Naval Facilities Engineering Command Northwest

Final

Biological Survey Work Plan Human Health and Ecological Risk Assessment, Keyport Operable Unit 1

NAVAL BASE KITSAP, KITSAP COUNTY, WA

May 19, 2020

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NAVAL BASE KITSAP, KITSAP COUNTY, WA

May 19, 2020

Prepared for NAVFAC Northwest by
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ACRONYMS AND ABBREVIATIONS

AECOM	AECOM Technical Services, Inc.
BSWP	biological survey work plan
Ecology	Washington Department of Ecology
EIM	Environmental Information Management
ERA	ecological risk assessment
GIS	geographic information system
g	gram
GPS	geographic positioning system
HHRA	human health risk assessment
ID	identification
NBK	Naval Base Kitsap
OU	Operable Unit
QAPP	quality assurance project plan
WDFW	Washington Department of Fish and Wildlife
WNDR	Washington Department of Natural Resources

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1. INTRODUCTION

This document presents the biological survey work plan (BSWP) for the Naval Base Kitsap (NBK) Keyport Operable Unit 1 (OU 1) Biological Survey, located in Kitsap County, Washington (Figure 1 and Figure 2). The NBK Keyport OU 1 biological survey will support development of the site-specific human health risk assessment and ecological risk assessment (HHRA/ERA) for NBK Keyport OU 1. The biological survey represents one of the tasks that will be completed prior to the site-specific HHRA/ERA for NBK Keyport OU 1. The goal of the biological survey is to determine the presence and relative abundance of biota (aquatic and upland) at the site to allow future selection of indicator species for the HHRA/ERA.[1] The biological survey objectives were defined as the following: To conduct pedestrian surveys and visual observation at NBK Keyport OU 1 and 2 to 3 potential reference sites. Surveys will identify the types of habitats and aquatic and upland biota, and map concentrations of individuals as time allows. Targeted information will be collected on the abundance of each biota, and availability of various plant parts to allow identification of viable indicator species to evaluate the impacts of various contaminated media on specific receptor groups at the site.[1]

More specifically, as described in this BSWP, the biological survey will collect information on the presence, relative abundance, percent cover, general condition/health, and spatial distribution of plant and animal species in the NBK Keyport OU 1 Study Area. The biological survey will be focused on those species which appear to be present in high enough abundance to be suitable for sampling at a later date. The biological survey will also be used to refine the list of potential indicator species for risk evaluation, to identify the preferred season(s) for indicator species sampling and to select reference site(s) that support the same indicator species and habitat conditions as the site. A limited number of tissue samples will also be collected during the biological survey to estimate the mass needed for lab analysis to be performed as part of the HHRA/ERA sampling program.

The biological survey field work will occur in May, June, and/or July 2020 and will consist of a reconnaissance level survey at Keyport OU 1, Haley State Park and up to two additional reference sites if needed. At Keyport OU 1, the biological survey will include the unpaved upland areas of the site and adjacent marsh, stream and tidelands. Data collected during the biological survey will be used to develop a quality assurance project plan (QAPP) for the sampling necessary to complete the site-specific HHRA/ERA.

This BSWP describes the reference site screening and selection process, background information on the potential reference sites, the timing of the biological survey, and the methods that will be used to collect biological information during the biological survey field work.

[1] As agreed during the February 4, 2020 Project Team Meeting.

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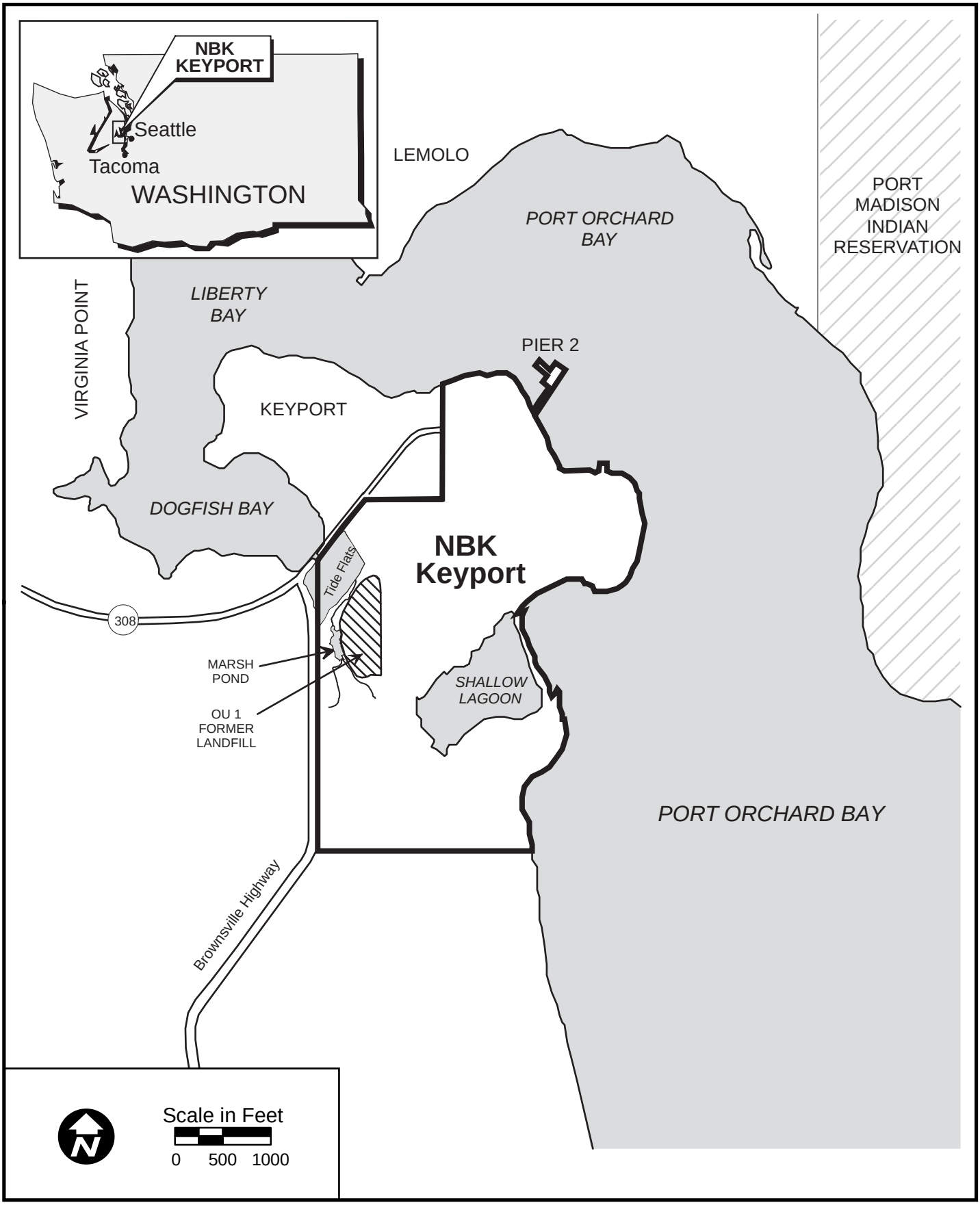

U.S. NAVY	**Figure 1** **NBK Keyport Vicinity Map**	CTO N4425519F4180 Biological Survey Work Plan

