NAVBASE Kitsap Bangor

Final
Wetland Delineation Report

Prepared for:

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LIST OF ACRONYMS AND ABBREVIATIONS

CZMP	Coastal Zone Management Program
DGPS	Differential Global Positioning System
EHW	Explosives Handling Wharf
EIS	environmental impact statement
GIS	Geographical Information System
GPS	Global Positioning System
HGM	hydrogeomorphic
IWTF	Industrial Waste Treatment Facility
JARPA	Joint Aquatic Resources Permit Application
NAVBASE	Naval Base
NEPA	National Environmental Policy Act
NRCS	National Resources Conservation Service
NWI	National Wetlands Inventory
OBL	obligate
OPNAVINST	Chief of Naval Operations Instruction
SAIC	Science Applications International Corporation
SSP	Strategic Systems Programs
TPS	Transit Protection System
U.S.	United States
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Services
USGS	United States Geological Survey
WDFW	Washington Department of Fish and Wildlife
WDOE	Washington State Department of Ecology
WIS	Wetland Indicator Status
WSDA	Washington State Department of Agriculture
WSDOT	Washington State Department of Transportation

1.0 INTRODUCTION

1.1 Report Objectives

The information in this report will be used for the United States (U.S.) Navy TRIDENT Support Facilities and Waterfront Security Projects environmental impact statements (EIS). This report describes the wetland resources located in the vicinity of the Naval Base (NAVBASE) Kitsap Bangor waterfront, some of which may be affected by proposed projects. The report facilitates the Navy's efforts to avoid or minimize impacts on wetlands and streams during the design process, document wetland and stream boundary determinations for review by regulatory authorities, provide early indications to project engineers of sensitive species within proposed project sites, and provide background information for wetland mitigation reports. The report will support Section 404 (JARPA) permit applications for proposed construction projects in the study area.

This report updates the wetland delineation report previously prepared by Science Applications International Corporation (SAIC) (Brown 2008), and consolidates information presented in other studies and reports, including SAIC (2009). Results of wetland identification and delineation surveys reported in this updated version were used to determine the boundaries of Section 404 (Clean Water Act) jurisdictional wetlands (federal wetlands) and other waters of the U.S. within several proposed project sites at NAVBASE Kitsap Bangor. Specific objectives for this report include the following:

- Consolidate data and information from previous studies and surveys, delineate wetlands that were not delineated in previous SAIC survey efforts, and present complete, updated information on wetlands and other waters of the U.S. that may be impacted by currently proposed projects.
- Determine which of these wetlands meet the definition of U.S. Army Corps of Engineers (USACE) jurisdictional wetlands.
- Present updated maps (using Geographical Information System [GIS]) for wetlands and other waters of the U.S. potentially impacted by proposed project actions.
- Rate the wetlands in accordance with the Washington State Department of Ecology's (WDOE) Wetland Rating System.
- Conduct a qualitative functional assessment for the wetlands using the Washington State Department of Transportation (WSDOT) Wetland Functions Characterization Tool.

This report is organized as follows:

- Section 2.0 (Methods) includes a description of the methods used to delineate and assess wetland resources and other waters of the U.S. (jurisdictional areas within the limits of ordinary high water, but not supporting wetland features) potentially impacted by proposed projects, including a brief description of previous studies and recent surveys conducted in the study area; and protocols for surveying, assessing, and classifying wetland resources.

- Section 3.0 (Results) presents the results of the wetland delineation surveys, including a general description of wetlands at NAVBASE Kitsap Bangor followed by detailed descriptions of each of the features that would be impacted by project activities.
- Section 4.0 (Discussion) summarizes the streams and wetlands potentially impacted by the Proposed Action.
- Section 5.0` provides a list of references for this report.
- Appendix A provides a list of plant species observed during surveys.
- Appendix B provides maps depicting wetland resources and other waters of the U.S. within the study area and the location of proposed projects.
- Appendix C provides the forms used to delineate, classify, and assess wetland resources.
- Appendix D provides representative photos of the wetlands within the study area.

1.2 Project Description

Chief of Naval Operations guidance (OPNAVINST 5520.14C 2001 and OPNAVINST C8126.1B) has directed improvements in the level of security at Naval bases. As part of the U.S. Navy's sea-based strategic deterrence mission, the Navy's Strategic Systems Programs (SSP) directs research, development, manufacturing, test, evaluation, and operational support of the TRIDENT Fleet Ballistic Missile program. SSP proposes to construct a variety of security projects to protect its assets at NAVBASE Kitsap Bangor. As a major federal action, the proposed construction and operation of these facilities must undergo environmental impact analysis as required by the National Environmental Policy Act (NEPA). This resource report provides background environmental information that will be used for compliance with NEPA, including preparation of the EISs for the SSP.

1.3 Location

NAVBASE Kitsap Bangor is located within Kitsap County, Washington, approximately 20 miles west of Seattle (Figure 1, Appendix B). The contiguous base property consists of 6,130 acres located on a mixture of industrial, residential, and undisturbed natural vegetation including 4.5 miles of waterfront along the eastern shoreline of Hood Canal (Figure 2, Appendix B). The base is approximately 9 miles northwest of Keyport, Washington, and its waterfront is located between Hood Canal Bridge and Dabob Bay. The portion of Hood Canal adjacent to NAVBASE Kitsap Bangor averages 1.5 miles wide and is bordered to the west by a 768-acre Navy-owned undeveloped forested buffer strip on the Toandos Peninsula in Jefferson County. The Navy base is restricted from public access and its waterfront has been classified as a Navy restricted area by USACE (33 CFR 334).

2.0 METHODS

2.1 Field Studies

Several studies of wetland resources have previously been conducted at NAVBASE Kitsap Bangor. The following studies were consolidated and reported by Brown (2008):

- A survey of wetlands throughout the base was conducted by Johnson Controls in 1992. The Johnson Controls (1992) survey used the routine onsite determination method with a recommendation that, should any construction encroach on a wetland area, it may be necessary to use a more rigorous delineation method.

- An assessment of resources, including wetland delineations, was conducted by Pentec Environmental (2003) for a proposed security enclave configuration.

- SAIC conducted surveys in October 2005 of wetlands and waters of the U.S. not previously surveyed by Pentec (2003) in response to modifications to the proposed security enclave project (SAIC 2006). Both the Pentec and SAIC surveys identified and delineated wetlands and other waters of the U.S. within or immediately adjacent to the proposed security enclave footprint (Pentec 2003; SAIC 2006) following the methods and definitions described in the USACE 1987 delineation manual (USACE 1987).

- SAIC conducted additional surveys in June, July and August 2007, focusing on wetlands not previously delineated by SAIC in October 2005 survey effort (SAIC 2006). Previously surveyed areas were revisited to confirm and update, if needed, mapped wetland boundaries.

- In July 2007, at the request of USACE, additional assessment of wetlands within the proposed security enclave system was conducted using the *Washington State Department of Ecology Wetlands Rating System* (Hruby 2004).

Additional surveys and delineations were conducted by SAIC and Otak in May and October 2008 and in January, February, and March 2009 in areas that would be impacted by the modified alignment of the proposed security enclave barrier, or other proposed projects on the NAVBASE Kitsap Bangor waterfront.

Prior to commencing field work, the following sources of information were reviewed:

- National Wetlands Inventory (NWI) maps (U.S. Fish and Wildlife Service [USFWS] 2007),

- National Resources Conservation Service (NRCS) soils surveys,

- United States Geological Survey (USGS) topographic maps,

- Washington Department of Natural Resources Plant Heritage of Washington database, and

- Washington Department of Fish and Wildlife (WDFW) Washington Priority Habitats and Species database and Washington Lakes and Rivers Information System database.

2.2 Field Sampling Methods/Protocols

The wetland delineation surveys included all areas within 300 feet of the proposed waterfront projects (i.e., Explosives Handling Wharf [EHW], Transit Protection System [TPS] Wharf, Land/Water Connection Structures), anticipated staging and parking areas, and areas that would be impacted by the security enclave project (Figure 2, Appendix B). Wetland sample points, wetland boundaries, and limits of other waters of the U.S. were mapped electronically using a sub-meter Differential Global Positioning System (DGPS) unit, and plotted in the field on aerial photos at an approximate scale of 1 inch = 150 feet.

Wetland boundaries were delineated and assessed using the USACE and WDOE protocols that are described in more detail below and were classified based on the USFWS classification system (Cowardin et al. 1979). In addition, surveys included a qualitative assessment of the functions of each wetland identified in the field, also described in more detail below.

Appendix A includes a list of observed plant species at NAVBASE Kitsap Bangor. Appendix B includes maps of wetlands and other waters of the U.S. These maps include resources confirmed by Johnson Controls (1992) and resources confirmed more recently by SAIC, as described in Section 2.1. SAIC-confirmed wetland sample points, wetland boundaries, and limits of other waters of the U.S. were mapped electronically using a sub-meter DGPS unit, and/or plotted in the field on aerial photos at an approximate scale of 1 inch = 150 feet (Appendix B). Johnson Controls-confirmed wetlands were mapped by approximate survey methods (Johnson Controls 1992). In Appendix B, Figure 2 is an overview of the study area, and Figures 3 through 7 depict details of the wetland resources in the study area.

Non-wetland waters of the U.S. (i.e., streams) were identified as natural drainages with either permanent or intermittent flow, and ditches that convey stormwater runoff from roads, parking lots, and buildings are identified as roadside drainage (Appendix B). Roadside drainage is not considered jurisdictional, except where it conveys natural stream flows; thus, where natural stream flows are intercepted by roadside drainage features, the flow downstream was considered jurisdictional. Stream segments that flow through culverts are also identified on project area maps. Not all roadside drainage ditches were mapped; only the roadside drainages that would be affected by the project were included in this report.

Appendix C includes copies of the USACE Wetland Delineation Forms (C-1), WDOE Wetland Rating Forms (C-2), and Functional Assessment Forms (C-3) for each wetland identified in this report (organized by wetland number). Representative photographs from the surveys are included in Appendix D.

2.1.1 Wetland Delineation (U.S. Army Corps of Engineers)

Federal wetlands and other waters of the U.S. have legal protection in accordance with Section 404 of the Clean Water Act (33 U.S.C. Section 1344). USACE generally requires the issuance of a permit, or coverage under an existing permit, for all actions that have the potential to degrade or modify these features. Under Section 404 of the Clean Water Act, wetlands are defined as areas that are:

> "inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas" (Environmental Protection Agency, 40 CFR 230.3 and USACE 1986, 33 CFR 328.3).

