UNITED STATES
DEPARTMENT
OF THE NAVY

NAVAL BASE KITSAP
BANGOR
SILVERDALE, WA

COOPERATING AGENCIES:

United States Army
Corps of Engineers

National Oceanic and
Atmospheric Administration,
National Marine
Fisheries Service

LAND-WATER INTERFACE AND SERVICE PIER EXTENSION AT NAVAL BASE KITSAP BANGOR

FINAL ENVIRONMENTAL IMPACT STATEMENT

VOLUME 1
CHAPTERS 1–6

VOLUME 2
APPENDICES A–I

JULY 2016

FINAL ENVIRONMENTAL IMPACT STATEMENT
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SILVERDALE, WASHINGTON

JULY 2016

LEAD AGENCY:	United States Department of the Navy
COOPERATING AGENCIES:	U.S. Army Corps of Engineers Seattle, Washington
	National Oceanic and Atmospheric Administration, National Marine Fisheries Service Silver Spring, Maryland
FOR FURTHER INFORMATION CONTACT:	Dr. Robert Senner, Project Manager Naval Facilities Engineering Command Northwest 1101 Tautog Circle Silverdale, WA 98315-1101

ABSTRACT:

This final environmental impact statement (FEIS) evaluates the environmental effects of constructing and operating a Land-Water Interface (LWI), and constructing and operating a Service Pier Extension (SPE), on Naval Base (NAVBASE) Kitsap Bangor. The FEIS has been prepared by the United States (U.S.) Department of the Navy (Navy) in accordance with the requirements of the National Environmental Policy Act (NEPA) of 1969. The LWI and SPE are independent actions, but are being analyzed in the same environmental impact statement (EIS) due to efficiencies, their geographic proximity, and the potential to affect the same resources. NAVBASE Kitsap is the action proponent for both projects.

LWI

The LWI Proposed Action is to complete the perimeter of the Waterfront Restricted Area (WRA) at NAVBASE Kitsap Bangor by constructing and operating barrier structures connecting the existing on-water Port Security Barrier (PSB) system to the existing on-land Waterfront Security Enclave (WSE). The purpose of the LWI is to comply with Department of Defense (DoD) directives to protect OHIO Class ballistic missile submarines (Section 1.2.1), hereafter referred to as Navy TRIDENT submarines, from increased and evolving threats and to prevent the seizure, damage, or destruction of military assets. The need for the LWI is to enhance security at the WRA and comply with security requirements. Two action alternatives and the No Action Alternative (Alternative 1) are evaluated in the DEIS. The two action alternatives are the Pile-Supported Pier (Alternative 2) and the Port Security Barrier (PSB) Modifications (Alternative 3), which is the Preferred Alternative. Under the No Action Alternative, the construction and operation of LWI would not occur. Under both action alternatives, there would

be two LWI structures, one at the north end and one at the south end of the WRA at NAVBASE Kitsap Bangor. Alternative 2 would construct two piers with a walkway, fence, and towers for lights and equipment. There would be a mesh extending from the bottom of the piers to the seafloor. Alternative 2 would also relocate a portion of the existing floating PSBs at the north and south LWIs. Alternative 3 would not include a fixed structure or an in-water mesh, but instead would entail lengthening and relocating the floating PSB systems to create the entire LWI. Both action alternatives would construct two concrete abutments at the shore cliff to which the LWI structures would attach. Under Alternative 3, each abutment would also include an observation post, and a third, existing observation post on Marginal Wharf would be demolished and replaced without in-water work. In-water and terrestrial construction would occur over approximately 2 years, although there would be only one in-water work season for Alternative 3. In-water work would be subject to timing and seasonal restrictions to avoid and minimize impacts on sensitive species. Project construction would begin in August 2016 and end in August 2018.

SPE

The SPE Proposed Action is to extend the existing Service Pier at NAVBASE Kitsap Bangor and construct associated support facilities. The SPE would provide additional berthing for maintenance of existing homeported and visiting submarines. The associated support facilities would provide logistical support for SEAWOLF, LOS ANGELES, and VIRGINIA Class submarines at the Navy's SSN research, development, test, and evaluation hub, which is currently located on NAVBASE Kitsap Bangor. Two action alternatives and the No Action Alternative (Alternative 1) are evaluated in the EIS. Under the No Action Alternative, the SPE would not be constructed or operated. The action alternatives are the Short Pier (Alternative 2), which is the Preferred Alternative, and the Long Pier (Alternative 3). Alternative 2 would extend the existing 500-foot (152-meter) long Service Pier by 540 feet (165 meters); Alternative 3 would extend it by 975 feet (297 meters). After construction of the SPE, the Service Pier would be 1,040 feet (317 meters) or 1,475 feet (450 meters) long under Alternatives 2 and 3, respectively. Both alternatives would include construction of a 2,100-square foot (195-square meter) Pier Services and Compressor Building on the Service Pier and relocation of the existing PSB system to attach to the end of the pier extension. The upland portions of the two action alternatives would be the same. A new 50,000-square foot (4,645-square meter) Waterfront Ship Support Building would be built at the site of an existing parking lot. Additional new project elements including an approximately 420-space parking lot, utilities, and road improvements would occupy a total of approximately 7 acres (2.8 hectares).

Military Construction projects such as SPE must be authorized and funded by Congress. The SPE project is not currently funded or programmed for implementation, and therefore a future construction schedule has not been determined. This means that the SPE project might be scheduled for construction in the future, but with limited resources and competing priorities, the decision to fund and construct the SPE and associated support facilities has not been made and a time frame for doing so has not been determined. Because the passage of time has the potential to alter the affected environment and anticipated impacts, completion of the NEPA process through a Record of Decision, along with regulatory consultations and permit applications, will be deferred until such time as a decision is made to proceed with the SPE project, so that any relevant supplemental information can be taken into account. However, because the SPE proposed action has already undergone significant analysis, and because the project authorization

and scheduling modifications occurred during the EIS preparation process, the Navy continued to include the description and environmental impact analysis of the SPE project in this Final EIS to provide the most comprehensive environmental information and to support the cumulative effects analysis.

Environmental Impacts

This FEIS evaluates direct, indirect, and cumulative impacts on the environment. For the LWI, the principal types of impacts during project construction would include pile driving noise (and its effects on fish and wildlife), turbidity, and habitat impacts. However, Alternative 3 would not involve in-water pile driving but would include pile driving in the dry (during low tides) and on-land for the abutments and observation posts (north and south). Impacts of operation and maintenance would include loss and shading of marine habitat including eelgrass, macroalgae, and the benthic community, as well as interference with migration of juvenile salmon, some species of which are protected under the Endangered Species Act (ESA). Both action alternatives would have the potential to affect fish and bird species protected under the ESA and marine mammals (behavioral harassment only) protected under the ESA and the Marine Mammal Protection Act (MMPA). The above impacts would be greater for Alternative 2 than Alternative 3. Upland construction would be the same for both action alternatives and would result in permanent and temporary vegetation disturbance. Wildlife would be disturbed by construction noise, especially pile driving; measures are proposed to mitigate these impacts. No terrestrial animals or plants protected under the ESA or Migratory Bird Treaty Act (MBTA) would be affected, but bald eagles could be disturbed during construction at the south LWI project site.

For the SPE, the principal types of impacts during project construction would include pile driving noise and its effects on fish, wildlife, and neighboring communities; turbidity; and habitat impacts. Impacts of operation and maintenance would include loss and shading of marine habitat, but minimal interference with migration of juvenile salmon. Both action alternatives would have the potential to affect fish and bird species protected under the ESA and marine mammals (behavioral harassment only) protected under the ESA and the MMPA. In-water impacts would be greater for Alternative 3 than Alternative 2, including greater over-water coverage and more pile driving. Upland impacts would be the same for both alternatives, including permanent and temporary vegetation disturbance. Wildlife would be disturbed by construction noise, especially pile driving; measures are proposed to mitigate these impacts. No wetlands or terrestrial animals or plants protected under the ESA, MBTA, or Bald and Golden Eagle Protection Act would be affected.

Permitting and Consultation

Permitting and consultation for LWI and SPE are being conducted as two independent actions, but in some instances, they are addressed in combined consultation packages due to their proximity. For LWI, the Navy conducted ESA Section 7 consultation to address potential impacts on federally listed species and designated critical habitat. The National Marine Fisheries Service (NMFS) provided its concurrence with the Navy's ***not likely to adversely affect*** determinations under informal consultation on November 13, 2015. NMFS also concurred with the Navy's ***may adversely affect*** determination for Essential Fish Habitat (EFH) under the Magnuson-Stevens Fishery Conservation and Management Act (MSA). NMFS determined that

no conservation recommendations were required because implementation of the Navy's best management practices will be sufficient to avoid, mitigate, or offset the impacts of the Proposed Action on intertidal EFH. The Navy also conducted Section 7 consultation with the U.S. Fish and Wildlife Service (USFWS). In a concurrence letter dated March 4, 2016, USFWS stated that for both the LWI and SPE projects impacts to bull trout are not measurable and therefore insignificant, and impacts to marbled murrelets are discountable. For the SPE project, ESA, MSA, and MMPA consultations with NMFS remain ongoing and have not been completed at the time of this publication.

In accordance with the Coastal Zone Management Act, the Navy submitted a Coastal Consistency Determination (CCD) for LWI to the Washington Department of Ecology (WDOE). The Navy also submitted an application for the LWI project to the U.S. Army Corps of Engineers (USACE) for permits under the Clean Water Act (CWA) and the Rivers and Harbors Act, and a request for CWA Section 401 Water Quality Certification from the WDOE. Discussions with these agencies for the LWI project are ongoing at the time of this publication. When the SPE project is programmed and scheduled, the Navy will submit a CCD to WDOE and an application for permits under the CWA and Rivers and Harbors Act for the SPE project to USACE and WDOE. The State Historic Preservation Officer concurred with the Navy's determination of no adverse effect on historic properties under the National Historic Preservation Act (NHPA) for the LWI and the SPE projects on July 30, 2015 and October 7, 2015, respectively. For both projects, the Navy is consulting with the affected American Indian tribes under the NHPA. In accordance with DoD policy and Navy instructions, the Navy invited government-to-government consultation regarding the Proposed Actions with the five federally recognized American Indian tribes that have treaty reserved rights and traditional resources in the project area: the Skokomish Indian Tribe, Port Gamble S'Klallam Tribe, Jamestown S'Klallam Tribe, Lower Elwha Klallam Tribe, and Suquamish Tribe.

EXECUTIVE SUMMARY

INTRODUCTION

Naval Base (NAVBASE) Kitsap Bangor, located on Hood Canal approximately 20 miles (30 kilometers) west of Seattle, Washington (Figure ES–1), provides berthing and support services to United States (U.S.) Department of the Navy (Navy) OHIO Class ballistic missile submarines, hereafter referred to as TRIDENT submarines, as well as a SEAWOLF Class[1] submarine.

