reduce/eliminate impacts, BMPs are distinguished from potential mitigation measures because BMPs are (1) existing requirements for the Action Alternative, (2) ongoing, regularly occurring practices, or (3) not unique to this Action Alternative. In other words, the BMPs identified in this document are inherently part of the Action Alternative and are not potential mitigation measures proposed as a function of the NEPA environmental review process for the Proposed Action. BMPs include actions required by federal or state law or regulation.

Table E-1 Best Management Practices for NBK-Bangor

BMP	*Description*	*Impacts Reduced/Avoided*
General Construction Best Management Practices (BMPs)	Work area is restricted to the authorized project footprint as shown in the design plans.	Reduces potential water quality impacts. These requirements include adherence to construction permit requirements, stormwater management, erosion control, maintenance of construction equipment, spill containment, spill response, and dust control.
	Prior to construction activities, all site limits would be marked using stakes and flagging.	
	Fueling would not occur on the pier or near water. Refueling equipment shall only be permitted at approved fueling facilities. All equipment will use ultra-low sulfur fuel.	
	There would be no discharge of oil, fuels, or chemicals to surface water or onto land or water.	
	Work would be conducted during daylight hours to the maximum extent practicable.	
	Do not clean paved areas, equipment, buildings, etc., on piers using wet methods (hosing down).	
	Solid waste containers on pier must be closed or covered at all times, except when waste is being added	
	Demolition and construction on pier must have containment and collection measures in place to prevent dust, dirt, debris, flakes, chips, drips, oil or any other pollutants generated from these surface preparation activities from entering Sinclair Inlet.	
General Construction Best Management Practices (cont.)	Containments such as tarps, drapes, shrouding, or other protective devices must be securely fastened to collect materials when applicable.	

BMP	*Description*	*Impacts Reduced/Avoided*
	Cleanup of all collected materials must be conducted as necessary, or at least by the end of shift, to prevent their release into the environment and entry into Sinclair Inlet.	
	Soil exposed as part of the project shall be protected from erosion (with plastic sheeting, filter fabric, etc.) after exposure.	
Stormwater Pollution Prevention Plan in compliance with the U.S. Environmental Protection Agency (EPA) Construction General Permit	The construction contractor shall prepare and implement a site-specific construction Stormwater Pollution Prevention Plan (SWPPP) in conformance with the *Stormwater Management Manual for Western Washington* (SWMMWW) (Ecology 2019) and ensure that all BMPs and other appropriate control measures specified in both the permit and SWPPP are implemented, monitored, and submitted to the Navy for regular review.	Reduces potential water quality impacts.
	Erosion controls compliant with the Ecology SWMMWW would be implemented.	
	During demolition, construction, and renovation, catch basins would be installed to convey stormwater to a series of detention vaults. Stormwater would then flow to existing stormwater treatment facilities, which would then discharge treated stormwater.	
Compliance with United Facilities Criteria (UFC) 3-210-10 Low Impact Development (LID); Energy Independence and Security Act (EISA) Section 438; and NBK-Bangor Municipal Separate Storm Sewer Systems (MS4) permit.	The MS4 permit requires compliance with the 2019 SWMMWW for stormwater quality and flow control.	Maintains or restores pre-development hydrology; reduces potential water quality impacts.
	Stormwater manufactured treatment devices (MTDs) and bioinfiltration swales would be used to treat stormwater quality with bypass structures oriented adjacent to the units. MTDs and other BMPs for stormwater from parking areas and roads would be specifically selected to treat N-(1,3-dimethyl)-N'-phenyl-p-phenylenediamine-quinone (6PPD-q), as identified and assessed by Ecology (2022). Stormwater detention vaults, stormwater management ponds, infiltration swales, and/or dispersion would be used for flow control.	
Debris Containment and Removal	Project-related waste and trash must be secured to ensure it does not enter adjacent surface waters	Reduces impacts to marine waters.
	A temporary platform or other suitable means of capturing debris from demolition operations must be provided. These facilities must be in place before starting work.	

BMP	*Description*	*Impacts Reduced/Avoided*
	Garbage, plastic, and debris found or created during construction shall be daily removed from the site and disposed of in an approved upland facility. The storage methods and locations while workers are on-site will occur so the trash would not enter the water or cause degradation of water quality. Storage methods and locations would be animal-, weather-, and wind-proof.	
	Any floating debris generated during construction shall be retrieved. Debris removed from the marine/aquatic environment shall be disposed at an approved landside disposal facility following local, state, and federal regulations.	
	All trash would be removed from the project and staging area daily, including concrete blocks or pieces, bricks, asphalt, metal, treated wood, glass, floating debris, and paper. All trash would be disposed of after work is complete.	
Dust Control	During high winds, enclosures and wet suppression techniques, as practical, would be used.	Reduces visible fugitive dust emissions and impacts to air quality.
	Establish and monitor speed limits for project rights-of-way.	
	Cover all moving, open-bodied trucks transporting materials that can generate fugitive dust.	
	Minimize truck idling time	
	Install dust screens or wind barriers around construction site.	
	During earth-moving activities, pre-apply and re-apply water as necessary to maintain soils in a damp condition, limit the number of exposed areas through planning and timing of project phases, and cover temporarily exposed areas.	
	The contractor shall cover excavated material and stockpiles when not in use.	
	Promptly remove “carry out“ materials from roads adjacent to the site.	
New Structures	All new structures should be designed and constructed to comply with seismic design criteria identified in the Department of Defense’s (DoD) safety certification program – MIL-STD-1625D(SH) and the DoD UFC.	Reduces potential effects of seismically induced ground movement.

BMP	*Description*	*Impacts Reduced/Avoided*
Concrete and Grout	Concrete and grout (watery concrete) must not be allowed to enter the water. Project areas utilizing concrete must be sealed against concrete leakage.	Prevents introduction of materials into surface or ground water.
	Only tremie or pre-cast (marine grade) or cast in place (marine grade) concrete shall be used. No lime, chemicals, or other toxic or harmful materials related to non-marine grade concrete shall be permitted.	
Inadvertent Discovery Procedures	If archaeological resources are discovered during project activities, work shall be stopped immediately, and the Navy Cultural Resources personnel shall be notified. The Navy will then adhere to the provisions of 36 CFR 800.13(b)(3). If human remains are encountered during project activities, work shall be stopped immediately, and the project Plan of Action will be followed.	Reduces impacts to cultural resources.
Visual Resource Compliance	New facilities shall be painted/treated to be consistent with surrounding infrastructure. New structures include a substation with respective electrical distribution system upgrades.	Reduces impacts to visual resources.
Construction Safety Plan	A construction safety plan shall be developed for on-site construction personnel including evacuation procedures in the event of an earthquake, tsunami, or adverse weather conditions. The construction safety plan shall be approved by the Navy prior to work occurring.	Reduces impacts to public health and safety.
	Micro-pile installation schedule would be communicated to the Child Development Center staff to facilitate planning outdoor Child Development Center activities during non-construction periods to minimize noise exposure.	
Contamination Management	Provisions for excess soil stockpiling, stormwater accumulation, excavation dewatering, sanitary sewer discharges, dust control, and waste management shall be pre-planned prior to excavation and in accordance with the contract documents.	Reduces impacts on public health and safety and water quality.

Appendix F
Coastal Consistency Determination

[To be included in the Final EA]

This page intentionally left blank.

Appendix G
Air Quality Methodology and Calculations

This page intentionally left blank.

TAB A. Assumptions

Work duration based on

8	hr/day			
7	days/wk			
56	hr/wk			
243	hr/month	based on average month =	30.4	days

Assume 20 mile round trip for worker trips

Note: MOVES does not calculate N2O for nonroad equipment. The ratio of N2O to CH4 has been used to derive emission values for nonroad equipment (lb):

0.45614

The ratio is from EPA. 2016. Direct Emissions from Mobile Combustion Sources, Table B-8. January.

Std dump truck capacity =	12	CY
Std concrete truck capacit	9	CY
Barge capacity	1500	tons

weight of CY asphalt =	3960	lbs	Source: aws-fd.com/weight-calculator
weight of CY concrete =	4050	lbs	Source: www.wasteremovalusa.com
weight of CY gravel =	2565	lbs	Source: https://www.epa.gov/sites/default/files/2016-03/documents/conversions.pdf

All production rates are from the Federal Highway Adminstration CFL production rate spreadsheet:
https://highways.dot.gov/federal-lands/design/tools/cfl/production-rates.xls

TAB B. Emissions Summary

Year	Location	Location	tons					
			VOCs	CO	NOx	SOx	PM10	PM2.5
2027	Onsite	Upland Site North	0.12	0.57	1.27	0.00	0.52	0.13
		Upland Site South	0.55	2.67	5.19	0.01	3.08	0.64
	Total Annual Onsite		0.67	3.24	6.46	0.01	3.61	0.77
	Offsite	Upland Site North	0.01	0.64	0.12	0.00	0.43	0.07
		Upland Site South	0.06	5.87	0.27	0.00	3.91	0.59
	Total Annual Offsite		0.08	6.51	0.39	0.00	4.34	0.66
	2027 Total Emissions		**0.74**	**9.75**	**6.85**	**0.01**	**7.95**	**1.43**
2028	Onsite	Upland Site North	0.95	4.54	9.07	0.01	3.16	0.89
		Upland Site South	0.55	2.67	5.19	0.01	3.08	0.64
	Total Annual Onsite		1.50	7.21	14.26	0.02	6.24	1.53
	Offsite	Upland Site North	0.06	4.16	0.43	0.00	2.77	0.43
		Upland Site South	0.06	5.87	0.27	0.00	3.91	0.59
	Total Annual Offsite		0.13	10.04	0.70	0.01	6.68	1.02
	2028 Total Emissions		**1.62**	**17.25**	**14.96**	**0.02**	**12.93**	**2.55**
2029	Onsite	Upland Site North	1.05	5.06	9.97	0.01	3.54	1.00
		Upland Site South	0.55	2.67	5.19	0.01	3.08	0.64
	Total Annual Onsite		1.60	7.73	15.16	0.02	6.62	1.64
	Offsite	Upland Site North	0.06	4.39	0.44	0.00	2.92	0.45
		Upland Site South	0.06	5.87	0.27	0.00	3.91	0.59
	Total Annual Offsite		0.13	10.27	0.71	0.01	6.84	1.04
	2029 Total Emissions		**1.72**	**18.00**	**15.86**	**0.02**	**13.46**	**2.68**
2030	Onsite	Upland Site North	1.05	5.06	9.97	0.01	3.54	1.00
		Upland Site South	0.55	2.67	5.19	0.01	3.08	0.64
	Total Annual Onsite		1.60	7.73	15.16	0.02	6.62	1.64
	Offsite	Upland Site North	0.06	4.39	0.44	0.00	2.92	0.45
		Upland Site South	0.06	5.87	0.27	0.00	3.91	0.59
	Total Annual Offsite		0.13	10.27	0.71	0.01	6.84	1.04
	2030 Total Emissions		**1.72**	**18.00**	**15.86**	**0.02**	**13.46**	**2.68**
2031	Onsite	Upland Site North	1.03	4.96	9.79	0.01	3.46	0.97
		Upland Site South	0.55	2.67	5.19	0.01	3.08	0.64
	Total Annual Onsite		1.58	7.63	14.98	0.02	6.54	1.61
	Offsite	Upland Site North	0.06	4.35	0.44	0.00	2.89	0.44
		Upland Site South	0.06	5.87	0.27	0.00	3.91	0.59
	Total Annual Offsite		0.13	10.22	0.71	0.01	6.80	1.04
	2031 Total Emissions		**1.70**	**17.85**	**15.68**	**0.02**	**13.35**	**2.65**
2032	Onsite	Upland Site North	0.04	0.19	0.41	0.00	0.13	0.04
	Total Annual Onsite		0.04	0.19	0.41	0.00	0.13	0.04
	Offsite	Upland Site North	0.00	0.22	0.03	0.00	0.15	0.02
	Total Annual Offsite		0.00	0.22	0.03	0.00	0.15	0.02
	2032 Total Emissions		**0.05**	**0.41**	**0.44**	**0.00**	**0.28**	**0.06**

Estimated total annual GHG emissions for Proposed Action in tons

Year	tons			
	CO2	CH4	N2O	CO2e
2027	3217	0.06	0.02	3225
2028	6388	0.12	0.05	6403
2029	6819	0.13	0.05	6836
2030	6819	0.13	0.05	6836
2031	6732	0.13	0.05	6749
2032	166	0.00	0.00	167

TAB C. Upland North (including Delta Pier)

1 pound= 453.59 grams

P817 Building renovation (assume all building renovation is indoors)

P817 7000 series renovations/additions

	Asphalt	Concrete	Gravel	
	0	2,310	2,310	CY
Truck Trips	0	257	193	

Bldg 7000	246,852	SF			
Bldg 7000A	4,374	SF			
Bldg 7003	17,496	SF			
Bldg 7058A	10,206	SF			
Bldg 7088	9,234	SF			
Bldg 7415	4,500	SF			
Bldg 7419	4,455	SF			
Bldg 7425	7,081	SF			
Bldg 7450	27,216	SF			
Total	**331,414**	**SF**	1543	days	Per P817 Basis of Design

where not specified, assume 4" thickness

0 Tons asphalt

4,679 Tons concrete

2,963 tons gravel

Delta Pier

120x30	3600
60x60	3600
60x45	2700

Building 7000 renovation concrete slab replacement	117,520	SF			Per P817 BOD
Incidental concrete work	16571	SF			Additional concrete for incidental work such as filling pits, pouring new ones, heavy equip foundations, concrete shear walls, etc.

Building construction

P817 Delta Pier

	Asphalt	Concrete	Gravel	
	0	122	122	CY
Truck Trips	0	14	10	

where not specified, assume 4" thickness

0 Tons asphalt

247 Tons concrete

157 tons gravel

P817 building additions	48,702	SF	5411	SY	From P817 BOD		
P817 Delta Pier	9,900	SF	1100	SY	From P817 BOD		

Site clearing (P817)

Laydown areas	14,560	SF	0.3	acres	1,618	SY	Gravel required for laydown areas (assume 4 inch thickness)
Laydown area for Delta Pier	196,020	SF	4.5	acres	21,780	SY	2,599 CY

Worker Trips:

P817 7000 Series Building Renovation	80	worker trips per day	Based on CalEEMod App A. Maximum number of daily worker trips is based on 1.25 workers per equipment during construction phase which would include 32 pieces of equipment. This value was then doubled, as this is industrial renovation, rather than residential.
	75298	total worker trips	
P817 7000 Series Seismic Upgrades	20	worker trips per day	2 seismic crews of 10 workers per day is assumed for the seismic upgrades to the buildings, in addition to the regular building renovation workers.
	12035	total worker trips	
Delta Pier Building Construction	25	worker trips per day	Based on CalEEMod App A. Maximum number of daily worker trips is based on 1.25 workers per equipment during construction phase which would include 20 pieces of equipment.
	33625	total worker trips	
Site Clearing	11	worker trips per day	Based on CalEEMod App A. Maximum number of daily worker trips is based on 1.25 workers per equipment during combined land clearing/grading phase which would include 9 pieces of equipment.
	450	total worker trips	

Phase Lengths:

P817 7000 series Building Renovation	941	days	Per P817 Basis of Design document (11/3/2027-1/23/2032) - assume 61% renovation/39% seismic upgrades
P7817 7000 series seismic upgrades	602	days	Based on BOD document
P817 Delta Pier	1345	days	Per P817 Basis of Design document (4/7/2028-12/12/2031)
P817 Laydown Area Site Clearing	40	days	assume 40 days based on quantities of materials to be removed/added
Total	**2928**	**total days**	

Percentage of activity days per year

	2027	2028	2029	2030	2031	2032
P817 renovation/ seismic upgrades	0.06	0.39	0.39	0.39	0.39	0.02
P817 Delta Pier		0.20	0.27	0.27	0.26	
Laydown	0.04					
Fugitive Dust	0.02	0.12	0.13	0.13	0.13	0.00

Fugitive dust is proportioned between all activities and years.

General Materials Trips: 54 Trips; 2928 days total — based on 0.1639 vendor trips/1000 SF (from South Coast AQMD Field Survey 2008/2010 and used in CALEEMOD).