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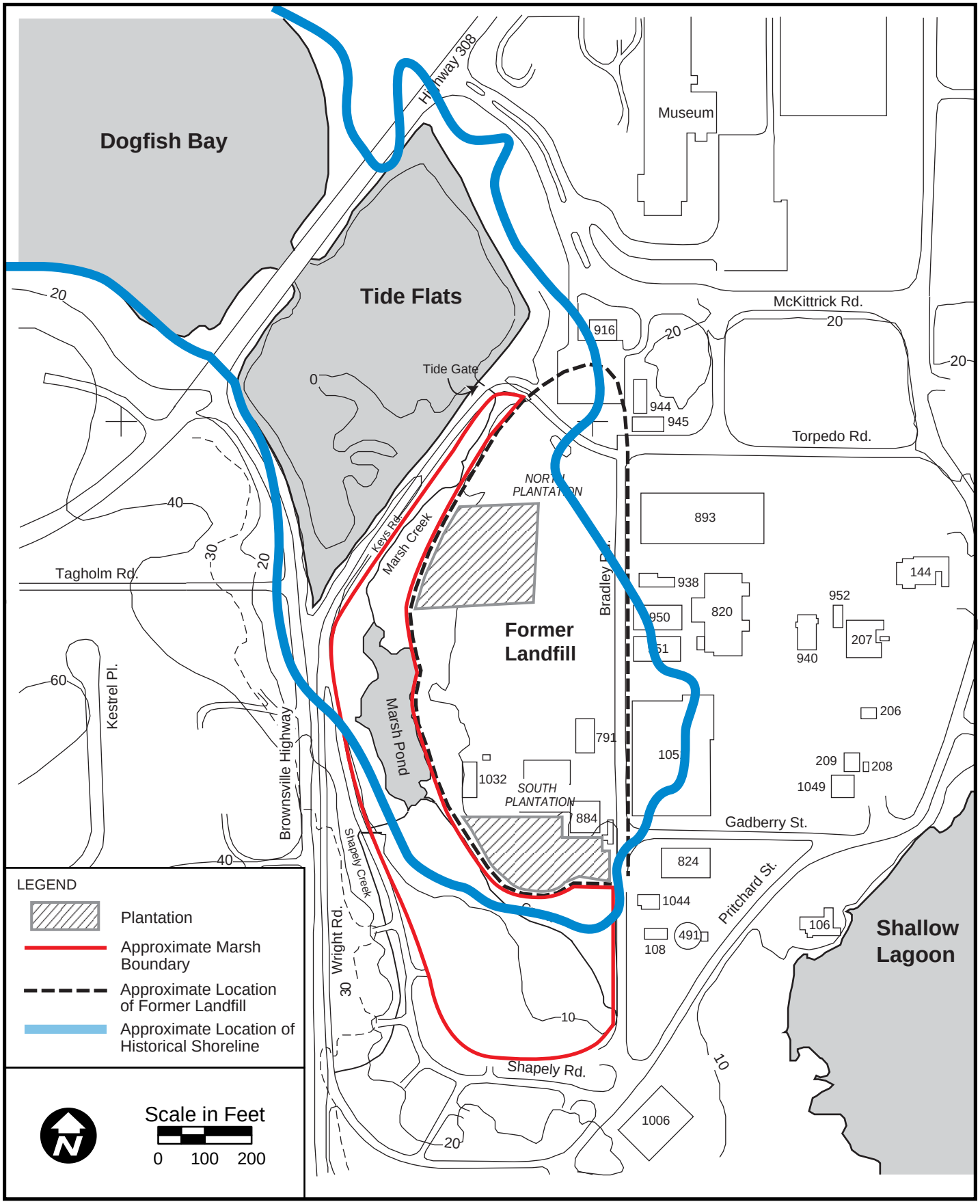

U.S. NAVY

Figure 2
Operable Unit 1

CTO N4425519F4180
Biological Survey
Work Plan

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2. BIOLOGICAL SURVEY SCOPE

This section describes the biological survey tasks, schedule, rationale, decision logic/criteria, and field data collection procedures.

2.1 TASKS

The biological survey tasks include the following office and field data collection activities.

Office-Based Tasks

- Screen and select reference site(s) for biological survey.
- Perform desktop mapping of potential reference sites.
- Perform desktop review of existing information on potential reference sites to identify potentially suitable habitat types.
- Establish field data collection procedures for Keyport OU 1 and reference site(s).

Field-Based Tasks

- Document presence, relative abundance, and distribution of plant and animal species at Keyport OU 1 and reference site(s).
- The biological survey will be conducted north, west, and south of the landfill and on the tide flats and in Dogfish Bay northwest of the landfill. This includes exposure areas 1a, 1b, 2, 5, 6, 7, 8, and 9 (Figure 3). The biological survey will not include the poplar tree plantations (exposure areas 3 and 4) or the paved portion of the landfill (exposure area 1a).
- Annotate species locations within study site and reference sites in diagrams or sketches.
- Obtain digital photographs of species locations.
- Determine location of eagle nest located near Keyport OU 1.
- Perform biological survey at reference site(s):
    - Document presence, relative abundance, and distribution of potential indicator plant and animal species identified at Keyport OU 1.
    - If indicator species are present in sufficient abundance for sample collection, continue to document presence, relative abundance, and distribution of remaining plant and animal species at selected reference site, annotate species locations within study site and reference sites in diagrams or sketches and obtain digital photographs of species locations.
    - If indicator species are not present in sufficient abundance, move to next highly ranked reference site and repeat.

This BSWP contains the results of the office-based tasks outlined above and describes the procedures that will be followed to accomplish field-based tasks during the late spring and summer of 2020.

2.2 PROJECT SCHEDULE AND DEVELOPMENT PROCESS

The BSWP approach has been under iterative development and refinement since October 2019. The timeline for development of the BSWP was established with the goal of completing field work during the spring/summer of 2020. This process has included workgroup and project team meetings comprised of the Navy, Navy contractors, state and federal regulatory agencies, and Suquamish Tribe representatives.

Meetings occurred on October 9, October 29, and December 18, 2019 and February 4, 2020 (meeting summaries are included in Appendix A). Each meeting provided a preview of different facets of this BSWP (outline, timeline, objectives, general approach, and reference site information) and built upon the previous meetings. All assigned action items were completed, often including the circulation of additional information and materials via email between meetings.

A draft version of the BSWP was provided to the project team for review and comments were received from Ecology, EPA, and Suquamish Tribe representatives. Responses were prepared and a comment resolution meeting was held on April 28, 2020. During this meeting the prepared responses were reviewed, and agreement was reached by the project team on changes needed to the BSWP based on the project team's comments. The BSWP was modified to incorporate these changes. The comment resolution meeting summary is included in Appendix A, and the project team comments and final responses to comments are included in Appendix B.

The field-portion of the biological survey at Keyport OU 1 and the reference site(s) is anticipated to occur between late May and late July 2020. The intent is to first complete the Keyport OU 1 biological survey, followed by review of preliminary data and additional workgroup and/or project team meetings with a goal of identifying potential indicator species to ensure these species are present at the reference site(s). Therefore, separate mobilizations to potential reference site(s) will occur after the initial Keyport OU 1 survey. The biological survey at the reference site(s) will have a stepped approach of first determining if potential indicator species are present followed by a broader investigation if sufficient abundance of the indicator species are present.

Timing of field work is discussed more specifically in Section 5.9.

3. SURVEY PERSONNEL

The anticipated personnel for the biological survey are listed below. Resumes are presented in Appendix C.

AECOM Field Team Leader – Jennifer Pretare, Ph.D.

Dr. Pretare has more than 20 years of experience as a biologist, with an emphasis on field studies, wildlife, wetlands, tissue sampling, and permitting. Dr. Pretare is a wildlife technical specialist and has worked on projects throughout the western US and Pacific Region. Dr. Pretare has supervised work in remote and logistically complex sites, include areas with unexploded munition, hazardous materials, and controlled access. Dr. Pretare is trained in OSHA 30-hour construction health and safety supervision, First Aid/CPR and 40-hour HAZWOPER. She has supervised numerous field sampling and survey efforts, including media such as: mussels, clams, benthic invertebrates, fish, crayfish, plants, surface sediment, subsurface sediment, surface water, and porewater.

AECOM Botanist – Jeff Walker

Mr. Walker has more than 24 years of experience as a botanist and over 20 years of experience as a wetland scientist, ecologist, and permit specialist. He has conducted wetland delineations and reconnaissance investigations, directed vascular and nonvascular plant surveys, performed monitoring of rare plant populations, and conducted noxious weed surveys. Mr. Walker was the lead botanist for a 2018 plant tissue study on the Upper Columbia River, which involved elevated lead and arsenic concentrations in soil. Stakeholders included the Colville Confederated Tribes, and USEPA.