The Navy is proposing two separate actions along the NAVBASE Kitsap Bangor waterfront: the Land-Water Interface (LWI) and the Service Pier Extension (SPE) projects. Under the LWI Proposed Action, the Navy proposes to enhance security at the perimeter of the Waterfront Restricted Area (WRA) on NAVBASE Kitsap Bangor by constructing physical barriers through shallow waters and onto the immediate upland areas at the northern and southern extent of the WRA. These structures would tie into the existing Port Security Barrier (PSB) system and the on-land Waterfront Security Enclave (WSE) system. Under the SPE Proposed Action, the Navy proposes to extend the existing Service Pier and construct associated support facilities. The SPE would provide additional berthing for maintenance of existing homeported and visiting submarines. The support facilities that are part of the SPE Proposed Action would provide logistical support for SEAWOLF, LOS ANGELES, and VIRGINIA Class submarines at the Navy's SSN research, development, test, and evaluation hub, which is located at NAVBASE Kitsap Bangor. Figure ES–2 shows the general location of the Proposed Actions.

This final environmental impact statement (FEIS) evaluates the environmental effects of constructing and operating the LWI, and constructing and operating the SPE, on NAVBASE Kitsap Bangor. Following the 45-day public comment period on the draft environmental impact statement (DEIS), the Navy reviewed and responded to comments in writing (Appendix I of this FEIS) and incorporated appropriate changes into the FEIS. The FEIS is being circulated for a 30-day wait period. Following the 30-day wait period, the Navy will prepare a Record of Decision that will address substantive new comments received on the FEIS and formally document the selected alternative for the LWI project and mitigation to be implemented by the Navy. The SPE project, which is currently on hold, will be addressed in a future Record of Decision before it is implemented.

In accordance with DoD policy and Navy instructions, the Navy invited government-to-government consultation regarding the Proposed Actions with the five federally recognized American Indian tribes that have treaty reserved rights and traditional resources in the project area: the Skokomish Indian Tribe, Port Gamble S'Klallam Tribe, Jamestown S'Klallam Tribe, Lower Elwha Klallam Tribe, and Suquamish Tribe. On March 3, 2016, the Navy and the Skokomish Indian Tribe completed a Memorandum of Agreement (MOA) to undertake treaty mitigation projects for LWI and SPE by contributing funding to support the Skokomish River Basin restoration, with the terms and conditions of the MOA to apply only after the Navy begins

[1] SEAWOLF is a class of SSN submarine. SSN is the Navy designation for nuclear-powered attack submarines. Other classes of SSNs are LOS ANGELES Class and VIRGINIA Class.

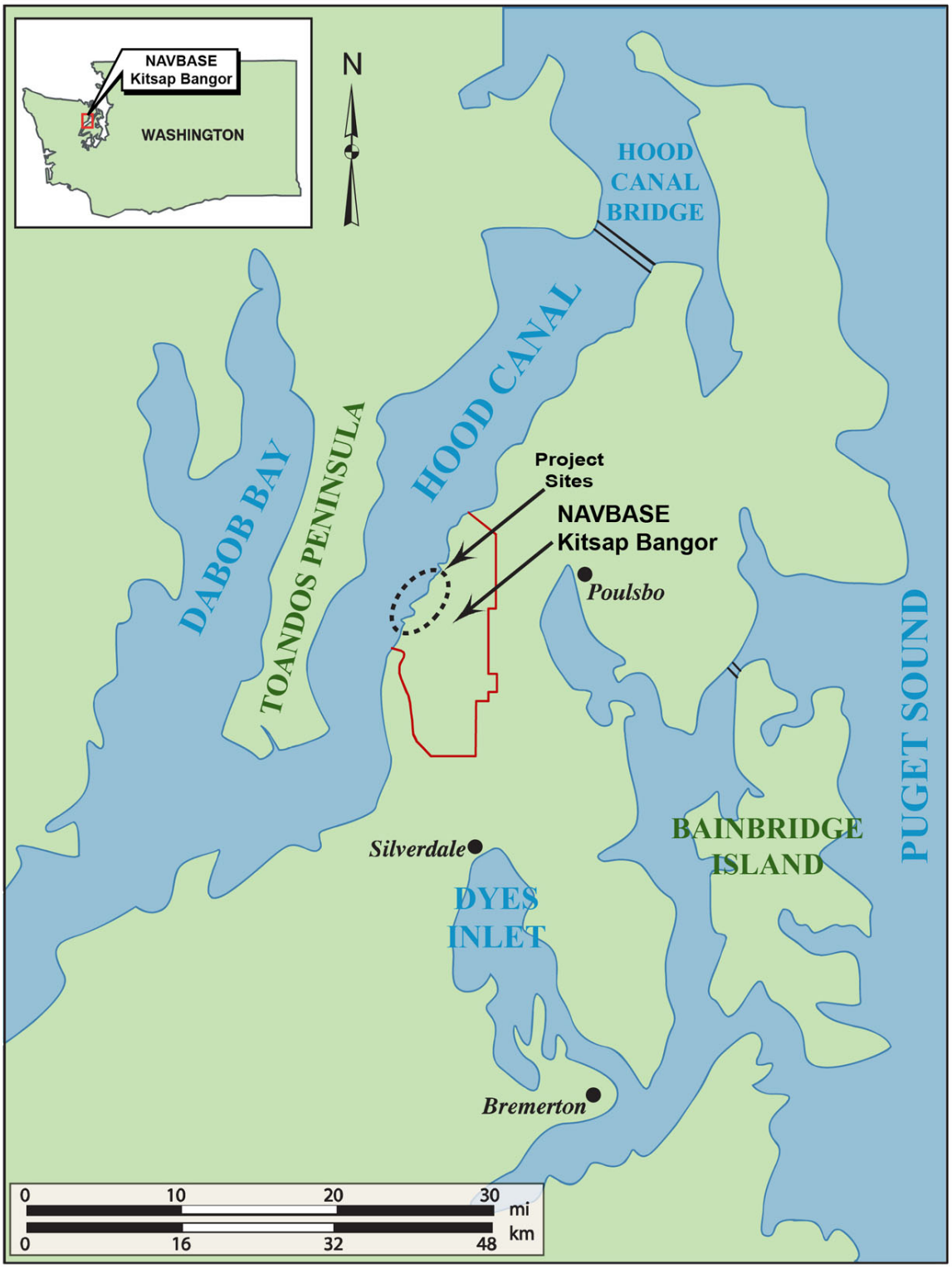

Figure ES–1. Site Location Map for NAVBASE Kitsap Bangor

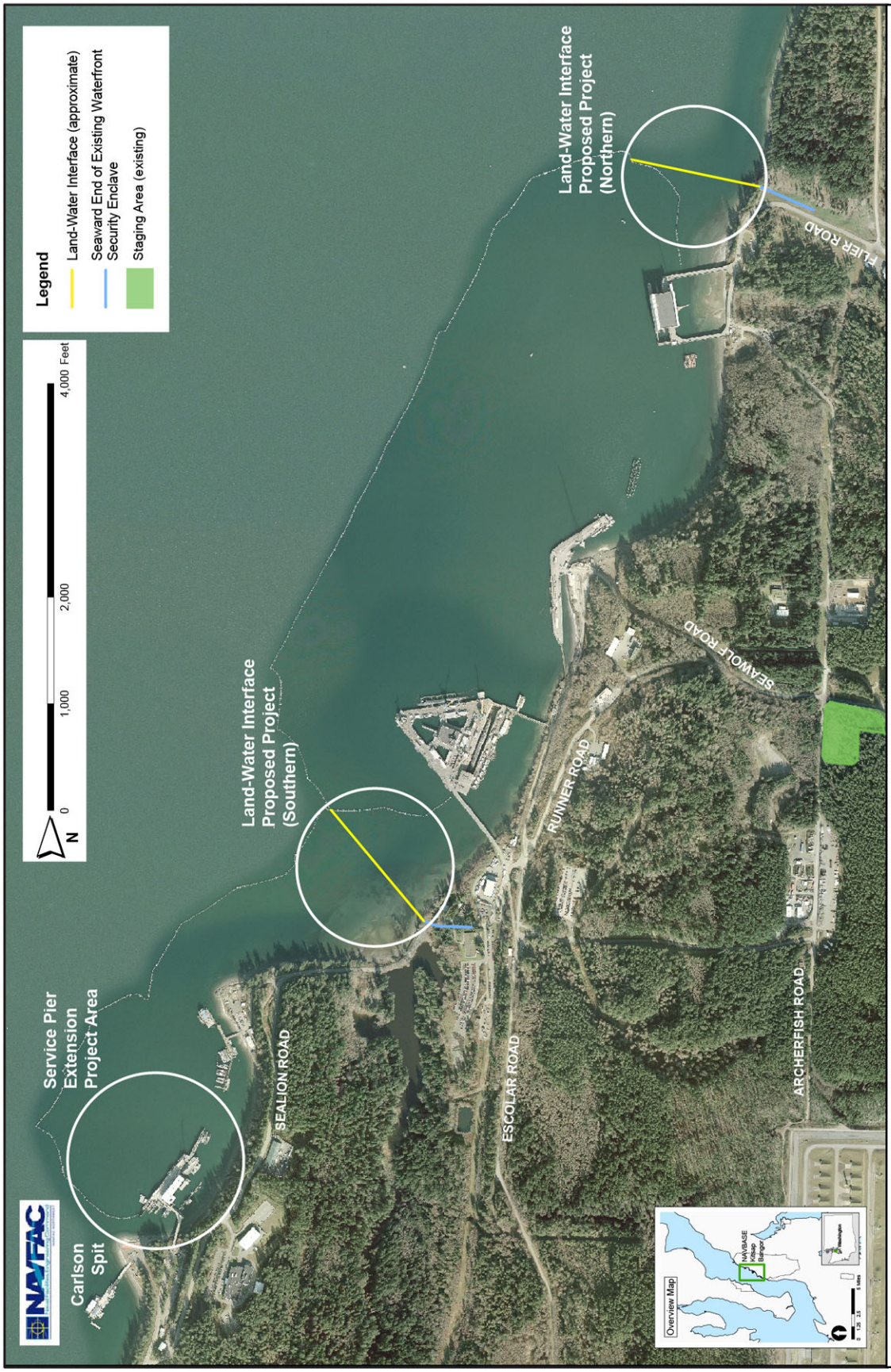

Figure ES–2. Location of the LWI and SPE Projects

in-water construction. The Navy and the Port Gamble S'Klallam Tribe, Jamestown S'Klallam Tribe, and Lower Elwha Klallam Tribe have conducted government-to-government consultation to discuss the nature, scope, and schedule of the Navy's Proposed Actions since 2008 for the LWI project and 2012 the SPE project. Although the Navy and these Tribes were not able to reach formal agreement on treaty mitigation projects at the time of publication of this FEIS, the Navy carefully considered tribal concerns regarding the Proposed Actions and assessed the potential for significant impact to tribal rights and protected resources. Based on the Navy's assessment, the Navy offered to fund one or more of several proposed treaty mitigation projects.

The U.S. Army Corps of Engineers (USACE) and National Marine Fisheries Service Headquarters (NMFSHQ) are Cooperating Agencies under the National Environmental Policy Act (NEPA) for the Proposed Actions.

The Navy has consulted with, or coordinated with, the following agencies regarding approvals for the Proposed Actions: USACE, NMFSHQ, NMFS West Coast Region office, U.S. Fish and Wildlife Service (USFWS) Washington Fish and Wildlife Office, U.S. Environmental Protection Agency, Washington State Department of Ecology (WDOE), and State Historic Preservation Officer (SHPO).