Assume 200 lb/square foot: 66,282,800 pounds of debris — Source: https://primedumpster.com/dumpsters/how-to-calculate-demolition-debris/

For building renovation, assume debris will be 50% of what it would be for demolition of a building

Assume the same values for the materials to be delivered

33,141,400 pounds, or 16,571 tons

Assume 600 lb/CY for general (non-concrete/asphalt) debris: 55,236 CY — https://www.bvrdumpsters.com/

Truck Transport - Renovation Debris from 7000 series building renovations

Dump truck weight hauling capacity estimated to be 14 tons for 12 CY truck

Task	Vehicle Type	Assumed Avg. Speed (mph)	Round Trip Distance (miles)	Total Project Trips (trucks)	Total Project VMT (miles)	Total Travel Time (hours)	Fraction Time in Idle	Total Time in Idle (hours)	Total Project Emissions (tons)									
									VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Total GHGs (CO2e)
Waste Hauling - Renovation	Dump Truck	35	44	1,184	52,079	1488	0.3	446	0.020	0.111	0.200	0.000	0.080	0.020	59	0.001	0.000	59
All waste and recyclables assumed to be hauled to the Olympic View Transfer Station (Approximately 22 miles one way)								**Totals**	**0.02**	**0.11**	**0.20**	**0.00**	**0.08**	**0.02**	**59**	**0.00**	**0.00**	**59**

Truck Transport - Material Deliveries for P817 7000 series building renovations/additions

Task	Vehicle Type	Assumed Avg. Speed (mph)	Round Trip Distance (miles)	Total Project Trips (trucks)	Total Project VMT (miles)	Total Travel Time (hours)	Fraction Time in Idle	Total Time in Idle (hours)	Total Project Emissions (tons)									
									VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Total GHGs (CO2e)
Concrete Delivery	Concrete Truck	35	26	257	6,675	191	0.3	57	0.003	0.014	0.026	0.000	0.010	0.003	8	0.000	0.000	8
Gravel Delivery	Delivery Truck	25	30	193	5,776	231	0.3	69	0.002	0.013	0.023	0.000	0.009	0.002	7	0.000	0.000	7
General Materials Delivery - Barge	Barge	8	100	7	674	84	NA	NA	0.013	0.039	0.239	0.000	0.006	0.006	29	0.000	0.001	29
General Materials Delivery - Truck	Delivery Truck	35	34	829	28,170	805	0.3	241	0.011	0.060	0.108	0.000	0.043	0.011	32	0.001	0.000	32
Notes: The following area businesses were used for estimating distance and travel time -								**Totals**	**0.028**	**0.126**	**0.396**	**0.000**	**0.069**	**0.022**	**75**	**0.001**	**0.002**	**75**

Gravel - Kitsap Quarry - 15 miles one way
Concrete - CalPortland - 13 miles one way
General Materials (Truck) - Assume from Bremerton, 17 miles one way
General Materials (Barge) - Assume from Seattle, 50 miles one way
Assume 80% of general materials deliveries for renovation, and 20% for seismic upgrades
Assume trucks delivering general materials are 20 ton semi trucks hauling from the port to the construction area

P817 Onsite material movement (movement of materials and equipment for shop relocation)

Equipment	Activity	Operating Hours	g/hr-vehicle Emission Rate VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O
Onsite trucks	Idle	19,420	5.23	21.99	34.17	0.02	2.54	2.34	5,728	0.27	0.08
	Total emissions in pounds		223.84	941.28	1,463.05	0.83	108.73	100.03	245,231	11.57	3.54

Equipment	MPH	Miles	g/VMT Emission Rate VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O
Onsite trucks	10	9,710	0.85	4.48	7.34	0.01	0.99	0.46	1,701	0.04	0.01
			Annual Emissions in Pounds								
			VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O
Assumed 10 trips/day, 0.5 miles one way per trip for total moving days, est. to be		971	18.13	95.85	157.11	0.12	21.15	9.74	36,414.37	0.93	0.18

Truck idling is estimated at 1 hour before and after each truck trip, for a total of 2 hours of idling per trip x 10 trips/day = 20 hours/day

Equipment emissions for P817 7000 series building renovations/additions

Off-road Equipment	Hours of Operation	Engine HP	Load Factor	Emissions VOC lb	CO lb	NOx lb	SO2 lb	PM lb	PM2.5 lb	CO_2 lb	CH4 lb	N2O lb	Notes on Hour Estimates
Excavator	148	450	0.53	2.49	15.81	42.67	0.12	2.53	2.46	41,732	0.22	0.10	based on 500 CY/day productivity rate x 2 pieces of equipment
Grader	29	145	0.58	0.11	0.71	2.46	0.01	0.17	0.16	2,872	0.01	0.00	based on 3000 SY/day productivity rate for 2 passes
Dozer	259	275	0.58	1.78	8.05	26.70	0.13	1.51	1.46	48,909	0.14	0.07	based on 231 CY/hr productivity rate
Compactor	45,179	19	1	700.97	2,950.92	7,260.52	4.10	344.36	334.03	1,115,245	58.13	26.52	based on loader activity productivity X 2 pc equip.
Skidsteer Loader	45,179	95	0.23	1,599.21	8,461.83	8,292.73	4.85	1,206.54	1,170.34	1,510,128	62.16	28.35	based on loader activity X 2 pc equip
Loader	22,590	300	0.48	248.29	1,189.19	3,560.58	10.56	220.73	214.11	3,849,124	21.56	9.83	based on total construction days X 3 units
25 ton Crane	7,530	150	1	103.12	436.66	2,150.55	3.67	101.43	98.38	1,322,047	8.92	4.07	based 4 hours per day for total construction days X 2 units
Telehandler	15,060	130	0.48	19.92	122.28	388.72	2.94	23.26	22.57	1,112,121	1.45	0.66	based on total construction days X 2 units
Forklift	22,590	74	0.48	90.43	345.11	4,505.85	2.78	28.00	27.16	1,054,286	15.86	7.24	based on total construction days and 3 units
Misc Curing Equipment	225	60	0.58	1.92	12.04	48.83	0.03	1.38	1.34	10,266	0.21	0.09	based on 500 tons/day productivity rate X 3 units
Concrete Finisher	674	74	0.58	7.11	44.54	180.68	0.11	5.10	4.95	37,984	0.77	0.35	based on curing equipment productivity X 3 pc equip.
Concrete Truck	231	300	0.21	4.63	20.97	87.52	0.05	2.80	2.72	17,028	0.28	0.13	based on 6 min/CY truck productivity at pour site
			Subtotal (lbs):	**2,779.99**	**13,608.10**	**26,547.81**	**29.34**	**1,937.81**	**1,879.67**	**10,121,744**	**169.72**	**77.42**	
			Construction Total in Tons	**1.39**	**6.80**	**13.27**	**0.0147**	**0.97**	**0.94**	**5,061**	**0.085**	**0.039**	

Worker Trips for 7000 series building renovations

Equipment	MPH	Miles	g/VMT Emission Rate VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O
Passenger Truck	45	1,505,968	0.04	4.52	0.13	0.00	3.01	0.45	386	0.01	0.00
			Total Emissions in Pounds								
			VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O
		Subtotal in pounds	**141.97**	**14,996.96**	**438.04**	**8.52**	**10,000.28**	**1,504.71**	**1,282,455**	**47.12**	**6.65**

Truck and Barge Transport - Material Deliveries for P817 7000 series seismic upgrades

Task	Vehicle Type	Assumed Avg. Speed (mph)	Round Trip Distance (miles)	Total Project Trips (trucks)	Total Project VMT (miles)	Total Travel Time (hours)	Fraction Time in Idle	Total Time in Idle (hours)	Total Project Emissions (tons) VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Total GHGs (CO2e)
General Materials Delivery	Delivery Truck	35	34	323	10,986	314	0.3	94	0.004	0.023	0.042	0.000	0.017	0.004	12.376	0.000	0.000	12.392
General Materials Delivery	Barge	8	100	4	431	54	NA	NA	0.008	0.025	0.153	0.000	0.004	0.004	18	0.000	0.001	19
								Totals	**0.012**	**0.048**	**0.195**	**0.000**	**0.021**	**0.008**	**31**	**0.000**	**0.001**	**31**

Notes: The following area businesses were used for estimating distance and travel time -
General Materials (Truck) - Assume from Bremerton, 17 miles one way
General Materials (Barge) - Assume from Seattle, 50 miles one way
Assume 61% of general materials deliveries for renovation, and 39% for seismic upgrades, based on # of days for each task (reno and upgrades)
Assume trucks delivering general materials are 20 ton semi trucks hauling from the port to the construction area

Equipment emissions for P817 7000 series seismic upgrades

Off-road Equipment	Hours of Operation	Engine HP	Load Factor	Emissions VOC lb	CO lb	NOx lb	SO2 lb	PM lb	PM2.5 lb	CO_2 lb	CH4 lb	N2O lb	Notes on Hour Estimates
Forklift	2,407	74	0.48	9.64	36.77	480.13	0.30	2.98	2.89	112,342	1.69	0.77	based on 4 hr/day usage for 100% of seismic upgrade construction days
25 ton crane	2,407	150	1	32.97	139.59	687.47	1.17	32.42	31.45	422,622	2.85	1.30	based on 4 hr/day usage for 100% of seismic upgrade construction days
Welder	2,407	10	0.19	11.81	53.14	47.96	0.03	6.18	6.00	6,984	0.78	0.35	based on 4 hr/day usage for 100% of seismic upgrade construction days
Auger Rig	2,407	300	1	335.68	891.10	4,176.12	2.71	185.54	179.97	844,473	19.85	9.06	based on 4 hr/day usage for 100% of seismic upgrade construction days
			Subtotal (lbs):	**390.09**	**1,120.60**	**5,391.68**	**4.20**	**227.13**	**220.31**	**1,386,421**	**25.17**	**11.48**	
			Construction Total in Tons	**0.20**	**0.56**	**2.70**	**0.0021**	**0.11**	**0.11**	**693**	**0.013**	**0.006**	

Worker Trips for 7000 series seismic upgrades

Equipment	MPH	Miles	g/VMT Emission Rate								
			VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O
Passenger Truck	45	240,708	0.04	4.52	0.13	0.00	3.01	0.45	386	0.01	0.00
			Total Emissions in Pounds								
			VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O
		Subtotal in pounds	**22.69**	**2,397.05**	**70.02**	**1.36**	**1,598.41**	**240.51**	**204,983**	**7.53**	**1.06**

Assume 200 lb/square foot 1,980,000 pounds of materials Source: https://primedumpster.com/dumpsters/how-to-calculate-demolition-debris/
990 tons

Assume 600 lb/CY for general (non-concrete/asphalt) debris 3,300 CY https://www.bvrdumpsters.com/

Truck Transport - Material Deliveries for building construction on Delta Pier

Task	Vehicle Type	Assumed Avg. Speed (mph)	Round Trip Distance (miles)	Total Project Trips (trucks)	Total Project VMT (miles)	Total Travel Time (hours)	Fraction Time in Idle	Total Time in Idle (hours)	Total Project Emissions (tons)									
									VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Total GHGs (CO2e)
Concrete Delivery	Concrete Truck	35	26	14	353	10	0.3	3	0.000	0.001	0.001	0.000	0.001	0.000	0	0.000	0.000	0
Gravel Delivery	Dump Truck	35	30	10	306	9	0.3	3	0.000	0.001	0.001	0.000	0.000	0.000	0	0.000	0.000	0
General Materials - Barge Delivery	Barge	8	100	1	66	8	NA	NA	0.001	0.004	0.023	0.000	0.001	0.001	3	0.000	0.000	3
General Materials Delivery	Delivery Truck	35	34	50	1,683	48	0.3	14	0.001	0.004	0.006	0.000	0.003	0.001	2	0.000	0.000	2
								Totals	**0.002**	**0.009**	**0.032**	**0.000**	**0.004**	**0.002**	**5**	**0.00**	**0.00**	**5**

Notes: The following area businesses were used for estimating distance and travel time -
Gravel - Kitsap Quarry - 15 miles one way
Concrete - CalPortland - 13 miles one way
General Materials - Assume from Bremerton, 17 miles one way
Assume trucks delivering general materials are 20 ton semi trucks hauling from the port to the construction area

Equipment emissions for building construction on Delta Pier

Off-road Equipment	Hours of Operation	Engine HP	Load Factor	Emissions									Notes on Hour Estimates
				VOC	CO	NOx	SO2	PM	PM2.5	CO_2	CH4	N2O	
				lb	lb	lb	lb	lb	lb	lb	lb	lb	
Excavator	8	450	0.53	0.13	0.84	2.26	0.01	0.13	0.13	2,207	0.01	0.01	based on 500 CY/day productivity rate x 2 pieces of equipment
Grader	6	145	0.58	0.02	0.14	0.50	0.00	0.03	0.03	584	0.00	0.00	based on 3000 SY/day productivity rate for 2 passes
Dozer	15	275	0.58	0.11	0.48	1.58	0.01	0.09	0.09	2,896	0.01	0.00	based on 231 CY/hr productivity rate
Compactor	31	19	1	0.48	2.00	4.93	0.00	0.23	0.23	758	0.04	0.02	based on loader activity productivity X 2 pc equip.
Skidsteer Loader	64,560	95	0.23	2,285.24	12,091.79	11,850.16	6.94	1,724.12	1,672.39	2,157,945	88.83	40.52	based on loader activity X 2 pc equip
Loader	32,280	300	0.48	354.80	1,699.33	5,088.01	15.09	315.42	305.96	5,500,326	30.80	14.05	based on total construction days X 3 units
25 ton Crane	5,380	150	1	73.68	311.99	1,536.55	2.62	72.47	70.29	944,590	6.38	2.91	based on 25% of total construction days X 2 units
Telehandler	21,520	130	0.48	28.47	174.73	555.47	4.20	33.24	32.25	1,589,200	2.07	0.95	based on total construction days X 2 units
Forklift	32,280	74	0.48	129.22	493.16	6,438.77	3.97	40.01	38.81	1,506,555	22.67	10.34	based on total construction days and 3 units
Misc Curing Equipment	12	60	0.58	0.10	0.64	2.58	0.00	0.07	0.07	543	0.01	0.01	based on 500 tons/day productivity rate X 3 units
Concrete Finisher	36	74	0.58	0.38	2.36	9.56	0.01	0.27	0.26	2,009	0.04	0.02	based on curing equipment productivity X 3 pc equip.
Concrete Truck	12	300	0.21	0.25	1.11	4.63	0.00	0.15	0.14	901	0.01	0.01	based on 6 min/CY truck productivity at pour site
		Subtotal (lbs):		**2,872.88**	**14,778.57**	**25,494.99**	**32.84**	**2,186.25**	**2,120.65**	**11,708,515**	**150.88**	**68.82**	
		Construction Total in Tons		**1.44**	**7.39**	**12.75**	**0.0164**	**1.09**	**1.06**	**5,854**	**0.075**	**0.034**	

Worker Trips for building construction on Delta Pier

Equipment	MPH	Miles	g/VMT Emission Rate								
			VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O
Passenger Truck	45	672,500	0.04	4.52	0.13	0.00	3.01	0.45	386	0.01	0.00
			Total Emissions in Pounds								
			VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O
		Subtotal in pounds	**63.40**	**6,696.99**	**195.61**	**3.80**	**4,465.69**	**671.94**	**572,689**	**21.04**	**2.97**

Truck Transport - Site clearing debris for P817 laydown areas

For land clearing, assume 420 cubic yards of debris per acre (https://urldefense.us/v3/__https://homeguide.com/costs/land-clearing-cost)

Task	Vehicle Type	Assumed Avg. Speed (mph)	Round Trip Distance (miles)	Total Project Trips (trucks)	Total Project VMT (miles)	Total Travel Time (hours)	Fraction Time in Idle	Total Time in Idle (hours)	Total Project Emissions (tons)									
									VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Total GHGs (CO2e)
Waste Hauling	Dump Truck	35	44	169	7,445	213	0.3	64	0.003	0.016	0.029	0.000	0.011	0.003	8.386	0.000	0.000	8.397
All waste and recyclables assumed to be hauled to the Olympic View Transfer Station (Approximately 22 miles one way)								**Totals**	**0.00**	**0.02**	**0.03**	**0.00**	**0.01**	**0.00**	**8**	**0.00**	**0.00**	**8**

Truck Transport - Material Deliveries for site clearing for P817 laydown areas

Task	Vehicle Type	Assumed Avg. Speed (mph)	Round Trip Distance (miles)	Total Project Trips (trucks)	Total Project VMT (miles)	Total Travel Time (hours)	Fraction Time in Idle	Total Time in Idle (hours)	Total Project Emissions (tons)									
									VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Total GHGs (CO2e)
Gravel Delivery	Delivery Truck	35	30	217	6,499	186	0.3	56	0.0025	0.0138	0.0249	0.0000	0.0100	0.0025	7.3205	0.0001	0.0000	7.3299
								Totals	**0.003**	**0.014**	**0.025**	**0.000**	**0.010**	**0.003**	**7**	**0.00**	**0.00**	**7**

Notes: The following area businesses were used for estimating distance and travel time -
Gravel - Kitsap Quarry - 15 miles one way

Equipment emissions for site clearing for P817 laydown areas

Off-Road Equipment	Quantity	Hours	HP	Load Factor	Emissions in lb								
					VOC	CO	NOx	SO_2	PM10	PM2.5	CO_2	CH4	N2O
Loader	5	1,600	300	0.48	17.59	84.23	252.19	0.75	15.63	15.17	272,631	1.53	0.81
Dozer	2	640	275	0.58	4.40	19.87	65.96	0.32	3.73	3.62	120,800	0.36	0.18
Grader	1	320	145	0.58	1.19	7.90	27.30	0.09	1.84	1.78	31,847	0.10	0.06
Excavator	1	320	450	0.53	5.38	34.21	92.33	0.25	5.48	5.31	90,310	0.47	0.25
				Subtotal in pounds	**28.56**	**146.21**	**437.78**	**1.41**	**26.68**	**25.88**	**515,588**	**2.46**	**1.30**

Worker Trips for site clearing for P817 laydown areas

Equipment	MPH	Miles	g/VMT Emission Rate								
			VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O
Passenger Truck	45	9,000	0.04	4.52	0.13	0.00	3.01	0.45	386	0.01	0.00
			Total Emissions in Pounds								
			VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O
		Subtotal in pounds	**0.85**	**89.63**	**2.62**	**0.05**	**59.76**	**8.99**	**7,664**	**0.28**	**0.04**

Fugitive Dust

	PM 10 tons/acre-mo	acres	months of disturbance	**PM10 Total Tons**	PM2.5/ PM10 Ratio	**PM2.5 Total Tons**
	0.11	2.0	96	**21.19**	0.1	**2.12**

Emission factor and ratio from WRAP Fugitive Dust Handbook, 2006

Based on productivity estimate allowing that approx 2 acres are disturbed at any time.