AECOM Wildlife Biologist – Glen Mejia

Glen Mejia has 20 years of experience as a biologist with a focus on managing and conducting protocol-level field surveys and habitat assessments for special status fish and wildlife species. He has conducted biological fieldwork including sampling for fish, macroinvertebrate, and plant tissue for environmental toxicity analyses in Washington, Oregon, Alaska, and California. Surveys included shellfish sampling within nearshore habitats in Hood Canal, Kitsap Peninsula, and Whidbey Island, Washington. Glen is trained in First Aid/CPR and 40-hour HAZWOPER.

AECOM Assistant Biologist – Linda Howard

Linda Howard is a biologist and environmental planner with 15 years of experience in biological surveys, permitting, field sampling and drafting technical reports. She has been a field team member on numerous tissue sampling projects in Washington State, including mussels, crayfish, plants and benthic macroinvertebrates. She has also conducted nearshore habitat assessments for the Navy at tidally influenced beach sites throughout Puget Sound. Linda is trained in First Aid/CPR and 40-hour HAZWOPER.

AECOM Alternate Biologist – Paul Hamidi

Mr. Hamidi has 23 years of experience as an environmental scientist, with an emphasis on wetlands and soil resources. He works on projects throughout the western U.S. and Alaska. He has been involved in all phases of wetlands and aquatic resources delineation, assessment, mitigation and monitoring; soil survey and assessment; ecological inventory; vegetation mapping; fish and wildlife habitat evaluation; and permitting. Paul is trained in First Aid/CPR and 40-hour HAZWOPER.

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4. REFERENCE SITE SELECTION

4.1 PRELIMINARY SELECTION OF REFERENCE SITES

Ideally a single reference site that has similar characteristics to Keyport OU 1 across several habitat types and landscape-scale characteristics could be selected. That reference site will need to be free from major sources of contamination or other human-induced modifications. A total of 32 potential reference sites were preliminarily selected for screening against a series of ecological criteria for similarity to Keyport OU 1 and a number of indicators of potential chemical contamination, as described below.

4.2 SELECTION CRITERIA FOR REFERENCE SITES

Based on discussion during multiple workgroup and project team meetings, the following factors were identified for selection of reference sites:

1. Publicly accessible land, where permission for sampling can be obtained in a short timeframe.
2. Contains salt marsh habitat and tide flats accessible during low tide.
3. Has perennial freshwater input into the salt marsh.
4. Must be relatively free of known contamination based on the following:
    - Not located within a Category 4 or 5 assessed waterway according to Washington Department of Ecology's (Ecology's) Environmental Information Management (EIM) website.
    - Have predicted arsenic concentrations of 20 parts per million or less from the Tacoma smelter plume, which was the lowest available category listed on Ecology's Tacoma Smelter Plume project web site listed in Section 4.3.
    - Greater than 0.25 mile from a documented contaminated site.

Sites making it through these screens were then prioritized by distance from documented contamination sites.

4.3 INFORMATION SOURCES FOR SCREENING CRITERIA

For input to the screening criteria matrix, the following online sources were used:

- Ecology's Washington State coastal atlas https://fortress.wa.gov/ecy/coastalatlas/
- Washington Department of Fish and Wildlife's (WDFW's) Priority Habitats and Species maps https://wdfw.wa.gov/species-habitats/at-risk/phs
- WDFW's SalmonScape maps which use a hydrography layer from the United States Geological Survey National Hydrographic Dataset https://apps.wdfw.wa.gov/salmonscape
- Publicly available aerial photos, such as from Google Maps and Bing, and associated tools to measure distance between sites
- Ecology's "What's in my Neighborhood" (for contamination) https://apps.ecology.wa.gov/neighborhood/
- Ecology's EIM System (Ecology n.d.) https://apps.ecology.wa.gov/eim/search/Map/Map.aspx?MapType=EIM
- Tacoma Smelter Plume project web site https://ecology.wa.gov/Spills-Cleanup/Contamination-cleanup/Cleanup-sites/Toxic-cleanup-sites/Tacoma-smelter

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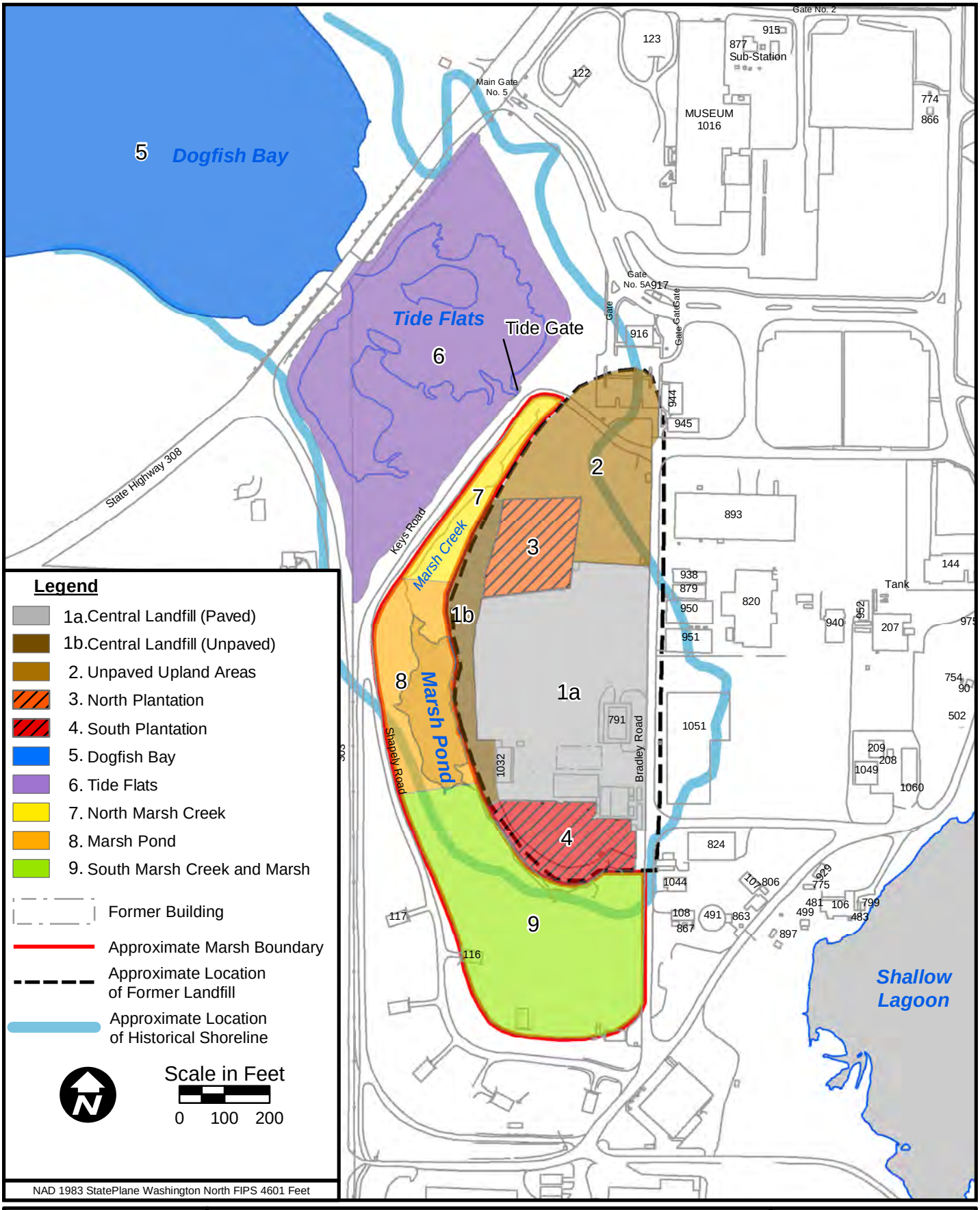

U.S. NAVY	**Figure 3** **Exposure Areas**	CTO N4425519F4180 Biological Survey Work Plan

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Information obtained from these various data sources was compiled into an Excel table, and sorted according the priorities one through five in Section 4.2. Results of this screening are presented below.