Jurisdictional wetlands are a subset of waters of the U.S. that include, in addition to wetlands as defined above, areas subject to the ebb and flow of the tide and non-tidal areas that are within the limits of ordinary high water. Other waters of the U.S. are currently described as any areas that might be considered waterways, either for commerce or recreation, even on a limited scale, and include tributaries to such waters. Frequently, the term "wetlands and other waters of the U.S." is used when describing areas under USACE jurisdiction. Ordinary high water is defined as some line or other evidence that was:

> "established by the fluctuations of water and indicated by physical characteristics such as a clear, natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding areas" (USACE 1986).

Wetland boundaries were delineated using the *USACE Wetland Delineation Manual* (USACE 1987) and the Routine Determination Method outlined in the *Washington State Wetland Identification and Delineation Manual* (WDOE 1997) and classified based on the USFWS classification system (Cowardin et al. 1979). The *Washington State Wetland Identification and Delineation Manual* is a revised version of the *USACE Wetland Delineation Manual* that uses the same basic methods (and delineation forms) but includes information specific to wetlands in Washington State. Wetland delineations conducted after April 2008 were done in accordance with the *USACE Wetland Delineation Manual* and *Interim Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys and Coast Region* (USACE 2008).

Representative sampling point locations were selected using vegetation communities, surface hydrological features, and topography (e.g., ponding) to identify areas of potential wetlands. At each sample point, the habitat was evaluated for the required three wetland parameters: soils, hydrology, and vegetation, using the procedures of the *USACE Wetland Delineation Manual* and accompanying wetland data form (Appendix C-1). Positive indicators of wetland conditions for all three parameters are normally present in wetlands, as follows:

- *Hydrophytic vegetation* is defined as macrophytic vegetation that is adapted to, and occurs in, areas where soils are frequently or permanently saturated of sufficient duration to exert a controlling influence on the plant species present. Plant species adjacent to the delineation pit were identified and included following the "50/20 rule," meaning that plant species in each layer of the vegetation (herb, shrub, tree, and vine) were included in order of abundance until at least 50 percent of total vegetation cover was accounted for, and all species with at least 20 percent relative cover were included. The hydrophytic vegetation parameter is met when the prevalent vegetation (more than 50 percent of the dominant plant species) is typically adapted to areas having wetland hydrology and hydric soil conditions. Plants are

assigned a Wetland Indicator Status (WIS) based on their frequency of occurrence in wetland habitats (U.S. Fish and Wildlife Service [USFWS] 1988). For example, plants with an obligate (OBL) WIS occur almost always (greater than 99 percent) in wetlands. A list of plant species observed during the wetland delineation surveys and additional information on WIS is provided in Appendix A.

- *Wetland hydrology* refers to inundation and/or saturation of the soil by flooding or a shallow water table for a prolonged period during the growing season, such that the character of the soil and vegetation are substantially different from areas that do not experience inundation/saturation in this manner. The identification of wetland hydrology follows the *USACE Wetland Delineation Manual* (USACE 1987). Geomorphic features associated with flooding (e.g., channels, shorelines) and sediment deposits are among the indicators of wetland hydrology.

- *Hydric soils*, which are indicative of wetlands, are defined as soils that are sufficiently ponded, flooded, or saturated throughout the growing season to produce anaerobic conditions that favor the growth of hydrophytic vegetation (USACE 1987). Hydric soils are identifiable based on observable properties that result from prolonged saturated-anaerobic conditions. To assess whether hydric soil was present at each sample point, a soil pit was excavated to a depth of 16 inches (when possible), and soil attributes (including color, mottling, texture, grain size, structure, streaking, degree of saturation) were recorded on the delineation forms. Soil colors were assessed using Munsell Soil Color Charts (Munsell Color 1992). Other than direct observation of saturated conditions, low chroma (dark) soil colors are among the most conspicuous indicators of hydric soils.

Locations of wetland sampling points (Pits), including those that were determined to be within wetlands and not within a wetland, are depicted in Figures 3 though 8 (Appendix B). Copies of the USACE Wetland Delineation Forms completed at each soil pit location are included in Appendix C-1.

2.1.2 Wetland Rating System (Washington State Department of Ecology)

In the state of Washington, the Coastal Zone Management Program (CZMP) states that federal activities that affect any land use, water use, or natural resources within the coastal zone must comply with the policies of the Shoreline Management Act (including local government shoreline master programs). The CZMP relies on WDOE's 2004 Wetland Rating System for Western Washington to classify wetlands in this region and evaluate their functions (Hruby 2004). Five criteria are used to categorize wetlands: (1) sensitivity to disturbance, (2) rarity, (3) Natural Heritage wetlands, (4) ability to replace them, and (5) the hydrogeomorphic functions (HGM) they provide. HGM functions include improving water quality, hydrologic (floodwater control), and wildlife habitat. This rating system is primarily intended for use with vegetated, freshwater wetlands. It categorizes estuarine wetlands but does not characterize their functions, nor does it characterize streambeds or riparian areas (Hruby 2004).

The WDOE rating categories are intended to be used as the basis for developing standards for protecting and managing the wetlands and to reduce further loss of their value as a resource (Hruby 2004). Wetlands within the study area were rated in accordance with the *Rating System*

for Western Washington (Hruby 2004), and composite scores for the three HGM functions and other rating criteria are presented in Table 2. Copies of the WDOE Rating Forms and additional notes are included in Appendix C-2.

2.1.3 Functional Assessment

Functions of wetlands delineated in this survey effort were evaluated using an additional tool developed by WSDOT called the *Wetland Functions Characterization Tool for Linear Projects* (WSDOT 2000). This tool relies on best professional judgment to quickly assess wetland functions in a consistent manner for projects that have the potential to cover large areas. The WSDOT manual divides wetland functions into fourteen categories and provides criteria for determining whether the function is applicable: Data forms for SAIC's wetland surveys using the WSDOT method at NAVBASE Kitsap Bangor are compiled in Appendix C-3.

3.0 RESULTS

3.1 Study Area (General Description)

NAVBASE Kitsap Bangor contains naturally occurring wetlands as well as wetlands that were created as a result of road or other construction after the Navy acquired the property in the 1940s. Wetlands and water resources are considered unique and valuable for their potential to provide quality habitat for the species that use them, including fisheries potential, and are to be protected (Navy 2001). Wetlands identified within the areas potentially affected by project activities are associated with seeps, soil and earth slumping events, or the many streams in the vicinity of the proposed action site. Most of the wetlands in the survey area are broad-leaved deciduous forested wetlands, emergent and broad-leaved deciduous scrub-shrub wetlands, and palustrine emergent marsh, with limited areas of open water.

Broad-leaved deciduous forested wetlands are the most common type in the survey area. Red alder (*Alnus rubra*) is most often the dominant tree species in this plant community with western red cedar (*Thuja plicata*) an uncommon associate, although red cedar was dominant in one wetland area. The shrub layer is typically dominated by salmonberry (*Rubus spectabilis*) with lady fern (*Athyrium felix-femina*), youth-on-age (*Tolmeia menziesii*), devil's club (*Oplopanax horridus*), and skunk cabbage (*Lysichiton americanus*) in the understory and Cooley's hedgenettle (*Stachys cooleya*), coltsfoot hairy willow-herb (*Epilobioum ciliatum*), stink currant (*Ribes bracteosum*), stinging nettle (*Urtica dioica*), small-fruited bulrush (*Scirpus mirocarpus*), sawbeak sedge (*Carex stipata*), and horsetail (*Equisetum* spp.) as common associates. The forest canopy of wetland areas ranges from open to closed, with the shrub stratum more developed in the open areas and less or lacking where the canopy is closed. Emergent and broad-leaved deciduous scrub-shrub wetlands are characterized by a mosaic of wetland vegetation types that include the broad-leaved deciduous forested wetlands interspersed with areas dominated by shrubs and herbaceous species typical of the understory of the forested wetlands where the tree canopy is sparse or lacking (Pentec 2003). Other emergent wetland plant species found in the more open and wetter areas, such as on the fringes of Hunter's Marsh and Devil's Hole, include cattails (*Typha latifolia*), rushes (*Scirpus* spp.), and sedges (*Carex* spp.).

The wetland habitats within the study area are surrounded by or grade into upland forest or disturbed areas dominated by shrubs or grass/herbaceous species. The upland forest communities in the study area are typical second growth deciduous or coniferous forest consisting of predominantly Douglas fir (*Pseudotsuga menziesii*), western hemlock (*Tsuga heterophylla*), and big leaf maple (*Acer macrophyllum*). Salal (*Gaultheria shallon*) is generally present in the understory with other common species including Oregon grape (*Mahonia nervosa*), rhododendron (*Rhododendron macrophyllum*), evergreen huckleberry (*Vaccinum ovatum*), holly (*Ilex aquifolium*), and sword fern (*Polystichum munitum*). Disturbed areas include areas around buildings and along roadsides or the edges of paved areas that are periodically maintained, as well as areas that have been disturbed in the past and have become vegetated with opportunistic species. Utility corridors that appear to be periodically cleared for access and maintenance of power lines occur in the study area. The disturbed areas that are vegetated are dominated by non-native grass species that include colonial bentgrass (*Agrostis capilaris*), tall fescue (*Festuca arundinacea*), reed canary grass (*Phalaris arundinacea*), and

orchard grass (*Dactylis glomerata*), and by herbaceous species that include Queen Ann's lace (*Daucus carota*), self heal (*Prunella vulgaris*), yellow parentucellia (*Parentucellia viscosa*), and St. John's wort (*Hypericum perforatum*), an invasive species. Other species commonly observed along the roadsides and other disturbed areas include invasive shrubs such as Himalayan blackberry (*Rubus discolor*) and Scot's broom (*Cytisus scoparius*) (Navy 2001). Both species are included in the Washington State List of Noxious Weeds (Washington State Department of Agriculture [WSDA] 2007). Within the study area, Himalayan blackberry forms large, dense thickets in all of the streams, especially adjacent to roadsides and the utility corridor, and was found in nearly all of the wetlands and streams surveyed.