Total emissions for Upland Site North

Activity	tons										
	VOCs	CO	NOx	SOx	PM10	PM2.5	CO2	CH4	N2O	CO2e	
P817 7000 series renovation truck/barge trips	0.05	0.24	0.60	0.00	0.15	0.04	133	0.00	0.00	134	
P817 7000 series renovation construction	1.51	7.32	14.08	0.02	1.03	0.99	5202	0.09	0.04	5215	Includes on-site material movement truck trips
P817 7000 series renovation worker trips	0.07	7.50	0.22	0.00	5.00	0.75	641	0.02	0.00	643	
P817 7000 series seismic upgrades truck/barge trips	0.01	0.05	0.20	0.00	0.02	0.01	31	0.00	0.00	31	
P817 7000 series seismic upgrades construction	0.20	0.56	2.70	0.00	0.11	0.11	693	0.01	0.01	695	
P817 7000 series seismic upgrades worker trips	0.01	1.20	0.04	0.00	0.80	0.12	102	0.00	0.00	103	
P817 Delta Pier truck trips	0.00	0.01	0.03	0.00	0.00	0.00	5	0.00	0.00	5.50	
P817 Delta Pier construction	1.44	7.39	12.75	0.02	1.09	1.06	5854	0.08	0.03	5865	
P817 Delta Pier worker trips	0.03	3.35	0.10	0.00	2.23	0.34	286	0.01	0.00	287	
Laydown areas truck trips	0.01	0.03	0.05	0.00	0.02	0.01	16	0.00	0.00	16	
Laydown areas site clearing	0.01	0.07	0.22	0.00	0.01	0.01	258	0.00	0.00	258	
Laydown areas worker trips	0.00	0.04	0.00	0.00	0.03	0.00	3.83	0.00	0.00	3.84	
Fugitive Dust	NA	NA	NA	NA	21.19	2.12	NA	NA	NA	NA	

Year	Location	tons									
		VOCs	CO	NOx	SOx	PM10	PM2.5	CO2	CH4	N2O	CO2e
2027	Onsite	0.12	0.57	1.27	0.00	0.52	0.13	627	0.01	0.00	628
	Offsite	0.01	0.64	0.12	0.00	0.43	0.07	76	0.00	0.00	77
2028	Onsite	0.95	4.54	9.07	0.01	3.16	0.89	3463	0.06	0.02	3471
	Offsite	0.06	4.16	0.43	0.00	2.77	0.43	411	0.01	0.00	413
2029	Onsite	1.05	5.06	9.97	0.01	3.54	1.00	3875	0.06	0.03	3884
	Offsite	0.06	4.39	0.44	0.00	2.92	0.45	431	0.01	0.00	432
2030	Onsite	1.05	5.06	9.97	0.01	3.54	1.00	3875	0.06	0.03	3884
	Offsite	0.06	4.39	0.44	0.00	2.92	0.45	431	0.01	0.00	432
2031	Onsite	1.03	4.96	9.79	0.01	3.46	0.97	3792	0.06	0.03	3801
	Offsite	0.06	4.35	0.44	0.00	2.89	0.44	427	0.01	0.00	428
2032	Onsite	0.04	0.19	0.41	0.00	0.13	0.04	144	0.00	0.00	144
	Offsite	0.00	0.22	0.03	0.00	0.15	0.02	22	0.00	0.00	22

TAB D. Upland South

1 pound= 453.59 grams

Demolition

Removal of asphalt pavement	61950	SF	6883	SY	1529	CY	Assume 4 inch pavement and 4 inch gravel underlay
Removal of concrete pavement	38100	SF	4233	SY	941	CY	Assume 4 inch pavement and 4 inch gravel underlay

Building construction and renovation

SSP Addition	26730	SF	2970	SY	includes basement and 4 floors (1, 2, Intermediate, and 3) - building footprint 8607.48 SF
TTF Renovation	355	SF	39	SY	
NAVSEA Addition	8191	SF	910	SY	
TTF Renovation - A Wing	4	SF	0.5	SY	
	Concrete	1307	CY		Assume 1 foot thickness for concrete

Paving

Sidewalks, ramps, access, parking (asphalt)	9000	SF	1000	SY	111	CY	Assume 4 inch pavement and 4 inch gravel underlay
Sidewalks, ramps, access, parking (concrete)	13625	SF	1514	SY	168	CY	Assume 4 inch pavement and 4 inch gravel underlay

Site clearing (laydown areas)	2.2	acres	10648	SY	1183	CY gravel required for laydown area (assume 4 inches thick)

	Asphalt	Concrete	Gravel		
	111	1,475	1,586	CY	where not specified, assume 4" thickness
Truck Trips	9	123	176		220 Tons asphalt
					2,987 Tons concrete
					2,034 tons gravel

Demolition for SSP Addition

Asphalt		Concrete	
20x80	1600	100x35	3500
140x170	23800	10x20	200
115x100	11500	180x40	7200
20x10	200	10x90	900
90x35	3150	20x225	4500
		40x40	1600
		50x120	6000

Demolition for NAVSEA Addition

Asphalt		Concrete	
120x140	16800	60x10	600
80x50	4000	170x80	13600
15x60	900		

Construction for SSP Addition

Asphalt		Concrete	
55x30	1650	140x20	2800
30x30	900	45x50 triar	1125
40x30	1200	50x20	1000
50x105	5250	20x80	1600
		80x20	1600
		20x20	400
		50x30	1500
		60x10	600

Construction for NAVSEA Addition

Asphalt		Concrete	
		10x140	1400
		50x20	1000
		20x30	600

Worker Trips:

Demolition (asphalt and concrete)	13	worker trips per day	Based on CalEEMod App A. Maximum number of daily worker trips is based on 1.25 workers per equipment during constructio
	78	total worker trips	would include 10 pieces of equipment.
Asphalt paving	26	worker trips per day	Based on CalEEMod App A. Maximum number of daily worker trips is based on 1.25 workers per equipment during construction phase which
	26	total worker trips	would include 21 pieces of equipment.
Concrete paving	26	worker trips per day	Based on CalEEMod App A. Maximum number of daily worker trips is based on 1.25 workers per equipment during construction phase which
	475	total worker trips	would include 21 pieces of equipment.
Building construction	80	worker trips per day	Based on CalEEMod App A. Maximum number of daily worker trips is based on 1.25 workers per equipment during construction phase which would include 32
	146000	total worker trips	pieces of equipment. This value was then doubled, as this is industrial renovation, rather than residential.
Site clearing/grading	11	worker trips per day	Based on CalEEMod App A. Maximum number of daily worker trips is based on 1.25 workers per equipment during combined land clearing/grading phase which
	203	total worker trips	would include 9 pieces of equipment.

Phase Lengths:

Asphalt removal (demolition)	2		3500	SY/day	CFL Production Rates
Concrete removal (demolition)	4		1000	SY/day	CFL Production Rates
Asphalt paving	1	days	1000	ton/day	CFL Production Rates - rounded to one full day.
Concrete paving	18	days	300	SY/day	CFL production Rates
Building construction	1825	days			Per MILCON Schedule document (5 years construction time - Jan 2027-Dec 2031)
Site clearing/grading	18	days			Assume 18 days based on quantities of materials to be removed/added
Total	**1868**	**total days**			

General Materials Trips	6	Trips	based on 0.1639 vendor trips/1000 SF (from South Coast AQMD Field Survey 2008/2010 and used in CALEEMOD).
	1868	days total	
Assume 200 lb/square foot	20,010,000	pounds of debris	Source: https://primedumpster.com/dumpsters/how-to-calculate-demolition-debris/
Assume the same values for the materials to be delivered	10,005	tons	
Assume 600 lb/CY for general (non-concrete/asphalt) debris	33,350	CY	https://www.bvrdumpsters.com/

Truck Transport - Demolition Debris Dump truck weight hauling capacity estimated to be 14 tons for 12 CY truck

Task	Vehicle Type	Assumed Avg. Speed (mph)	Round Trip Distance (miles)	Total Project Trips (trucks)	Total Project VMT (miles)	Total Travel Time (hours)	Fraction Time in Idle	Total Time in Idle (hours)	Total Project Emissions (tons)									
									VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Total GHGs (CO2e)
Waste Hauling	Dump Truck	35	44	715	31,444	898	0.3	270	0.012	0.067	0.121	0.000	0.048	0.012	35	0.001	0.000	35
All waste and recyclables assumed to be hauled to the Olympic View Transfer Station (Approximately 22 miles one way)								**Totals**	**0.01**	**0.07**	**0.12**	**0.00**	**0.05**	**0.01**	**35**	**0.00**	**0.00**	**35**

Equipment emissions - demolition

Off-road Equipment	Hours of Operation	Engine HP	Load Factor	Emissions VOC lb	CO lb	NOx lb	SO2 lb	PM lb	PM2.5 lb	CO_2 lb	CH4 lb	N2O lb	Notes on Hour Estimates
Excavator	79	450	0.53	1.33	8.45	22.81	0.06	1.35	1.31	22,308	0.12	0.05	based on 500 CY/day productivity rate X 2 pieces of equipment
Grader	59	145	0.58	0.22	1.46	5.06	0.02	0.34	0.33	5,901	0.02	0.01	based on 3000 SY/day productivity rate for 2 passes
Dozer	11	275	0.58	0.07	0.33	1.10	0.01	0.06	0.06	2,018	0.01	0.00	based on 231 CY/hr productivity rate
Compactor	298	19	1	4.62	19.44	47.83	0.03	2.27	2.20	7,346	0.38	0.17	based on loader activity productivity X 2 pc equip.
Skidsteer Loader	298	95	0.23	10.53	55.74	54.63	0.03	7.95	7.71	9,947	0.41	0.19	based on loader activity X 2 pc equip
Loader	149	300	0.48	1.64	7.83	23.45	0.07	1.45	1.41	25,355	0.14	0.06	based on total construction days X 3 units
Forklift	149	74	0.48	0.60	2.27	29.68	0.02	0.18	0.18	6,945	0.10	0.05	based on total construction days and 3 units
			Subtotal (lbs):	**19.01**	**95.53**	**184.55**	**0.23**	**13.61**	**13.20**	**79,820**	**1.18**	**0.54**	
			Construction Total in Tons	**0.01**	**0.05**	**0.09**	**0.0001**	**0.01**	**0.01**	**40**	**0.001**	**0.000**	

Worker Trips - demolition

Equipment	MPH	Miles	g/VMT Emission Rate VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O
Passenger Truck	45	1,550	0.04	4.52	0.13	0.00	3.01	0.45	386	0.01	0.00
			Total Emissions in Pounds								
			VOC	**CO**	**NOx**	**SO2**	**PM10**	**PM2.5**	**CO2**	**CH4**	**N2O**
		Subtotal in pounds	**276.22**	**29,178.31**	**852.26**	**16.58**	**19,456.71**	**2,927.59**	**2,495,164**	**91.68**	**12.95**

Truck Transport - Material Deliveries for building construction and renovation

Task	Vehicle Type	Assumed Avg. Speed (mph)	Round Trip Distance (miles)	Total Project Trips (trucks)	Total Project VMT (miles)	Total Travel Time (hours)	Fraction Time in Idle	Total Time in Idle (hours)	Total Project Emissions (tons) VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Total GHGs (CO2e)
Asphalt Delivery	Dump Truck	35	26	9	241	7	0.3	2	0.0001	0.0005	0.0009	0.0000	0.0004	0.0001	0.27	0.0000	0.0000	0.27
Concrete Delivery	Concrete Truck	35	26	164	4,261	122	0.3	37	0.0017	0.0090	0.0164	0.0000	0.0065	0.0017	4.80	0.0001	0.0000	4.81
Gravel Delivery	Dump Truck	35	30	132	3,965	113	0.3	34	0.0015	0.0084	0.0152	0.0000	0.0061	0.0015	4.47	0.0001	0.0000	4.47
General Materials Delivery - Barge	Barge	8	100	7	667	83	NA	NA	0.012	0.039	0.237	0.000	0.006	0.006	28.49	0.000	0.001	28.87
General Materials Delivery	Delivery Truck	35	34	500	17,009	486	0.3	146	0.0066	0.0361	0.0653	0.0001	0.0261	0.0066	19.16	0.0003	0.0001	19.18
								Totals	**0.022**	**0.093**	**0.334**	**0.000**	**0.045**	**0.016**	**57**	**0.00**	**0.00**	**58**

Notes: The following area businesses were used for estimating distance and travel time -

Gravel - Kitsap Quarry - 15 miles one way

Asphalt - Agate Asphalt - 13 miles one way

Concrete - CalPortland - 13 miles one way

General Materials (Barge) - Assume from Seattle, 50 miles one way

General Materials - Assume from Bremerton, 17 miles one way

Assume trucks delivering general materials are 20 ton semi trucks hauling from the port to the construction area

Equipment emissions for construction and renovation

Off-road Equipment	Hours of Operation	Engine HP	Load Factor	Emissions VOC lb	CO lb	NOx lb	SO2 lb	PM lb	PM2.5 lb	CO_2 lb	CH4 lb	N2O lb	Notes on Hour Estimates
Excavator	102	450	0.53	1.71	10.85	29.29	0.08	1.74	1.69	28,646	0.15	0.07	based on 500 CY/day productivity rate x 2 pieces of equipment
Grader	34	145	0.58	0.13	0.85	2.93	0.01	0.20	0.19	3,415	0.01	0.01	based on 3000 SY/day productivity rate for 2 passes
Roller	12	401	0.58	0.28	1.87	5.23	0.01	0.26	0.25	3,288	0.02	0.01	based on paving machine productivity X 2 pc equip.
Paving Machine	6	164	0.58	0.07	0.34	1.09	0.00	0.08	0.07	672	0.01	0.00	based on 500 tons/day productivity rate
Asphalt Curbing Machine	12	130	0.58	0.11	0.52	1.71	0.00	0.12	0.11	1,066	0.01	0.00	based on paving machine productivity X 2 pc equip.
Dozer	158	275	0.58	1.09	4.91	16.29	0.08	0.92	0.89	29,842	0.09	0.04	based on 231 CY/hr productivity rate
Compactor	88,517	19	1	1,373.38	5,781.61	14,225.23	8.03	674.68	654.44	2,185,054	113.89	51.95	based on loader activity productivity X 2 pc equip.
Skidsteer Loader	88,517	95	0.23	3,133.27	16,578.91	16,247.61	9.51	2,363.92	2,292.99	2,958,732	121.79	55.55	based on loader activity X 2 pc equip
Loader	44,259	300	0.48	486.47	2,329.93	6,976.11	20.69	432.47	419.50	7,541,431	42.23	19.26	based on total construction days X 3 units
25 ton Crane	14,753	150	1	202.05	855.52	4,213.48	7.18	198.72	192.76	2,590,233	17.49	7.98	based on 4 hours per day for total construction days X 2 units
Telehandler	29,506	130	0.48	39.03	239.58	761.60	5.75	45.58	44.21	2,178,933	2.84	1.30	based on total construction days X 2 units
Forklift	44,259	74	0.48	177.18	676.17	8,828.12	5.44	54.86	53.22	2,065,620	31.08	14.18	based on total construction days and 3 units
Misc Curing Equipment	143	60	0.58	1.23	7.68	31.17	0.02	0.88	0.85	6,553	0.13	0.06	based on 500 tons/day productivity rate X 3 units
Concrete Finisher	430	74	0.58	4.54	28.43	115.33	0.07	3.26	3.16	24,247	0.49	0.22	based on curing equipment productivity X 3 pc equip.
Concrete Truck	147	300	0.21	2.96	13.39	55.87	0.04	1.79	1.74	10,870	0.18	0.08	based on 6 min/CY truck productivity at pour site
			Subtotal (lbs):	**5,423.48**	**26,530.56**	**51,511.06**	**56.92**	**3,779.47**	**3,666.08**	**19,628,601**	**330.41**	**150.72**	
			Construction Total in Tons	**2.71**	**13.27**	**25.76**	**0.0285**	**1.89**	**1.83**	**9,814**	**0.165**	**0.075**	

Worker Trips for construction and renovation

Equipment	MPH	Miles	g/VMT Emission Rate VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O
Passenger Truck	45	2,930,034	0.04	4.52	0.13	0.00	3.01	0.45	386	0.01	0.00
			Total Emissions in Pounds								
			VOC	**CO**	**NOx**	**SO2**	**PM10**	**PM2.5**	**CO2**	**CH4**	**N2O**
		Subtotal in pounds	**276.22**	**29,178.31**	**852.26**	**16.58**	**19,456.71**	**2,927.59**	**2,495,164**	**91.68**	**12.95**

Truck Transport - site clearing debris for laydown area

For land clearing, assume 420 cubic yards of debris per acre (https://urldefense.us/v3/__https://homeguide.com/costs/land-clearing-cost)

Task	Vehicle Type	Assumed Avg. Speed (mph)	Round Trip Distance (miles)	Total Project Trips (trucks)	Total Project VMT (miles)	Total Travel Time (hours)	Fraction Time in Idle	Total Time in Idle (hours)	Total Project Emissions (tons) VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Total GHGs (CO2e)
Waste Hauling	Dump Truck	35	44	77	3,388	97	0.3	29	0.001	0.007	0.013	0.000	0.005	0.001	4	0.000	0.000	4
All waste and recyclables assumed to be hauled to the Olympic View Transfer Station (Approximately 22 miles one way)								**Totals**	**0.00**	**0.01**	**0.01**	**0.00**	**0.01**	**0.00**	**4**	**0.00**	**0.00**	**4**

Truck Transport - Material Deliveries for site clearing for laydown area

Task	Vehicle Type	Assumed Avg. Speed (mph)	Round Trip Distance (miles)	Total Project Trips (trucks)	Total Project VMT (miles)	Total Travel Time (hours)	Fraction Time in Idle	Total Time in Idle (hours)	Total Project Emissions (tons) VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Total GHGs (CO2e)
Gravel Delivery	Delivery Truck	35	30	99	2,957	84	0.3	25	0.0011	0.0063	0.0114	0.0000	0.0045	0.0011	3	0.0001	0.0000	3
Notes: The following area businesses were used for estimating distance and travel time - Gravel - Kitsap Quarry - 15 miles one way								**Totals**	**0.001**	**0.006**	**0.011**	**0.000**	**0.005**	**0.001**	**3**	**0.00**	**0.00**	**3**

Equipment emissions for site clearing for laydown area

Off-Road Equipment	Quantity	Hours	HP	Load Factor	Emissions in lb VOC	CO	NOx	SO_2	PM10	PM2.5	CO_2	CH4	N2O
Loader	5	720	300	0.48	7.91	37.90	113.49	0.34	7.04	6.82	122,684	0.69	0.37
Dozer	2	288	275	0.58	1.98	8.94	29.68	0.15	1.68	1.63	54,360	0.16	0.08
Grader	1	144	145	0.58	0.54	3.55	12.28	0.04	0.83	0.80	14,331	0.05	0.03
Excavator	1	144	450	0.53	2.42	15.39	41.55	0.11	2.47	2.39	40,639	0.21	0.11
				Subtotal in pounds	**12.85**	**65.79**	**197.00**	**0.63**	**12.01**	**11.64**	**232,015**	**1.11**	**0.58**

Worker Trips for site clearing and grading

Equipment	MPH	Miles	g/VMT Emission Rate VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O
Passenger Truck	45	4,050	0.04	4.52	0.13	0.00	3.01	0.45	386	0.01	0.00
			Total Emissions in Pounds								
			VOC	**CO**	**NOx**	**SO2**	**PM10**	**PM2.5**	**CO2**	**CH4**	**N2O**
		Subtotal in pounds	**0.38**	**40.33**	**1.18**	**0.02**	**26.89**	**4.05**	**3,449**	**0.13**	**0.02**

Fugitive Dust

	PM 10 tons/acre-mo	acres	months of disturbance	**PM10 Total Tons**	PM2.5/ PM10 Ratio	**PM2.5 Total Tons**
	0.11	2.0	61	**13.52**	0.1	**1.35**

Emission factor and ratio from WRAP Fugitive Dust Handbook, 2006

Based on productivity estimate allowing that approx 2 acres are disturbed at any time.