4.4 RESULTS OF REFERENCE SITE SCREENING

The screening criteria described in Section 4.2 were applied to the 32 sites located in the Puget Sound area following the established screening priority. The results of the screening process are shown in Appendix D.

Twenty-eight of the 32 sites were screened out of consideration as a reference site based on criteria described in Section 4.2 and information sources described in Section 4.3. The four remaining sites are, in descending order of rank:

1. Haley State Park
2. Quilcene Bay Tidelands
3. Skookum Inlet Natural Area Preserve
4. Crescent Creek Park

More information on these sites is provided in the following sections.

4.4.1 Recommended Reference Sites

Haley State Park is recommended for use as the primary reference site for Keyport OU1 based on the criteria established during the workgroup and project team meetings, and desktop information gathered in support of the screening process. Substantial information about the vegetation communities at Haley State Park from previous on-site surveys by AECOM Technical Services, Inc. (AECOM) biologists is available for review (URS 2009). That information is described in more detail below in Sections 4.5.1 and 4.6.1.

Information on the characteristics of the mudflat and freshwater input (stream or creek) is less certain. For that reason, the second ranking reference site, Quilcene Bay Tidelands, is recommended for consideration as a secondary reference site should mudflat and/or salt marsh habitat at Haley State Park be too limited for biological sampling (or lack potential animal (mollusk) indicator species). However, Quilcene Bay Tidelines contains limited terrestrial habitat. Information on Quilcene Bay Tidelands is provided in Sections 4.5.2 and 4.6.2. Brief descriptions of Skookum Inlet Natural Area Preserve and Crescent Creek Park are provided in Sections 4.5.3 and 4.5.4 as potential alternate reference sites if the Haley State Park and Quilcene Bay Tidelands (either individually or in combination) are not suitable as reference sites.

4.5 CHARACTERISTICS OF PRIORITIZED REFERENCE SITES

Additional desktop review was conducted for the four potential reference sites that were identified during the screening process. The following sections present information regarding location, ownership/access and general characteristics of the four prioritized reference sites.

4.5.1 Haley State Park

Haley State Park is a 179-acre park located in western Pierce County, Washington. It is approximately 34 miles from Keyport OU 1 (Figure 4). Haley State Park is an undeveloped property located between Jackson Lake Road and the Puget Sound. Haley State Park includes some nearshore habitat in Case Inlet, and elevations on the property range from below sea level to approximately 260 feet. It is

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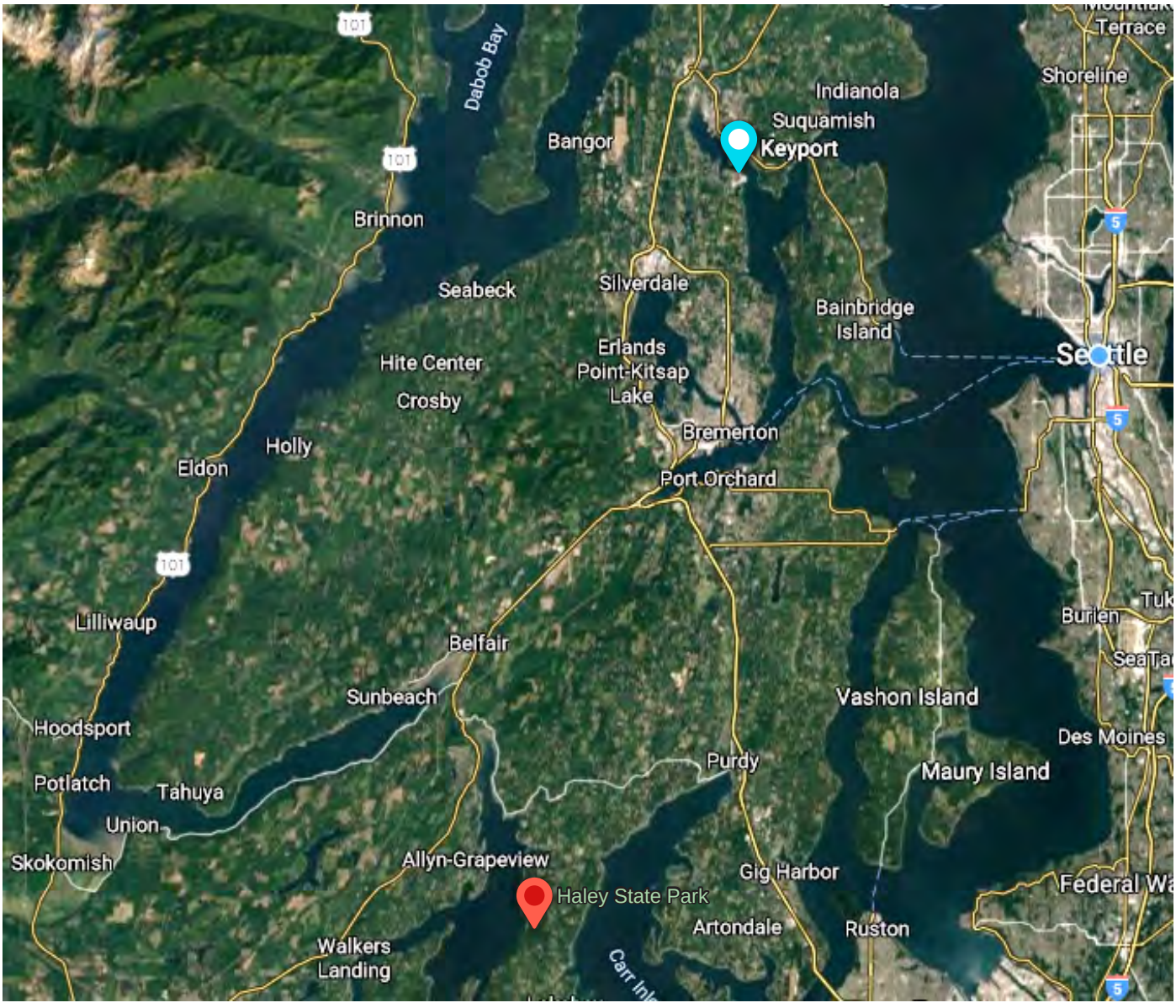

Source: Google Earth Pro

U.S. NAVY	**Figure 4** **Haley State Park Location Map**	CTO N4425519F4180 Biological Survey Work Plan

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estimated to have almost 2,000 feet of saltwater shoreline. The source of freshwater input appears to be a perennial freshwater stream approximately 0.9 mile in length that is fed by two or more perennial streams, and empties to a marsh/wetland. Additional maps of Haley State Park can be found in Appendix E.

Ecology's EIM System shows that the nearest Category 5 impaired waterbody in the vicinity of Haley State Park is approximately 1.5 miles away and is impaired for dissolved oxygen. The nearest contaminated site is approximately 2.2 miles away according to 'What's in my Neighborhood'. That site is awaiting cleanup for gasoline, petroleum, and other contaminants.

4.5.2 Quilcene Bay Tidelands

The Quilcene Bay Tidelands are administered by the WDFW and are located in Jefferson County, Washington (Figure 5). This natural area is located approximately 14 miles northwest of Keyport OU 1 on Quilcene Bay, adjacent to Dabob Bay. Additional maps of and information on Quilcene Bay Tidelands can be found in Appendix F. As mentioned previously, the Quilcene Bay Tidelines contains limited terrestrial habitat.

Ecology's EIM System shows that the nearest Category 5 impaired waterbody in the vicinity of Quilcene Bay Tidelands is the Big Quilcene River, which is approximately 0.27 miles away and is impaired for temperature. EIM also shows numerous water quality monitoring stations and wells in the Quilcene Bay vicinity. The same location is also a Category 4 impaired water body for fish and shellfish. The nearest contaminated site according to "What's in my Neighborhood" is the "Heisel property" located approximately 0.87 miles away. There appears to be no further pending actions related to this site.