PURPOSE AND NEED

The LWI and SPE are independent actions, but are being analyzed in the same environmental impact statement (EIS) due to efficiencies, their geographic proximity, and because construction periods for the two projects were initially projected to overlap. However, these are not connected projects. Each Proposed Action fulfills a separate purpose and need, independent of the other Proposed Action.

LWI Purpose and Need

The purpose of the LWI Proposed Action is to comply with Department of Defense (DoD) directives to protect Navy TRIDENT submarines from increased and evolving threats and to prevent the seizure, damage, or destruction of military assets. The LWI is needed to enhance security within the WRA and comply with security requirements.

SPE Purpose and Need

The purpose of the SPE Proposed Action is to provide additional berthing capacity and improve associated support facilities for existing homeported and visiting submarines at NAVBASE Kitsap Bangor. The SPE project is needed to:

- Provide alternative opportunities for berthing to mitigate restrictions at NAVBASE Kitsap Bremerton on navigating SEAWOLF Class submarines through Rich Passage under certain tidal conditions;
- Improve long-term operational effectiveness for the three SEAWOLF Class submarines on NAVBASE Kitsap;

- Provide berthing and logistical support for SEAWOLF, LOS ANGELES, and VIRGINIA submarine classes at the Navy's SSN research, development, test, and evaluation hub, which is currently located on NAVBASE Kitsap Bangor; and
- Improve submarine crew training and readiness through co-location of command functions at NAVBASE Kitsap Bangor submarine training center.

LWI ALTERNATIVES

LWI Alternatives Development and Screening Criteria

The environmental impact statement (EIS) must evaluate all reasonable alternatives in accordance with the Council on Environmental Quality regulations (40 Code of Federal Regulations [CFR] Part 1502.14) and Navy regulations (32 CFR Part 775) that implement the NEPA. The development of reasonable alternatives for analysis is dependent on the stated purpose and need for the Proposed Action. Screening criteria were developed to determine if a potential alternative was reasonable, whether it met the purpose and need, and if it should be carried forward for detailed analysis in the EIS. The screening criteria listed below were used in the identification and evaluation of LWI action alternatives:

- Meets security and TRIDENT program requirements,
- Compatible with existing security features,
- Must be located within the WRA,
- Compatible with a dynamic intertidal environment,
- Supports master planning considerations and does not impact other operational missions on NAVBASE Kitsap, and
- Avoids or minimizes impacts on tribal usual and accustomed harvest areas.

LWI ALTERNATIVE 1: NO ACTION

Under LWI Alternative 1, the No Action Alternative, there would be no construction and operation of LWI structures and existing PSBs would not be relocated. This alternative would not meet security requirements and, therefore, would not meet the purpose and need for the Proposed Action. No environmental impacts are anticipated from the No Action Alternative, as no construction or physical alteration to the waterfront would occur, and there would be no changes in operations. The No Action Alternative is carried forward for analysis because it is required by NEPA and constitutes baseline conditions for environmental analysis of the Proposed Action.

LWI ALTERNATIVE 2: PILE-SUPPORTED PIER ALTERNATIVE

Under LWI Alternative 2, construction and operation of LWI structures would include pile-supported piers built from the base of the shoreline bluff out to a connection point with the existing PSB system (Figures ES–2, 2–2, and 2–3) at both the north and south ends of the WRA. The piers would connect to solid concrete abutments that would be built at the shoreline bluff, and an anchoring structure for the PSBs would be installed at the seaward end of each pier.

Construction is expected to require one barge with a crane plus one supply barge, a tugboat, and work skiffs. Table 2–1 summarizes the physical features of the two LWI action alternatives. Best management practices (BMPs) and impact reduction measures that would be implemented to avoid or minimize potential environmental impacts associated with the LWI Proposed Action are discussed in Section 2.3.

Pier Structures

The LWI pier structures would be 13 feet (4 meters) wide and 280 feet (85 meters) long at the north location and 730 feet (223 meters) long at the south location. The last (seaward) 23 feet (7 meters) of each pier would be 20 feet (6 meters) wide. The piers would include a walkway for their entire length and 40-foot (12-meter) tall steel monopole towers supporting lights and security equipment; there would be 14 towers on the south pier and 6 towers on the north pier. A fence would be installed along the entire length of each pier. A mesh material would extend from the bottom of the walkway into the water and would be anchored to heavy steel plates placed on the seafloor using a barge-mounted crane assisted by divers. The steel plate anchors would remain in place based on their weight and occupy approximately 1,500 square feet (140 square meters) at the north LWI and 4,000 square feet (370 square meters) at the south LWI, for a total area of approximately 5,500 square feet (510 square meters). The pier deck would consist of metal grating that allows 65 percent of light to pass through. The elevation of the pier deck would be approximately 21.5 feet (6.6 meters) above mean lower low water (MLLW), and the elevation of the bottom of the pier structure would be approximately 17 feet (5.2 meters) above MLLW. There would be a floating dock for small boat access approximately 12 by 35 feet (4 by 11 meters) at the end of each pier, on the inside, or secure side, of the pier. This dock would be anchored with four piles (included in the 136 total number of permanent piles) and would have a metal grating deck. Access to the floating dock from the pier would be by means of a gangway 80 feet long by 3 feet wide (24 by 1 meter). The gangway deck would also consist of metal grating.

Pile Installation

The north LWI would require a maximum of 54 hollow steel piles, 24 inches (60 centimeters) in diameter. The south LWI would require a maximum of 82 hollow steel piles, 24 inches in diameter. The estimated total number of permanent piles in the project is therefore 136. Piles primarily would be driven using vibratory methods. An impact hammer would be used to "proof" piles to ensure they provide the required load-bearing capacity. Where geotechnical conditions do not allow piles to be driven to the required depth using vibratory methods, an impact hammer may be used to drive some piles for part or all of their length. Pile driving is expected to take no more than 80 days and would be completed during the first in-water work season (August 1, 2016 through January 15, 2017).

Piles are expected to be installed primarily using a crane on a floating barge. Pile installation in shallow areas would be tidally dependent, such that the hull of the barge would not be permitted to ground or contact the seafloor at any time during the work. Therefore, the barge would move in and out with the tide as necessary to install the piles and decking. The barge would be positioned by means of spuds and anchors. Because the majority of the piles for the south LWI would be in shallow water that would make barge operations difficult, the analysis considered

that the contractor would build a temporary trestle adjacent to the LWI structure to install the permanent piles and decking in this shallow area. This temporary trestle would be approximately 300 feet (90 meters) long and 20 feet (6 meters) wide; the deck would be of metal grating that allows 65 percent of light to pass through. Approximately 120 temporary 24-inch (60-centimeter) steel piles would be needed. These piles would be driven in the same manner as the permanent piles, within the same 80 days as the permanent piles. The piles would be extracted by vibratory means.

PSBs

Existing PSB systems close to the proposed LWIs would be relocated and attached to the end of the new piers. For the north LWI, approximately 1,000 feet (300 meters) of the existing PSB system would be relocated and 200 feet (60 meters) would be removed. For the south LWI, approximately 650 feet (200 meters) of the existing PSBs would be relocated and 550 feet (170 meters) would be removed. Existing PSBs that are still serviceable would be configured into the new PSB alignment. When PSBs would be removed, they would be disassembled and recycled as scrap metal. The ends of the remaining PSB systems would be attached to a dolphin near the end of each pier; these dolphins would consist of eight closely spaced 24-inch (60-centimeter) diameter steel piles supporting an 8 by 8-foot (2.5 by 2.5-meter) concrete platform. For each LWI, two existing PSB buoys and associated anchors would be relocated and one would be removed. Each buoy is attached to three anchor legs. Each leg consists of a 120-foot (40-meter) chain attached to a main 10-ton (9-metric ton) concrete anchor (11 feet long, 5.5 feet wide, 5 feet high [3.5 by 1.8 by 1.6 meters]) and two concrete clump anchors, each 3 by 3 feet (1 by 1 meter) and weighing 2 tons (1.8 metric tons) (Figure 2–4).

Shoreline and Upland Construction

The north abutment would be approximately 40 feet (12 meters) high and 72 feet (23 meters) long and extend from an approximate elevation of 13 feet (4 meters) above (landward of) MLLW to the top of the slope at elevation 50 feet (15 meters). The south abutment would be approximately 20 feet high and 72 feet (6 by 22 meters) long and extend from an elevation of approximately 11 feet (3.4 meters) above MLLW to the top of the slope at elevation 24 feet (7 meters). The upper limit of the intertidal zone is considered to be MHHW, approximately 11 feet above MLLW at NAVBASE Kitsap Bangor.

The north abutment would be supported on 15 36-inch (90-centimeter) piles driven on land using vibratory and impact methods. The south abutment would be supported on 16 piles of the same size and also driven on land. Each abutment would include a stairway on one end, from the top of the abutment to the LWI deck and base of the bluff. At each abutment, the stairs would be attached to the abutment wall or supported on piles driven to grade and include a second stairway to the base of the bluff. The abutment stairways would be supported on five 24-inch (60-centimeter) piles each plus 6- by 2-foot (2- by 0.6-meter) concrete pads. The piles for the abutment stairways would be driven at low tide (“in the dry”) using a crane mounted on top of the bluff.

The abutment stair landings would lie below (waterward of) MHHW; the area below MHHW occupied by these new structures would be approximately 12 square feet (1.1 square meters) at

each LWI. The total area excavated below MHHW during abutment construction would be approximately 15,600 square feet (1,449 square meters). The total volume of material excavated below MHHW would be approximately 2,889 cubic yards (2,208 cubic meters). [2] Construction of abutment at the south LWI would require removal of approximately 40 feet (12 meters) of creosoted timber anti-torpedo baulk at the base of the bluff. Similar to work for the stairway piles (see above), the abutment and stair work would also be conducted at low tide in the dry. Beach contours would be returned to pre-construction conditions following construction, except for the areas occupied by the new structures and riprap placed at base of abutment wall. All bluff slopes disturbed by construction of the abutment would be stabilized using riprap (see Table 2-1 for quantities). The riprap would be placed below the abutment walls to elevations just below MHHW, ending just above 10 feet (3 meters) above MLLW at the north LWI and just below 9 feet (2.7 meters) above MLLW at the south LWI. The LWI project would utilize the existing beach sediment that was removed for LWI construction and place that over the protective armor rock at grade to preserve the natural shoreline dynamics. Several tidal cycles would be required to sort the material, but it is expected that the beach sediment will mimic existing conditions when the project is completed. Although additional armoring should not be required, if toe protection is needed to prevent erosion at the base of the LWI abutments, the Navy will implement soft armoring techniques such as placement of large woody debris (tree trunks or root wads). The intent of this technique is to add structure and complexity to diminish wave erosion without placing large armor rocks for LWI toe protection. A temporary sheet pile coffer dam would be constructed to create a dry area to install piles for the abutment. The lengths of the proposed coffer dams are 140 feet (43 meters) for the north abutment, 160 feet (49 meters) for the north stairs, 190 feet (58 meters) for the south abutment, and 160 feet long for the south stairs.

Construction of both abutments would clear a total of approximately 47,000 square feet (4,366 square meters) of upland area and would require excavation of approximately 6,245 cubic yards (4,775 cubic meters) of soil and fill of 6,966 cubic yards (5,326 cubic meters) including the concrete.