Total emissions for Upland South

	tons									
Activity	**VOCs**	**CO**	**NOx**	**SOx**	**PM10**	**PM2.5**	**CO2**	**CH4**	**N2O**	**CO2e**
Truck trips	0.04	0.17	0.48	0.00	0.10	0.03	100	0.00	0.00	100
Construction and demolition	2.72	13.31	25.85	0.03	1.90	1.84	9854	0.17	0.08	9879
Site clearing for laydown area	0.01	0.03	0.10	0.00	0.01	0.01	116	0.00	0.00	116
Fugitive Dust	NA	NA	NA	NA	13.52	1.35	NA	NA	NA	NA
Worker Trips	0.28	29.20	0.85	0.02	19.47	2.93	2497	0.09	0.01	2503

Annual emissions for Upland South

Year	**Location**	**VOCs**	**CO**	**NOx**	**SOx**	**PM10**	**PM2.5**	**CO2**	**CH4**	**N2O**	**CO2e**
2027	Onsite	0.55	2.67	5.19	0.01	3.08	0.64	1994	0.03	0.02	1999
	Offsite	0.06	5.87	0.27	0.00	3.91	0.59	519	0.02	0.00	521
2028	Onsite	0.55	2.67	5.19	0.01	3.08	0.64	1994	0.03	0.02	1999
	Offsite	0.06	5.87	0.27	0.00	3.91	0.59	519	0.02	0.00	521
2029	Onsite	0.55	2.67	5.19	0.01	3.08	0.64	1994	0.03	0.02	1999
	Offsite	0.06	5.87	0.27	0.00	3.91	0.59	519	0.02	0.00	521
2030	Onsite	0.55	2.67	5.19	0.01	3.08	0.64	1994	0.03	0.02	1999
	Offsite	0.06	5.87	0.27	0.00	3.91	0.59	519	0.02	0.00	521
2031	Onsite	0.55	2.67	5.19	0.01	3.08	0.64	1994	0.03	0.02	1999
	Offsite	0.06	5.87	0.27	0.00	3.91	0.59	519	0.02	0.00	521

Note - the timeline for Upland South activities is 2027-2031, so total emissions were divided evenly among the 5 years.

Tab E. GHG COMPARATIVE ANALYSIS

average passenger vehicle

400	grams of CO2 per mile	source: https://www.epa.gov/greenvehicles/
0.88	lb of CO2 per mile	
13,476	Average annual mileage	Source: https://www.fhwa.dot.gov/ohim/onh00/bar8.htm

CO2 emissions for Action Alternative	**30,215**	**tons**	**5,088**	**cars driving**	**13,476**	**miles per year**

Tab G. MOVES3.0.1 Onroad Emission Factors

Road Type	Vehicle Type	Speed (MPH)	Emission Factor Units	Emission Factor											
				VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Total GHGs (CO2e)	Benzene	Formaldehyde
Highway	Passenger Car	35	g/VMT	0.0276	4.1309	0.0676	0.0020	3.4459	0.5175	297.8770	0.0112	0.0012	298.5200	0.0012	0.0004
Sidestreets	Passenger Car	15	g/VMT	0.0430	6.5931	0.0844	0.0031	6.9147	1.0377	469.0130	0.0173	0.0029	470.2970	0.0018	0.0006
Idle	Passenger Car	0	g/hr	0.1700	1.9367	0.2963	0.0209	0.0219	0.0000	3151.2200	0.0623	0.0432	3165.6400	0.0071	0.0024
Highway	Passenger Truck	35	g/VMT	0.0428	4.5170	0.1319	0.0026	3.0120	0.4532	386.2690	0.0142	0.0020	387.2170	0.0018	0.0006
Sidestreets	Passenger Truck	15	g/VMT	0.0673	6.8668	0.1584	0.0040	6.3331	0.9513	595.2660	0.0218	0.0047	597.1980	0.0028	0.0009
Idle	Passenger Truck	0	g/hr	0.2009	4.0675	0.5445	0.0266	0.0132	0.0116	4000.8500	0.0687	0.0701	4023.4500	0.0085	0.0029

Truck Emission Factors

Road Type	Vehicle Type	Speed (MPH)	Emission Factor Units	Maximum Emission Factor											
				VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Total GHGs (CO2e)	Benzene	Formaldehyde
Highway	SUSH Truck	35	g/VMT	3.07E-01	1.74E+00	3.19E+00	3.31E-03	1.37E+00	3.33E-01	9.73E+02	1.46E-02	2.36E-03	9.74E+02	2.30E-03	2.41E-02
Sidestreets	SUSH Truck	15	g/VMT	6.07E-01	3.40E+00	5.80E+00	4.92E-03	4.37E+00	8.88E-01	1.45E+03	3.12E-02	5.52E-03	1.45E+03	4.52E-03	4.74E-02
Idle	SUSH Truck	0	g/hr	5.23E+00	2.20E+01	3.42E+01	1.95E-02	2.54E+00	2.34E+00	5.73E+03	2.70E-01	8.27E-02	5.76E+03	3.88E-02	4.06E-01

SUSH = Single Unit Short Haul

TAB F. EQUIPMENT DATA AND EMISSION FACTORS

Construction Equipment	HP	Load Factor	Emissions Factors									
			VOC	CO	NOx	SO_2	PM10	PM2.5	CO_2	CH4	Benzene	Formaldehyde
			g/hp-hr	g/hp-hr	g/hp-hr	g/hp-hr	g/hp-hr	g/hp-hr	g/hp-hr	g/hp-hr	g/hp-hr	g/hp-hr
Grader	145	0.58	0.02	0.13	0.46	0.001	0.03	0.03	536.77	0.002	9.85E-04	5.39E-03
Dozer	275	0.58	0.02	0.09	0.29	0.001	0.02	0.02	536.77	0.002	7.92E-04	4.44E-03
Excavator	450	0.53	0.03	0.20	0.55	0.001	0.03	0.03	536.74	0.003	0.001	0.01
Roller	401	0.58	0.05	0.31	0.85	1.52E-03	0.04	0.04	537	0.003	0.002	0.01
Paving Machine	164	0.58	0.06	0.27	0.87	1.50E-03	0.06	0.06	537	0.004	0.003	0.02
Asphalt Curbing Machine	130	0.58	0.06	0.26	0.86	1.50E-03	0.06	0.06	537	0.004	0.003	0.02
Compactor	19	1	0.37	1.56	3.84	2.17E-03	0.18	0.18	589.31	0.031	0.019	0.11
Skidsteer Loader	95	0.23	0.73	3.89	3.81	0.002	0.55	0.54	693.89	0.029	0.023	0.18
Loader	300	0.48	0.03	0.17	0.50	0.001	0.03	0.03	536.73	0.003	0.002	0.01
25 ton Crane	150	1	0.04	0.18	0.86	0.001	0.04	0.04	530.93	0.004	0.002	0.01
Misc Curing Equipment	60	0.58	0.11	0.70	2.83	0.002	0.08	0.08	595.83	0.012	0.005	0.03
Concrete Finisher	74	0.58	0.11	0.70	2.83	0.002	0.08	0.08	595.83	0.012	0.005	0.03
Telehandler	130	0.48	0.01	0.06	0.19	0.001	0.01	0.01	536.80	0.001	0.0004	0.002
Forklift	74	0.48	0.05	0.20	2.55	0.002	0.02	0.02	595.99	0.009	0.003	0.01
Welder	10	0.19	1.17	5.27	4.76	0.003	0.61	0.59	692.63	0.077	0.052	0.32
Auger Rig	300	1	0.21	0.56	2.62	0.002	0.12	0.11	530.44	0.012	0.009	0.05
Concrete truck	300	0.21	0.14	0.65	2.73	0.002	0.09	0.08	530.63	0.009	0.006	0.04

Note: The MOVES model does not include emission factors for N2O for nonroad equipment. N2O for nonroad equipment is estimated using ratio N2O/CH4 ratio of 0.26/0.57 from EPA (2016), Table B-8.

1 kW = 1.34 hp

Boat Equipment	Engine kW	Load Factor	Emissions Factors									
			VOC	CO	NOx	SO_2	PM10	PM2.5	CO_2	CH4	N_2O	BSFC
			(g/kWh)	(g/kWh)	(g/kWh)	(g/kWh)	(g/kWh)	(g/kWh)	(g/kWh)	(g/kWh)	(g/kWh)	(g/kWh)
Tow Boat - propulsion	671	0.68	0.30	0.92	5.64	0.006	0.15	0.14	679	2.68E-03	0.03	213
			(g/hp-hr)	(g/hp-hr)	(g/hp-hr)	(g/hp-hr)	(g/hp-hr)	(g/hp-hr)	(g/hp-hr)	(g/hp-hr)	(g/hp-hr)	(g/hp-hr)
			0.22	0.69	4.21	0.00	0.11	0.11	507	0.00	0.02	159

Barge emission factors from Bremerton EIS

Tab H. **NAAQS Table**

Air Pollutant	Averaging Time	Federal Primary Standard	Federal Secondary Standard
CO	1-hour 8-hour	35 ppm 9 ppm	None
NO_2	1-hour Annual	100 ppb 53 ppb	None 53 ppb
PM_{10}	24-hour Annual	150 µg/m^3 None	150 µg/m^3 None
$PM_{2.5}$	24-hour Annual	35 µg/m^3 9 µg/m^3	35 µg/m^3 15 µg/m^3
O_3	8-hour	0.070 ppm	0.070 ppm
SO_2	1-hour 3-hour 24-hour Annual	75 ppb None None None	None None None 10 ppb

Notes : (1) The period over which pollutant concentrations are measured.

(2) Primary Standards set limits to protect public health, including the health of "sensitive" populations such as asthmatics, children, and the elderly.

(3) Secondary Standards set limits to protect public welfare, including protection against decreased visibility, damage to animals, crops, vegetation, and buildings.

Legend : µg/m^3 = microgram per cubic meter; CO = carbon monoxide; NO_2 = nitrogen dioxide; O_3 = ozone; ppb = parts per billion; ppm = parts per million; 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; SO_2 = sulfur dioxide

Appendix H
Endangered Species Act and Essential Fish Habitat Documentation

[To be included in the Final EA]

This page intentionally left blank.

Appendix I
National Historic Preservation Act Section 106 Documentation

[To be included in the Final EA]

This page intentionally left blank.

Appendix J
Tribal Government-to-Government Documentation

[To be included in Final EA]

This page intentionally left blank.

Appendix K
Supplemental Sound Terminology and Methodology

This page intentionally left blank.

Table of Contents

1. Supplemental Sound Terminology....K-1
Definitions of Sound Terminologies....K-1
Basics of Sound and A-Weighted Sound Levels....K-2
2. Sound Exposure....K-5
Humans....K-5
Impacts of Noise....K-5
3. Acoustic Effects....K-13
Ambient Airborne Sound....K-13
Airborne Sound Propagation....K-13
Humans Assessment – Noise Modeling Methodology and Assumptions....K-13
4. References....K-17

List of Figures

Figure 1-1 A-Weighted Sound Levels from Typical Sources.... K-3
Figure 2-1 Schultz Curve Relating Percent Highly Annoyed to Day-Night Average Sound Level (Schultz 1978).... K-6
Figure 2-2 RANCH Study Reading Scores Varying with L_{eq}.... K-8

List of Tables

Table 1-1 Definitions of Common Airborne Acoustical Terms.... K-1
Table 1-2 Subjective Responses to Changes in A-Weighted Decibels.... K-2
Table 2-1 Non-Acoustic Variables Influencing Aircraft Noise Annoyance.... K-7
Table 2-2 Indoor Noise Level Criteria Based on Speech Intelligibility.... K-9
Table 2-3 OSHA Permissible Noise Exposures.... K-10
Table 3-1 Average maximum noise levels at 50 feet from common construction equipment.... K-14

This page intentionally left blank.

1. Supplemental Sound Terminology

This appendix provides supplemental information, including metrics and methodology, for the noise analyses presented in *Section 3.8 Noise*.

Definitions of Sound Terminologies

This section introduces the reader to the basics of sound measurements and sound propagation. Sound may be purposely created to convey information, communicate, or obtain information about the environment. Examples of such sounds are vocalizations and tones used in hearing experiments. Whether a sound is considered undesirable noise depends on the receiver (i.e., human, animal, or system that detects the sound). Noise also refers to sound sources that may interfere with detection of a desired sound; the combination of all the sounds at a particular location is referred to as ambient noise and is the background level of noise that is consistently present but may also vary over time (e.g., daytime vs. nighttime). Table 1-1 summarizes common acoustic terminology.

Table 1-1 Definitions of Common Airborne Acoustical Terms

Term	*Definition*
Decibel (dB)	A unit describing the amplitude of sound, equal to 20 times the logarithm to the base 10 of the ratio of the pressure of the sound measured to the reference pressure. The reference pressure for water is 1 micropascal (µPa) and for air is 20 µPa (approximate threshold of human audibility).
Sound Pressure Level (SPL)	Sound pressure is the force per unit area, usually expressed in micropascals (or 20 micro-Newtons per square meter), where 1 pascal is the pressure resulting from a force of 1 Newton exerted over an area of 1 square meter. The SPL is expressed in decibels and is the quantity directly measured by a sound level meter.
Frequency	Frequency is expressed in terms of the number of pressure variation cycles occurring per second, commonly referred to as hertz (Hz). Typical human hearing ranges from 20 Hz to 20,000 Hz.
Sound Exposure Level (SEL)	SEL combines both the intensity of a sound and its duration by equating the total acoustic energy normalized to a specific time interval. Unless otherwise noted, noise analysis presented in this document reflects the standardized SEL time interval of 1 second.
Intensity	The power carried by a sound wave per unit area, in a direction perpendicular to the direction in which the sound waves are travelling.
A-Weighting Sound Level	The SPL in decibels as measured on a sound level meter using A-weighting filter network. The A-weighting filter de-emphasizes the low- and high-frequency components of the sound in a manner similar to the frequency response of the human ear and correlates well with subjective human reactions to noise.
Ambient Noise Level	The background sound level, which is a composite of noise from all sources near and far. The normal or existing level of environmental noise at a given location.
Maximum Sound Level (L_{max})	The maximum sound level (L_{max}) measured over a duration of one-eighth of a second.
Equivalent Sound Level (L_{eq})	Combines a series of noise events over a period of time by averaging the sound energy. The time period specified for L_{eq} typically relates to a type of activity and is presented in parenthesis (e.g., $L_{eq(24)}$ for 24 hours). For example, a 1-hour L_{eq} ($L_{eq(1hr)}$) is most common for construction noise impact analysis.

Term	*Definition*
Day-Night Average Sound Level (DNL or L_{dn})	A cumulative metric that is calculated as the energy average of all noise events occurring over a 24-hour period with a 10 dB penalty applied to events occurring during the nighttime period between 10 p.m. and 7 a.m.

Legend: µPa = micropascal; dB = decibel; dB re 1 µPa = decibels referenced to a pressure of 1 micropascal; dB re 1 µPa2•s = decibel referenced to 1 micropascal squared seconds; dBA = A-weighted decibel; Hz = hertz; L_{max} = maximum sound level; SEL = sound exposure level; SPL = sound pressure level

Basics of Sound and A-Weighted Sound Levels

The loudest sounds that can be comfortably heard by the human ear have intensities a trillion times higher than those of sounds barely heard. Because of this vast range, it is unwieldy to use a linear scale to represent the intensity of sound. As a result, a logarithmic unit known as the decibel (abbreviated dB) is used to represent the intensity of a sound, also referred to as the sound level. A sound level of 0 dB is approximately the threshold of human hearing and is barely audible under extremely quiet listening conditions. Normal speech has a sound level of approximately 60 dB re 20 µPa. Sound levels above 120 dB begin to be felt inside the human ear as discomfort. Sound levels between 130 and 140 dB are felt as pain (Berglund and Lindvall 1995).

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 (Hz). 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, which places less weight on very low and very high frequencies in order to replicate human hearing sensitivity. The general range of human hearing is from 20 to 20,000 cycles per second, or Hz; humans hear best in the range of 1,000 to 4,000 Hz. A-weighting is a frequency-dependent adjustment of sound level used to approximate the natural range and sensitivity of the human auditory system. Table 1-2 provides a comparison of how the human ear perceives changes in loudness on the logarithmic scale.

Table 1-2 Subjective Responses to Changes in A-Weighted Decibels

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

Legend: dB = decibel

Figure 1-1 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 of time. 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 below.