Surface water within the proposed action area includes several perennial streams that occupy small, steep-sided drainages. Devil's Hole, Hunter's Marsh, and Cattail Lake are manmade features at the downstream end of streams that contain perennial surface water in the study area. Devil's Hole (Figure 2) is a manmade lake that was created in the 1940s when the Navy modified a road. The lake supports anadromous fish populations and is used by base personnel for sport fishing. Cattail Lake (Figure 4), at the northern end of the study area and near the northern boundary of the base, is also a manmade lake that was created as a result of road modifications; this lake also supports anadromous fish populations and is used by base personnel for sport fishing. Bald eagle nest sites have been observed in the vicinity of Cattail Lake and Devil's Hole (WDFW 2007; Leicht 2008). Hunter's Marsh (Figure 6) is a large perennial marsh that was created during construction of the EHW and access roads. The flow of water from the stream associated with Hunter's Marsh was partially blocked at the access road, which created the area of open-water habitat. This wetland does not support an anadromous fish population, but it provides forested habitat for wetland-associated wildlife species and this area was reported to support a great blue heron rookery (Navy 2001). In addition, there is a manmade stormwater detention pond (Wetland 7) just south of Hunter's Marsh that supports year-round surface water. Devil's Hole, the detention pond, Hunter's Marsh, and Cattail Lake are the only wetlands within the study area that are included on the National Wetlands Inventory (USFWS 2007). Other wetlands in the study area include those associated with intermittent streams, roadside drainages, and groundwater seeps, most of which ultimately discharge either into one of the perennial streams or directly into Hood Canal.

The soils at NAVBASE Kitsap Bangor are typically developed on Vashon till and usually consist of a moderately dense layer (20 to 40 inches thick) overlying a very dense hardpan layer. These soils are relatively impermeable and support perched water tables during winter months. Perched water flows laterally and discharges in depressions and streams and via seeps along hillsides and roadcuts, and soils are typically mapped as Alderwood soils. In the study area, most soils are developed on advance outwash sediments that consist of layers of gravel, sand, and silt. The soils are very deep and, because of their coarse texture, tend to be excessively drained. These soils are typically mapped as Indianola soils (Navy 2001).

3.2 Description of Streams and Wetland Resources

Streams that are directly associated with wetlands in the study area, either as the source of hydrology or the outfall of wetlands, were described and mapped, but the discussion of streams in the study area is not comprehensive. An overview of the study area depicting project sites, wetlands, and associated streams is shown in Appendix B, Figures 2 (north) and 3 (south). More

detailed maps of the wetland resources, including the dominant plant communities within the wetlands, are depicted in Appendix B, Figures 4 through 8. These figures also include data from a previous study (Johnson Controls 1992) for wetland resources outside the affected area. Table 1 lists streams in the study area that are associated with wetlands described in this report. Table 2 lists wetlands within the study area, including those identified during the 2007–2009 wetland delineation work and in the SAIC (2006) and Pentec (2003) reports. Appendix D provides representative photos of streams and wetlands in the study area.

Table 1. Streams in the Study Area

Stream Name	Figure Number	Notes
Stream A1	3	This large natural stream flows from the east side of Escolar Road, then enters a very long culvert under buildings, parking lots, and roads, and resurfaces in a roadside drainage along Sealion Road and empties into Devil's Hole. At the downstream portion of the stream, before it flows into Devil's Hole, water and wetland plants are present and the stream channel is sand, gravel, and cobble (non-wetland).
Stream A2	3	This drainage runs adjacent to an old railroad track that parallels the west side of Escolar Road. The drainage is intermittent and gets water from a natural stream southeast of the study area, as well as runoff from the road. It empties into a grate that joins the culvert from Stream A1.
Stream A	3	Most of the stream is within a roadside ditch, but the primary source of water appears to be from a natural seep (Wetland 13). Water also flows into this stream as runoff from roads and parking lots in the vicinity. The stream enters a culvert just south of Stream B2, but some water also appears to go into the Stream B2 culvert. The Stream A culvert empties into another roadside drainage ditch near Delta Pier before eventually discharging into Hood Canal. Wetland plants are present at scattered locations, and water is present; soils are sand, gravel, and cobble (non-wetland).
Stream B2	3	Small wetland area (Wetland 5) is present; the streambank near Runner Road is becoming overrun with Himalayan blackberry. Stream flows into a culvert that empties into another roadside drainage ditch near Delta Pier (same as Stream A) before eventually entering another culvert and discharging into Hood Canal.
Stream B	3, 4	Immediately upstream of Runner Road, Stream B is ponded apparently by a poorly functioning culvert. Culvert crosses under both Runner and Escolar Roads and empties into Hood Canal. Upstream channel is narrow and incised and is bordered by Himalayan blackberry thickets. Johnson Controls-verified wetlands are present upstream.
Stream B1	4	The southern edge of Wetland 4 drains into Stream B1 east of Runner Road. Near the road the channel has become overrun with Himalayan blackberry. The stream flows into a culvert that goes under both Runner and Escolar Roads and empties into Hood Canal.
Stream C	4	The northern edge of Wetland 4 is present in Stream C. No distinct stream channel on east side of Runner Road, but water flows through wetland area, then into a drainage ditch and culvert under Runner Road. Stream channel is more distinct on west side of Runner Road and flows to edge of Escolar Road and Wetland 1. The ditch along Runner Road supports wetland plants and is also becoming overrun with Himalayan blackberry. The ditch along Escolar Road flows into a culvert near Wetland 2 and empties into Hood Canal.
Stream D	4	Upstream from Runner Road Stream D has steep banks and is overrun with Himalayan blackberry, especially where drainage is crossed by utility line (within the proposed fence crossing). Upstream, Stream D is associated with Wetland 30. Downstream from Runner Road, Stream D is associated with Wetland 2 and Wetland 3.
Stream E	4, 5	Stream E has two channels that originate on the forested slope north of Seawolf Road. Wetland 12 discharges into Stream E.

Stream Name	Figure Number	Notes
Stream F		Stream F begins in a forested slope where three distinct headwater channels join, then flows to the west and empties into Hood Canal. Wetlands 9 and 17 are associated with Stream F.
Stream I	6	Wetland 14 is present in this stream. The stream goes subsurface downstream from Wetland 14, and has no surface connection to other waters.
Stream G	7	Braided stream with extensive wetlands, including Hunter's Marsh (Wetland 6) at the westernmost end of the stream. Outlet is constricted by Tang Road and water passes through a weir and culvert, discharging into Hood Canal.
Stream H	7	Stream H is shallow intermittent outflow from the southwest corner of Wetland 24a that flows westerly across a maintained utility corridor and then into a forested area north of Hunter's Marsh (Wetland 6), where it goes subsurface before reaching Wetland 6.
Stream J	7	Stream receives flow from Wetland 24b through a culvert, and surface runoff from an adjacent building/parking lot. Input from Wetland 24a through a connecting saturated swale is also likely. The stream is also supported by roadside drainage. Stream J flows through Wetland 16 westerly to roadside drainage, then through a culvert under Tang Road to Hood Canal.
Stream N	7	Stream N drains Wetlands 22a and 22b. Stream flows westerly from Amberjack Avenue through a culvert under Tang Road to Hood Canal.

1. Streams are defined as natural watercourses, and may include flow that has been intercepted by roadside drainage ditches.

Table 2. Wetlands in the Study Area

Wetland Name	Figure Number	Cowardin Classification[1]	USACE Jurisdiction[2]	WDOE Rating	Wetland Area[3]	Date of Survey (Delineator)
Devil's Hole		L1UBH[4]	Yes	IV	20 acres	Oct 2005, Jul 2007 (SAIC)
Wetland 1		PEM1/FO1C	Yes	IV	0.1 acre	Jul & Aug 2003 (Pentec); Jul 2007 (SAIC)
Wetland 2		PEM1/FO1C	Yes	IV	0.25 acre	Jul & Aug 2003 (Pentec); Jul 2007 (SAIC)
Wetland 3		PEM1C	Yes	IV	0.2 acre	Jul & Aug 2003 (Pentec)
Wetland 4		PEM1/FO1C	Yes	IV	5.6 acres	Oct 2005 (SAIC)
Wetland 5		PEM1C	Yes (?)	IV	<0.01 acre	Jul & Aug 2003 (Pentec); Oct 2005, Jul 2007 (SAIC)
Hunter's Marsh/ Wetland 6		PEM/SS/FO1H PUB/H[4]	Yes	II	6 (+) acres	Jul & Aug 2003 (Pentec); Oct 2005, Jul 2007, Oct 2008 (SAIC)
Stormwater Detention Pond		PUBHx[4]	No (manmade pond)	IV	<0.5 acre	Jul & Aug 2003 (Pentec); Oct 2005, Jul 2007 (SAIC)
Wetland 8		PEM1/SSC	Yes	IV	0.6 acre	Jul & Aug 2003 (Pentec); Jan & Feb 2009 (SAIC)
Wetland 9		PEM1C	Yes	III	<1 acre	Jul & Aug 2003 (Pentec)
Wetland 10		PFO1C	Yes	IV	<0.2 acre	Jul & Aug 2003 (Pentec)
Wetland 11		PEM1/FO1C	No (isolated)	IV	<0.2 acre	Jul & Aug 2003 (Pentec)
Wetland 12		PEM1/SS/FO1C	Yes	III	1.8 acres	Oct 2005, Jul 2007, Oct 2008 (SAIC)
Wetland 13		PEM1/SS/FO1C	Yes	III	1.5 acres	Oct 2005, Jul 2007 (SAIC)

Wetland Name	Figure Number	Cowardin Classification[1]	USACE Jurisdiction[2]	WDOE Rating	Wetland Area[3]	Date of Survey (Delineator)
Wetland 14		PEM1C	Yes	IV	0.66 acre	Oct 2005, Jul 2007, Oct 2008 (SAIC)
Wetland 15		PEM1/FO1C	Yes	IV	<0.1 acre	Oct 2005, Jul 2007 (SAIC)
Wetland 16		PEM1/SS/FO1C	Yes	IV	0.6 acre	Oct 2005, Jul 2007, Oct 2008 (SAIC)
Wetland 17		PFO1C	Yes	IV	<0.2 acre	Jul 2007 (SAIC)
Wetland 18		PFO1C	Yes	IV	0.06 acre	Jul 2007, Jan & Feb 2009 (SAIC)
Wetland 19		PEM1H/FO1C	Yes	III	1.1 acres	Jul 2007 (SAIC)
Wetland 20		PFO1C	Yes	IV	<0.1 acre	Jul 2007 (SAIC)
Wetland 21		PEM1C	No (isolated)	IV	<0.05 acre	Jul 2007 (SAIC)
Wetland 22a		PEM1/SS/FO1H	Yes	II	3.4 acres	Jul 2007, Oct 2008 (SAIC)
Wetland 22b		PEM1/FO1C	Yes	III	1.3 acres	Oct 2008 (SAIC)
Wetland 23		PEM1C	No (isolated)	IV	<0.05 acre	Jul 2007 (SAIC)
Wetland 24a		PEM1C	Yes	III	2.2 acres	Jul 2007, Jan & Feb 2009 (SAIC)
Wetland 24b		PEM1C	No	IV	<0.2 acre	Oct 2008 (SAIC)
Wetland 25/ Cattail Lake		L1/PEM1/SS/ FO1H, PUB/H[4]	Yes	II	5 (+) acres	Jul 2007 (SAIC)
Wetland 26		PFO1C	Yes	IV	1.2 acres	Jul 2007 (SAIC)
Wetland 27		PEM1/FO1C	Yes	IV	0.3 acre	Jul 2007 (SAIC)
Wetland 28		PEM1/SS/FO1C	Yes	IV	1.2 acres	Jan & Feb 2009 (SAIC)
Wetland 29		PEM1C	No	IV	<0.01	Jan & Feb 2009 (SAIC)
Wetland 30		SS/FO1C	Yes	III	1.9 acres	Jan & Feb 2009 (SAIC)