4.5.3 Skookum Inlet Natural Area Preserve

This 143-acre preserve (Figure 6) is managed by the Washington Department of Natural Resources (WDNR), located in Mason County (WDNR 2020). It contains a variety of salt-marsh communities and tide flats, along with a second growth forested buffer. There is a small creek which enters the estuary within the preserve. The WDNR web site lists three salt-marsh ecosystem types (low intertidal, high salinity, silty marsh; high intertidal, high salinity marsh; and high intertidal, low salinity marsh) and associated plant communities.

Skookum Inlet Natural Area Preserve does appear to have similar habitat and landscape characteristics to Keyport OU 1. Aerial photos show a relatively undeveloped landscape surrounding the site. Logistical access (for vehicles and pedestrians) appears limited and may be a prohibitive factor in completing a biological survey and/or later sampling activities. However, if Haley State Park was ruled out as a reference site after the biological survey, Skookum Inlet Natural Area Preserve appears to be the next best choice for terrestrial habitat based on the established screening criteria and similarity of habitat types.

Ecology's EIM System shows that the nearest Category 5 impaired water body in the vicinity of Skookum Inlet Natural Area Preserve is the Little Skookum River, which is approximately 1.25 miles away and is impaired for dissolved oxygen. The nearest contaminated site is approximately 0.63 miles away according to 'What's in my Neighborhood'. That site is awaiting cleanup for benzene, lead, metals, gasoline, diesel, petroleum, other non-halogenated organics, and polycyclic aromatic hydrocarbons.

4.5.4 Crescent Creek Park

Crescent Creek Park is owned by the City of Gig Harbor in Pierce County (Figure 7). Limited information was found on the City's website (City of Gig Harbor 2020). The park appears to have a playground, tennis courts, picnic area, and a limited amount of shoreline. Aerial photos indicate that Crescent Creek drains into a marsh area that is surrounded by forest; however, it is unclear if the marsh and creek are formally

encompassed by the park boundary. The park is relatively small and surrounded by residential development. Based on the small size and recreational land use, Crescent Creek Park does not appear to provide reasonable conditions similar to Keyport OU1. In addition, the close proximity of Gig Harbor urban development makes Crescent Creek Park a less suitable reference site.

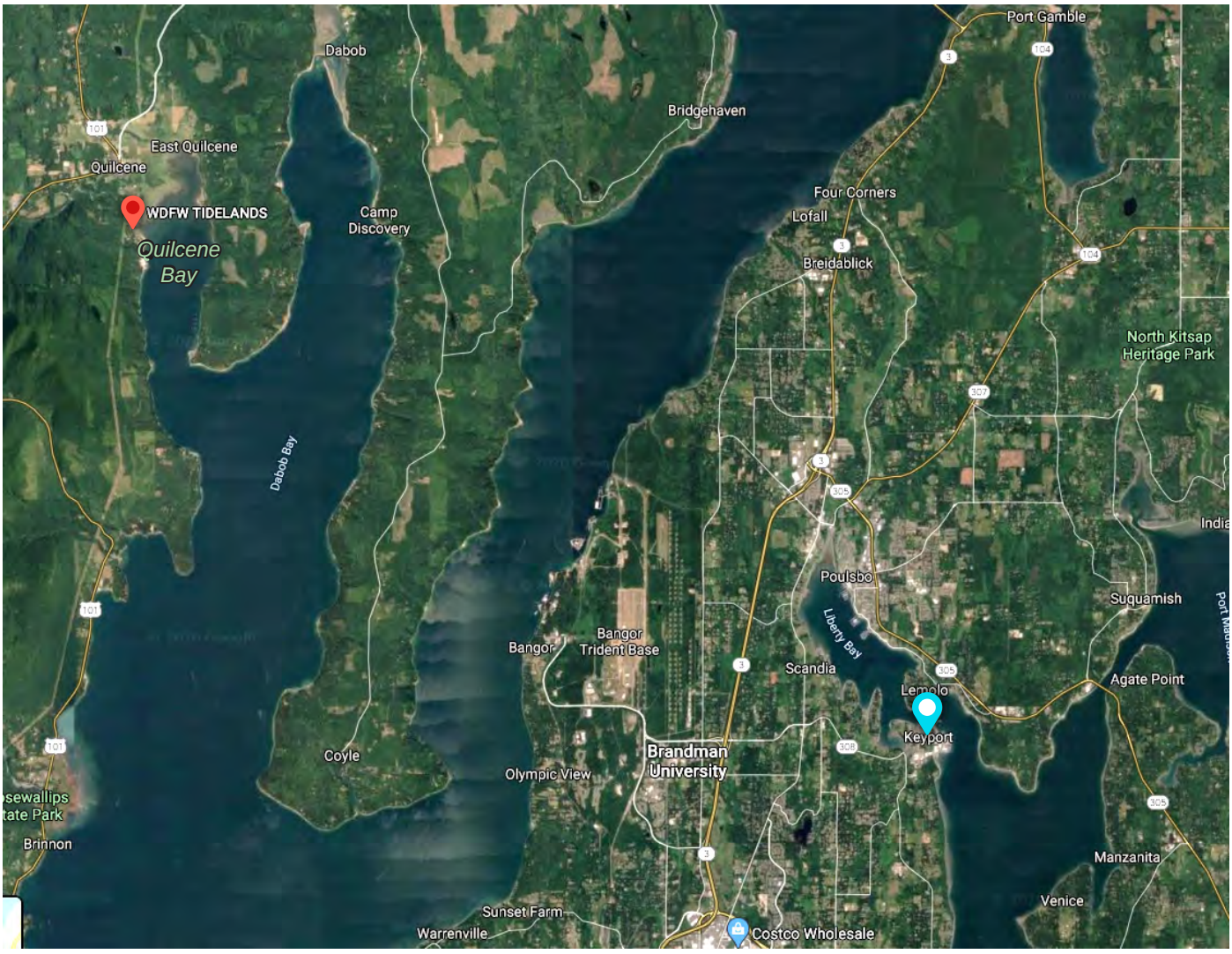
Ecology's EIM System shows that the nearest Category 4 impaired waterbody in the vicinity of Crescent Creek Park is approximately 0.62 miles away and is impaired for fish and shellfish habitat. Eleven contaminated sites are less than 1 mile away according to 'What's in my Neighborhood'. The two nearest are "Conan Vacant Property" which is awaiting cleanup for petroleum and diesel, and "Eagle Quest" which is not awaiting any further action, for arsenic.

4.6 HABITATS AND SPECIES OF PRIORITIZED REFERENCE SITES

This section provides a more focused look at the habitats and species known to occur at Haley State Park and Quilcene Bay Tidelands. All information reviewed comes from publicly available information.

4.6.1 Haley State Park

Information about Haley State Park habitat was obtained from an existing vegetation survey report (URS 2009) produced for the Washington State Parks and Recreation Commission (WSPRC). Based on permission given by WSPRC, relevant portions of the report are reproduced in Appendix E, including a description of the vegetation communities, maps, aerial photographs and a plant species list. Plant surveys described in the report were conducted on June 10, 2008.