The staging area for both LWI construction sites would be 6,562 square feet (610 square meters) within a 5.4-acre (2.2-hectare) site near the intersection of Archerfish and Seawolf Roads (Figure ES-2). This site has been used for staging other construction projects and is highly disturbed.

Construction Schedule

Upland construction would take approximately 540 days; equipment would include backhoes, bulldozers, loaders, graders, trucks, and a crane/pile driver. Project construction would begin in August 2016 and end in August 2018. All in-water pile driving and abutment construction would take place during one in-water work season, August 1, 2016 through January 15, 2017, and would minimize potential impacts on Endangered Species Act (ESA)-listed fish species. Other in-water activities such as installation of the mesh material and relocation of PSB units and anchors would begin in January 2017 and end by August 2018, and could occur either within or

[2] Areas and volumes excavated are the minimum needed to achieve the purpose of the abutment construction.

outside the in-water work season. Materials and equipment for the in-water work would be brought in by barge, while materials and equipment for abutment construction would be brought in by truck. The number of construction workers is estimated at 100.

LWI ALTERNATIVE 3: PSB MODIFICATIONS (PREFERRED)

LWI Alternative 3 is the Preferred Alternative. Under this alternative, the construction and operation of the LWI structures would consist of modifying the existing PSB system to extend across the intertidal zone to attach to concrete abutments at the shoreline that would be the same as the abutments described above for the Pile-Supported Pier Alternative (Figure 2–5). In addition, three observation posts would be installed: one at the north LWI, one at the south LWI, and one on Marginal Wharf. There would be no underwater mesh, which requires a rigid, fixed structure for attachment. As a security requirement, Alternative 3 would use a greater number of security personnel than Alternative 2. However, the frequency of security vessel operations would not increase.

For the north LWI, approximately 1,200 feet (370 meters) of the existing PSB system would be relocated and 100 feet (30 meters) of new PSB would be added (Figure 2–6). Four existing buoys and associated anchors would be relocated. The mooring system for two of the four relocated buoys would be reduced from three anchor legs to two anchor legs, each with one 2-ton (1.8-metric ton) clump anchor (3 by 3 feet [1 by 1 meter]) and one 10-ton (9-metric ton) anchor (11 feet long, 5.5 feet wide, 5 feet high [3.5 by 1.8 by 1.6 meters]). For the south LWI, approximately 1,200 feet of the existing PSB system would be relocated and 200 feet (60 meters) of new PSB would be added (Figure 2–7). Three existing buoys and associated anchors would be relocated. One of these would have its anchor legs reduced from three to two, each with one clump anchor and one 10-ton anchor. One new buoy would be installed with two mooring legs (each with one clump anchor and one 10-ton anchor).

Each PSB unit would be 50 feet (15 meters) long and would support an 8-foot high fence on a metal frame (Figure 2–8). Each unit would be supported on three pontoons: a center pontoon 18 feet (5 meters) long, and two end pontoons each 6 feet (2 meters) long. The pontoons would be 42 inches (107 centimeters) in diameter. A metal grating (guard panel) 42 inches high would be suspended below the metal frame, between the pontoons. Because the height of this guard panel would be the same as the diameter of the pontoons, it would extend into the water the same distance as the pontoons (less than 1 foot [30 centimeters]). Openings in the barrier system to allow vessel passage would be created by disconnecting adjacent PSB units at strategic locations and towing the barrier out of the way.

PSBs at Low Tide

On an average low tide, approximately 11 PSB units including 33 pontoons (north and south LWI combined) would “ground out” in the intertidal zone. Over the long term, which would include extreme low tides, approximately 18 PSB units including 54 pontoons would ground out in the intertidal zone. Five of these PSB units would ground out at the north LWI and 13 would ground out at the south LWI. To minimize the resulting disturbance of the intertidal zone, each center pontoon would be fitted with three “feet” and the outer pontoons would be fitted with two feet that would prevent an entire pontoon from contacting the sediment surface (Figure 2–8).

These feet would be 12 by 24 inches (30 by 60 centimeters) in size and constructed of high-density polyethylene, a durable, inert plastic often used for water mains and sewer systems. Considering a total of 126 such feet (18 intertidal PSBs with 7 feet each), and that these feet would not always ground out at the same location, it is estimated that approximately 2,520 square feet (234 square meters) of the intertidal zone would be disturbed over the long term (700 square feet [65 square meters] at the north LWI, and 1,820 square feet [169 square meters] at the south LWI). In addition, one buoy at the south LWI would ground out on an average low tide. Over the long term, including extreme low tides, three buoys (one at the north LWI and two at the south LWI) would ground out at low tide. These buoys are 30 inches (76 centimeters) in diameter. Over the long term, grounding out by these buoys would disturb approximately 74 square feet (7 square meters) of seafloor.

Shoreline and Upland Construction

The abutments would be the same as described above under Alternative 2. In addition, an observation post would be installed at each LWI location. These posts would be approximately 25 by 45 feet (8 by 14 meters) and would include a separate stairway to the base of the bluff. Each post would require 12 30-inch (76-centimeter) piles that would be driven from land at low tide in the dry using vibratory methods and impact methods as needed. The observation post stairways would be supported on 2 by 2 foot (0.6 by 0.6 meter) concrete pads. Each observation post would require a temporary construction trestle having dimensions of 20 by 50 feet (6 by 15 meters), along with 10 24-inch (60-centimeter) diameter steel pipe piles supporting the temporary trestle at each LWI location. Driving of all piles for LWI Alternative 3 would require a maximum of 30 days of pile driving.

A third observation post 600 square feet (56 square meters) in area would be installed on the deck of Marginal Wharf, at the seaward apex of the wharf (Figure 2-1) and would include removal of an existing observation post. This new observation post would be similar in configuration but smaller than the two shoreline observation posts (Figure 2-5). The post would be constructed of reinforced concrete. There would be no in-water construction, no part of this observation post would extend into the water, and no new over-water area would be created. Lighting would be similar to the existing post. Communication cables would be installed from an existing hub under an existing roadway to access the wharf, using standard construction methods that would include patching of the roadway after construction. The existing observation post is a small pre-engineered steel building that would be removed intact using a crane and truck. The roof has asbestos-containing material and would be handled and disposed of appropriately. The rest of the building would be sent to a metal recycler. Removal of the existing observation post and construction and operation of the replacement observation post would not affect vessel operations at the wharf. There would be no increase in airborne noise over existing conditions on this industrial wharf.

For Alternative 3, two 30-foot (9-meter) tall, on-land towers would be installed by bolting them to concrete foundations, one at the north LWI and one at the south LWI. These towers would be located within the extension of the WSE; no additional ground would be disturbed for the towers.

Construction Schedule

The overall construction schedule for LWI Alternative 3 would be the same as described above for Alternative 2, except only one in-water work season would be needed.

LWI OPERATIONS

Operation of the LWI would consist primarily of maintenance of the in-water and upland structures, including routine inspections, cleaning, repair, and replacement of facility components (no pile replacement) as required. Operation would also include opening and closing of the PSBs for boat traffic, using small tug boats. The presence of the LWI would result in changes in patterns of security vessel movements, but such movements would be within the WRA and would not increase in frequency. For both alternatives, cleaning and replacement of the PSB guard panels (unbolted and re-bolted out of the water) would occur as needed. Cleaning would be accomplished by power washing. Measures would be employed to prevent discharges of contaminants to the environment (see BMPs, Section 2.3.2). Maintenance would require infrequent visits by vehicles to the upland portions and by small boats to the LWI structures (tying up to the floating docks). Operational lighting at the abutments for both alternatives would not exceed one foot candle to a distance of 50 feet (15 meters) from the abutments; these lights would operate continuously. For Alternative 2, operational lighting levels would not exceed 10 foot candles along the immediate pier structure, 0.5 foot candle out to a distance of 50 feet (15 meters) from the LWI structure, and 0.05 foot candle to a distance of 100 feet (30 meters). These lights would operate only during security responses. For Alternative 3, there would be no lighting on the PSB units, only on the abutment towers.

Comparison of LWI Alternatives

Table 2–1 summarizes the physical features of LWI Alternatives 2 and 3. Table 3.17–1 summarizes the environmental impacts of the LWI alternatives. Under Alternative 1, the No Action Alternative, there would be no change to the environment due to construction and operation of an LWI. Therefore, the No Action Alternative is not discussed in this section.

Alternative 3 is the preferred Alternative, in part because it would have fewer environmental impacts than Alternative 2 and, therefore, it is also the environmentally preferred alternative and the Least Environmentally Damaging Alternative according to the Clean Water Act (CWA) Section 404(b)(1) guidelines. The principal reasons for Alternative 2's greater impacts are that it would have a larger number of piles (and thus greater noise impacts), in-water pile driving, greater habitat impacts, and greater potential to affect migration of juvenile salmonids than Alternative 3. Unlike Alternative 2, Alternative 3 would have two observations posts supported by piles in the upper intertidal zone and a third on Marginal Wharf. The upland impacts of the two alternatives would be the same. Alternative 2 would have greater adverse impacts on traffic and greater positive impacts on socioeconomics.

Construction of LWI Alternative 2 would include driving 120 in-water support piles for the permanent piers, 16 permanent piles for the dolphins (8 at each), and 120 in-water piles for the temporary construction trestle, which would generate underwater and airborne noise levels for up to 80 days. In comparison, construction of Alternative 3 would require no in-water pile driving, thus avoiding resulting underwater noise impacts to marine biota. For both alternatives,

however, marine mammals (pinnipeds), marbled murrelets, and upland wildlife could be exposed to airborne noise from driving of the abutment piles. In addition to pile driving noise, construction impacts on the marine environment would include minor turbidity from pile driving (LWI Alternative 2 only), PSB mooring anchor removal and placement (both alternatives), and boat movement (both alternatives). For Alternative 2, pile driving noise could result in behavioral disturbance or injury of ESA-listed salmonids (Hood Canal summer-run chum salmon, Puget Sound Chinook salmon, Puget Sound steelhead, and bull trout) or marbled murrelets occurring in the immediate project area, as well as behavioral disturbance of marine mammals. ESA-listed rockfish (bocaccio, yellow-eye rockfish, and canary rockfish) are not expected in the project area. Marine mammals potentially affected by behavioral harassment (Alternative 2 only) would include the following non-ESA-listed species: Steller sea lion, harbor seal, California sea lion, harbor porpoise, and transient killer whales. The ESA-listed humpback whale is not expected to be exposed to behavioral harassment due to the rare occurrence of this species in the project area. The ESA-listed Southern Resident killer whale is not present in the project area. Limiting pile driving and abutment work below MHHW to the first in-water work season of August 1, 2016 through January 15, 2017 would minimize potential impacts on ESA-listed salmonids. Pile driving noise for Alternative 3 (airborne noise only) is not expected to result in behavioral disturbance of pinnipeds or marbled murrelets, and would have no measurable impacts on ESA-listed fish.