Sources: Pentec 2003; SAIC 2006; SAIC 2007; Brown 2008; SAIC 2009

1. Cowardin Classification (Cowardin et al. 1979): L1 = Lacustrine, Limnetic; P = Palustrine; UB = Unconsolidated Bottom; EM = Emergent (1-Persistent); SS = Scrub-Shrub; FO = Forested (1= Broad-leaved deciduous); C = Seasonally Flooded; H = Permanently Flooded; x = Excavated.
2. USACE Jurisdiction to be confirmed by USACE.
3. Wetland areas are calculated from current GIS data. Hunter's Marsh/Wetland 6 and Wetland 25/Cattail Lake includes only mapped wetland boundaries; wetlands continue upstream and actual area is larger than 5 acres.
4. Indicates category assigned by National Wetland Inventory (USFWS 2007).

The following section includes descriptions of the wetlands and streams within the study area. Many of the wetlands and streams are connected and the discussion combines them as appropriate. The discussion follows the study area from south to north as depicted on Figures 2 and 3. Only wetlands that could potentially be impacted by currently proposed construction projects were delineated, although other wetlands described by Johnson Controls (1992), Pentec (2003) or noted in SAIC field surveys are mentioned in this section.

All of the natural streams that cross Runner Road, Amberjack Avenue and other north-south roads have been affected by construction of the road and installation of culverts. The stream channels become narrower as they approach the road, with restricted flow channels and faster moving water. Near the roadside, the stream banks are often vegetated with small alders and/or a

thick understory of Himalayan blackberry. Surveys focused on the portion of the streams that would be affected by proposed waterfront construction projects and associated upland facilities, but selected upstream areas were also n investigated to compare with the descriptions provided in the Johnson Controls (1992) report and are also described below.

Wetland 28 (Figure 3) – Wetland 28 (1.22 acres) is located in an area east of Escolar Road that was proposed for development as a parking lot in earlier security enclave project maps. A reconnaissance survey was conducted in May 2008, and the wetland was delineated in February 2009. Wetland 28 is on a fairly wide, flat bench at the toe of a forested slope on the east side, with Escolar Road on the west side. Terrain on the flat bench is hummocky, resulting in a mosaic of wetland, which predominates, interspersed with smaller upland patches, most of which support large western red cedars. The larger upland areas were bounded out, but some smaller upland patches amounting to less than about 15 percent of the total wetland area were included in the wetland. Wetland 28 was delineated in February 2009 (Appendix C-1, Wetland Delineation Forms, Pits 119 and 120 in May 2008, and Pits 28-1, 28-2, 28-3 in February 2009).

The slope supports conifer forest and the flat bench supports mixed deciduous forest with patches of western red cedars. Red alder is the most abundant species in the tree layer; salmonberry and salal dominate the shrub layer, and a mix of wetland and upland herbaceous species is present in the understory. Slough sedge (*Carex obnupta*) is abundant in the wetter areas as well as devil's club and scattered skunk cabbage.

Five soil pits were dug to confirm the boundary between wetlands and uplands. Soils in the area have loamy silt in the upper layer and sandy loam below; one wetland soil pit revealed muck with hydrogen sulfide odor, and another had reduced matrix with redox features.

Small areas had ponded water present, and soils in the remainder of the wetland were saturated at the surface. There was no surface flow into, or out of, Wetland 28 during either site visit. Seeps from the toe of the slope on the east edge of the wetland appear to support the wetland hydrology.

Streams A1, A2 (Figure 3) – Streams A1 and A2 are located at the southernmost security fence boundary and the proposed relocation of Escolar and Sealion roads. In this area, a natural stream (Stream A1) originates from east of Escolar Road and south of Greenling Road (just east of Buildings 7055 and 7011). The stream is contained within a long culvert from east of the building and parking lot off Escolar Road until it daylights at Sealion Road just north of Devil's Hole. From here, it follows a roadside drainage and empties directly into Devil's Hole. Upstream of the culvert, a manmade structure in Stream A1 causes the water to back up and release slowly so there is perennial flow in Stream A1 where it emerges from the culvert. The ponded area upstream from this structure has an adjacent herbaceous and scrub-shrub wetland surrounded by upland forest. Between the structure and the culvert, the stream channel is deep with steep banks. Just east of the culvert, there is a small wetland on the stream banks that appears to be fed by road runoff, a culvert under Greenling Road, as well as underground seeps. Shallow surface water flows from the wetland into the stream. Downstream of the culvert (study area), the outflow into the roadside drainage had a bed consisting of sand, gravel, and cobble, and wetland plants were present only in a narrow band along the edge of the drainage bank.

A drainage ditch north of Devil's Hole was originally thought to be the outflow of the Stream A1 culvert described above; however, further investigation during the November 2005 surveys determined this was not connected to any of the natural streams or wetlands in the vicinity. A culvert under Sealion Road and small roadside ditches that capture runoff from the adjacent road and buildings direct water into this drainage. This appears to be a manmade feature, and the vegetation included native forest trees as well as a planted redwood (*Sequoia sempervirens*) with an understory of non-native vines, including Himalayan blackberry and ornamental ivy (*Hedera helix*), and herbaceous species, including annual grasses and horsetail. No water was observed in the drainage, and results of a soil pit investigation indicated no wetlands were present in this drainage (Appendix C-1, Wetland Delineation Forms, Pit 10). This small drainage may not be considered jurisdictional wetlands or waters of the U.S.; however, it should be noted that any outflow within this ditch empties directly into Hood Canal.

Another intermittent stream that parallels Escolar Road (Stream A2) was previously identified as a wetland (Johnson Controls 1992). Stream A2 flows through a forested area between an abandoned railroad grade and tracks and the base of the west bank of Escolar Road. The stream originates at a ponded wetland fed by a natural stream that originates on the east side of Escolar Road about 900 feet south of the study area. The stream itself flows into a grate and joins below the surface with the culvert that carries Stream A1 toward Devil's Hole. Within the study area, a few wetland plants were present along Stream A2 in the understory, including rushes and horsetail, but the soils were road base with a layer of sediment and organic matter on the top (Appendix C-1, Wetland Delineation Forms, Pit 11). No water was present during the 2005 survey, but flowing water was present in the channel in May 2008. The ponded area outside the study area appears to be perennial and supports emergent wetland vegetation and open water with a forested overstory. Stream A2 is intermittent but originates from a natural stream and empties into Devil's Hole, therefore it would be considered a jurisdictional water of the U.S.

Stream A (Figure 3) – This stream originates in Wetland 13 and flows into a drainage ditch along the north side of Greenling Road, and then turns north to follow the east side of Runner Road. Flowing water was observed in this drainage during the 2005 and 2007 surveys, and wetland plants (including *Juncus* sp. and watercress [*Rorippa nasturtium-aquaticum*, an obligate wetland plant species]) were observed at widely scattered locations along this roadside drainage. Other plants present consist of annual grasses, common roadside weeds, and Himalayan blackberry, which forms a dense thicket along the road banks. The low flow channel within the ditch was about 2 feet wide and 2 inches deep and flowing rapidly during both the 2005 and 2007 surveys. The stream appears to flow into several culverts, including a culvert at the corner of Greenling and Runner Roads and discharges into a roadside ditch in the vicinity of the Delta Pier, which eventually enters a culvert near Wetland 1 that discharges into Hood Canal. Roadside drainage ditches are manmade features and are generally not considered jurisdictional unless they convey water from a natural source, Stream A drains Wetland 13 and ultimately discharges into Hood Canal. Thus, Stream A would be considered a jurisdictional water of the U.S.

Stream B2 (Figure 3) –Flowing water was present in Stream B2 during the 2005 and 2007 surveys (greater flow in 2007). Water flowing through the Stream B2 culvert was from both the stream and the drainage along Runner Road. The culvert for Stream B2 extends from the east side of Runner Road and empties into a roadside drainage ditch near Delta Pier. This ditch

eventually empties into a culvert south of Wetland 1 and discharges into Hood Canal. In November 2005, the low flow channel for Stream B2 was narrow, about 1 foot wide, with very little water present. In 2007, the low flow channel was shallow and varied in width from 2 to 4 feet. Upstream of the study area, the banks of Stream B2 are steep and the channel bottom is narrow. Alder and big leaf maple are on the banks and Himalayan blackberry is no longer in the understory. The edges of the channel bottom support wetland shrubs and herbaceous plants including salmonberry, lady fern, and piggy-back plant.

Wetland 5 (Figure 3) – Wetland 5 was identified by Pentec (2003) as a small hillside seep adjacent to a stream channel (Stream B2). Wetland 5 is overrun with Himalayan blackberry, although emergent wetland plants and saturated soils were found in this area during both the November 2005 surveys and again in June 2007.

Stream B (Figure 4) – Stream B flows westerly from a Johnson Controls (1992)-verified wetland toward Runner Road, and is conveyed through a single culvert under Runner Road and Escolar Road to Hood Canal. The streambanks in the wetland support a community with alder and big leaf maple canopy, salmonberry in openings, and lady fern and piggy-back plant in the understory. Patches of skunk cabbage are also present in the stream bottom. West of the wetland, Stream B passes through a maintained utility corridor dominated by thickets of Himalayan blackberry on both stream banks. Herbaceous wetland vegetation is sparse in the understory but includes sword fern and salmonberry. Water was present in the drainage during surveys in 2005 and 2007 within a narrow steeply incised channel that was about 1 to 2 feet wide and 6 inches deep. At the east edge of Runner Road the stream banks include a small broadleaf deciduous forest community dominated by red alder and big leaf maple. A single culvert conveys Stream B under both Runner and Escolar Roads to empty into Hood Canal. In a March 2009 survey, ponded water was found in a depression at the east end of the culvert, within the project alignment.