Source: Google Earth Pro

U.S. NAVY	**Figure 5** **Quilcene Bay Tidelands Location Map**	CTO N4425519F4180 Biological Survey Work Plan

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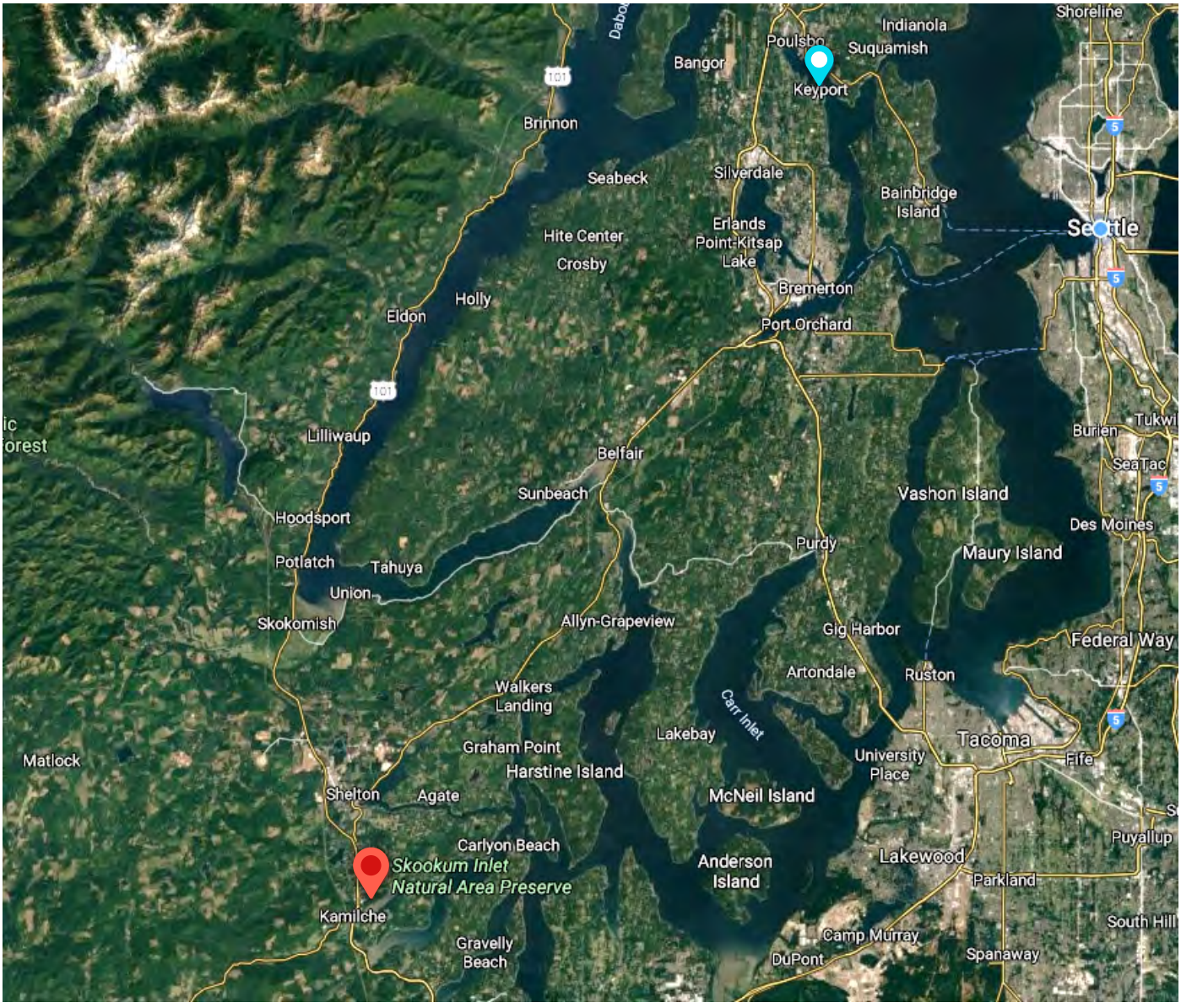

Source: Google Earth Pro

U.S. NAVY	**Figure 6** **Skookum Inlet Natural Area Preserve Location**	CTO N4425519F4180 Biological Survey Work Plan

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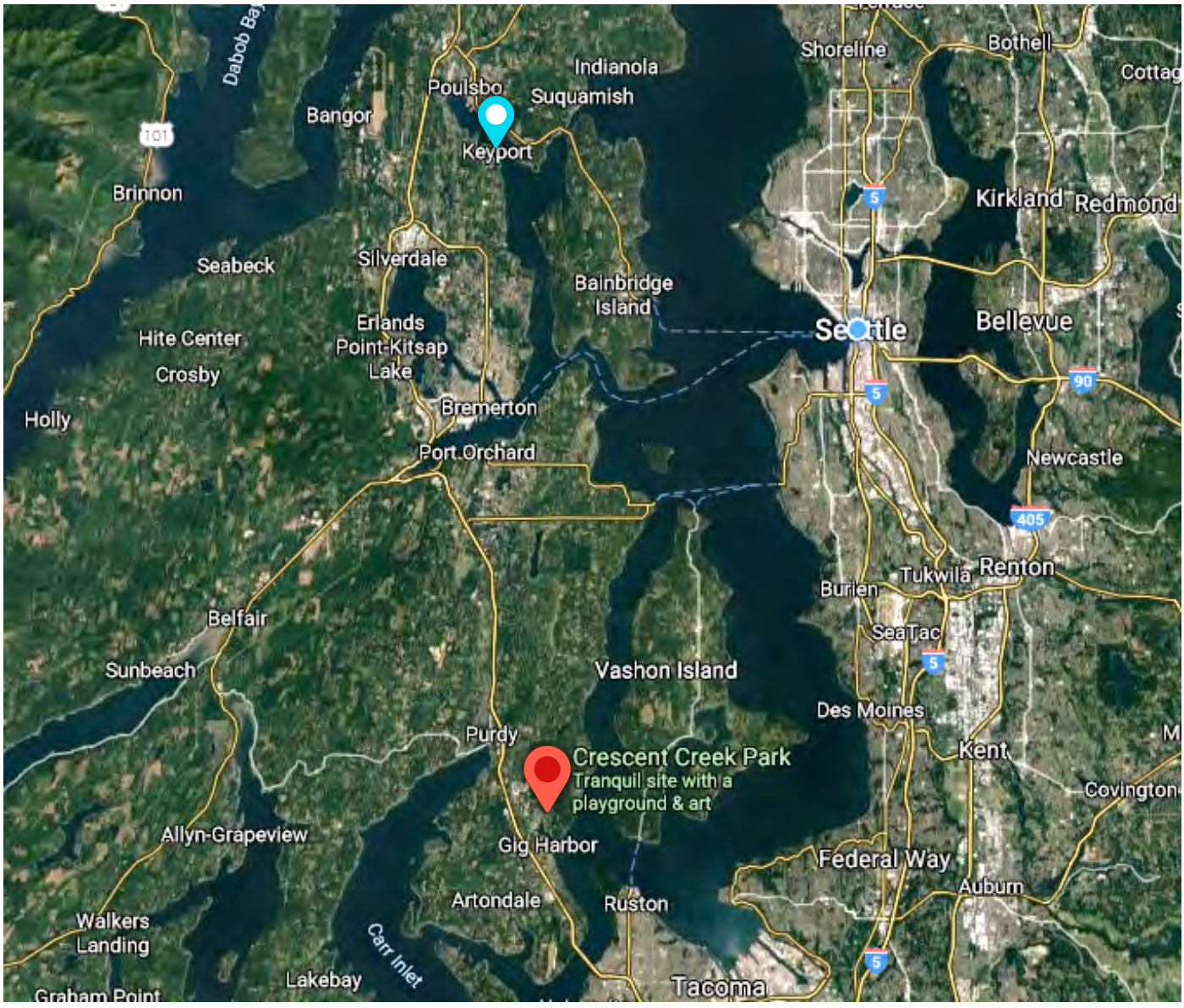

Source: Google Earth Pro

U.S. NAVY	**Figure 7** **Crescent Creek Park Location**	CTO N4425519F4180 Biological Survey Work Plan

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All of the forested communities on the property have been logged at least once. Haley State Park has three distinct upland forest plant associations and two wetland plant associations. They are described and mapped in Appendix E.

The 2008 plant species list from Haley State Park (Appendix E) was compared to a 2019 plant species list from Keyport OU 1 (Appendix G). Both plant lists are considered reconnaissance-level and represent species observed during 1 day or less spent on each site. The plant lists have at least 46 species in common. Based on the similarities in landscape features, habitat types, and specific plants observed, Haley State Park appears to be reasonably similar to Keyport OU 1 for terrestrial areas.

Although saltwater mud flats appear to be present at Haley State Park, very little detailed information was found during the desktop review. Aerial photos show a limited amount of exposed tidal mud flats. A May 2019 Washington Trails Association trip report shows photographs of a rocky high beach with some tide flats and indicate that sand dollars were present, suggesting sandy beach conditions (Appendix E).