Construction of the shoreline abutments would be the same for both alternatives and would require temporary excavation of an area of approximately 15,600 square feet (1,449 square meters) below MHHW. The abutment stair landings and observation post piles for Alternative 3 would lie below MHHW, with a total area of approximately 142 square feet (13.2 square meters). Alternative 2 would not have observation posts, so the area below MHHW would be 24 square feet (2.2 square meters). For both LWI Alternatives, 650 feet (198 meters) of temporary coffer dam would be installed to provide for excavation of the abutment wall and stair landings. Once the abutment foundations were built, the excavated area below MHHW would be backfilled and a 2-foot (0.6-meter) high by approximately 10-foot (3-meter) wide riprap berm (303 cubic yards [232 cubic meters]) would be placed above the natural beach contour. Placement of the steel plate anchors and piles for LWI Alternative 2 would result in permanent loss of 1,040 square feet (97 square meters) of eelgrass habitat. Placement of PSB buoy mooring anchors and PSB grounding under LWI Alternative 3 would result in permanent loss of 580 square feet (54 square meters) of eelgrass habitat. Under Alternative 3, the observation posts would shade benthic habitat (total of 2,000 square feet [186 square meters]), but not marine vegetation or oyster beds. Similarly, the dolphin platforms (Alternative 2 only) would shade benthic habitat (128 square feet [12 square meters]) but not marine vegetation or oysters. The presence of the pier and in-water mesh under Alternative 2 could represent at least a partial barrier to the migration of ESA-listed salmonids along the Bangor waterfront. In contrast, Alternative 3 would have less of a barrier effect on ESA-listed salmonids because it would lack the pier and in-water mesh. The guard panels between PSB pontoons would have negligible impacts on migration of ESA-listed salmonids.

Practices and measures to minimize impacts to ESA-listed species would be implemented as described in the Mitigation Action Plan (Appendix C). Construction and operation of LWI Alternatives 2 and 3 may affect, but is not likely to adversely affect, ESA-listed salmonids, rockfish, marbled murrelets and Southern Resident killer whales. The Navy conducted Section 7

consultation to address potential impacts on federally listed species and designated critical habitat. The National Marine Fisheries Service (NMFS) provided its concurrence with the Navy's ***not likely to adversely affect*** determinations under informal consultation on November 13, 2013. NMFS also concurred with the Navy's ***may adversely affect*** determination for Essential Fish Habitat (EFH) for under the Magnuson-Stevens Fishery Conservation and Management Act (MSA). NMFS determined that no conservation recommendations were required because implementation of the Navy's best management practices will be sufficient to avoid, mitigate, or offset the impacts of the Proposed Action on intertidal EFH. The Navy also conducted Section 7 consultation with the USFWS. In a concurrence letter dated March 4, 2016, USFWS stated that LWI project impacts to bull trout are not measurable and therefore insignificant, and impacts to marbled murrelets are discountable. The preferred alternative would not result in harassment of marine mammal as defined by the MMPA, so MMPA consultation is not required.

For Alternative 2, periodic cleaning of the mesh by power washing would result in minor water quality impacts, which would be minimized by employing appropriate BMPs. Likewise for both alternatives, periodic cleaning of the PSB guard panels would result in minor water quality impacts, which would be minimized by employing appropriate BMPs. Pursuant to the CWA, the Navy submitted a Joint Aquatic Resources Permit Application (JARPA) for permits from USACE for fill associated with the abutment stair landings, and for a Section 401 water quality certification from WDOE. In accordance with the Coastal Zone Management Act (CZMA), the Navy submitted a Coastal Consistency Determination (CCD) to WDOE.

Impacts of both alternatives on the upland environment would be similar and include approximately 1.1 acre (0.44 hectare) of vegetation clearing, construction traffic, air pollutant emissions, and pile driving and conventional construction noise. With the exception of 0.12 acre (0.048 hectare) of new impervious surface and 0.1 acre (0.039 hectare) of permanent pervious surfaces such as aggregate pathways, the disturbed area would be revegetated with native species. There would be no impacts on wetlands. Wildlife could be disturbed by construction noise and lighting, but no terrestrial animals or plants protected under the ESA would be affected. Potential impacts to bald eagles may occur as a result of elevated noise levels or visual disturbance during construction, but no incidental takes are anticipated.

Nearby residential areas and recreational users of the waters off NAVBASE Kitsap Bangor may experience elevated noise levels during construction, but no other impacts on land use or recreation are anticipated. Both alternatives would have minimal impacts on aesthetics; impacts would be greater for Alternative 2 than for Alternative 3, because of the larger structure and larger number of piles for Alternative 2. Both alternatives would be consistent with the NAVBASE Kitsap Bangor TRIDENT Support Site Master Plan. Temporary socioeconomic impacts of construction would be positive: for every $100 million spent by the Navy in construction expenditures, an estimated 919 direct jobs would be created, as well as an estimated 426 indirect and induced jobs. Indirect or induced jobs would be concentrated in the following industries: food services and drinking places, real estate establishment, health care, architecture and engineering, wholesale trade, and retail stores. For Alternative 2, the construction cost is estimated to be approximately $54 million, representing the total economic impact of 500 direct jobs and 233 indirect and induced jobs. Total economic output to the region would be in excess of $80 million. For Alternative 3, the construction cost is estimated to be approximately $33 million,

representing the total economic impact of 300 direct jobs and 139 indirect and induced jobs. Total economic output to the region would be in excess of $48 million. Long-term socioeconomic impacts would be minimal. Neither alternative would have disproportionately high and adverse human health or environmental effects on minority populations or low-income populations because the affected areas do not disproportionately contain minority or low-income populations. In addition, because the project is located within a military restricted area, there would be no potential for children to be exposed to pollutants, other hazardous materials, or safety hazards as a result of construction and operation of either LWI alternative.

The cultural setting of Delta Pier and the existing Explosives Handling Wharf (EHW-1), which are eligible to be listed in the National Register of Historic Places (NRHP), would not be adversely affected. In July 2015 the State Historic Preservation Officer (SHPO) concurred with the Navy's determination of no adverse effect of the LWI project on historic properties under the NHPA. There would be a small potential for disturbance of archaeological resources (prehistoric sites) during construction. However, if any such resources were encountered, the Navy would coordinate with the SHPO and tribes. Access to tribal shellfish harvesting areas would be restricted in the construction area only during construction of the LWI. During operations access would not be restricted but the new structures would result in permanent loss of 1,880 square feet (175 square meters) of the shellfish harvesting areas under Alternatives 2 and 3 (Table 3.17–1). Neither alternative would have population-level effects on salmon stocks harvested by the tribes. Construction vessels could interfere with tribal fishing vessels operating in Hood Canal. In accordance with DoD policy and Navy instructions, the Navy invited government-to-government consultation regarding the Proposed Actions with the five federally recognized American Indian tribes that have treaty reserved rights and traditional resources in the project area: the Skokomish Indian Tribe, Port Gamble S'Klallam Tribe, Jamestown S'Klallam Tribe, Lower Elwha Klallam Tribe, and Suquamish Tribe.

Construction would generate truck traffic, but this traffic would be within the capacity of the base road system. However, construction traffic for both alternatives would exacerbate existing peak-hour delays at both gates to NAVBASE Kitsap Bangor and roads immediately outside the gates. Alternative 2 would have a greater impact than Alternative 3 on traffic crossing the Hood Canal Bridge because of the larger number of construction barges. Impacts on air quality would not be significant for either alternative because emissions would be well below regulatory thresholds. Air quality in the vicinity of the LWI and SPE project sites, the upland project area, and the greater area of NAVBASE Kitsap Bangor, all of which are located in Kitsap County, is generally rated as good, which is the highest air quality rating. Kitsap County is presently in attainment for all National Ambient Air Quality Standards (NAAQS) for criteria pollutants.

SPE Alternatives

SPE Alternatives Development and Screening Criteria

The screening criteria listed below were used in the identification and evaluation of SPE action alternatives:

- Supports master planning considerations and does not impact other operational missions on NAVBASE Kitsap,

- Avoids or minimizes impacts on tribal usual and accustomed harvest areas,
- Integrates pier and support facilities into existing facilities and infrastructure to the extent practicable, and
- Provides unrestricted access to the ocean.

SPE ALTERNATIVE 1: NO ACTION

Under SPE Alternative 1, the No Action Alternative, no Service Pier extension or associated support facilities would be built at NAVBASE Kitsap Bangor. This alternative would not meet the purpose and need for the Proposed Action. It would not provide alternative opportunities for berthing to mitigate restrictions at NAVBASE Kitsap Bremerton on navigating SEAWOLF Class submarines through Rich Passage under certain tidal conditions, or improve long-term operational effectiveness for the three SEAWOLF Class submarines on NAVBASE Kitsap. The No Action Alternative would not provide berthing and logistical support for SEAWOLF, LOS ANGELES, and VIRGINIA submarine classes at the Navy's SSN research, development, test, and evaluation hub, nor improve submarine crew training and readiness through co-location of command functions on the NAVBASE Kitsap Bangor submarine training center. No environmental impacts would result from the No Action Alternative, as no construction or physical alteration to the waterfront would occur, and there would be no changes in operations. The No Action Alternative is carried forward for analysis because it is required by NEPA and constitutes baseline conditions for environmental analysis of the Proposed Action.

SPE ALTERNATIVE 2: SHORT PIER (PREFERRED)

SPE Alternative 2 is the Preferred Alternative. Under this alternative, the Navy would construct and operate an approximately 540-foot (165-meter) long and 68 feet (21 meters) wide, 44,000-square foot (4,090-square meter) surface area extension to the existing Service Pier (Table 2–2) that would be capable of a double-breasted (side-by-side) berthing configuration for submarine maintenance. The new total length of the Service Pier would be 1,040 feet (317 meters). Proposed new facilities would include a pier crane on a 28- by 60-foot (9- by 18-meter) foundation, 2,100-square foot (195-square meter) Pier Services and Compressor Building located on the Service Pier, an upland 50,000-square foot (4,645-square meter) Waterfront Ship Support Building, an approximately 420-car parking lot, and roadway and utility improvements (transmission line upgrades and a new substation) (Figure 2–9). The Waterfront Ship Support Building would be designed and constructed to receive a minimum Leadership in Energy and Environmental Design (LEED) certification of Silver. LEED is a third-party certification program and nationally accepted benchmark for the design, construction, and operation of high-performance green buildings developed by the U.S. Green Building Council. BMPs and impact reduction measures that would be implemented to avoid or minimize potential environmental impacts associated with the SPE Proposed Action are discussed in Section 2.3.

The proposed Pier Services and Compressor Building would house the compressor and would be located at the south end of the existing Service Pier (Figure 2–9). The Pier Services and Compressor Building is needed to house sewage lift stations, and "high pressure" and "low pressure" compressors that would provide an off-hull source of air for charging submarine air banks, as well as breathing quality air needed for purging the ship's ballast tanks to allow entry

for maintenance. The compressors need to be located as near to the ship as possible to minimize the accumulation of moisture in the air lines.