Wetland 4 (Figure 4) – Wetland 4 (5.6 acres) surrounds the Industrial Waste Treatment Facility (IWTF) located off Runner Road on the north, east, and south sides. Outflow from the wetland feeds two drainages: on the south, the wetland drains into Stream B1, and on the north it drains into Stream C.

In 2005, the water seemed to seep through the roadbank, densely vegetated with red alder and Himalayan blackberry, before entering the culvert at Stream C. In 2007, a new building was constructed on the west side of Runner Road and a barricade was installed along the east side of the road at Stream C. The barricade seems to have increased runoff to the roadside at this location, and soils were saturated along the roadbank, slightly expanding the boundaries of Wetland 4 at the Stream C culvert. In addition, in 2007, all of the roadside drainages in this area had more water, and wetland vegetation, including cattails, was observed at several locations within the roadside drainages. Wetland 4 was delineated in November 2005 (Appendix C-1, Wetland Delineation Forms, Pit 7, 18, 19, 20, 21, 22).

Wetland 4 is a forested scrub-shrub wetland with an overstory dominated by red alder and occasional western red cedar and big leaf maple. The entire wetland area was delineated in 2005. The shrub layer is dominated by salmonberry with sword fern and piggy-back plant common in the herb layer. Other locally common plant species include lady fern, horsetail,

devil's club, and skunk cabbage in the wetter areas. Western hemlock, salal, holly, and evergreen huckleberry are present in the drier spots within the wetland and outside the wetland boundaries (Appendix C-1, Wetland Delineation Forms, Pit 22). The northwest portion of Wetland 4 includes a cleared utility corridor. This part of Wetland 4 supports willows (*Salix* sp.), bulrush, lady fern, piggy-back plant, and horsetail. In 2005, the willows were 6 to 7 feet high and in 2007 they were 15 feet high indicating the area has not been recently cleared.

Soils within the wetland areas are sand or silty-sand with high organic content in the surface. The redox dark surface indicator was present in wetland soil pits.

No clear drainage patterns occur within the wetland, although small, shallow rills of running water were periodically observed and the entire area identified as wetland was mucky and saturated with some areas of shallow standing water (Appendix C-1, Wetland Delineation Forms, Pit 7).

Stream B-1 (Figure 4) – Stream B1 on the south side of the IWTF includes a 2-foot wide channel. Flowing water was present in this channel at the time of the November 2005 survey, and wetland plants adjacent to the flow channel included rushes, sedges, horsetail, and piggy-back plant. Soils were saturated to the surface within the ordinary high water mark. The soils were sandy silt on the surface with an impenetrable layer of sand, cobble, and gravel at about 8 inches. Indicators for hydric soils were not present, and this site was determined not to be a wetland within the study area (Appendix C-1, Wetland Delineation Forms, Pit 6). In 2007, the drainage appeared very similar with shallow flowing water in the stream channel and similar vegetation cover, except Himalayan blackberry and Scot's broom had expanded into a disturbed utility corridor next to Runner Road, and covered the stream channel. Stream B1 flows into a long culvert that extends under both Runner and Escolar Roads and discharges onto the shoreline at Hood Canal.

Stream C (Figure 4) – Stream C is a small stream that originates in Wetland 4, is culverted under Runner Road, flows on the surface between Runner Road and Escolar Road, and is culverted again under Escolar Road before emptying onto the Hood Canal shoreline. A stormwater pipe that begins near the downstream end of the Stream C culvert extends to Escolar Road, although it is not clear where the stormwater pipe discharges (storm drain covers were observed and are indicated on Figure 4.

Wetland 1 (Figure 4) – Stream C flows into Wetland 1, which also receives water from a roadside drainage along the east side of Escolar. A culvert at Wetland 1 discharges flows into Hood Canal, and the roadside drainage also carries surface water to the north (toward Wetland 2). Wetland 1 supports a forested community dominated by red alder with a low cover of salmonberry in the shrub layer and an herbaceous layer dominated by colt's foot (*Petasites frigidus*) and horsetail. The roadside drainage along Escolar Road also supports emergent wetland vegetation. Soils had positive indicators for hydric conditions, and were saturated, although there was no indication of ponding outside the stream channel and roadside ditch.

The slope between Runner and Escolar Roads is densely vegetated with young alders, and the base of the slope (on Escolar Road) has several wetland seeps in addition to the roadside drainage that appeared to be fed by seeps and runoff (based on the presence of flowing surface

water). This slope area was investigated in 2007 to determine if it would meet the criteria for determination of wetlands. During the 2007 survey, pits 26 and 27 were dug in an area dominated by red alder, with an understory of salmonberry, stinging nettle, horsetail, and sword fern. The soils were very fine sand that appeared to be well-drained, and there were no positive indicators of wetland hydrology. The alder forest is on a gradual slope near Runner Road but becomes very steep near Escolar Road. The wetlands in this area are primarily associated with streams or with seeps at the base of the steep slope near Escolar Road, and there are no wetlands on the upper portions of the slope near Runner Road.

Stream D (Figure 4) – Stream D drains Wetland 30 on the east side of Runner Road. Stream D flows into a culvert on Escolar Road adjacent to Wetland 2 (described below) and empties into Hood Canal. Drainage emerging from Wetland 30 flows westerly through a maintained utility corridor in a steeply incised narrow channel. Vegetation bordering the channel is dominated by Himalayan blackberry, salmonberry, and Scot's broom. Himalayan blackberry forms an overstory above the channel within the utility line corridor. The channel is 1 to 2 feet wide with perennial flow that is augmented by hillslope seeps primarily on the south side of the wetland.

Wetland 3 – Wetland 3 is a forested wetland, about 0.2 acre, that originates from a seep emerging on the south bank of Stream D and drains into Stream D. The stream is deeply incised at this location, and the seep is within the banks of the stream channel. Soils in Wetland 3 were saturated and wetland vegetation was present in the forest understory. A pad and building were constructed upslope from this wetland (prior to the August 2007 survey) but there was no indication that construction impacted the wetland or Stream D (no indications of vegetation removal or soil erosion were observed).

Wetland 2 – Wetland 2 is a forested wetland, about 0.25 acre, on a slope adjacent to Escolar Road. The wetland is associated with a seep, and the east side of the wetland is bordered by a steep slope indicating past landslide activity. The drainage for this wetland is to the west toward Hood Canal. There are no distinct drainage channels in the wetland itself, but the water flows into roadside drainages on the west side of Escolar Road and eventually flows into a culvert for Stream D. The roadside drainages in this area also support emergent wetland plants, and there is a narrow channel with aquatic habitat, which is 6 to 12 inches deep with floating aquatic plants. Wetland 2 was surveyed in 2007 (Appendix C-1, Wetland Delineation Forms, Pit 25) and remapped in 2009 following additional delineation work.

Wetland 2 supports a forested wetland dominated by red alder with a shrub understory dominated by salmonberry and an herbaceous layer densely vegetated with colt's foot and horsetail. Big leaf maple is included in the tree layer on the adjacent upland slopes with sword fern in the understory. Non-native plants species are common, and include butterfly bush (*Budleya* sp.) in the forest and Himalayan blackberry along the road. Soils are saturated to the surface, although there is no indication of ponding.

Wetland 30 (Figure 4) – Wetland 30 (1.9 acres) is a forested wetland associated with Stream D that is located southeast of Runner Road where the road curves to the northeast. A defined stream channel is present only at the westernmost end of the wetland; otherwise the wetland is a depression characterized by saturated soils. The wetland narrows immediately upstream from a

culvert that conveys its outfall (Stream D) under Runner Road. Wetland 30 was delineated in March 2009 (Appendix C-1, Wetland Delineation Forms, Pits 30-1, 30-2, 30-3).

The tree canopy is dominated by red alder, western red cedar, and big leaf maple, and adjacent uplands are coniferous second-growth forest. Understory vegetation is dominated by salmonberry and devil's club in a dense shrub layer, and the herbaceous layer contains piggy-back plant, skunk cabbage, lady fern, and sword fern.

Wetland soil pits had redox concentrations in a depleted matrix or redox dark surface indicators**.** Hydrology indicators included saturation within a depth of 12 inches from the surface.

Wetland 12 (Figure 5) – Wetland 12 (1.8 acres) is located on the south side of Seawolf Road, between Runner and Flier Roads. The road bank on the south side of Seawolf Road forms the northern boundary of the wetland, and the southern boundary is also a steep slope. The wetland boundaries correspond to the topography at this location; the wetland is narrow at its eastern end and expanded on the western end before constricting again to form a channel that flows into a culvert at the intersection of Runner and Seawolf Roads. The culvert conducts water into a channel on the north side of Seawolf Road and eventually joins Stream E, which discharges into Hood Canal. Wetland 12 was delineated in November 2005 and revised in November 2008, with the 2008 boundaries slightly expanded on the south side of the wetland. It is not clear if Wetland 12 was originally part of a natural drainage, but it is likely that the road has contributed to the formation of the wetland at this site.

Wetland 12 is a forested scrub-shrub wetland with an overstory dominated by red alder and occasional western red cedar and big leaf maple. The shrub layer is dominated by salmonberry with sword fern, Devil's club, piggy-back plant, and skunk cabbage common in the herb layer. Soils were sandy and saturated to the surface with a top layer that was mucky with a high organic content and low chroma (Appendix C-1, Wetland Delineation Forms Pit 8, 112b, 113, 114, 115a). Western hemlock, salal, holly, and evergreen huckleberry are present outside the wetland boundaries.

Within the wetland, soils were sandy clay loam with the redox dark surface indicator. The main source of water in this wetland appears to be natural underground seeps. A swale at the southeastern end of the wetland was investigated in 2005 and 2008, and was dry and lacked any evidence of a channel, although it may periodically direct some road runoff into Wetland 12. The culvert is present on the northeast side of the wetland, but there was no indication that it contributes significant flows into the wetland (i.e., no channels or other erosion below the culvert). However, Wetland 12 does support slow moving surface water and surface ponding, likely from underground seeps, with a main flow channel about 1 to 3 feet wide.