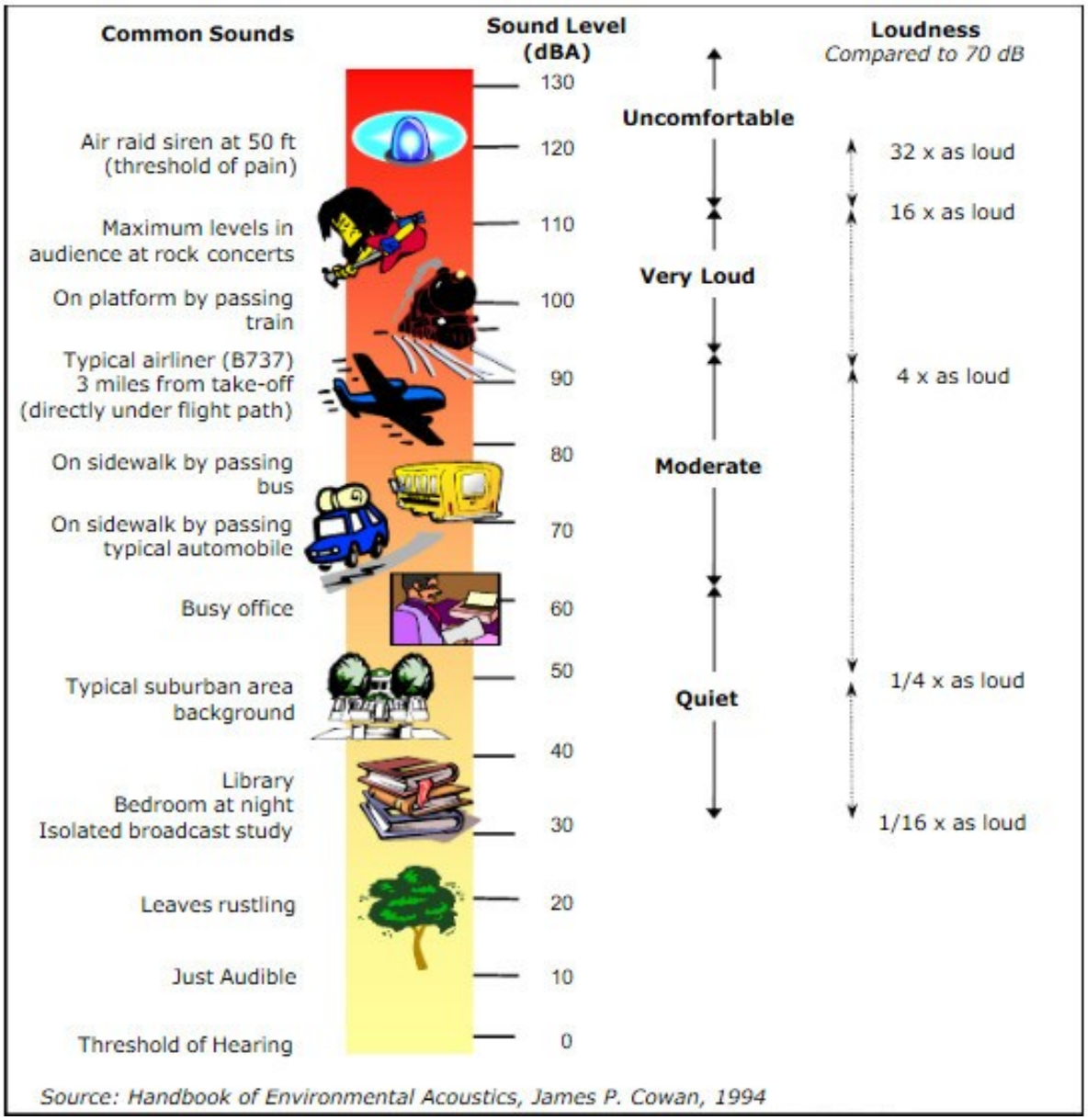


Figure 1-1 A-Weighted Sound Levels from Typical Sources

Sound is a physical phenomenon consisting of vibrations that travel through a medium, such as air or water. Sound is characterized primarily by two factors, frequency and intensity (Table 1-1). For in-air sound pressure, the standard reference value is 20 micropascal (µPa) and is expressed as "dB re 20 µPa" (µPa, or 10^{-6} pascals). When describing underwater sound pressure, the standard reference value is 1 and is expressed as dB re 1 µPa. Sound levels measured in air and water are not directly comparable, and it is important to note which reference value is associated with a given sound level. Because the dB is a logarithmic measure, each increase of 20 dB reflects a ten-fold increase in signal amplitude (i.e., 20 dB means ten times the amplitude, 40 dB means one hundred times the amplitude, 60 dB means one thousand times the amplitude, and so on). Because the decibel is a relative measure, any value expressed in decibels is meaningless without an accompanying reference.

All sounds have a spectral content, which means their magnitude or level varies by frequency. Many organisms perceive sounds with the same magnitude but different spectra differently. Presenting noise levels as "A-weighted" better mimics the human ear's non-linear sensitivity to different frequencies of sound by de-emphasizing very low and very high frequencies. A-weighted sound is denoted as dBA but is often simplified to dB for brevity when the weighting used is obvious.

2. Sound Exposure

This section presents sound exposure criteria for humans.

Humans

Impacts of Noise

The potential adverse effects of noise on humans include speech interference, sleep disturbance, and noise-induced hearing impairment. Annoyance provides the most accurate indicator of impacts to communities exposed to environmental noise (Department of Defense Noise Working Group 2009).

Annoyance

Early noise survey studies performed after the introduction of jet aircraft gained common ground in the 1970s when Schultz correlated the Day-Night Average Sound Level (DNL) metric to the percent of highly annoyed people (Schultz 1978), as depicted in Figure 1-2. A refinement of that relationship by Finegold et al. 1994 used additional study data, which was later endorsed by the U.S. Federal Interagency Committee on Aviation Noise (FICAN) for use in transportation noise analysis (FICAN 1997).

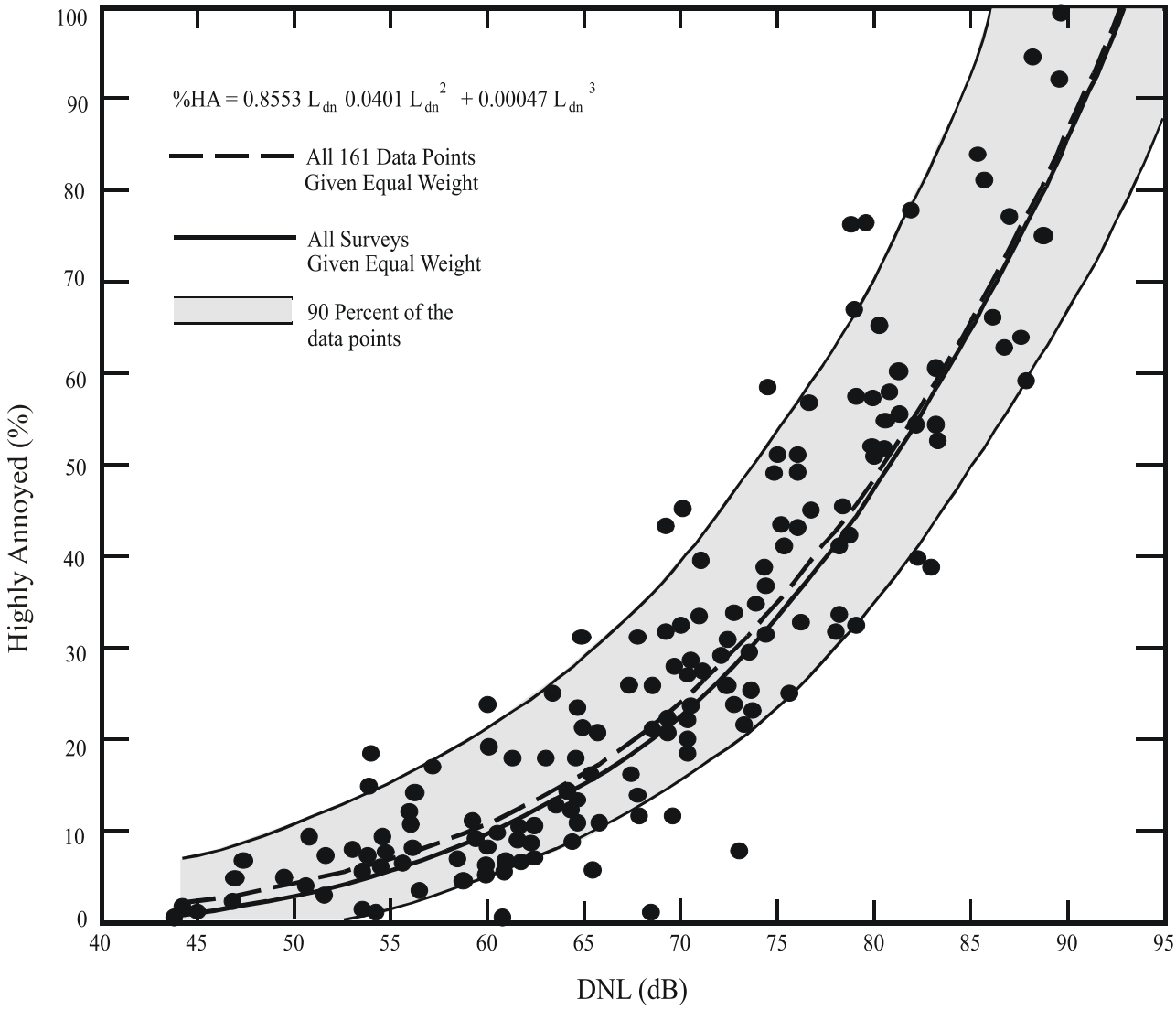


Figure 2-1 Schultz Curve Relating Percent Highly Annoyed to Day-Night Average Sound Level (Schultz 1978)

When the fit of survey data to the Schultz curve is examined, the correlation between groups of people is high, but the correlation between individuals is far lower due to personal differences. Newman and Beattie (1985) divided the non-acoustic factors into the emotional and physical variables shown in Table 2-1.

Table 2-1 Non-Acoustic Variables Influencing Aircraft Noise Annoyance

Emotional Variables	*Physical Variables*
• Feeling about the necessity or preventability of the noise • Judgement of the importance and value of the activity that is producing the noise • Activity at the time an individual hears the noise • Attitude about the environment • General sensitivity to noise • Belief about the effect of noise on health • Feeling of fear associated with the noise	• Type of neighborhood • Time of day • Season • Predictability of the noise • Control over the noise source • Length of time individual is exposed to a noise

Speech Interference

Speech interference from noise disrupts routine activities such as radio or television listening, telephone use, or conversation leads to frustration and annoyance. The quality of speech communication is important in classrooms and offices. In the workplace, speech interference from noise can cause fatigue and vocal strain in those who attempt to talk over the noise. In schools it can impair learning.

Classroom Learning Interference

Studies identified a range of linguistic and cognitive factors to be responsible for children´s unique difficulties with speech perception in elevated noise environments. Children have lower stored phonological knowledge to reconstruct degraded speech, reducing the probability of successfully matching incomplete speech input when compared with adults. Additionally, young children are less able than older children and adults to make use of contextual cues to reconstruct noise-masked words presented in sentential context (Klatte et al. 2013).

Early studies in several countries (Bronzaft and McCarthy 1975; Cohen et al. 1973, 1980, 1981; Evans et al. 1998; Green et al. 1982; Haines et al. 2002; Lercher et al. 2003) showed lower reading scores for children living or attending school in noisy areas than for children away from those areas. In some studies, noise-exposed children were less likely to solve difficult puzzles or more likely to give up.

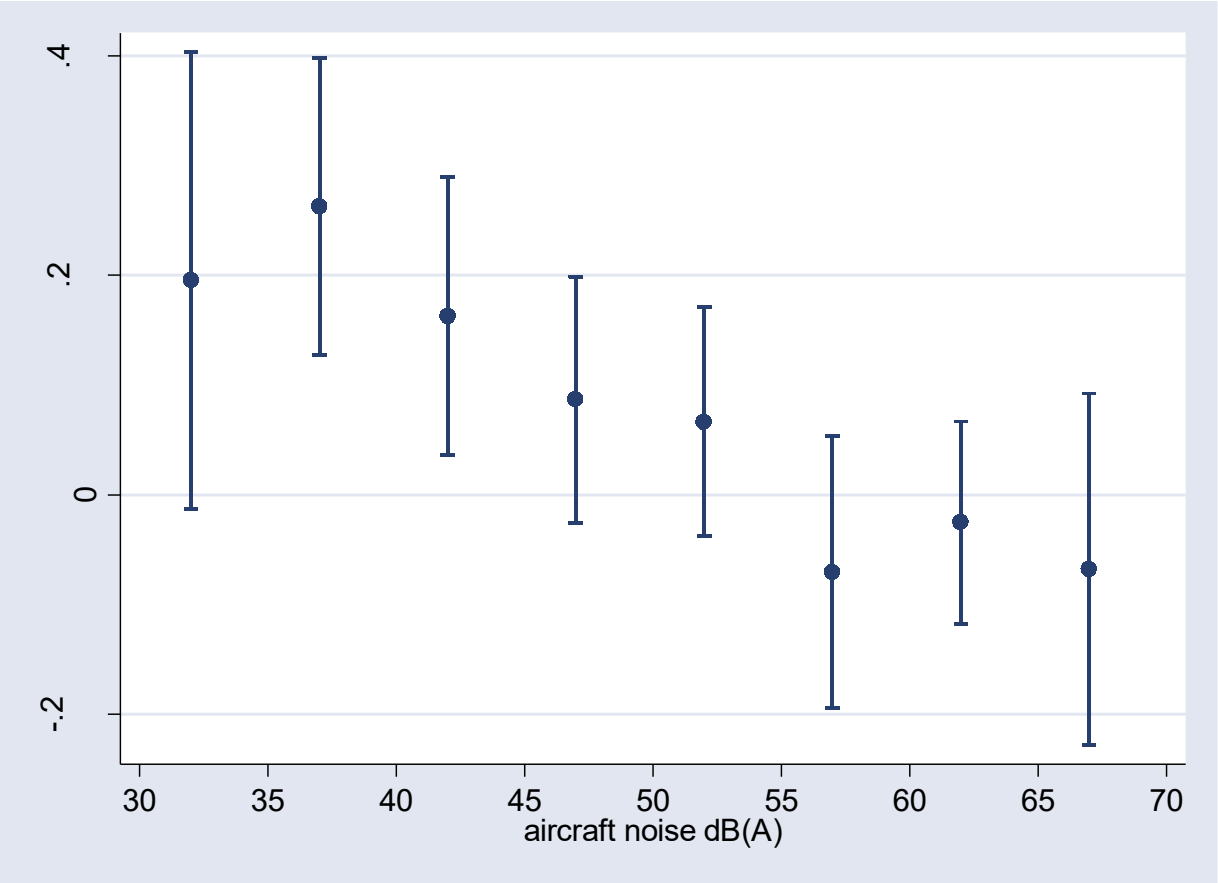
A longitudinal study reported by Evans et al. (1998) conducted prior to relocation of the old Munich airport in 1992, reported that high noise exposure was associated with deficits in long-term memory and reading comprehension in children with a mean age of 10.8 years. Two years after the closure of the airport, these deficits disappeared, indicating that noise effects on cognition may be reversible if exposure to the noise ceases. Most convincing was the finding that deficits in memory and reading comprehension developed over the 2-year follow-up for children who became newly noise exposed near the new airport; deficits were also observed in speech perception for the newly noise-exposed children.

More recently, the Road Traffic and Aircraft Noise Exposure and Children's Cognition and Health (RANCH) study (Clark et al. 2005, Stansfeld et al. 2005) compared the effect of aircraft and road traffic noise on over 2,000 children in three countries. This was the first study to derive exposure-effect associations for a range of cognitive and health effects and was the first to compare effects across countries.

The study found a linear relation between chronic aircraft noise exposure and impaired reading comprehension and recognition memory. No associations were found between chronic road traffic noise exposure and cognition. Conceptual recall and information recall surprisingly showed better

performance in high road traffic noise areas. Neither aircraft noise nor road traffic noise affected attention or working memory (Clark et al. 2005, 2009; Stansfeld et al. 2005).

Figure 2-2 shows RANCH's result relating noise to reading comprehension. It shows that reading falls below average (a z-score of 0) at equivalent sound level (L_{eq}) greater than 55 dB. Because the relationship is linear, reducing exposure at any level should lead to improvements in reading comprehension.



Sources: Clark et al., 2005; Stansfeld et al., 2005

Figure 2-2 RANCH Study Reading Scores Varying with L_{eq}

While there are many factors that can contribute to learning deficits in school-aged children, there is increasing awareness that chronic exposure to high noise levels may impair learning. This awareness has led World Health Organization (WHO) and a North Atlantic Treaty Organization (NATO) working group to conclude that daycare centers and schools should not be located near major sources of noise, such as highways, airports, and industrial sites (NATO 2000, WHO 1999). The awareness has also led to the classroom noise standards described in Table 2-2 providing noise level criteria for speech intelligibility across various agencies. Other than the Federal Aviation Administration (1985) 45 dB maximum sound level (L_{max}) criterion, they are consistent with a limit on indoor background noise of 35–40 dB L_{eq} and a single event limit of 50 dB L_{max}. It should be noted that these limits were set based on students with normal hearing and no special needs. At-risk students may be adversely affected at lower sound levels.