4.6.2 Quilcene Bay WDFW Tidelands

Information about Quilcene Bay WDFW Tidelands habitats and species was obtained from the WDFW web site (Appendix F) and a YouTube video (Munn 2016). This site appears to have very limited upland habitat and no forest. However, mudflats with shellfish are abundant. The beach has a large population of Manila clams (*Venerupis philippinarum*), native littleneck clams (*Protothaca staminea*), and softshell clams (*Mya arenaria*). Some of the upper beach areas appear to have marsh fringe vegetation. The shellfish season is open year-round and current water quality (as of February 10, 2020) meets public health standards for recreational shellfish harvesting (Appendix F).

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5. FIELD SURVEY DATA COLLECTION PROCEDURES

The sections below provide details for field data collection for the biological survey at Keyport OU 1 and reference site(s) (hereafter, "the survey areas"). Appendix H provides an example field form that will be used to capture information on species and relative abundance. Appendix I has written Standard Operating Procedures which provide additional information and step by step procedures on recording locations, field documentation, and digital photographs.

5.1 EQUIPMENT AND SUPPLIES

The following planning documents will be reviewed in advance and will accompany the field team to support the biological survey data collection activities:

- This BSWP (including appendices and extra field data forms)
- Electronic versions of property information and maps
- Site information packets for each survey area (each packet will contain hard copies of property-specific information, including copies of signed access agreements, aerial photographs with preliminary habitat maps, driving directions, and field forms for completion during the site visit)
- The project-specific health and safety plan

The following equipment and supplies will be needed to perform the field reconnaissance and data collection:

- Geographic positioning system (GPS) unit with sub-meter accuracy (programmable unit such as Trimble GeoX7 or GeoXH)
- Oversized prints showing survey area boundaries on high resolution aerial photographs
- Digital camera with integrated GPS (or include coordinates in photo logbook) with replacement batteries and memory card capable of 200+ photographs per day
- Dry-erase white boards and markers (approximately 2 feet by 3 feet in size)
- Mobile telephone
- Botanical field guides
- Hand lens for plant identification
- Mollusk field guides
- Logbook (Rite in the Rain)
- Grabbers, plant clippers, plastic bags, paper bags, labels, permanent ink markers, and other plant/animal material collection supplies
- Waders and/or knee-high rubber boots
- Tool to pry open mollusk and scrape tissue out, such as Oyster "knife"
- Ruler and scale to measure and/or weigh plants and other tissues
- Food dehydrator to dry plant tissues (in office task)

5.2 FIELD DATA FORMS

A project-specific biological survey data form has been developed and is provided in Appendix G. The biological survey data form provides a systematic and structured template to assist with field documentation, and requires entry of the following fields:

- Keyport OU 1 exposure area or reference area
- Field crew initials
- Date and time
- Species name (common/scientific)
- Organism part (e.g., entire plant, shoots, seeds, root, berry, leaves, nut, stalk, whole organism)
- Specific part of organism observed, species relative abundance, percent cover (for plants)
- General health of organism
- Spatial data identifier
- Photo identifier

5.3 POTENTIAL INDICATOR SPECIES

A list of plant species observed at Keyport OU 1 during the August 8, 2019 site visit is included in Appendix G. Data on plant and animal species that to be collected at Keyport OU 1 during the first biological survey currently scheduled for May 26-28, 2020 will be used to begin discussions with the project team regarding potential indicator plant and animal species for use during the HHRA/ERA. Potential indicator plant species will focus on wild plants and endemic invasive species, such as the Himalayan blackberry. Ornamental species will not be included in relative abundance estimates of plant species. The potential indicator animal species will focus on mollusks that inhabit multiple habitats.

5.4 KEYPORT OU 1 SURVEY METHOD

The Keyport OU 1 site is divided up into nine exposure areas (Figure 3). The exposure areas that are part of this BSWP are the Central Landfill (Unpaved) (exposure area 1b), Unpaved Upland Areas (exposure area 2), Dogfish Bay (exposure area 5), Tide flats (6), North Marsh Creek (7), Marsh Pond (8), and South Marsh Creek and Marsh (9). Dogfish Bay will be surveyed from the shoreline. The remaining exposure areas (Central Landfill (Paved), North Plantation, and South Plantation) are not included in the BSWP because they are either developed or planted with hybrid poplars (*Populus* sp.).

The biological survey at Keyport OU 1 will focus on plants and mollusks, noting other wildlife habitat and observations (including determining the location of the adjacent eagle nest). The plant surveys will be focused in exposure areas 1b, 2, 7, 8, and 9; while the mollusk surveys will be focused in 5, 6, 7, and 8.

The following steps will be used to conduct the plant survey:

1. Each morning, a safety tailgate meeting will be conducted, per the project-specific health and safety plan.
2. Upon arrival at the exposure area to be surveyed, a biological survey data form will be started (Appendix H). One field form will be used for each exposure area.
3. The survey will be conducted, marking the presence of potential indicator plant species on the data form and field maps with aerial photos.

4. The phenology (e.g., root, shoots, stalk, leaves, fruit, seed/nut, or senescent) of plant species will be recorded.
5. Once the survey of the exposure area is finished, the relative abundance (rather than stem count) will be recorded. Abundance categories included on the data form are: 1-2 plants (low), 3-5 plants (medium), 6-10 plants (high).
6. In addition to the relative abundance of the individual plants, notes will be taken on the amount of plant materials present. For example, several shrubs may be present, but they may be immature and not contain fruit. This will be noted.
7. The general health of plants will be also be recorded on the data form. Notes on health will be limited to prominent visible problems such as a large amount of insect herbivory, insect galls, fungal infestation, or discolored leaves/needles.
8. A limited amount of plant material may be gathered to aid species identification and sampling plan refinement (see Section 5.5). No root materials will be collected from exposure areas. No other ground disturbing activities will be conducted.
9. GPS points or polygons will be taken of concentrated occurrences of plant species per Section 5.6.
10. Photographs will be taken of general habitats and species per Section 5.7.

The following steps will be used to conduct the mollusk survey:

1. Each morning, a safety tailgate meeting will be conducted, per the project-specific health and safety plan, in combination with plant survey.
2. Upon arrival at the exposure area to be surveyed, a biological survey data form will be started (Appendix H). One field form will be used for each exposure area surveyed.
3. A survey will be conducted in tidal mud flat habitats, and other aquatic environments where mollusks may be present, marking the presence of potential mollusk species on the data form and field maps with aerial photos.
4. In subtidal habitats, clam shows (i.e., a hole or dimple where a clam has withdrawn) will be visually pinpointed and mapped. Density or relative abundance will be documented.
5. In other aquatic environments (such as a creek) mollusks will simply be counted within the area where they are present.
6. A limited number of mollusks will be dug up or removed from their substrate. The size (length, width), weight, and general condition/health of mollusk species will be recorded. Mollusks will be measured and weighed with their shell, then mollusk tissues will be extracted, and the shell and tissues weighed separately. Up to 10 of each species will be measured in this way to document a range of tissue to shell size weights.
7. GPS points or polygons will be taken of concentrated occurrences of animal species per Section 5.6.
8. Photographs will be taken of general habitats and species per Section 5.7.

5.5 REFERENCE SITE SURVEY METHOD

An intuitive-controlled approach will be used to survey the reference site(s). This method consists of meandering through the entire reference site, with more intensive focus on areas with appropriate habitat

for potential indicator plant and animal species. The potential indicator species will be chosen prior to survey of the reference site(s) in collaboration with the project team (see Section 2.2).