Wetlands 8, 9, 17 and Stream F (Figure 6) – Wetland 17 is a narrow, forested wetland, less than 0.2 acre, associated with a wetland seep that empties into a narrow drainage channel. The drainage is within a mixed coniferous/deciduous forest dominated by red alder, big leaf maple, and Douglas fir. Near the wetland area, shrubs are present but sparse in the understory and include salmonberry and Indian plum (*Oemleria cerasiformis*). The herbaceous layer is dominated by water parsley (*Oenanthe sarmentosa*) with lady fern, stinging nettle, and youth-on-age common. Other locally common plant species include horsetail and devil's club. Salal,

sword fern, and evergreen huckleberry are also present in the forest. West of the wetland area, the topography at this part of the base is a steep slope and the drainage channel becomes a small waterfall that empties onto the shore and into Hood Canal. At the time of the survey, soils were saturated and water was flowing into the drainage (Appendix C-1, Wetland Delineation Forms, Pit 20).

Wetland 18 (Figure 6) is a forested wetland seep, about 0.1 acre in size, that may have formed as a result of slide on the east side. There are no indications of drainage channels around the wetland, either inflow or outflow, and all of the water appears to come from groundwater.

Wetland 18 is dominated by herbaceous plants including horsetail, veronica (*Veronica anagallis-arvensis*), youth-on-age, and coltsfoot. Lady fern and stinging nettle were also common. Although not rooted in the wetland area, Indian plum, red alder, and big leaf maple in the shrub and tree overstory shade all of the wetland area. At the time of the survey, the soils were saturated with small areas of shallow ponding (Appendix C-1, Wetland Delineation Forms, Pit 19).

Stream I and Wetland 14 (Figures 6 and 7) – Stream I and associated Wetland 14 (0.66 acre) end just east of a dirt parking lot near the EHW. There is no indication of a surface connection between Stream I and Stream G, and no drainage ditches were observed in the vicinity of the parking lot that could potentially connect the two drainages. Upstream from Wetland 14, Stream I is very shallow with no distinct channel or indications of an ordinary high water mark. The stream is crossed by a disturbed utility corridor, which supports non-native grasses as the dominant plants, as well as scattered patches of rushes. Stream I has no apparent surface flow downstream from Wetland 14; however, the stream may have subsurface connection to either Stream G or the manmade detention pond that drains into Hood Canal. Thus, they may be considered jurisdictional by USACE. The wetland was delineated in November 2005 and May 2008 (Appendix C-1, Wetland Delineation Forms, Pits 14, 15, 110, 111, 112b).

Red alder is the dominant tree within the stream channel on both sides of the utility corridor with emergent wetland vegetation in the understory and in the cleared utility corridor. Himalayan blackberry is present on both sides of the utility corridor through the wetland. Soils in Wetland 14 and Stream I are silty sand with redox dark surface and stripped matrix indicators. A high water table was present within the wetland.

Stream G and Wetland 6/Hunter's Marsh (Figure 7) – Stream G is one of the three major drainages into Hood Canal at NAVBASE Kitsap Bangor. East of Archerfish Road, Stream G flows northerly and turns westerly in the vicinity of a power line corridor located east of the study area. The stream then flows westerly at a low gradient through the study area, passing through a weir and culvert under Tang Road and into Hood Canal. Due to the constriction by these structures, Stream G has created a broad depositional floodplain up to 150 feet wide upstream within the study area. Stream G flows through this area in braided channels and supports Wetland 6/Hunter's Marsh, a depressional wetland containing emergent, broad-leaved deciduous forested and scrub-shrub wetland vegetation classes. The mapped portion of the wetland is greater than 6 acres, but the wetland appears to extend farther upstream from the study area.

Wetland boundaries were initially delineated in 2005 (Appendix C-1, Wetland Delineation Forms, Pits 12 and 13) and were re-delineated in May 2008 (Appendix C-1, Wetland Delineation Forms, Pits 102 to 109). In addition to the influence of flows in Stream G, the wetland is supported by numerous seeps along the steep hillslopes above the floodplain. Hillslope characteristics change in the vicinity of the power line corridor. Upstream from the power line, the seep areas are more abundant and higher on the north hillslope, whereas the seep areas were higher and more numerous on the south hillslope downstream from the power line corridor. Hillslopes above the stream and wetland are very unstable, as evidenced by fallen trees, sloughed banks, and seeps.

Distinct drainage patterns and sediment patterns were present within the Stream G/Hunter's Marsh floodplain. The stream channel within the ordinary high water mark is fairly wide (up to 150 feet), and within this, the main channel of the stream is about 5 feet wide with several smaller side channels (1 to 2 feet wide). During the November 2005 survey, most flow was in a channel about 2 feet wide and 2 inches deep. The main channel had similar characteristics in the May 2008 survey but was in a different location. Recent sand and gravel deposits in the floodplain indicated the dynamic nature of stream channels and ponding in this system. Following severe storm events in December 2007, the open-water portion of Hunter's Marsh adjacent to Tang Road was filled with sediment. Wetland vegetation was observed re-growing in many areas, although there was little to no open water except for the shallow flowing Stream G channel.

The forest overstory in Wetland 6 is dominated by red alder. The shrub layer is dominated by salmonberry with lady fern, piggy-back plant, stinging nettle, and horsetail common in the understory. Devil's club and skunk cabbage are also common in the herb layer, sometimes occurring in dense patches on the bottom of the floodplain or in the wetland seeps on the hillslopes.

Soils in the wetland generally have a clay-loam upper layer above a sandy layer with organic streaking, reduced matrix and/or oxidized rhizospheres, although in some soil pits (Appendix C-1, Wetland Delineation Forms, Pit 108) recent sand deposits had covered the clay-loam layer. Surface water ponding, high water table, and saturated soils were observed within the wetland.

Wetland 23 (Figure 7) is a small (less than 0.05 acre), herbaceous wetland within the utility corridor that appears to be isolated from the wetland complex described above. The wetland supports emergent marsh vegetation dominated by soft rush, horsetail, and sedges and has saturated soils and positive indicators for hydric soils (Appendix C-1, Wetland Delineation Forms, Pit 17). The wetland is in a slight depression adjacent to the disturbed utility corridor and may have developed as a result of the utility corridor. It is expected the wetland receives runoff from the corridor and adjacent surfaces, but it does not appear to be connected to any of the intermittent drainages in the area and is therefore considered an isolated wetland feature.

Wetland 26 (Figure 7) is a forested wetland dominated by red alder that originates east of Flier Road, becomes a narrow drainage that crosses the road, and continues as a stream that supports a small area of wetlands on the west side of Flier Road. Near Flier Road, salmonberry is dominant in the shrub layer and lady fern and youth-on-age in the herbaceous layer. Johnson Controls (1992) identified wetlands on the east and west side of Flier Road but depicted the stream as

intermittent with no associated wetlands. However, during the 2007 surveys, saturated soils and surface water were observed within the stream channel at the crossing of Flier Road, and it was determined that the stream at this location also supports wetlands (Appendix C-1, Wetland Delineation Forms, Pit 22). However, the culvert across Flier Road appears to be completely blocked except for a small amount of water seeping through to the part of the wetland located on the west side of Flier Road. The soils also have indications of sediment deposits, which may be a result of the blocked culvert. It is likely the blockage has contributed to the wetlands within the drainage at the Flier Road crossing. On the west side of Flier Road, the wetland flows into an intermittent drainage that eventually connects to Stream G, which flows into Hunter's Marsh.

Wetland 27 (Figure 7) is associated with both a seep and a drainage that crosses Flier Road at the Intersection of Darter Road. The roadside drainages at this location support emergent wetland plant species. There is no clear indication of the source of the water for the roadside drainage (the south side of Darter Road); therefore, it is concluded that this also originates from a groundwater seep. After the water flows through the culvert at Darter/Flier Road, the stream empties into a forested wetland on the south side of Flier Road. Wetland 27 supports very saturated, mucky soils, and the level of saturation indicates the water source is groundwater in addition to the drainage as there does not appear to be sufficient flow from the drainage to support the wetland. Wetland soil pits were not dug and a wetland delineation form was not filled out since wetland soils, vegetation, and hydrology were apparent (WDOE Wetland Rating and Functional Assessment forms were filled out). Not all of the wetland was mapped, although the survey continued downstream for a minimum of 300 feet, because the Global Positioning System (GPS) unit was affected by the canopy (or lack of satellites) and it was difficult to determine the extent of the wetland and the main stream channel on the aerial photos. The wetland continued more than 300 feet from the roadside and appeared to continue for some distance away from the study area. Based on the Johnson Controls (1992) report, this wetland flows into a small stream that eventually connects to Stream G/Hunter's Marsh. Figure 7 depicts the boundaries of the wetland that were confirmed during the field survey and notes the wetland continues downstream.

Wetland 24a, 24b, and Stream H – Wetlands 24a and 24b are on the north and south side of a paved building pad off of Flier Road. Wetland 24a is a large wetland seep, about 4 acres in size that extends from the south side of the building pad and to the east. The wetland supports both forested and herbaceous wetland plant communities. In the vicinity of the building, the wetland supports emergent wetland plants dominated by soft rush, creeping buttercup (*Ranunculus repens* var. *repens*), tall manna grass (*Glyceria borealis elata*), and Cooley's hedge nettle (*Stachys cooleyae*). Red alder dominates the forested part of the wetland and the adjacent forest. The wetland receives water primarily from runoff from the building and is also the septic drain field for the building. Groundwater seeps also contribute water to the wetland.

A small, shallow drainage (Stream H, about 1 to 2 feet wide and 6 inches deep) flows to the west from Wetland 24a), through the cleared utility corridor, and into the adjacent forest where the channel disappears. Water was observed in the channel in surveys in February 2009. Wetland 24a and Stream H are adjacent to Stream G, but these features do not appear have a surface water connection to Stream G. However, the soils in the area are very sandy and an underground connection to Stream G is likely; thus, the stream and wetland would be considered jurisdictional by USACE.

Wetland 24b is a detention swale less than 0.2 acre, located between a building and parking lot and Flier Road. The wetland supports emergent marsh vegetation including spike rush (*Eleocharis palustris*) and sedges, and has saturated soils and seasonal shallow ponding. This wetland receives runoff from the paved areas around the building and Flier Road, but there is no outlet and it is expected the water remains in this wetland where it eventually leaches into the ground. Water may overflow the wetland during extreme rain events, but otherwise does not appear to be connected to any drainage or stream in the area and is therefore isolated. However, recent data indicate there may be a culvert connecting the wetland to Stream J (discussed below).

Stream J and Wetland 16 (Figure 7) – Stream J and surrounding Wetland 16 (0.6 acre) are parallel to the south edge of Flier Road. Water reaches these features from culverts under an adjacent building and parking lot on the south side of Flier Road at the intersection with Amberjack Avenue, and from Wetland 24b. Some input may originate in Wetland 24a through a connecting grassy swale adjacent to the fence around the adjacent parking lot. A culvert under Flier Road conveys additional roadside runoff from the north side to the south side of the road into Wetland 16 and Stream J. Stream J flows into a culvert under Tang Road just north of the EHW, and discharges into Hood Canal. Water was present in the downstream portion of the drainage at the time of the November 2005 survey, but no wetland plants were observed in the drainage.