Pile Installation and Wave Screen

The existing Service Pier is approximately 500 feet long by 85 feet wide (152 by 26 meters). The proposed extension of the Service Pier would be approximately 540 by 68 feet (165 by 21 meters) and would require installation of approximately 230 36-inch (92-centimeter) diameter steel pipe support piles. After construction of the SPE, the pier would be 1,040 feet (317 meters) long. SSNs would rest against mooring camels which would have 50 24-inch (60-centimeter) diameter steel pipe support piles. Approximately 105 18-inch (45-centimeter) square concrete fender piles would also be installed. Driving of the steel support piles would use a combination of vibratory (primary) and impact methods and would require pile driving on no more than 125 days during the first in-water work season. Driving of the concrete piles would use impact methods only and would require pile driving on no more than 36 days during the second in-water work season. The pier extension would extend to the southwest from the south end of the existing Service Pier and would parallel Carlson Spit in water depths of 30 to 50 feet (9 to 15 meters) below MLLW, such that the berthing areas for the new submarines would be in water depths of approximately 50 to 85 feet (15 to 26 meters) below MLLW. A concrete float 150 feet (46 meters) long and 15 feet (4.6 meters) wide would be attached to the south side of the SPE (Figure 2–10). The existing PSB system would be re-configured to attach to the end of the new pier extension, with approximately 540 feet of existing PSB removed. Removal and disposal of existing PSBs would be as described for the LWI project. Construction is expected to require one barge with a crane, one supply barge, a tugboat, and work skiffs.

Construction would be preceded by removal of an existing wave screen (including piles) and other existing piles from the Service Pier. A total of 36 existing creosote wood piles (19 18-inch [45-centimeter] and 17 15-inch [38-centimeter] piles) would be removed by using a clam shell or similar methods and would be cut at the mudline if splitting or breakage occurs. A floating boom and other measures would be used to protect water quality during this activity (Section 2.3.2). In addition, a new wave screen would be installed under the SPE (Figure 2–10). This screen would be approximately 200 feet (60 meters) long and 27 feet (8 meters) high (20 feet [6 meters] below to 7 feet [2 meters] above MLLW), made of concrete or steel, and attached to the steel support piles for the SPE.

Upland Construction

The proposed Waterfront Ship Support Building would be located on an existing 36,000-square foot (330-square meter) parking lot on the east side of Wahoo Road which has 107 parking spaces. Based on the loss of this lot and related relocation of existing personnel at NAVBASE Kitsap Bangor, a new parking lot of approximately 420 spaces would be needed. This parking lot would be located approximately 1,200 feet (370 meters) south of the proposed Waterfront Ship Support Building within a vegetated area. Road improvements to accommodate changes in traffic patterns along Wahoo and Sealion Roads, repairs to existing roads damaged from construction activity, and electrical utility upgrades would also be included under this alternative. The area permanently occupied by new project elements would be approximately 7 acres (2.8 hectares). Approximately 4 acres (1.6 hectares) would be disturbed temporarily for a

construction laydown area and other construction-related disturbance and revegetated with native species following construction. The parking lot, utilities, and laydown area would be located within the area between Sturgeon Street and Sealion Road, as shown on Figure 2–9.

Construction Schedule

The SPE project is currently unprogrammed and a construction schedule has not been determined. Upland construction would take approximately 400 days; equipment would include backhoes, bulldozers, loaders, graders, trucks, and paving equipment. Construction of all proposed facilities is anticipated to take approximately 24 months. Pile driving would occur within the in-water work windows (July 15 to January 15) to minimize potential impacts on ESA-listed fish species. It is not expected that completion of pile driving would require two full 6-month in-water work seasons. Relocation of existing PSB units and anchors could occur outside the in-water work window. There would be no work in the intertidal zone. The number of construction workers is estimated at 225.

SPE ALTERNATIVE 3: LONG PIER

Under this alternative the pier extension would be approximately 975 feet (297 meters) long and 68 feet (21 meters) wide, and would have a surface area of approximately 70,000 square feet (6,500 square meters) (Figure 2–11). The new total length of the Service Pier would be approximately 1,475 feet (450 meters). This design would allow two submarines to be berthed in an in-line configuration rather than breasted (side-by-side). Table 2–2 summarizes the physical features of SPE Alternative 3. The total number of 24-inch (60-centimeter) diameter steel support piles would be approximately 500, including those for small craft and camel mooring; there would be approximately 160 18-inch (45-centimeter) square concrete fender piles. Driving of steel piles would require driving on no more than 155 days and would take place during the first in-water construction season. Driving of concrete piles would require driving on no more than an additional 50 days and would take place during the second in-water work season. The PSB relocation would differ from the relocation under SPE Alternative 2 so as to connect the PSBs to the end of the longer pier extension (approximately 975 feet of existing PSBs would be removed). All other aspects of SPE Alternative 3 would be the same as SPE Alternative 2, including upland features and overall construction schedule. It is expected that completion of in-water work would require two full in-water work seasons. Alternative 3 would meet the purpose and need and screening criteria, but would have greater environmental impacts (Table 2–2) and cost more than Alternative 2.

SPE OPERATIONS

Operation of the SPE would be similar to existing day-to-day operations that currently occur at NAVBASE Kitsap Bangor. With the use of two additional submarine moorage spaces for varying periods, the average daily number of employees on site at the Service Pier is estimated to increase from 390 to 712 (an increase of 322). There would be a corresponding increase in equipment operations, maintenance activities, transfer of materials on and off the submarines, and vehicular traffic. Facilities such as transit, food service, maintenance, housing, and training are already in place to accommodate two additional submarines and associated personnel at NAVBASE Kitsap Bangor. The proposed changes would allow maintenance activities to be performed on three submarines simultaneously. All waste discharges from the submarines

would be pumped ashore to the appropriate base waste treatment systems. Drainage water from the SPE would be collected in a trench drain on the pier, treated using an in-line canister system designed to meet the basic treatment requirements of the WDOE *Stormwater Management Manual for Western Washington*, and then discharged to Hood Canal in accordance with a National Pollutant Discharge Elimination System permit.

The average number of one-way Hood Canal transits of submarines to or from the Service Pier would increase from approximately 0.5 per month currently to about 2 per month. These submarines would not be escorted to and from NAVBASE Kitsap Bangor as are the TRIDENT Class submarines, but there would be an increase in small support vessel traffic at the Service Pier.

Operational lighting levels would not exceed 10 foot candles on the pier deck, 0.5 foot candle from the pier deck to a distance of 50 feet (15 meters) from the deck, and 0.05 foot candle to a distance of 100 feet (30 meters).

Comparison of SPE Alternatives

Table 2–2 summarizes the physical features of SPE Alternatives 2 and 3. Table 3.17–3 summarizes the environmental impacts of the SPE alternatives. Under Alternative 1, the No Action Alternative, there would be no change to the environment because extension of the Service Pier and construction and operation of the associated support facilities would not occur. Therefore, the No Action Alternative is not discussed in this section.

SPE Alternative 2 is the Preferred Alternative in part because it would have fewer environmental impacts than Alternative 3 and, therefore, it is also the Environmentally Preferred Alternative and the Least Environmentally Damaging Alternative according to CWA Section 404(b)(1) guidelines. The longer pier under Alternative 3 would result in more pile driving (and associated noise) and habitat impacts. Both alternatives would have minimal effects on juvenile salmon migration and tribal fisheries resources, and no effect on tribal shellfish beds. Upland impacts for both alternatives would be the same. Alternative 3 would have greater impacts on traffic on the Hood Canal Bridge and socioeconomics (positive) because of the larger construction project that would be required for the longer pier extension.

The principal difference between SPE Alternatives 2 and 3 is the length of the pier extension: 540 feet (165 meters) under Alternative 2 and 975 feet (297 meters) under Alternative 3. The width of both alternative pier extensions would be 68 feet (21 meters). SPE Alternative 2 would include driving of fewer piles (total of 385) than Alternative 3 (total of 660) and would generate pile driving noise over a shorter period. Alternative 2 would require up to 125 days of steel pile driving during the first in-water work window, and 36 days of concrete fender pile driving during the second, compared to Alternative 3's maximum of 155 days of steel pile driving during the first in-water work window, and 50 days of concrete pile driving during the second.

Pile driving noise could potentially result in behavioral disturbance or injury of ESA-listed salmon (Hood Canal summer-run chum salmon, Puget Sound Chinook salmon, Puget Sound steelhead, and bull trout) and marbled murrelets occurring in the immediate vicinity of the project. ESA-listed rockfish (bocaccio, yellow-eye rockfish, and canary rockfish) are not

expected in the project area. Behavioral disturbance of marine mammals is also possible. Marine mammals potentially affected by behavioral harassment would include the Steller sea lion, harbor seal, California sea lion, harbor porpoise, and transient killer whales. These effects would occur over a shorter period for SPE Alternative 2 than for Alternative 3. The ESA-listed humpback whale is not expected to be exposed to behavioral harassment due to its rare occurrence in the project area. The ESA-listed Southern Resident killer whale is not present in the project area. Limiting pile driving to the established in-water work season (July 15 to January 15) would minimize potential for impacts on ESA-listed fish.

The new overwater coverage created would be less under SPE Alternative 2 (44,000 square feet [4,090 square meters]) than Alternative 3 (70,000 square feet [6,500 square meters]), resulting in less shading of the benthic community. Under both alternatives, new pier structures would lie in water depths greater than 30 feet (9 meters), resulting in no shading of eelgrass or macroalgae habitat and minimal effects on salmon migration.

Practices and measures to minimize impacts to ESA-listed species would be implemented as described in the Mitigation Action Plan (Appendix C). Construction and operation of SPE Alternatives 2 and 3 may affect, but is not likely to adversely affect, ESA-listed salmonids and rockfish, marbled murrelets, and Southern Resident killer whales. The Navy is in ESA Section 7 consultation with the NMFS West Coast Region office and concluded consultation with USFWS Washington Fish and Wildlife Office. In a concurrence letter dated March 4, 2016, USFWS stated that the SPE project impacts to bull trout are not measurable and therefore insignificant, and impacts to marbled murrelets are discountable. Consultations are also ongoing with the NMFS West Coast Region office under the MSA and with the NMFSHQ Office for MMPA compliance. The Navy has submitted an Incidental Harassment Authorization (IHA) application for the first year of construction and will prepare and submit an additional MMPA authorization application for the second year of construction.

Upland features of SPE Alternatives 2 and 3 would be the same, resulting in the same impacts. Construction of new project elements would result in permanent loss of 7 acres (2.8 hectares) of forest vegetation and wildlife habitat (Figures 2–9 and 3.5–3). An additional 4 acres (1.6 hectares) of vegetation would be disturbed temporarily during construction, but revegetated with native species following construction. There would be no impacts on wetlands. Wildlife would be disturbed by pile driving noise for a shorter period under Alternative 2 than under Alternative 3. Four trees potentially suitable for nesting by marbled murrelets may be removed under both alternatives. No other terrestrial animals or plants protected under the ESA would be affected. Wildlife could be disturbed by construction noise and lighting, but no terrestrial animals or plants protected under the ESA would be affected. Potential impacts to foraging bald eagles may occur as a result of elevated noise levels or visual disturbance during construction, but no incidental takes are anticipated.

When the SPE project is programmed and scheduled, the Navy will submit a CCD to WDOE and an application for permits under the CWA and Rivers and Harbors Act for the SPE project to USACE and WDOE.