Table 2-2 Indoor Noise Level Criteria Based on Speech Intelligibility

Metric/Level (dB)	*Effects and Notes*	*Source*
$L_{eq(during\ school\ hours)}$ = 45 dB	Federal assistance criteria for school sound insulation; supplemental single-event criteria may be used.	FAA 1985
L_{max} = 50 dB/SIL 45	Single event level permissible in the classroom.	Lind et al. 1998, Sharp and Plotkin 1984, Wesler 1986
L_{eq} = 35 dB L_{max} = 50 dB	Assumes average speech level of 50 dB and recommends signal to noise ratio of 15 dB.	WHO 1999
L_{eq} = 35 dB, based on Room Volume (e.g., cubic feet)	Acceptable background level for continuous and intermittent noise.	ANSI 2010
$L_{eq(30min)}$ = 30–35 dB L_{max} = 55 dB	Minimum acceptable in classroom and most other learning environs.	UKDFES 2003

Legend: ANSI = American National Standards Institute; dB = decibel; FAA = Federal Aviation Administration; L_{eq} = equivalent sound level; L_{max} = maximum sound level; UKDFES = United Kingdom Department for Education and Skills; WHO = World Health Organization

Building attenuation with windows open typically reduces the interior sound levels to 15 dB less than exterior levels for external noise sources and with windows closed reduces by 25 dB. For windows open, the higher risk of impact condition, the corresponding exterior thresholds for screening purposes equate to 60 dB L_{eq} and 65 L_{max} if following the FAA or DNWG recommendations (DNWG 2013).

Sleep Disturbance

Sleep disturbance is a major concern for communities exposed to elevated noise at night. A large amount of research developed in the laboratory during the past 30 years has produced variable results suggesting a complex interaction of factors, including the noise characteristics and individual sensitivity, rather than a clear dose-effect relationship (Muzet 2007, Mulsow et al. 2021). Sleep disorders may cause negative health effects such as cardiovascular problems, neuroendocrine abnormalities and changes in cognition, mood, and memory. The causal relationships between noise exposure, effects on sleep, and contribution to health disturbances, both behavioral and physical, are not yet firmly established (Zaharna 2010).

Noise-induced Hearing Impairment

This section provides a brief overview of hearing loss caused by noise exposure. Hearing loss is generally interpreted as a decrease in the ear's sensitivity or acuity to perceive sound (i.e., a shift in the hearing threshold to a higher level). This change can either be a Temporary Threshold Shift (TTS) or a Permanent Threshold Shift (PTS) (Berger et al. 1995).

TTS can result from exposure to loud noise over a given amount of time. An example of TTS might be a person attending a loud music concert. After the concert is over, there can be a threshold shift that may last several hours. While experiencing TTS, the person becomes less sensitive to low-level sounds, particularly at certain frequencies in the speech range (typically near 4,000 Hz). Normal hearing eventually returns, as long as the person has enough time to recover within a relatively quiet environment.

PTS usually results from repeated exposure to high noise levels, where the ears are not given adequate time to recover. A common example of PTS is the result of regularly working in a loud factory. A TTS can

eventually become a PTS over time with repeated exposure to high noise levels. Even if the ear is given time to recover from TTS, repeated occurrence of TTS may eventually lead to permanent hearing loss. The point at which a TTS results in a PTS is difficult to identify and varies with a person's sensitivity. The National Institute for Occupational Health and Safety had assumed the audiogram to be the standard functional test and therefore that an exposure that causes only a TTS to be considered benign. However, recent work has shown that noise-induced neuropathy can exist independent of PTS but would likely affect more complex auditory tasks such as speech discrimination in noise (Liberman 2016).

Occupational Noise Exposure Regulations and Potential for Hearing Loss

The Occupational Safety and Health Administration issues workplace health and safety regulations and prescribes permissible noise exposure levels applicable to federal, state, and private sector employees, as detailed in Table 2-3. In situations where workers need to operate in environments above these thresholds, the employer is required to provide sufficient personal protective equipment to mitigate the noise exposure to within the permissible levels, which were developed based upon an assumed 40-year working lifetime.

Table 2-3 OSHA Permissible Noise Exposures

Duration Per Day (hours)[1]	*Sound Level (dBA, slow response)2*
8	90
6	92
4	95
3	97
2	100
1 ½	102
1	105
½	110
¼	115

Note: [1] When the daily noise exposure is composed of two or more periods of noise exposure of different levels, their combined effect should be considered, rather than the individual effect of each. If the sum of the following fractions: C(1)/T(1) + C(2)/T(2) C(n)/T(n) exceeds unity, then the mixed exposure should be considered to exceed the limit value. Cn indicates the total time of exposure at a specified noise level, and Tn indicates the total time of exposure permitted at that level. Exposure to impulsive or impact noise should not exceed 140 dB peak SPL.
[2] OSHA sound levels presented are based upon worker exposure over a 40-year working lifetime, which is not directly applicable to short term exposure like the Leq noise levels presented in construction noise analysis of annoyance (OSHA 1983).

Legend: dBA = A-weighted decibel; OSHA = Occupational Safety and Health Administration

As part of the noise analysis in environmental studies, such as environmental impact statements, DoD prescribes the 80 Day-Night A-Weighted (DNL) noise contour to screen for populations at the most risk of potential hearing loss based upon EPA Report No. 550/9-82-105, Guidelines for Noise Impact Analysis (EPA 1982). If populations are expected to be exposed to 80 dB DNL or greater, then a count of the population exposed to 80 dB Leq or greater provides the threshold of impact for the potential for hearing loss. For reference, a lifetime noise exposure of 80 $L_{eq(24hr)}$ is expected to result in an average reduction 3 dB in hearing sensitivity (DNWG 2013). This approach provides the most conservative methodology because it assumes that a person is outdoors. The actual 24-hour noise exposure (L_{eq24hr}) for any person living in the at-risk area is determined by the time that person is outdoors and directly

exposed to the noise. Many of the people living within the 80 dB Leq24 will not be resident during the daytime hours – they may be at work, at school, or involved in other activities outside the at-risk area. Some will be inside their homes and exposed to lower noise levels, benefitting from the noise attenuation provided by the house structure – a minimum of 15 dB with windows open so the actual risk of potential for hearing loss will be less than calculated.

Non-auditory Health Impacts

The potential for environmental noise to impair one's health deserves special attention and accordingly has been the subject of numerous epidemiological studies and meta-analyses of the gathered data.

The basic premise is that noise can cause annoyance, annoyance can cause stress, and prolonged stress is known to be a contributor to a number of health disorders, such as hypertension, myocardial infarction (heart attack), cardiovascular disease, and stroke. Research studies seem to indicate that aircraft noise may contribute to the risk of health disorders, along with other factors such as heredity, medical history, smoking, alcohol use, diet, lack of exercise, air pollution, etc., but that the measured effect is small compared to these other factors, and often not statistically significant, i.e., not necessarily real.

According to Kryter and Poza (1980), "It is more likely that noise related general ill-health effects are due to the psychological annoyance from the noise interfering with normal everyday behavior, than it is from the noise eliciting, because of its intensity, reflexive response in the autonomic or other physiological systems of the body." The WHO notes that there is still considerable variation among studies (WHO 2011). Additionally, almost without exception, research studies conclude that additional research is needed to determine if such a causal relationship exists. The European Network on Noise and Health (European Network on Noise and Health 2013) in its summary report of 2013 concludes that "while the literature on non-auditory health effects of environmental noise is extensive, the scientific evidence of the relationship between noise and non-auditory effects is still contradictory."

This page intentionally left blank.

3. Acoustic Effects

Ambient Airborne Sound

Airborne sounds are commonly referenced to human hearing using a method that weights sound frequencies according to measures of human perception, de-emphasizing very low and very high frequencies that are not perceived well by humans (measured in dBA). The existing noise environment in the vicinity of the proposed project sites experience noise from security rounds via vehicles, klaxon, automated voice warnings, and vehicle traffic from the nearby roadways and parking lots. Ambient background noise levels were estimated at 55 dBA at Upland Site-North, Keyport Annex, Upland Site-South, and ranging from 55 to 85 dBA at the Pier Site. This estimate is based on noise levels measured during an on-site noise monitoring study conducted at NBK-Bangor, which serves as the baseline condition for this analysis (Illingworth and Rodkin 2012).

Airborne Sound Propagation

Airborne noise propagates freely in all directions from the source, resulting in spherical spreading loss, which equates to 6 dB decrease in SPL per doubling of distance. The water surface is considered a hard surface and acts as a reflective surface where it does not provide any attenuation (Washington State Department of Transportation [WSDOT] 2025). The TL equation is:

$$TL = 20 \log_{10} \left(\frac{R_1}{R_2} \right)$$

Where:

TL is the transmission loss in dB.

R1 is the distance of the modeled SPL from the noise source.

R2 is the distance (usually 50 feet [15 meters]) from the noise source of the initial measurement).

Natural factors such as topography, vegetation, and temperature can further reduce noise over distance. This section covers a few of the common factors and their applicability in increasing the noise reduction per doubling of distance from the source.

A hard site exists where noise travels away from the source over a generally flat, hard surface such as water, concrete, or hard-packed soil. These are examples of reflective ground, where the ground does not provide any attenuation. The standard attenuation rate for hard site conditions is 6 dB per doubling of distance for point source noise and 3 dB per doubling of distance from line sources. When ground cover or normal unpacked earth (a soft site) exists between the source and receptor, the ground becomes absorptive of noise energy. In soft-site conditions where there is interposing dense vegetation (e.g., trees and shrubs) between the noise source and receptors, there is an initial reduction of 10 dB. Added to the standard reduction rate for soft site conditions, point source noise attenuates at a rate of 7.5 dB per doubling of distance, and line source noise decreases at a rate of 4.5 dB per doubling of distance (WSDOT 2025).

Humans Assessment – Noise Modeling Methodology and Assumptions

Table 3-1 provides average maximum noise levels for common construction equipment measured at 50 feet. In order to provide a conservative estimate of the potential noise from construction equipment, the

analysis selected the loudest noise sources from Table 3-1 that could apply to the proposed action that includes shears on backhoe for felling trees or cutting metal (Lmax of 96 dBA at 50 feet), jack hammer (Lmax of 88 dBA at 50 feet), and a concrete paver and slip former (Lmax of 91 dBA at 50 feet). Then the standard attenuation rates for both hard and soft site conditions were applied to each sound source to determine the estimate noise that would occur across a range of distances from each source.

Micro-pile installation is proposed at Upland Site-North for foundation support, which differs from conventional piles because they utilize duplex drilling instead of impact or vibratory drilling. Duplex drilling would produce noise levels similar to auger or rock drilling, depending upon the substrate material and would be substantially lower than noise levels produced during impact drilling.

Table 3-1 Average maximum noise levels at 50 feet from common construction equipment.

Equipment Description[1]	*Impact Device?*	*Actual Measured Average L_{max} at 50 feet*[2]
Air-Operated Post Driver	Yes	83
Asphalt Distributor Truck (Asphalt Sprayer)	No	70
Auger Drill Rig	No	70
Backhoe4	No	80
Backup / Movement Alarm	No	80
Bar Bender	No	73
Blasting (rock slope production)[3]	Yes	126
Blasting (mitigated rock fracturing)	Yes	94
Boring Jack Power Unit[3]	No	83
Chain Saw	No	83
Chip Spreader	No	77
Clam Shovel (dropping)[3]	Yes	87
Compactor (ground)	No	75
Compressor (air)	No	68
Concrete Batch Plant	No	90
Concrete Grinder (Diamond Grinder)	No	97
Concrete Mixer Truck	No	82
Concrete Pump Truck[4]	No	82
Concrete Saw	No	85
Crane	No	79
Directional Drill Rig	No	76
Dozer d	No	85
Drill Rig Truck[3]	No	79
Drum Mixer	No	74
Dump Truck (Cyclical)	No	91
Dump Truck (Passby)	No	73
Excavator	No	87
Flat Bed Truck[3]	No	74
Front End Loader (Cyclical)[4]	No	80
Front End Loader (Passby)	No	71

Equipment Description[1]	*Impact Device?*	*Actual Measured Average L_{max} at 50 feet*[2]
Generator	No	68
Generator (<25KVA, VMS signs)[3]	No	73
Gradall[3]	No	83
Grader (Passby)	No	79
Grapple (on backhoe)	No	87
Hoe Ram	Yes	97
Horizontal Boring Hydr. Jack	No	88
Impact Pile Driver	Yes	105
Jackhammer (Asphalt / Concrete)[4]	Yes	88
Joint Sealer	No	74
Light Tower	No	63
Mud Recycler	No	74
Man Lift	No	75
Pavement Scarifier[4]	No	83
Paving – Asphalt (Paver + Dump Truck)	No	82
Paving – Asphalt (Paver + MTV + Dump Truck)	No	83
Paving – Concrete (Placer + Slipform Paver)	No	91
Paving – Concrete (Texturing / Curing Machine)	No	74
Paving – Concrete (Triple Roller Tube Paver	No	89
Pickup Truck	No	75
Power Tools – Air Hose	No	98
Power Tools – Chipping Gun	No	101
Power Tools – Circular Saw (Cutting metal / wood)	No	77
Power Tools – Grinder (Grinding metal / concrete)	No	73
Power Tools – Hammer Drill	No	75
Power Tools – Impact Wrench	Yes	74
Power Tools – Jig Saw (Cutting steel)	No	95
Power Tools – Nail Gun	Yes	73
Power Tools – Reciprocating Saw (Cutting metal / wood)	No	66
Power Tools – Sander	No	69
Pumps	No	74
Refrigerator Unit[3]	No	73
Rivet Buster/chipping gun	Yes	107
Rock Drill	No	93
Roller	No	82
Rumble Strip Grinding (asphalt)	No	87
Sand Blasting (single nozzle)	No	103
Scraperd	No	85
Shears (on backhoe)	No	96
Shot Crete Pump/Spray	No	86
Slurry Plant	No	78
Slurry Trenching Machine	No	80
Street Sweeper	No	81

Equipment Description[1]	*Impact Device?*	*Actual Measured Average L_{max} at 50 feet*[2]
Street Sweeper (vacuum)	No	82
Telescopic Handler (Forklift)	No	88
Tractor[3]	No	84
Vacuum Excavator (Vac-truck)	No	87
Vacuum Street Sweeper[3]	No	82
Ventilation Fan	No	64
Vibrating Hopper[3]	No	87
Vibratory Concrete Mixer	No	80
Vibratory Pile Driver	No	105
Warning Horn	No	102
Water Jet Deleading[3]	No	92
Water Spray Truck	No	72
Welder/Torch	No	75

Source: WSDOT 2025

Notes: 1) NCHRP 25-49, 2018. Development of a Highway Construction Noise Prediction Model (Database) .
2) Lmax is the maximum value of a noise level that occurs during a single event.
3) Construction Noise Handbook (FHWA 2006).
4) Transit Noise and Vibration Impact Assessment Manual (FTA 2018)

4. References

American National Standards Institute, Inc. 2010. Acoustical Performance Criteria, Design Requirements, and Guidelines for Schools. Part 1, Permanent Schools. ANSI S12-60-2010.

Berger, E. H., Ward, W. D., Morrill, J. C., & Royster, L. H. 1995. Noise And Hearing Conservation Manual, Fourth Edition, American Industrial Hygiene Association, Fairfax, Virginia.

Berglund, B., and Lindvall, T. (Eds.). 1995. Community Noise, Jannes Snabbtryck, Stockholm, Sweden.

Bronzaft, A. L., and McCarthy, D. P. 1975. The Effects of Elevated Train Noise on Reading Ability. J. Environment and Behavior, 7, 517-527.

Clark, C., Martin, R., van Kempen, E., Alfred, T., Head, J., Davies, H. W., Haines, M. M., Barrio, I. L., Matheson, M., and Stansfeld, S. A. 2005. Exposure-effect Relations Between Aircraft and Road Traffic Noise Exposure at School and Reading Comprehension: the RANCH Project. American Journal of Epidemiology, 163, 27-37.

Clark, C., Stansfeld, S. A., and Head, J. 2009. The Long-term Effects of Aircraft Noise Exposure on Children's Cognition: Findings from the UK RANCH Follow-up Study. In Proceedings of the Euronoise Conference. Edinburgh, Scotland, October.

Cohen, S., Glass, D. C., and Singer, J. E. 1973. Apartment Noise, Auditory Discrimination, and Reading Ability in Children. Journal of Experimental Social Psychology, 9, 407-422.

Cohen, S., Evans, G. W., Krantz, D. S., et al. 1980. Physiological, Motivational, and Cognitive Effects of Aircraft Noise on Children: Moving from Laboratory to Field. American Psychologist, 35, 231-243.

Cohen, S., Evans, G. W., Krantz, D. S., et al. 1981. Aircraft Noise and Children: Longitudinal And Cross-sectional Evidence on Adaptation to Noise and the Effectiveness of Noise Abatement. Journal of Personality and Social Psychology, 40, 331-345.

Cowan, J. P. 1994. Handbook of Environmental Acoustics. New York: John Wiley & Sons.

Department of Defense Noise Working Group. 2009. Community Annoyance Caused by Noise from Military Aircraft Operations. December.

Department of Defense Noise Working Group. 2013. Speech Interference from Aircraft Noise. December.

Environmental Protection Agency. 1982. Guidelines for noise impact analysis, Environmental Protection Agency Report No. 550/9-82-105.

European Network on Noise and Health. 2013. Final Report ENNAH – European Network on Noise and Health EU Project No. 226442, FP-7-ENV-2008-1.

Evans, G. W., Bullinger, M., and Hygge, S. 1998. Chronic Noise Exposure and Physiological Response: A Prospective Study of Children Living under Environmental Stress. Psychological Science, 9, 75-77.

Federal Aviation Administration. 1985. Airport Improvement Program (AIP) Handbook, Order No. 100.38.

Federal Highway Administration. 2006. Roadway Construction Noise Model User's Guide. January.

FICAN (Federal Interagency Committee on Aviation Noise). 1997. "Effects of Aviation Noise on Awakenings from Sleep." June.

Green, K. B., Pasternack, B. S., and Shore, R. E. 1982. Effects of Aircraft Noise on Reading Ability of School-Age Children. Archives of Environmental Health, 37 (1), 24-31.