Wetland 16 was delineated in May 2008 (Appendix C-1, Wetland Delineation Forms, Pits 16, 17, 115b and 116). Wetland 16 was cleared in 2008 as part of a separate project and is within an area that will be maintained as cleared (mowed). In the future it is likely that the wetland and Stream J will support herbaceous wetland vegetation (similar to Wetland 22b).

Prior to clearing in the summer of 2008, Wetland 16 was forested with young red alder and an understory of willow, salmonberry, and herbaceous wetland plants. Soils in the area are sandy clay loam, with the redox dark surface indicator. Soils were saturated, and there were some areas with shallow surface water.

Wetland 22a (Figure 7) is a large wetland complex (2.3 acres) located northeast of the intersection of Amberjack Avenue and Flier Road. The wetland was delineated in June/July 2007 (Appendix C-1, Pits 2007-10, 2007-11, 2007-12, 2007-13, 2007-14, and 2007-15). Installation and maintenance of a roadside fence and a utility corridor have altered the wetlands in this area, but the wetlands appear to be connected by intermittent drainage channels. Therefore, the entire wetland complex is mapped and rated as one resource area.

The general direction of flow is from east to west toward Amberjack Avenue where it flows through a culvert into Wetland 22b (Stream N). A roadside drainage ditch receives some of the flow and supports large patches of willows and cattails within and outside of the ditch along Amberjack Avenue. The open areas of the ditch support herbaceous wetland plants including veronica and creeping buttercup. There are also willows and herbaceous wetlands within the ditches along Flier Road. The roadside vegetation, including portions of the ditch, is periodically mowed.

In the immediate vicinity of the fence and utility corridor, the wetland includes scrub-shrub plant communities dominated by willows associated with drainage channels and open herbaceous wetland plant communities dominated by soft rush and cattails. The largest portion of the wetland, farther from the influence of the road and utility corridor, is a pristine forested wetland dominated by western red cedar. The canopy is dense and the understory sparse in most of the area. The stand includes very large live trees, snags, and downed wood. Soils were saturated and some shallow ponded areas with flowing water were observed during field surveys in 2007 and 2008.

Wetland 22b is located west of Amberjack Avenue and is associated with perennial Stream N, which flows westerly from Wetland 22a, passing through culverts under Amberjack Avenue and Tang Road near the Hood Canal shoreline. Wetland 22b is approximately 1.3 acre. The wetted area is narrow at the eastern end near Amberjack Avenue and widens going westerly. Flow from the Tang Road culvert reaches Hood Canal after dropping approximately 30 feet, preventing fish passage between Hood Canal and the stream.

The upstream half of Wetland 22b supports a natural conifer forest overstory and shrub/herbaceous understory. The dominant canopy species in the wetland include western red cedar and red alder; dominant understory species include salmonberry and creeping buttercup. Small patches of slough sedge, lady fern, and mannagrass occur at wider portions of the wetland. The downstream half of the wetland is in the area adjacent to Flier Road that was cleared of all understory and most trees during the summer of 2008. The site was hydroseeded, although wetland indicator plants were identified from sprouts on the site during field surveys in February 2009, including soft rush (*Juncus effusus*). Hydrology and soils indicators remain in this portion of the wetland. Some red alders and western red cedars remain in the canopy of the wetland area, but the understory will be maintained in a low grassland/herbaceous condition. Wetland boundaries were flagged by NAVBASE Kitsap Bangor environmental staff prior to the missile haul route clearing project. Two wetland delineation pits were examined in the forested portion of the wetland by SAIC/Otak staff and five pits were examined in the unvegetated western portion (Appendix C-1, Wetland Delineation Forms, Pits 22b-100, 22b-101, 22b-102, 22b-103, and 22b-104) to confirm wetland boundaries.

Wetland 21 (Figure 5) is a very small isolated wetland, less than 0.05 acre, that supports emergent wetland plant species, including soft rush, tall manna grass, sedges, and Cooley's hedge nettle, and has positive indications of wetland soils (Appendix C-1, Wetland Delineation Forms, Pit 9). The wetland is within an open area in mixed coniferous/deciduous forest with red alder and red cedar dominant in the tree canopy. Although there were no indications of wetland hydrology at the time of the survey, the wetland is within a topographical low spot, supports perennial wetland plant species, and was determined to be a wetland. However, the wetland does not appear to be connected to any stream of drainages and is therefore considered isolated.

Wetland 19 (Figure 5) is primarily a natural drainage that appears to have been altered by Amberjack Avenue and Tang Road. Currently, runoff from Amberjack Avenue flows into a ditch and is connected to a small, natural drainage that is culverted under Tang Road before widening into a larger wetland area. Wetland 19 is 1.1 acres, which includes the wetlands on both sides of Tang Road. At the northern end of this wetland, a gravel berm impedes flow to the Hood Canal shoreline and likely has contributed to the formation of the wetland. The southern

part of the drainage is a narrow, forested wetland adjacent to an intermittent drainage. The drainage was dry at the time of the survey although there were positive indicators for wetland vegetation and soils in the channel (Appendix C-1, Wetland Delineation Forms, Pits 6 and 7). The vegetation is dominated by red alder with western red cedar in the tree layer and salmonberry and trailing blackberry common in the shrub layer. The herbaceous layer is more developed in the upper, drier part of the drainage, at higher elevation and closer to Amberjack Avenue (Appendix C-1, Wetland Delineation Forms, Pit 7), which supports horsetail and sedges with non-native grasses. The lower portion of the drainage (Appendix C-1, Wetland Delineation Forms, Pit 6), near the culvert under Tang Road, has sparse herbaceous understory although a few individuals of skunk cabbage, an obligate wetland plant species, are present.

The northern part of the wetland is wider with a fairly flat bottom with permanently saturated soils and some shallow ponded areas (Appendix C-1, Wetland Delineation Forms, Pits 5a and b). The vegetation is emergent marsh with an overstory of shrubs and trees only on the edges. The dominant plants within the emergent marsh habitat vary with skunk cabbage, sedges, and horsetail dominant at the upstream portion, at the culvert under Tang Road, which likely has the most freshwater influence. This grades into a dense stand of cattails and then a stand of hardstem bulrush (*Scirpus acutus*) closer to the shoreline. Veronica and creeping buttercup (*Ranunculus repens*) are common along the edges of the wetland in the transition between the forested and herbaceous plant communities. At the time of the survey, there was no distinct flow channel in this portion of the wetland and it is likely that water flows into this part and remains for an extended period of time. There also may be some influx over the berm in extreme high tide events.

Wetland 25 and Cattail Lake are associated with a perennial stream that originates in a large forested wetland area east of Flier Road (Figure 8), then becomes a stream that flows north through a culvert across Darter Road and becomes Cattail Lake at its north end (Figure 4). Cattail Lake was formed as a result of Amberjack Avenue and is managed for recreation (fishing). Cattail Lake supports open water that is surrounded by mixed deciduous/coniferous forest. The banks of the lake are fairly steep and there is little to no lance fringe wetland habitat. Upstream, where the open water becomes shallow, there is dense emergent marsh vegetation within the stream with forested wetlands on the outer edges. As the stream becomes narrower, it supports forested wetland vegetation. Within the study area, Darter Road crosses the stream through a fairly large culvert. The study area is designated as Wetland 25, although for the purpose of rating the wetland, the system is considered one large wetland resource area. On both sides of Darter Road, small intermittent streams flow into Wetland 25 (Figure 7). On the north side of the road, the small stream supports a wetland scrub community dominated by willows. On the south side of the road, there is a manmade pond with open water that appears to be only intermittently connected to a drainage that is dry, then becomes wet with shallow flowing water, and supports a large wetland area as it approaches the stream channel (Figure 7). Most of Wetland 25 supports a mixed forested wetland plant community with red alder dominant and western red cedar present in the overstory; salmonberry common in the shrub layer; and skunk cabbage, horsetail, youth-on-age, and lady fern common in the herbaceous layer. During the 2007 survey, soils were saturated to the surface and had positive indicators for hydric soils (Appendix C-1, Wetland Delineation Forms, Pits 23 and 24).

Wetland 20 (Figure 4) is a small wetland, less than 0.1 acre, within an intermittent stream channel northwest of Cattail Lake. The stream and wetland have been affected by a road at this location, which is indicated by the presence of road base material both in the wetland and the adjoining slope. It is a forested wetland community dominated by red alder and western red cedar. The understory includes a mix of upland and wetland species including sedges, sword fern, trailing blackberry, and red fescue, a non-native facultative wetland grass species. There are positive indicators of both wetland hydrology and soils at this location (Pit 1). The culvert for the stream channel is slightly higher than the base of the drainage and it is likely that water collects in this area for sufficient time to support the wetland vegetation.

Other wetland areas – In addition to the wetland resources described above, several other wetland areas associated with drainage ditches along roadsides were identified during field surveys in the study area. These wetlands were mapped as encountered during surveys but are not described in detail because they are not affected by project activities. One area, near the intersection of Scorpion and Silversides Road (Figure 3), was investigated and found to support a very small area of wetlands at the culverts in the roadside ditches (Pit 28). Wetland plant species are present in this area but are dominant only near the culvert. The remaining ditch supports a mix of upland grasses and non-native species including St. John's wort, Himalayan blackberry, and Scot's broom. At the time of the 2007 survey, there were no positive indicators for wetland hydrology, but the area does have low topography that may pool water at the culverts. Positive indicators for wetland soils were found, so the area was mapped as a wetland although it is very small (less than 0.01 acre).

Non-wetland areas – Several wetland delineation pits were investigated and determined not to meet the criteria for wetland determination. Pits 2 and 3 (Figure 4) are within a roadside drainage that empties into Cattail Lake. These areas support some wetland plant species but did not have positive indicators for hydric soils or wetland hydrology other than being a drainage ditch.

Pit 4 (Figure 5) is in an area dominated by dune grass that was previously identified as wetland by Johnson Controls (1992). According to Johnson Controls (1992), the area was dominated by pickleweed (*Salicornia virginica*). Currently, the area is dominated by dune grass with pickleweed present but uncommon. Soil investigations in 2007 showed several layers of sediment indicating this area may have filled in over the past few years, which has altered the hydrology and vegetation.