Nearby residential areas and recreational users of the waters off NAVBASE Kitsap Bangor may experience elevated noise levels during construction, but no other impacts on land use or

recreation are anticipated. SPE Alternative 2 would result in a shorter duration of construction, and would have somewhat less potential lighting impacts on residential areas, than SPE Alternative 3. Aesthetic impacts would be slightly greater under SPE Alternative 3, but minimal under both alternatives. Both alternatives would be consistent with the NAVBASE Kitsap Bangor TRIDENT Support Site Master Plan. Temporary socioeconomic impacts would be positive and greater for SPE Alternative 3. The construction cost for SPE Alternative 2 is estimated to be approximately $89 million, representing the total economic impact of 818 direct jobs and 380 indirect and induced jobs. Total economic output to the region would be in excess of $131 million. The construction cost for SPE Alternative 3 is estimated to be approximately $116 million, representing the total economic impact of 1,066 direct jobs and 494 indirect and induced jobs. Total economic output to the region would be in excess of $170 million. Neither alternative would have disproportionate adverse effects on minority or disadvantaged populations.

In October 2015, the SHPO concurred with the Navy's determination of no adverse effect of the SPE project on historic properties under the NHPA. There would be a small potential for disturbance of archaeological resources (prehistoric sites) during construction; if any such resources were encountered, the Navy would coordinate with the SHPO and tribes. Activities of construction vessels and submarine transits could temporarily interfere with operation of tribal fishing vessels in Hood Canal. Neither alternative would affect tribal fishing access, nor have a population-level effect on salmon stocks harvested by the tribes. In accordance with DoD policy and Navy instructions, the Navy invited government-to-government consultation regarding the Proposed Actions with the five federally recognized American Indian tribes that have treaty reserved rights and traditional resources in the project area: the Skokomish Indian Tribe, Port Gamble S'Klallam Tribe, Jamestown S'Klallam Tribe, Lower Elwha Klallam Tribe, and Suquamish Tribe.

Construction traffic would exacerbate existing peak-hour delays at both gates to NAVBASE Kitsap Bangor and on roads immediately outside the gates. Construction traffic impacts would persist longer for Alternative 3 than Alternative 2. On-base construction traffic impacts would be minimal. During construction, both alternatives would increase the frequency of openings of the Hood Canal Bridge, an adverse impact on travelers on SR-104; this impact would last longer for Alternative 3 than for Alternative 2. Over the long term, there would be an estimated two additional openings of the Hood Canal Bridge per month under either action alternative. Impacts on air quality would be minimal because emissions would be well below regulatory thresholds. Air quality in the vicinity of the LWI and SPE project sites, the upland project area, and the greater area of NAVBASE Kitsap Bangor, all of which are located in Kitsap County, is generally rated as good, which is the highest air quality rating. Kitsap County is presently in attainment for all NAAQS for criteria pollutants.

After the SPE and associated support facilities become operational, the average number of one-way Hood Canal surface transits of submarines to or from the Service Pier would increase from approximately 0.5 per month currently to about 2 per month. This long-term increase in submarine traffic would present a greater-than-present probability of interaction with tribal or recreational use of Hood Canal. Although the frequency of submarine passages would remain low, there would be an increased potential for interference with fishing gear and wake-related disturbances to small recreational watercraft.

COMBINED IMPACTS OF LWI AND SPE

Although the LWI and SPE projects are independent, if both were implemented it is important to understand their combined impacts on environmental resources (the cumulative impacts of the Proposed Actions in conjunction with other past, present, and reasonably foreseeable actions are discussed in the next section). Under the current schedules, construction of the two projects would not overlap. This would extend the projects' impacts over a longer period than the 2-year period for each project alone. Migratory species would experience construction impacts on water quality in two locations rather than just one. Limiting in-water construction to the in-water work windows would minimize the impacts of these construction impacts on juvenile salmon species protected under the ESA. Construction of the two projects would result in combined economic benefits. Combined construction traffic from the two projects would be within the capacity of the base road system. Combined construction vessel traffic would result in delays of traffic on SR-104 over a longer period than for each project alone, due to openings of the Hood Canal Bridge. In the long term, operations of the two projects would have combined impacts on marine habitats and species, including migrating juvenile salmon. Regarding the combined impacts on terrestrial habitat, most of the impacts would come from the SPE project.

CUMULATIVE IMPACTS

Past, present, and reasonably foreseeable future actions have had and will have adverse impacts on marine habitats and species in Hood Canal. Construction and operation of the LWI and SPE would contribute to regional cumulative impacts in conjunction with past, present, and future actions on marine resources such as shallow-water habitat, including loss of eelgrass, macroalgae, and habitat for juvenile salmon and other fish and invertebrate species. However, through the implementation of proposed compensatory aquatic mitigation actions in the Mitigation Action Plan (Appendix C), the project's contribution to cumulative impacts in conjunction with past, present, and future actions would not be significant.

The other construction impacts of the Proposed Actions, such as air and water quality effects, would be minor and highly localized and, thus, would not contribute significantly to cumulative impacts in conjunction with past, present, and future actions in the region.

Impacts on upland habitats and species from LWI and SPE would be moderate, and all but 7.2 acres (2.9 hectares) would be revegetated; approximately 4.9 acres (2 hectares) would be revegetated. The 7.2 acres would contribute to cumulative impacts to upland habitats in the region. During construction, marine vessel traffic from LWI and SPE would increase the frequency of openings of the Hood Canal Bridge by roughly half, resulting in an adverse impact on travelers on SR-104. The construction and operational impacts of the Proposed Actions on other resources would be minimal and have little potential to contribute to cumulative impacts in conjunction with past, present, and future actions in the region. The multiple projects would have cumulative economic benefits.

It is also possible that construction of the LWI and/or SPE would overlap in time with construction of other waterfront structures on NAVBASE Kitsap Bangor. In this case, pile driving for the multiple projects could result in cumulative noise impacts, as discussed above for the LWI and SPE projects themselves. If more than one construction project occurred at the

same time, the predominant noise impact would be expansion of the geographic area affected by maximum sound levels. In limited areas where the noise spheres of influence would overlap, the total sound levels would increase by up to 3 dB. As a result, more individuals of marine species (fish, marine mammals, and marine birds) would be affected, but it is unlikely that population-level effects due to cumulative sound levels would be greater than those of the LWI and SPE projects alone. Noise impacts on nearby residential and recreational areas also would increase slightly due to the separated locations of the multiple construction projects. It is not expected that there would be major marine construction projects outside of NAVBASE Kitsap Bangor that would overlap with the other Navy projects and cause cumulative noise impacts. Concurrent construction of multiple projects would exacerbate traffic impacts on base roads and delays at the gates entering the base, with increased impacts to traffic on adjacent regional roadways.

BEST MANAGEMENT PRACTICES, CURRENT PRACTICES, MITIGATION MEASURES, AND REGULATORY COMPLIANCE

The following are the principal measures proposed for both projects to avoid, minimize, or compensate for the environmental impacts of the Proposed Actions:

Best Management Practices and Current Practices

- To reduce the likelihood of any petroleum products, chemicals, or other toxic or deleterious materials from entering the water, fuel hoses, oil or fuel transfer valves, and fittings will be checked regularly for drips or leaks and will be maintained and stored properly to prevent spills from construction and pile driving equipment into state waters.
- To limit soil erosion and potential pollutants contained in stormwater runoff, a Storm Water Pollution Prevention Plan will be prepared and implemented in conformance with the *Stormwater Management Manual for Western Washington* (WDOE 2014).
- Oil booms will be deployed around in-water construction sites as required by a CWA Section 401 Water Quality Certification for the projects, to minimize water quality impacts during construction.
- Debris will be prevented from entering the water during all demolition or new construction work. During in-water construction activities, floating booms will be deployed and maintained to collect and contain floatable materials that are accidentally released. Any accidental release of equipment or materials will be immediately retrieved and removed from the water. Following completion of in-water construction activities, an underwater survey will be conducted to remove any remaining construction materials that may have been missed previously. Retrieved debris will be disposed of at an appropriate commercial landfill.
- Removed creosote-treated wood piles and associated sediments (if any) will be contained on a barge or, if a barge is not utilized, stored in a containment area near the construction site. All creosote-treated material and associated sediments will be disposed of in a landfill that meets the liner and leachate standards of the Washington Administrative Code.
- Piles will be removed by using a clam shell or similar methods and will be cut at the mudline if splitting or breakage occurs.

- To minimize impacts on marine habitat, limitations will be placed on construction vessel operations, anchoring, and mooring line deployment. A mooring and anchoring plan will be developed and implemented to avoid dragging anchors and lines in special status areas. Spudding/anchoring in existing eelgrass habitat will be avoided whenever possible. Vessel operators will be provided with maps of the construction area with eelgrass beds clearly marked.
- Barges and other construction vessels will not be allowed to run aground. Additionally, vessel operators will be instructed to avoid excess engine thrust in water depths shallower than 30 feet (9 meters) to the extent possible.
- To minimize impacts on ESA-listed fish species, in-water construction will be conducted within the in-water work window (July 15 through January 15). The exception is that mesh installation (LWI Alternative 2), relocation of PSBs, and placement of anchors could occur outside the work window.
- For LWI Alternative 2, the in-water mesh will be cleaned regularly by power washing to minimize impacts on migrating fish. For both alternatives, the grates (guard panels) between the pontoons will be cleaned regularly.
- Applicable measures described above for Construction (Section 2.3.2.1) to protect water quality and habitats will be implemented during operational procedures.
- Low impact development and integrated management practices will be developed and implemented.

Mitigation Measures

- Pile driving of steel piles would be done using vibratory rather than impact methods whenever feasible, which would reduce noise levels by approximately 20 decibels root mean square (dB RMS) at 33 feet (10 meters) from the source.
- Bubble curtains would be used around steel piles being driven by impact methods to attenuate in-water sound pressure of the pile driving activity. The Navy would also consider other equally or more effective noise attenuation methods that may become available. Noise attenuation would not be used for driving concrete piles (SPE only), because of the much lower level of noise generated by driving of concrete piles compared to steel piles, and the resulting much lower potential for impacts to biota.
- During impact pile driving, a soft-start approach would be used to induce marine mammals to leave the immediate area. This soft-start approach requires contractors to initiate noise from hammers at reduced energy, followed by a waiting period. Due to mechanical limitations, soft starts for vibratory driving would be conducted only with drivers equipped with variable moment features. Typically, this feature is not available on larger, high-power drivers. The Navy would use the driver model most appropriate for the geologic conditions at the project location, and would perform soft starts if the hammer is equipped to conduct them safely.
- Construction activities would not be conducted during the hours of 10:00 p.m. and 7:00 a.m. Between July 15 and September 23, impact pile driving would only occur between 2 hours after sunrise and 2 hours before sunset to protect foraging marbled murrelets during the breeding season. Between September 24 and January 15, in-water construction activities

would occur during daylight hours (sunrise to sunset). The Navy would notify the public about upcoming construction activities and noise at the beginning of each construction season.