Haines, M. M., Stansfeld, S. A., Head, J., and Job, R. F. S. 2002. Multilevel Modelling of Aircraft Noise on Performance Tests in Schools Around Heathrow Airport London. Journal of Epidemiology and Community Health, 56, 139-144.

Illingworth & Rodkin. 2012. Acoustic monitoring report. Test Pile Program. Prepared by Illingworth & Rodkin, Petaluma, CA. Prepared for NAVBASE Kitsap-Bangor, WA. April 27, 2012.

Kryter, K. D., and Poza, F. 1980. "Effects of Noise on Some Autonomic runca Activities," The Journal of the Acoustical Society of America, 67(6), 2036-2044.

Lercher, P., Evans, G. W., and Meis, M. 2003. Ambient Noise and Cognitive Processes Among Primary School Children. J. Environment and Behavior, 35, 725-735.

Liberman, M. C. 2016. Noise-Induced Hearing Loss: Permanent Versus Temporary Threshold Shifts and the Effects of Hair Cell Versus Neuronal Degeneration. Adv Exp Med Biol. 875:1-7. Doi: 10.1007/978-1-4939-2981-8_1.

Lind, S. J., Pearsons, K., and Fidell, S. 1998. Sound Insulation Requirements for Mitigation of Aircraft Noise Impact on Highline School District Facilities, Volume I, BBN Systems and Technologies. BBN Report No. 8240.

Mulsow, J., Finneran, J. J., Houser, D. S., Burkard, R. F., Strahan, M. G., and Jones, R. 2021. The offset auditory brainstem response in bottlenose dolphins (Tursiops truncatus): Evidence for multiple underlying processes The Journal of the Acoustical Society of America 149, 3163 (2021); https://doi.org/10.1121/10.0004830.

Muzet, A. 2007. Environmental noise, sleep and health. Sleep Medicine Reviews, 11:135-42.

Newman, J. S., and Beattie, K. R. 1985. "Aviation Noise Effects," U.S. Department of Transportation, Federal Aviation Administration Report No. FAA-EE-85-2.

Occupational Safety and Health Administration. 1983. Hearing Conservation Amendment; Final Rule, 48 Fed. Reg. 9738, 9740 (March 8, 1983).

Schultz, T. J. 1978. Synthesis of Social Surveys on Noise Annoyance. The Journal of the Acoustical Society of America, 64(2), 377-405.

Sharp, B. H., and Plotkin, K. J. 1984. Selection of Noise Criteria for School Classrooms. Wyle Research Technical Note TN 84-2 for the Port Authority of New York and New Jersey, October.

Stansfeld, S. A., Berglund, B., and Clark, C., Lopez-Barrio, I., Fischer, P., Öhrström, E., Haines, M.M., Head, J., Hygge, S., and van Kamp, I., Berry, B. F., on behalf of the RANCH study team. 2005. Aircraft and Road Traffic Noise and Children's Cognition and Health: A Cross-National Study. Lancet, 365, 1942-1949.

United Kingdom Department for Education and Skills. 2003. Building Bulletin 93, Acoustic Design of Schools - A Design Guide. London: The Stationary Office.

Wesler, J. E. 1986. Priority Selection of Schools for Soundproofing. Wyle Research Technical Note TN 96-8 for the Port Authority of New York and New Jersey, October.

WHO (World Health Organization). 1999. Guidelines for Community Noise. Berglund, B., T. Lindvall, and D. Schwela, eds.

WHO. 2011. Burden of Disease from Environmental Noise. WHO Regional Office for Europe.

Zaharna M., and Guilleminault, C. 2010. Sleep, noise and health: review. Noise Health, 12, 64-9. Retrieved from https://www.noiseandhealth.org/text.asp?2010/12/47/64/63205 .

This page intentionally left blank.

Appendix L
List of Preparers

This page intentionally left blank.

Appendix L
List of Preparers

U.S. Department of the Navy

Name	*Title/Organization*
Naval Facilities Engineering Systems Command Atlantic (NAVFAC LANT)	
Jennifer Shore	Contracting Officer Representative/ Project Manager
Dara Suich	NEPA Supervisor
Sara Goodwin	NEPA Planner
United States Fleet Forces Command (USFF)	
Greg Thompson	Environmental Home Basing/Homeporting NEPA Program Manager
Jamie Gormley	Marine/Natural Resources Manager
Joslyn Noonan	Environmental Compliance Analyst
Ted Brown	Installations and Environmental Public Affairs Office
Commander, Navy Region Northwest (CNRNW)	
Julianne Leinenveber	PAO
Naval Facilities Engineering Systems Command Northwest (NAVFAC NW)	
Corey Cicio	Design Manager
Katherine Whittlesey	NEPA Project Manager
Jenn Steele	NEPA Coordinator
Philip Nenninger	Environmental Restoration
Cindi Kunz	Supervisory Environmental Planning/Cons. Branch Manager
Anna Bausher	NEPA EV23 Supervisor
Tiffany Selbig	Natural Resources/ESA Lead
Julia Long	Tribal Relations
Kate Vaughn	Archaeologist
Matt L Hamilton	Air Quality
Amanda McCarthy	PAO
Wade Gore	Engineering Technician
Todd Bolden	Engineering Technician
Kristen Bass	Environmental Programs Director (Acting)
Katherine Childs	Environmental Planner
Naval Base Kitsap	
Richard Chong	EV Planner
Rebecca Johnson	Natural Resources Manager
Chris Stanis	PAO
Anna Whalen	Community Planning Liaison Officer
PEO SSBN/SSP	
Daniel Sanchez	PEO SSBN MILCON Admin Assistant

Name	*Title/Organization*
Stafford Coakley	PEO SSBN Senior Engineer
Jamiyo Mack	SSP Environmental Program Manager

Contractors

Name/Organization	*Education*	*Years of Experience*	*Responsible for:*
Jennifer Weitkamp Stantec	B.S., Fisheries	24	Project Manager Senior Review, Quality Assurance/Quality Control, Biological Resources
Carol Zurawski Stantec	M.E.M. Environmental Management and Policy	24	Deputy Project Manager, Senior Review, Traffic and Transportation
Kathleen Riek Stantec	B.S. Biology	36	Senior Review, Quality Assurance/Quality Control
Lisa Woeber Stantec	B.B.A., Business Administration	25	Senior Review, Quality Assurance and Quality Control
Stephanie Clark, GISP Stantec	B.S., Biology and Environmental Studies	8	Geographic Information System Analysis
Milo Honsberger Stantec	M.S., Applied Geospatial Systems and Technologies	5	Geographic Information System Analysis
Joshua DeGuzman Stantec	B.S., Wildlife Management and Conservation	9	Biological Resources
Lesley Hamilton Stantec	B.A. Chemistry	35	Air Quality
Scott Baggiore Stantec	B.S., Mechanical Engineering	20	Air Quality
Patrick Kester Stantec	B.S., Mechanical Engineering	16	Noise
Scott Coombs Stantec	M.S., Marine Science	23	Geological Resources, Water Resources
Katie Briscoe, RPA Stantec	M.A. Archaeology M.S. Historic Preservation	5	Architectural Resources
Isla Nelson, RPA Stantec	M.P.S. Cultural and Heritage Resource Management	24	American Indian Traditional Resources
Daniel Ortega	M.S., Biology	7	Hazardous Materials and Waste, Public Health and Safety, Coastal Consistency
Raul Castillo	M.S., Urban Planning	7	Socioeconomics

Appendix M
References

This page intentionally left blank.

Appendix M
References

Agness, A. M., & Tannenbaum, B. R. 2009. *Naval Base Kitsap at Bangor marine bird resource report.* Prepared by Science Applications International Corporation, Bothell, WA. Prepared for BAE Systems Applied Technologies, Inc., Rockville, MD.

Bhuthimethee, M., Hunt, C., Ruggerone, G., Nuwer, J., & Hafner, W. 2009. *Naval Base (NAVBASE) Kitsap-Bangor fish presence and habitat use, Phase III field survey report, 2007-2008.* Prepared by Science Applications International Corporation, Bothell, WA, and Natural Resources Consultants, Inc. (Ruggerone), Seattle, WA. Prepared for BAE Systems Applied Technologies, Inc., Rockville, MD.

Brinkmann, M., D. Montgomery, S. Selinger, J.G.P. Miller, E. Stock, A.J. Alcaraz, J.K. Challis, L. Weber, D. Janz, M. Hecker, S. Wiseman. 2022. Acute toxicity of the tire rubber-derived chemical 6PPD-quinone to four fishes of commercial, cultural, and ecological importance. *Environmental Science & Technology Letters,* 9(4), 333—338. DOI: 10.1021/acs.estlett.2c00050.

Bureau of Economic Analysis. 2020. Gross Domestic Product by county and metropolitan area: Kitsap County, WA. Table CAGDP2.

Bureau of Economic Analysis. 2021. Interactive Data Tables. Annual Gross Domestic Product by state: Washington. Table SAGDP2N.

Caltrans. 2016. Technical Guidance for Assessment and Mitigation of the Effects of Traffic Noise and Road Construction Noise on Birds. June.

Carter, H.R., and S.G. Sealy. 1990. Daily foraging behavior of marbled murrelets. *Studies in Avian Biology, 14*, 93–102.

Command Navy Region Northwest. 2021. Enterprise Safety Application Management System. Available at:https://www.cnic.navy.mil/regions/cnrnw/om/safety/enterprise_safety_application_management_syste m.html. Accessed: 11 March.

DoD. 2018. DOD INSTRUCTION 4710.02 DOD INTERACTIONS WITH FEDERALLY RECOGNIZED TRIBES. 24 September.

Dooling, R.J. and A.N. Popper. 2007. The effects of highway noise on birds. Prepared for Caltrans by Environmental BioAcoustics LLC. September 2007. 74pp.

Dunagan, C. 2021. Discovery of tire-related chemical that kills coho salmon sparks widespread response. University of Washington. Puget Sound Institute. August.

Duquette, C.A., S.R. Loss and T.J. Hovick. 2021. A meta-analysis of the influence of anthropogenic noise on terrestrial wildlife communication strategies. Journal of Applied Ecology. DOI: 10.1111/1365-2664-13880.

Ecology. 2019. Stormwater Management Manual for Western Washington. Available at: https://apps.ecology.wa.gov/publications/SummaryPages/1910021.html.

Ecology. 2022. Washington's 2014-2018 Clean Water Act (CWA) 303(d) List (List). Available at: https://apps.ecology.wa.gov/ApprovedWQA/ApprovedPages/ApprovedSearch.aspx.

Ecology. 2025. Available at: https://ecology.wa.gov/water-shorelines/water-quality/water-improvement/assessment-303d-list#303d. Accessed on December 22, 2025.

EPA. 2021. United States Environmental Protection Agency (EPA) National Pollutant Discharge Elimination Systems (NPDES) Multi-Sector General Permit (MSGP) for Stormwater Discharges Associated with Industrial Activity. Available at: https://www.epa.gov/npdes/stormwater-discharges-industrial-activities-epas-2021-msgp.

EPA 2025a. Washington Nonattainment/Maintenance Status. Available online: https://www3.epa.gov/airquality/greenbook/anayo_wa.html Accessed 23 July 2025.

EPA. 2025b. Executive Order 13045: Protection of Children from Environmental Health Risks and Safety Risk. Accessed 31 Dec. https://www.epa.gov/children/executive-order-13045-protection-children-environmental-health-risks-and-safety-risks.

EPA. 2026a. Greenhouse Gases Equivalency Calculator. Available at: https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator.

EPA. 2026b. What is a Wetland? Available at: https://www.epa.gov/wetlands/what-wetland#:~:text=Inland/non%2Dtidal%20wetlands%20are,breeding%20exclusively%20in%20these%20areas. Accessed 24 April 2026.

ESA and Suquamish Tribe. 2020. Puget Sound steelhead East Kitsap DIP Recovery Plan. Available: https://westsoundpartners.org/pdfs/East%20Kitsap%20steelhead%20Recovery%20Plan%20with%20Appendices%20May%202020.pdf. Accessed August 20, 2025.

FEMA. 2017. FEMA Flood Map Service Center: Kitsap County, Washington and Incorporated Areas, Map Number 53035C0205F. Effective February 3, 2017. Available at: https://www.fema.gov/flood-maps.

Flores, Mugdha. 2023. Saving Washinton's Salmon from Toxic Tire Dust. Washington State Department of Ecology.

French, B.F, D.H. Baldwin, J. Cameron, J. Prat, K. King, J.W. Davis, J.K. McIntyre, and N.L. Scholz. 2022. Urban Roadway Runoff is Lethal to Juvenile Coho, Steelhead, and Chinook Salmonids, but not Congneric Sockeye. Environ. Sci. Technol. Lett. 9. 733-738.

Grund et al. 2025. Archaeological Survey and Evaluation at Naval Base Kitsap-Bangor, Kitsap County, Washington.

Hamer, T. E., and S.K. Nelson 1995. Nesting Chronology of the Marbled Murrelet. In Ralph, C. J., Hunt, G. L., Piatt, J., and Raphael, M. (Eds.), Conservation Assessment for the Marbled Murrelet, USDA Forest Service General Technical Report PSW-152. Arcata, CA: U.S.D.A. Forest Service, Redwood Sciences Laboratory.

Hamer Environmental. 2019. 2016-2018 Marbled Murrelet Surveys and Habitat Assessment Results. Hamer Environmental, Mount Vernon, WA.

Hampton, Roy A., and Maria Gissendanner. 2010. Architectural Inventory and Evaluation of Naval Base Kitsap-Bangor Part 1: Upper Base. Kitsap County, Washington. Prepared for NAVFAC Atlantic, Norfolk, Virginia. Prepared by Hardlines Design Company, Columbus, Ohio.

Hart Crowser, Inc. 2013. Naval Base Kitsap at Bangor Explosives Handling Wharf 2, Bangor Washington. Year 1 Marbled Murrelet Monitoring Report (2012–2013). Prepared by Hart Crowser, Inc. for Naval Facilities Engineering Northwest, Silverdale, Washington. Hart Crowser, Inc., Seattle, WA.

Hart Crowser, Inc. 2014. Naval Base Kitsap at Bangor Explosives Handling Wharf 2, Bangor Washington. Year 3 Marbled Murrelet Monitoring Report (2013–2014). Prepared by Hart Crowser, Inc. for Naval Facilities Engineering Northwest, Silverdale, Washington. Hart Crowser, Inc., Seattle, WA.

Hart Crowser, Inc. 2015. Naval Base Kitsap at Bangor Explosives Handling Wharf 2, Bangor Washington. Year 3 Marbled Murrelet Monitoring Report (2014–2015). Prepared by Hart Crowser, Inc. for Naval Facilities Engineering Northwest, Silverdale, Washington. Hart Crowser, Inc., Seattle, WA.

Heaston, E.D., M.J. Kaylor, and D.R. Warren. 2018. Aquatic food web response to patchy shading along forested headwater streams. Canadian Journal of Fish and Aquatic Sciences.

Illingworth & Rodkin. 2012. *Acoustic monitoring report. Test Pile Program.* Prepared by Illingworth & Rodkin, Petaluma, CA. Prepared for Naval Base Kitsap, Bangor, WA. April 27, 2012.

International Forestry Consultants. 2001. Timber Inventory: Naval Submarine Base, Bangor, WA; Naval Magazine, Indian Island; Naval Undersea Warfare Station, Keyport, WA; Jim Creek Radio Station; Whidbey Island Naval Air Station; and Naval Observatory Flagstaff and Detachment, Bayview, ID. Prepared by International Forestry Consultants, Bothell, WA. Prepared for Department of the Navy, Silverdale, WA.

Jaeger, A., J. Monaghan, H. Tomlin, J. Atkinson, C.G. Gill, E.T. Krogh. 2024. Intensive spatiotemporal characterization of the tire wear toxin 6PPD quinone in urban waters. *Environmental Science & Technology Letters,* 4(12), 5566—5574. DOI: 10.1021/acsestwater.4c00614.

Jaeger, A., J. Zvekic, M. Maguire, S.H., and E. T. Krogh. 2025. Physicochemical properties of tire-derived para-phenylenediamine quinones – a comparison of experimental and computational approaches. Environmental Science: Processes and Impacts.

Kitsap Audubon Society. 2008. Kitsap Audubon Society Christmas Bird Counts, 2001-2007. Area 8: NAVBASE Kitsap-Bangor. Data provided by Nancy Ladenberger, Area 8 Leader, Kitsap Audubon, Poulsbo, WA.

Kitsap County. 2016. Kitsap County Comprehensive Plan 2016 - 2036. Final. June 2016 with revisions through April 2020. https://www.kitsap.gov/dcd/PEP%20Documents/2016%20Comp%20Plan%20Complete.pdf.

Kitsap County. 2017. Critical Aquifer Recharge Areas Category I and II. Available at: https://www.kitsap.gov/services/Pages/Map-Library.aspx.

Kitsap County. 2022. Kitsap County 2022 Budget Book. Department of Administrative Services.

Kitsap County. 2025. Water Resource Inventory, Area 15 Watersheds. Available at: https://www.kitsap.gov/services/Pages/Map-Library.aspx.

King, M.D., T.F.M. Rodgers, G. Sharma, S. Reger, X. Liao, A.R.S. Ross, M. Mueller, S. Drew, R.C. Scholes, T.M. Brown. 2025. Tracking 6PPD-quinone dynamics in a coho salmon-bearing stream following rain reveals elevated concentrations for multihour periods during high flow. *Environmental Science & Technology Letters,* 12(8), 1026—1031. DOI: 10.1021/acs.estlett.5c00477.

Lorenz, T.J., M.G. Raphael, R.D. Young, D. Lynch, S. Kim Nelson, and W.R. McIver. 2021. Status and Trend of Nesting Habitat for the Marbled Murrelet Under the Northwest forest Plan, 1993 to 2017. U.S. Forest Service, Pacific Northwest Research station, Portland, OR.