Pit 8 (Figure 5) is in a small patch of wetland vegetation in open forest along the east side of Amberjack Avenue, within an area that has been harvested for trees in the past (the canopy is lacking and there are many remnant cut stumps). The patch of wetland vegetation is dominated by soft rush and horsetail. During the 2007 survey, the soils were slightly moist, but not saturated and there were no positive indicators of hydric soils. There are a few other similar, smaller patches of horsetail and soft rush in this area, but none have any indication of wetland hydrology, except Wetland 21 as discussed previously.

Pit 16 (Figure 6) is a small patch of wetland vegetation adjacent to the utility corridor east of Flier Road, similar to Wetland 23. However, at the time of the 2007 survey, this area had no positive indicators for wetland hydrology or wetland soils and was determined not to meet the criteria for wetland determination.

Pit 21 (Figure 7) is within a disturbed area south of Flier Road. This area appears to be an old road, and wetland vegetation is present in the area. During the 2007 survey, a wetland delineation pit was dug at a low spot where wetland vegetation was dominant. However, there were no positive indicators for wetland hydrology or wetland soils.

Pits 26 and 27 (Figure 8) are in an area of alder forest between Runner and Escolar Road that supports several wetland seeps. During the 2007 survey, two wetland delineation soil pits were dug in an area dominated by red alder, with an understory of salmonberry, stinging nettle, horsetail, and swordfern. The soils were very fine sand that appeared to be well drained and there were no positive indictors of wetland hydrology. The alder forest is on a slope that is gradual near Runner Road but becomes very steep near Escolar Road. The wetlands in this area are primarily associated with streams or with seeps at the base of the steep slope, near Escolar Road, and there do not appear to be wetlands on the upper portions of the slope, near Runner Road.

4.0 DISCUSSION

4.1 Recommended Buffers for Wetlands

Because wetlands are considered important biological resources requiring regulatory permitting and oversight, the USACE Seattle District, U.S. Environmental Protection Agency (USEPA), Region 10, and WDOE developed a guidance document to outline agency recommendations, requirements, and expectations for wetland protection and mitigation (WDOE et al. 2006). This document provides recommended wetland buffers to protect different classifications of wetlands, based on the WDOE Wetland Rating System, from certain types of activities. The guidance document recommends incorporating wetland buffers (described as "undisturbed, vegetated areas adjacent to critical areas such as wetlands") to protect the different classifications of wetlands, based on the WDOE Wetland Rating System, from certain types of activities. Categories of impact are determined by land use definition based on common zoning categories and include the following:

- High Category includes commercial, urban, industrial, institutional, retail sales, residential with more than 1 unit/acre, high intensity agriculture (such as dairies), or high intensity recreation (such as golf courses and ball fields).

- Moderate Category includes residential with 1 unit/acre or less, moderate-intensity open space (such as parks), and moderate-intensity agriculture (such as orchards and hay fields).

- Low Category includes forestry and low-intensity open space such as passive recreation and natural resources preservation.

The High Category for Land Use, which includes Industrial and Institutional Use (see WDOE et al. [2006]), is used to determine the maximum buffer areas. Table 2 provides the width of buffers recommended to protect Category II, III, and IV wetlands, which occur in the study area (Category I wetlands are not included because none occur in the study area). Although not all of the wetlands within the study area would be affected by the currently proposed project activities, Table 3 lists all of the wetlands, their wetland classification, and their associated recommended buffer width. Figure 10 (Appendix B) depicts the wetlands and buffers in the study area and the currently proposed project sites. Actual buffer areas may be less depending on the proposed project activity. Tree harvest in areas adjacent to wetlands would be considered a low category for change in land use (WDOE et al. 2006).

Table 3. Recommended Buffers for Wetlands in Western Washington

Wetland Category	Wetland Characteristics	Buffer Widths by Impact of Proposed Land Use	Other Measures Recommended for Protection
IV - For wetlands scoring less than 30 points for all functions using the rating system	Score for all three basic functions less than 30 points	Low – 25 feet Moderate – 40 feet High – 50 feet	No recommendations at this time
III - For wetlands scoring 30 – 50 points for all functions using the rating system	Moderate level of function for habitat (score for habitat 20–28 points)	Low – 75 feet Moderate – 110 feet High – 150 feet	No recommendations at this time
	Not meeting above characteristic	Low – 40 feet Moderate – 60 feet High – 80 feet	No recommendations at this time
II - For wetlands scoring 51 – 69 points for all functions using the rating system	High level of function for habitat (score for habitat 29–36 points)	Low – 150 feet Moderate – 225 feet High – 300 feet	Maintain connections to other habitat areas.
	Moderate level of function for habitat (score for habitat 20–28 points)	Low – 75 feet Moderate – 110 feet High – 150 feet	No recommendations at this time
	Not meeting above characteristic	Low – 50 feet Moderate – 75 feet High – 100 feet	No recommendations at this time

Source: WDOE et al. 2006

Table 4. Buffers for Wetlands at NAVBASE Kitsap Bangor

Wetland Name	WDOE Rating	Buffer Width
Devil's Hole	III***	80 feet
Wetland 1	IV	50 feet
Wetland 2	IV	50 feet
Wetland 3	IV	50 feet
Wetland 4	IV	50 feet
Wetland 5	IV	50 feet
Wetland 6/Hunter's Marsh	II*	300 feet
Wetland 7	IV	50 feet
Wetland 8	IV	50 feet
Wetland 9	III**	150 feet
Wetland 10	IV	50 feet
Wetland 11	IV	50 feet
Wetland 12	III***	80 feet
Wetland 13	III**	150 feet
Wetland 14	IV	50 feet
Wetland 15	IV	50 feet
Wetland 16	IV	50 feet
Wetland 17	IV	50 feet
Wetland 18	IV	50 feet
Wetland 19	III***	80 feet
Wetland 20	IV	50 feet
Wetland 21	IV	50 feet
Wetland 22	III**	150 feet
Wetland 23	IV	50 feet
Wetland 24a and b	IV	50 feet
Wetland 25/ Cattail Lake	II*	300 feet
Wetland 26	IV	50 feet
Wetland 27	IV	50 feet
Wetland 28	IV	50 feet
Wetland 30	III	80 feet

Source: WDOE et al. 2006

*Wetlands have high score for habitat functions.

**Wetlands have moderate score for habitat functions.

***Wetlands have low score for habitat functions.

5.0 REFERENCES

Brown, L. 2008. Naval Base Kitsap – Bangor, Final wetland delineation report. Prepared by Science Applications International Corporation, Inc., Bothell, WA. Prepared for BAE Systems Applied Technologies, Inc., Rockville, MD.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deepwater habitats of the United States. Government Printing Office, Washington, D.C.

Hruby. 2004. Washington State wetland rating system for western Washington—Revised. Washington State Department of Ecology Publication # 04-06-025. http://www.ecy.wa.gov/pubs/0406025.pdf.

Johnson Controls. 1992. SUBASE Bangor wetlands report and maps. August 1992.

Leicht, G. 2008. Greg Leicht, Naval Base Kitsap Environmental Director, Bremerton, WA. July 18, 2008. Personal communication with Ted Turk, Program Manager, Science Applications International Corporation, Bothell, WA, re: bald eagle nest discovered at NAVBASE Kitsap Bangor.

Munsell Color. 1992 (revised edition). Munsell soil color charts. Macbeth, Newburgh, New York.

Pentec. 2003. Marine and terrestrial resources security force facility and enclave fencing at Naval Submarine Base Bangor, Washington. Prepared for SRI International. Prepared by Pentec Environmental. November 18, 2003.

SAIC (Science Applications International Corporation). 2006. Naval Base Kitsap at Bangor, Waterfront Security Enclave wetland delineation report, Final. Prepared by Science Applications International Corporation, Bothell, WA. Prepared for BAE Systems Applied Technologies, Inc. January 2006.

SAIC. 2007. Naval Base Kitsap at Bangor, Waterfront Security Enclave supplemental wetland delineation report, Draft. Prepared by Science Applications International Corporation, Bothell, WA. Prepared for BAE Systems Applied Technologies, Inc. July 2007.

SAIC. 2009. NAVBASE Kitsap Bangor Waterfront Security Enclave Project, Final Revised Wetland Delineation Report. Prepared by Science Applications International Corporation, Bothell, WA. Prepared for BAE Systems Applied Technologies, Inc. March 5, 2009.

USACE (U.S. Army Corps of Engineers). 1986. Regulatory Programs of the Corps of Engineers; Final Rule. Federal Register 33 CFR Parts 320-330.

USACE. 1987. Corps of Engineers wetlands delineation manual. Technical Report Y-87-1, U.S. Army Corps of Engineers Waterways Experiment Station, Vicksburg, MS. http://www.wes.army.mil/el/wetlands/pdfs/wlman87.pdf

USACE. 2008. Interim Regional Supplement to the Corps of Engineers Wetlands Delineation Manual: Western Mountains, Valleys and Coast Region. Report Number: ERDC/EL TR-08-13. Vicksburg, MS. http://www.usace.army.mil/CECW/Documents/cecwo/reg/west_mt_intersupp.pdf

USFWS (U.S. Fish and Wildlife Service). 1988. National list of plant species that occur in wetlands. U.S. Department of Commerce, National Technical Information Service. PB89-128748.

USFWS. 2007. National wetlands inventory. http://www.fws.gov/nwi/

Navy (U.S. Navy). 2001. Integrated natural resources management plan. Naval Submarine Base Bangor, Silverdale, WA. March 2001.

WDFW (Washington Department of Fish and Wildlife). 2007. Washington State Status Report for the Bald Eagle. Washington Department of Fish and Wildlife, Olympia, WA. 86 + viii pp.

WDOE (Washington State Department of Ecology). 1997. Washington State wetland identification and delineation manual. Publication #96-94. WDOE, Olympia, WA. http://www.ecy.wa.gov/pubs/9694.pdf

WDOE, USACE Seattle District, and USEPA (U.S. Environmental Protection Agency) Region 10. 2006. Wetland mitigation in Washington State – Part 1: Agency policies and guidance (Version 1). Washington State Department of Ecology Publication #06-06-011a. Olympia, WA. March 2006.

WSDA (Washington State Department of Agriculture). 2007. Washington State Department of Agriculture Noxious Weed List. http://www.nwcb.wa.gov/Brochures&bulletins/statelist2007.web.pdf

WSDOT (Washington State Department of Transportation). 2000. Wetland functions characterization tool for linear projects. Washington State Department of Transportation, Environmental Affairs Office, Olympia, WA. http://www.wsdot.wa.gov/environment/biology/docs/bpjtool.pdf