- Construction in the upper intertidal zone (LWI abutments and observation posts) would be conducted at low tide ("in the dry") to minimize impacts to marine water quality and underwater noise.
- To avoid impacts on marine mammals protected by ESA and MMPA and marine birds protected by ESA, monitoring of shut down and buffer zones around in-water pile driving locations would be implemented. Detailed marine mammal and marbled murrelet monitoring plans would be developed and implemented in consultation with NMFS and the USFWS.
- To protect potential breeding marbled murrelets, tree removal for the SPE project would not be conducted during the marbled murrelet breeding season of April 1 through September 23. Tree removal would be conducted in a manner that is protective of all migratory birds.
- A revegetation plan would be developed with the objective of restoring native vegetation to the areas temporarily cleared for the construction laydown area and construction of new roads. A monitoring and maintenance program (such as once a month) would be implemented until the native plants are sufficiently established to minimize invasion by noxious weeds.
- The Navy would develop a local Notice to Mariners to establish uniform procedures to facilitate the safe transit of vessels operating in the project vicinity. Barge trips and associated bridge openings would be scheduled to avoid peak commuting hours. The Notice to Mariners would also serve to notify divers, including tribal divers, of potential underwater noise impacts.
- The Navy would, as part of the Proposed Actions, undertake Compensatory Mitigation to offset unavoidable adverse impacts on aquatic resources under the provisions of the CWA Final Rule for Compensatory Mitigation for Losses of Aquatic Resources. The Navy would purchase habitat credits from the Hood Canal In-Lieu Fee Program, which would implement appropriate mitigation in the Hood Canal watershed.
- The Navy would undertake mitigation projects proposed to address potential effects of the Proposed Actions on reserved treaty rights and resources of the involved federally recognized American Indian tribes.

Regulatory Compliance

The Navy must comply with a variety of federal environmental laws, regulations, and Executive Orders (EOs). These include the following:

- Bald and Golden Eagle Protection Act
- Clean Air Act
- Clean Water Act
- Coastal Zone Management Act
- Endangered Species Act
- Magnuson-Stevens Fishery Conservation and Management Act

- Marine Mammal Protection Act
- Migratory Bird Treaty Act
- National Historic Preservation Act
- Rivers and Harbors Act
- Energy Independence and Security Act
- EO 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*
- EO 13045, *Protection of Children from Environmental Health Risks and Safety Risks*
- EO 13175, *Consultation and Coordination with Indian Tribal Governments*
- EO 13653, *Preparing the United States for the Impacts of Climate Change*
- EO 13693, *Planning for Federal Sustainability in the Next Decade*

Chapter 3 discusses the applicability of and compliance with these laws and regulations, as well as the laws and regulations of the state of Washington, that apply to the Proposed Actions. Regulatory compliance is summarized in Chapter 5.

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VOLUME 1: MAIN TEXT

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

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VOLUME 2: APPENDICES A–I

LIST OF APPENDICES

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LIST OF ACRONYMS AND ABBREVIATIONS

°C	degrees Celsius
°F	degrees Fahrenheit
µg/kg	micrograms per kilogram
µg/m^3	micrograms per cubic meter
AAQS	ambient air quality standards
ACHP	Advisory Council on Historic Preservation
AIRFA	American Indian Religious Freedom Act
APE	Area of Potential Effect
AQI	air quality index
BMP	best management practice
BOD	biochemical oxygen demand
CAA	Clean Air Act
CCD	Coastal Consistency Determination
CDP	Census Designated Place
CDF	cumulative distribution functions
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CH_4	methane
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent
COMNAVREGNWINST	Commander Navy Region Northwest Instruction
CP	current practices
CSDS-5	Commander, Submarine Development Squadron Five
CSL	Cleanup Screening Level
cu m	cubic meter
cu yd	cubic yard
CVN	aircraft carrier
CWA	Clean Water Act
CZMA	Coastal Zone Management Act
CZMP	Coastal Zone Management Program
DAHP	Department of Archaeology and Historic Preservation
dB re 1 µPa	decibels referenced at 1 micropascal
dB	decibel
dBA	A-weighted decibel
DDESB	Department of Defense Explosives Safety Board
DEIS	draft environmental impact statement
DO	dissolved oxygen
DoD	Department of Defense
DPS	distinct population segment
dw	dry weight
EA	Environmental Assessment

LIST OF ACRONYMS AND ABBREVIATIONS (CONTINUED)

EFH	Essential Fish Habitat
EHW-1	Explosives Handling Wharf
EHW-2	Explosives Handling Wharf-2
EIS	environmental impact statement
EISA	Energy Independence and Security Act
ELWS	extreme low water of spring tides
EO	Executive Order
EQ	Extraordinary Quality
ESA	Endangered Species Act
ESU	evolutionarily significant unit
FEIS	final environmental impact statement
FEMA	Federal Emergency Management Agency
FMC	Fishery Management Council
FMP	Fishery Management Plan
FR	*Federal Register*
FRD	Formerly Restricted Data
ft	foot/feet
FY	fiscal year
g	gravitational acceleration
GHG	greenhouse gas
GIS	Geographic Information System
gpd	gallons per day
gpm	gallons per minute
GWP	global warming potential
HAP	hazardous air pollutants
HAPC	Habitat Areas of Particular Concern
HCCC	Hood Canal Coordinating Council
HCDOP	Hood Canal Dissolved Oxygen Program
HDPE	high density polyethylene
HLUC	Historic Land Use Complexes
HPAH	high molecular weight polycyclic aromatic hydrocarbon
Hz	hertz
IHA	Incidental Harassment Authorization
IMP	integrated management practices
IMPLAN	Impact Analysis for Planning
INRMP	Integrated Natural Resources Management Plan
JARPA	Joint Aquatic Resources Permit Application
KB	Keyport/Bangor
kHz	kilohertz
km	kilometer
kph	kilometers per hour
kVA	kilovolt-ampere
kW	kilowatt

LIST OF ACRONYMS AND ABBREVIATIONS (CONTINUED)

LAA	likely to adversely affect
LEED	Leadership in Energy and Environmental Design
Leq	equivalent sound level
LOA	Letter of Authorization
LOS	level of service
Lmax	maximum sound level
LPAH	low molecular weight polycyclic aromatic hydrocarbon
LWI	Land-Water Interface
m	meter
MBTA	Migratory Bird Treaty Act
mg/kg	milligrams per kilogram
mg-N/kg	ammonia
mg/L	milligrams per liter
mgd	million gallons per day
MHHW	mean higher high water
MHWS	mean high water of spring tides
mi	mile
mL	milliliters
MLI	minority and low-income
MLLW	mean lower low water
mm	millimeter
MM	mitigation measures
MMO	marine mammal observer
MMPA	Marine Mammal Protection Act
MOA	Memorandum of Agreement
mph	miles per hour
MPN	most probable number
MSA	Magnuson-Stevens Fishery Conservation and Management Act
MSF	Magnetic Silencing Facility
MSGP	Multi-Sector General Permit for Stormwater Discharges Associated with Industrial Activity
MSL	mean sea level
MTCA	Model Toxics Control Act
N_2O	nitrous oxide
NAAQS	National Ambient Air Quality Standards
NAGPRA	Native American Graves Protection and Repatriation Act
NAM	not adversely modify
NAVBASE	Naval Base
NAVFAC	Naval Facilities Engineering Command Northwest
Navy	U.S. Department of the Navy
NCP	National Oil and Hazardous Substances Contingency Plan
ND	not detected
NE	no effect
NEPA	National Environmental Policy Act

LIST OF ACRONYMS AND ABBREVIATIONS (CONTINUED)

NHPA	National Historic Preservation Act
NLAA	not likely to adversely affect
NMFS	National Marine Fisheries Service
NMFSHQ	National Marine Fisheries Service Headquarters
NMSDD	Navy Marine Species Density Database
NO_2	nitrogen dioxide
NOA	Notice of Availability
NOAA	National Oceanic and Atmospheric Administration
NOC	Notice of Construction
NOI	Notice of Intent
NOSSA	Naval Ordnance Safety and Security Activity
NO_x	nitrogen oxides
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
NRHP	National Register of Historic Places
NSWCCD	Navy Surface Warfare Center Carderock Division
NTU	Nephelometric Turbidity Units
NWTT	Northwest Training and Testing
O_3	ozone
OA	Operational Area
OPNAVINST	Chief of Naval Operations Instruction
OSHA	Occupational Safety and Health Administration
OU	operable unit
PAH	polycyclic aromatic hydrocarbon
PBDE	polybrominated diphenyl ether
PCB	polychlorinated biphenyl
PCE	Primary Constituent Element
PFC	properly functioning condition
PFMC	Pacific Fishery Management Council
PGA	peak ground acceleration
PM	respirable particulate matter
PM_{10}	particulate matter less than 10 microns in diameter
$PM_{2.5}$	particulate matter less than 2.5 microns in diameter
PNPTT	Point No Point Treaty Tribes
PNPTC	Point No Point Treaty Council
ppm	parts per million
ppt	parts per thousand
PSAMP	Puget Sound Ambient Monitoring Program
PSAT	Puget Sound Action Team
PSB	Port Security Barrier
PSCAA	Puget Sound Clean Air Agency
PSD	prevention of significant deterioration
PSTRT	Puget Sound Technical Recovery Team
PSU	practical salinity unit

LIST OF ACRONYMS AND ABBREVIATIONS (CONTINUED)

PTRCIT	Property of Traditional Religious and Cultural Importance to an Indian Tribe
PTS	permanent threshold shift
Qal	alluvium, colluviums, and fill material
Qva	advanced outwash
Qvgl	Vashon glacio-lacustrine
Qvt	Vashon till
RCW	Revised Code of Washington
RMS	root mean square
ROD	Record of Decision
ROI	Region of Influence
SAIC	Science Applications International Corporation
SARA	Superfund Amendments and Reauthorization Act
SECNAVINST	Secretary of the Navy Instruction
SEL	Sound Exposure Level
SEPA	State Environmental Policy Act
SHPO	State Historic Preservation Officer
SIP	State Implementation Plan
SL	source level
SLR	sea level rise
SMA	Shoreline Management Act
SMP	Shoreline Management Plan
SMS	Sediment Management Standards
SO_2	sulfur dioxide
SOx	sulfur oxides
SPCC	Spill Prevention, Control, and Countermeasure
SPE	Service Pier Extension
SPL	sound pressure level
sq ft	square feet
sq km	square kilometers
sq m	square meters
sq mi	square miles
SQS	sediment quality standards
SR	State Route
SSBN	OHIO Class Ballistic Missile submarines
SSN	SEAWOLF Class submarine (This document does not address other classes of attack submarines)
SSP	Strategic Systems Program
SUBASE	Naval Submarine Base
SWPPP	Stormwater Pollution Prevention Plan
TCP	Traditional Cultural Property
TL	transmission loss
TMDL	total maximum daily load
TOC	total organic carbon
TPP	Test Pile Program
TPS	Transit Protection System

LIST OF ACRONYMS AND ABBREVIATIONS (CONTINUED)

TRIDENT	TRIDENT Fleet Ballistic Missile
T-ROC	Thorndyke Resources Operation Complex
TSS	total suspended solids
TTS	temporary threshold shift
U&A	Usual and Accustomed
U.S.	United States
UCNI	Department of Defense Unclassified Controlled Nuclear Information
USACE	U.S. Army Corps of Engineers
USC	United States Code
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGBC	U.S. Green Building Council
USGS	U.S. Geological Survey
VOC	volatile organic compound
W	Watts
WAC	Washington Administrative Code
WDFW	Washington Department of Fish and Wildlife
WDNR	Washington Department of Natural Resources
WDOE	Washington Department of Ecology
WDOH	Washington Department of Health
WISAARD	Washington Information System for Architectural and Archaeological Records Data
WRA	Waterfront Restricted Area
WSDOT	Washington State Department of Transportation
WSE	Waterfront Security Enclave
ZOI	zone of influence