McWain, Alan; Crabill, D.; Goroch, J.; Fohn, M. 2025. Clear Creek Restoration Guidelines: A Framework for the Future. Kitsap County Surface and Stormwater Management.

National Center for Education Statistics. 2022. PSS Private School Universe Survey data 2019-2020 school year: Kitsap County.

National Center for Education Statistics. 2024. CCD public school data 2020-2021 school year: Kitsap County.

NOAA Fisheries. 2022. Salmon Life Cycle and Seasonal Fishery Planning. Coho Salmon. https://www.fisheries.noaa.gov/west-coast/sustainable-fisheries/salmon-life-cycle-and-seasonal-fishery-planning. Last updated October 2022.

NMFS. 2016. 5-Year Review: Summary and Evaluation of Puget Sound Chinook Salmon, Hood Canal Summer-run chum salmon, and Puget Sound Steelhead. National Marine Fisheries Service, West Coast Region, Portland, OR. 98 pp.

NMFS. 2024. Endangered Species Act Section 7(a)(2) Biological Opinion, Section 7(a)(4) Conference Opinion, and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for the Tang Road Repairs Project, Naval Base Kitsap - Bangor, Kitsap County, Washington (6th Field HUC 171100180108). WCRO-2024-00351. National Oceanic and Atmospheric Administration Fisheries, West Coast Region, Portland, OR.

Navickis-Brasch, A.S., M. Maurer, T. Hoffman-Ballard, S. Bator, J. Diamond. 2022. Stormwater treatment of tire contaminants: Best management practices (BMP) effectiveness. Prepared for Washington State Department of Ecology, Olympia, WA.

Navy. 2009a. Naval Base Kitsap (NBK) - Bangor Carderock Wave Screen Installation (MILCON P-364) Marbled Murrelet Survey Report, January 16, 2009 - January 22, 2009. Department of the Navy, Naval Base Kitsap, Bremerton, WA. April 24, 2009.

Navy. 2009b. OPNAVINST 5530.14E. Navy Physical Security and Law Enforcement Program.

Navy. 2016. Environmental Impact Statement for NBK Land-Water Interface and Service Pier Extension. www.nbkeis.com.

Navy. 2020. Final Supplemental Environmental Impact Statement/Overseas Environmental Impact Statement for Northwest Training and Testing. Record of Decision issued September 2021. https://nwtteis.com/.

Navy. 2021. Hazardous and Industrial Waste Management Plan. Naval Base Kitsap-Bangor, Camp Wesley Harris, Jackson Park Housing Complex, and Naval Hospital Bremerton. Prepared by Naval Base Kitsap Environmental Office. June.

Navy. 2023. Environmental Assessment for Transit Protection Program Pier and Support Facilities. NBK-Bangor. March.

Navy. 2025a. Survey numbers and marbled murrelet detection info for Table 3-2 (of BA-EFHA) provided by Rebecca Johnson via comments on V2 of the BA-EFH Assessment. October 16.

Navy. 2025b. Atlantic Fleet Training and Testing Final Environmental Impact Statement/Overseas Environmental Impact Statement. August 2025.

Navy, 2025c. NBK-Bangor Trident Refit Facility Expansion. Traffic Study Report.

Naval Base Kitsap (NBK). 2018. Integrated Natural Resources Management Plan. September.

NAVFAC NW. 2021. Stormwater Pollution Prevention Plan - Naval Base Kitsap-Bangor. Naval Facilities Engineering Command Northwest, Silverdale, WA. December.

NAVFAC Northwest (NAVFAC NW). 2025a. FY27 MCON P-817 Columbia Submarine Repair Facility Expansion Preliminary Design Basis of Design. February.

NAVFAC NW. 2025b. Wellhead Protection Plan. December.

Pacific Fisheries Management Council (PFMC). 1999. Final Amendment 13 to the Pacific Coast salmon plan. PFMC, Portland, Oregon. 75 p.

PFMC. 2024a. Coastal Pelagic Species Fishery Management Plan, as Amended through Amendment 21. PFMC, Portland, OR. April 2024.

PFMC. 2024b. Pacific Coast Salmon Fishery Management Plan for Commercial and Recreational Salmon Fisheries off the Coasts of Washington, Oregon, and California as Revised through Amendment 24. PFMC, Portland, OR. 84 p. February 2024.

Pacific Fisheries Management Council (PFMC). 2025. Pacific Coast Groundfish Fishery Management Plan, for the California, Oregon, and Washington Groundfish Fishery. PFMC, Portland, OR. June 2025.

Parrish, Allison, Jennifer Bryant, and Dulaney Barclay. 2013. Cultural Resources investigation in Support of Environmental Requirements for Subdevron Five Homeporting Pier Extension and Waterfront Support Facility, Naval Base Kitsap, Bangor, Washington. Prepared for NAVFAC Northwest, Silverdale, Washington. Prepared by Cardno TEC, Seattle, Washington.

Pearson, S.F., and M.M. Lance. 2013. Fall-winter 2012/2013 marbled murrelet at-sea Densities for Four Strata Associated with U.S. Navy Facilities: Annual Research Progress Report. Washington Department of Fish and Wildlife, Wildlife Science Division, Olympia, WA.

Pearson, S. F., and Lance, M. M. 2014. Fall-winter 2013/2014 Marbled Murrelet at-sea Densities for Four Strata Associated with U.S. Navy Facilities: Annual Research Progress Report. Washington Department of Fish and Wildlife, Wildlife Science Division. Olympia, WA.

Pearson and Lance. 2015. Fall through spring 2014/2015 Marbled Murrelet At-Sea Densities in Five Strata Associated with U.S. Navy Facilities: Annual Research Progress Report. Washington Department of Fish and Wildlife, Wildlife Program Science Division, Olympia, WA.

Pearson and Lance. 2016. Fall through spring 2015/2016 Marbled Murrelet At-Sea Densities for Five Strata Associated with U.S. Navy Facilities: Annual Research Progress Report. Washington Department of Fish and Wildlife, Wildlife Science Division, Olympia, WA.

Pearson and Lance. 2017. Fall through spring 2016/2017 Marbled Murrelet At-Sea Densities in Five Strata Associated with U.S. Navy Facilities in Washington State: Annual Research Progress Report. Washington State Department of Fish and Wildlife, Wildlife Science Division, Olympia, WA.

Pearson and Lance. 2018. Fall through spring 2017/2018 Marbled Murrelet At-Sea Densities in Five Strata Associated with U.S. Navy Facilities in Washington State: Annual Research Progress Report. Washington State Department of Fish and Wildlife, Wildlife Science Division, Olympia, WA.

Pearson and Lance. 2019. Fall through spring 2018/2019 Marbled Murrelet At-Sea Densities In Five Strata Associated with U.S. Navy Facilities in Washington State: Annual Research Progress Report 2019. WDFW, Wildlife Science Division, Olympia, WA.

Pearson, S. F., and Lance, M. M. 2020. Fall-spring 2019/2020 Marbled Murrelet at-sea Densities for Four Strata Associated with U.S. Navy Facilities: Annual Research Progress Report. Washington Department of Fish and Wildlife, Wildlife Science Division. Olympia, WA.

Pearson and Lance. 2021. Fall-spring 2020/2021 Marbled Murrelet At-Sea Densities for Four Strata Associated with U.S. Navy Facilities in Washington State: Annual Research Progress Report 2021. WDFW, Wildlife Science Division, Olympia, WA. Deliverable under US Navy Cooperative Agreement N44255-20- 2-0003.

Pearson, S.F., I. Keren, M.M. Lance, M.G. Raphael. 2022. Nonbreeding changes in at-sea distribution and abundance of the threatened marbled murrelet (Brachyramphus marmoratus) in a portion of its range exhibiting long-term breeding season declines. PLoS ONE 17(4): e0267165. https://doi.org/10.1371/journal.pone.0267165.

Pearson, S.F., M.M. Lance, K. Beach, C. Norris, K. Saksa, and S. Tanedo. 2023. Fall-spring 2022-2023 Marbled Murrelet At-Sea Densities for Four Strata Associated with U.S. Navy Facilities in Washington State: Annual Research Progress Report 2023. WDFW, Wildlife Science Division, Olympia, WA. Deliverable under US Navy Cooperative Agreement N44255-22-2-1000.

Pearson, SF., M.M. Lance, K. Beach, K. Saksa, S. Tanedo, and J. Winn. 2024. Fall-spring 2023-2024 Marbled Murrelet At-sea Densities for Four Strata Associated with U.S. Navy Facilities in Washington State: Annual Research Progress Report 2024. Washington Department of Fish and Wildlife, Wildlife Science Division, Olympia, WA.

Pelekai, K., J. Johnson, and J. Brill. 2024. Fish Species Presence and Composition in Devils Hole and Cattail Basin at NBK-Bangor. USFWS, Western Washington Fish and Wildlife Office, Lacey, WA. Funded by U.S. Navy under agency agreement N6874221GTC4122.

Raedeke. 2025a. First-Year Summary of Inland Marbled Murrelet Surveys at the Bangor Powerline Site – 2024. RAI Project No. 2024-028-003. January 14.

Raedeke. 2025b. First-Year Summary of Inland Marbled Murrelet Surveys at the Bangor Forge Shop Site – 2024. RAI Project No. 2024-028-003. January 14.

Raphael, M.G., J. Baldwin, G.A. Falxa, M.H. Huff, M. Lance, S.L. Miller. 2007. Regional population monitoring of the marbled murrelet: field and analytical methods. General Technical Report PNW-GTR-716. U.S. Forest Service, Portland, OR.

Richardson, W.J., C. R. Greene, Jr., C.I. Malme, and D.H. Thomson. 1995. Marine Mammals and Noise. San Diego, CA: Academic Press.

Sackett, Russell. 2010. Architectural Inventory and Evaluation of Eligibility of Buildings within EHW-2 Area of Potential Effect, Naval Base Kitsap-Bangor, Washington. Prepared for NAVFAC Northwest, Silverdale Washington. Prepared by NAVFAC Northwest, Silverdale, Washington.

SAIC. 2011. Final Summary Report: Environmental Sound Panel for Marbled Murrelet Underwater Noise Injury Threshold. Science Panel convened July 27-29, 2011, attended by representatives of the U.S. Fish and Wildlife Service, National Marine Fisheries Service, U.S. Navy, National Marine Mammal Foundation, and other experts. Prepared by Science Applications International Corporation, Bothell, WA. Prepared for NAVFAC Northwest, Silverdale, WA. September.

SAIC. 2012. Final Summary Report: Marbled Murrelet Hydroacoustic Science Panel II. Panel conducted March 28-30, 2012, attended by representatives of the U.S. Fish and Wildlife Service, U.S. Geological Survey, National Marine Fisheries Service, U.S. Navy, and other experts. Prepared by Bernice Tannenbaum, Science Applications International Corporation, Bothell, WA. Prepared for NAVFAC Northwest, Silverdale, WA. September 4, 2012.Strachan, G., M. McAllister, C.J. and Ralph. 1995. Marbled murrelet at-sea and foraging behavior. In C. J. Ralph, G. L. Hunt, M. G. Raphael, & J. F. Piatt (Eds.), *Ecology and conservation of the marbled murrelet* (pp. 247-253). Albany, CA. U.S. Forest Service, Pacific Southwest Research Station. PSW-GTR-152.

Schick, L. 2008. Flood Fight: The pineapple express and flooding in western Washington. International Snow Science Workshop. U.S. Army Corps of Engineers, Seattle, WA.

Sibley, D. 2003. *The Sibley field guide to birds of western North America* (1st ed.). Knopf.

Stell Environmental Enterprises, Inc. (Stell), and Cardno TEC, Inc. (Cardno TEC). 2013. Archaeological Survey at Naval Base Kitsap, Bangor, Kitsap County, Washington.

Prepared by SEE, Elverson Pennsylvania and Cardno TEC, Boise, Idaho. Prepared for NAVFAC NW, Silverdale, Washington.

Strachan, G., M. McAllister, C.J. and Ralph. 1995. Marbled murrelet at-sea and foraging behavior. In C. J. Ralph, G. L. Hunt, M. G. Raphael, & J. F. Piatt (Eds.), *Ecology and conservation of the marbled murrelet* (pp. 247-253). Albany, CA. U.S. Forest Service, Pacific Southwest Research Station. PSW-GTR-152.

Tannenbaum, B.R., M. Bhuthimethee, L. Delwiche, G. Vedera, and J.M. Wallin. 2009. Naval Base Kitsap at Bangor 2008 marine bird survey report. Science Applications International Corporation, Bothell, WA.

Tannenbaum, B.R., W. Hafner, J.M. Wallin, L. Delwiche, and G. Vedera. 2011. Naval Base Kitsap at Bangor 2009–2010 marine bird survey report. Science Applications International Corporation, Bothell, WA.U.S.

Tian, Z., H. Zhao, K.T. Peter, M. Gonzalez, J. Wetzel, C. Wu, X. Hu, J. Prat, E. Mudrock, R. Hettinger, A. E. Corina, R.G Biswas, F. Vinicius, C. Kock, R. Soong, A. Jenne, B. Du, F. Hou, H. He, R. Lundeen. A. Gilbreath, R. Sutton, N.L. Scholz, J.W Davis, M.C. Dodd, A. Simpson, J. K. McIntyre, and E.P. Kolodziej. 2021. A Ubiquitous Tire Rubber-Derived Chemical Induces Acute Mortality in Coho Salmon. Science Journal 371, 185-189. https://www.science.org/doi/epdf/10.1126/science.abd6951.

Tiefenthaler, L.L., K.C. Schiff, S.M. Bay. 2001. Characteristics of parking lot runoff produced by simulated rainfall. Technical Report 343. Southern California Coastal Water Research Project, Westminster, CA.

U.S. Bureau of Labor Statistics. 2024. Local Area Unemployment Statistics, labor force data by county, 2024 annual averages.

U.S. Bureau of Labor Statistics. 2025. Employment status of the civilian noninstitutional population, not seasonally adjusted.

U.S. Census Bureau. 2010. 2010 Decennial Census, Summary File 1, Table P1.

U.S. Census Bureau. 2019. Annual Survey of State and Local Government Finances. Table 1. State and Local Government Finances by Level of Government and by State: Washington.

U.S. Census Bureau. 2023. 2023 American Community Survey, 5-Year Estimates: Tables DP02, DP03, DP04, and DP05 for Kitsap County and Washington.

U.S. Environmental Protection Agency (EPA) Region 10. 2020. National Pollutant Discharge Elimination System (NPDES) Permit for Municipal Separate Storm Sewer System (MS4) Discharges to: Naval Base Kitsap, Washington WAS026646. Effective date: February 1, 2021. Available at: https://www.epa.gov/npdes-permits/npdes-stormwater-permit-naval-base-kitsap-ms4-washington.

USFWS. 2012. *Guidance for identifying marbled murrelet nest trees in Washington State*. https://wsdot.wa.gov/sites/default/files/2021-10/Env-FW-MAMU-Habitat-FWS.pdf.

USFWS. 2013a. Biological Opinion for Effects to Northern Spotted Owls, Critical Habitat for Northern Spotted Owls, Marbled Murrelet, Critical Habitat for Marbled Murrelets, Bull

Trout, and Critical Habitat for Bull Trout from Selected Programmatic Forest Management Activities March 25, 2013 to December 31, 2023 on the Olympic National Forest. USFWS Reference: 13410-2009-F-0388.

U.S. Fish and Wildlife Service (USFWS). 2013b. Conducting masking analysis for marbled murrelets & pile driving projects. (Presentation for WSDOT Biologists and Consultants by Emily Teachout). U.S. Fish and Wildlife Service, Washington Fish and Wildlife Office Transportation Branch, Lacey, WA. November 19.

USFWS. 2016. Endangered and Threatened Wildlife and Plants; Determination of Critical Habitat for the Marbled Murrelet, 81 Fed. Reg. 51348.

USFWS. 2020. Biological Opinion: Programmatic Forest Management Activities on the Olympic National Forest. June 15, 2020 to June 15, 2030. U.S. Fish and Wildlife Service. Lacey, Washington.

USFWS. 2023. Sound Exposure Level Calculator for Marbled Murrelet and Bull Trout.

USFWS. 2025. Information for Planning and Consulting. Available online: https://ipac.ecosphere.fws.gov/location/G33HLGGVY5C2BIIKGDHJVYFFSE/resources Accessed 30 June 2025.

U.S. Geological Survey (USGS). 2020. TopoView Online Topographic Map Viewer. Poulsbo, WA. US Topo. 1:24,000 scale. Available at: https://ngmdb.usgs.gov/topoview/viewer/#15/47.6892/-122.7166. Accessed: 20 December 2022.

Volkhardt, G., P. Topping, and D. Seiler. 2000. Assessment of Factors Limiting Salmon Production in Devil's Hole Creek, Final Report, Bangor, WA. WDFW, Fisheries Science Division, Olympia, WA.

Washington Department of Fish and Wildlife (WDFW). 2022. Figure 8 Marbled murrelet observations indicating occupancy in the proximity of NAVBASE Kitsap-Bangor (WDFW Priority Habitats and Species data, current as of November 2022). Figure 8 from Biological Assessment for Launcher Equipment Processing Building at Naval Base Kitsap-Bangor, 23 April 2025. Prepared by NAVFAC Northwest.

WDFW. 2025. SalmonScape. Accessed June 3. https://apps.wdfw.wa.gov/salmonscape/map.html

Washington State Department of Transportation (WSDOT). 2025a. Biological Assessment Preparation Manual. Chapter 7.0 Construction Noise Impact Assessment. Available online: https://wsdot.wa.gov/sites/default/files/2022-11/BA-Manual-Chapter7.pdf.

WSDOT. 2025b. Traffic Counts AADT Current. Available at: https://geo.wa.gov/datasets/WSDOT::wsdot-traffic-counts-aadt-current/about.

West Sound Partners for Ecosystem Recovery (WSPER). 2025. East Kitsap Watershed Salmon Recovery Chapter Update. June.