The following steps will be used to conduct the plant survey:

1. Each morning, a safety tailgate meeting will be conducted, per the project-specific health and safety plan.
2. Upon arrival at the reference site to be surveyed, a biological survey data form will be started (Appendix H). One field form will be used for each reference site surveyed.
3. The intuitive control meander will be conducted, marking the presence of potential indicator plant and species on the data form and field maps with aerial photos.
4. The phenology (i.e., root, shoots, stalk, leaves, fruit, seed/nut, or senescent) of potential indicator plant species will be recorded.
5. Once the traverse of the reference site is finished, the relative abundance (rather than stem count) will be recorded for each potential indicator species that occurs in the reference site. Abundance categories are included on the data form; 1-2 plants (low), 3-5 plants (medium), 6-10 plants (high).
6. In addition to the relative abundance of the individual potential indicator plants, notes will be taken on the amount of sample materials present. For example, several potential indicator shrubs may be present, but they may be immature and not contain fruit. This will be noted.
7. The general health of potential indicator plants will be also be recorded on the data form. Notes on health will be limited to prominent visible problems such as a large amount of insect herbivory, insect galls, fungal infestation, or discolored leaves/needles for potential indicator plants.
8. A limited amount of plant material may be gathered to aid species identification and sampling plan refinement (see Section 5.5). No root materials will be collected from reference sites. No other ground disturbing activities will be conducted.
9. GPS points or polygons will be taken of concentrated occurrences of potential indicator plant species per Section 5.6.
10. Photographs will be taken of general habitat and potential indicator species per Section 5.7.

The following steps will be used to conduct the mollusk survey:

1. Each morning, a safety tailgate meeting will be conducted, per the project-specific health and safety plan, in combination with plant survey.
2. Upon arrival at the reference site to be surveyed, a biological survey data form will be started (Appendix H). One field form will be used for each reference site surveyed.
3. An intuitive control meander will be conducted in tidal mudflat habitats, and other aquatic environments where mollusks may be present, marking the presence of potential mollusk species on the data form and field maps with aerial photos.
4. In subtidal habitats, clam shows (i.e., a hole or dimple where a clam has withdrawn) will be visual pinpointed and mapped. Density or relative abundance will be documented.
5. In other aquatic environments (such as a creek) mollusks will simply be counted within the area where they are present.
6. A limited number of mollusks will be dug up or removed from their substrate. The size (length, width), weight, and general condition/health of potential indicator mollusk species will be recorded.

Mollusks will be measured and weighed with their shell, then mollusk tissues will be extracted, and the shell and tissues weighed separately. Up to 10 of each species will be measured in this way to document a range of tissue to shell size weights.

7. GPS points or polygons will be taken of concentrated occurrences of potential indicator animal species per Section 5.6.
8. Photographs will be taken of general habitat and potential indicator species per Section 5.7.

5.6 PLANT AND ANIMAL TISSUE COLLECTION

A limited amount of plant and animal species material will be collected for sampling plan refinement. Plants may also be collected for identification in an office setting with the use of a dissecting microscope. The evaluation of plant materials will focus on weights of fruits (e.g., berries), seeds, and vegetative materials (e.g., leaves, stems, bark) in order to determine required sample volumes to inform collection volumes during the sampling event. The following plants species and parts are anticipated to be collected as representative of their broader family: willow (*Salix* sp.) leaves, baldhip rose (*Rosa gymnocarpa*) hips (if available), leaves and stems, hardstem bulrush (*Schoenoplectus acutus*) stems, slough sedge (*Carex obnupta*) stems, and Himalayan blackberry (*Rubus bifrons*/*R. armeniacus*) berries. In addition, whole plants (minus roots) of clover (Trifolium sp.) and giant horsetail (*Equisetum telmateia*).

The evaluation of animal tissue weights/measurements is anticipated to be limited to mollusks. This will be done to determine the weight of whole organisms within their shell, in addition to the weight of the organism's tissue and shell separately.[2] Only abundant or common materials will be collected.

None of the plant or animal materials collected during the biological survey will be sent to the laboratory for analysis; therefore, no decontamination protocols will be necessary. No preparation (e.g., peeling, cooking) will be done. The following procedure will be utilized for collecting plant and animal tissue:

- Collect representative sample mass for selected plant and animal species.
- Collect multiple plant parts, including fruits, seeds, flowers, leaves, stems.
- Collect mollusk tissues.
- Weigh wet tissue samples in field.
- Dry plant materials with a dehydrator and weigh again in office.
- Back calculate mass needed per sample for field collection and subsequent volume of plant materials required to be collected per sample.

An example of how field weights for plant species will be recorded is provided in Table 1. An example of how field weights for animal species will be recorded is provided in Table 2.

[2] A recreational WDFW shellfish license will be obtained for this relatively small collection amount. Collection of any other form of tissue (mammal, bird, amphibian) is subject to a scientific collection permit, which is not currently planned.

Table 1: Wet and Dried Weights for Plant Species (Example)

Species	Wet Weight (g)	Number	Unit	Average Wet Weight per Unit (g)	Dry Weight (g)	Average Dry Weight per Unit (g)
Willow (*Salix* sp.)	26.0	2	15 cm length	13.0	14.0	7.0
Baldhip rose (*Rosa gymnocarpa*)	6.1	1	Stems and leaves – 30 cm length	6.1	2.4	2.4
Hardstem bulrush (*Schoenoplectus acutus*)	11.0	6	15 cm stem	1.83	4.0	0.67
Slough sedge (*Carex obnupta*)	13.2	20	10 cm stem	0.66	8.6	0.43
Clover (*Trifolium* sp.)	9.0	10	Stems, leaves and flowers	0.9	1.8	0.18
Giant horsetail (*Equisetum telmateia*)	32.0	1	Whole plant minus roots	32.0	22.0	22.0
Himalayan blackberry (*Rubus bifrons*/*R. armeniacus*)	0.6	5	Berries	0.12	1.0	0.14

cm centimeter
g gram

Table 2: Wet Weights for Animal Species (Example)

Species	Total Weight (g)	Number	Unit	Shell Weight (g)	Wet Tissue Weight (g)	Tissue to Total Weight Ratio
Manila clam (Venerupis philippinarum)	25	1	2-inch length	13.5	11.5	.46
Littleneck clam (Protothaca staminea)	40	1	3-inch length	20	20	0.5
Mussel sp.	16	1	1-inch length	9	7	0.43

5.7 GPS DATA COLLECTION

GPS coordinates (points or polygons) will be collected to locate where potential indicator plant and animal species identified for sampling occur in high density or notable concentrations.

Detailed operating procedures and procedures for verifying the accuracy and quality of GPS readings provided in the operations manual for the specific GPS unit selected for use will be followed. The field team leader will be experienced with operating the GPS units selected for field reconnaissance and will be familiar with these procedures prior to obtaining field coordinates for this study. The following steps will be taken to obtain and document GPS coordinates:

1. For a given species location, latitude and longitude coordinates will be consistently obtained and recorded in decimal degrees.
2. GPS waypoints will be labeled with the potential indicator plant or animal species name and reference site number.
3. At the conclusion of each field day, the field team leader will download the recorded GPS data files from the GPS unit onto a dedicated field laptop.

In cases where satellite reception is consistently inadequate and impedes the use of a GPS unit in waypoint navigation and positioning, no GPS coordinates will be recorded in the field. Instead the location of a target species will be hand drawn by field personnel onto a field map and GPS coordinates will be obtained using publicly available mapping sites such as Google Earth. In addition, GPS coordinates will not be noted for

potential indicator plants that are ubiquitous on a reference site. For example, if a baldhip rose is abundant across a given reference site, the locations of that species will only be noted on the field map.

5.8 PHOTOGRAPHS

Representative digital photographs of vegetation communities and habitat types found within the survey areas will be collected. Representative photographs of potential indicator plants and animals will also be collected. The following steps will be taken to obtain, label, and manage digital photographs:

1. Take field photographs with a quality digital camera (at least 5 megapixels) that is capable of efficient download and archiving onto a field laptop as secondary backup.
2. For each survey area take at least 1 representative photograph for each vegetation community/habitat type.
3. For each potential indicator species or habitat photograph (or series of photographs) taken, use a dry-erase whiteboard to identify and label the reference site on the photograph with a unique identification (ID), as follows:
4. Photo ID: "Location – Photo Type – P#" where:
    - Location = unique 2-digit location for each survey area
    - Photo Type = Species name or habitat type
    - P# = unique picture number in sequence to match field location and field form
5. Record each photo in a photo log.
6. Record the location of each photo onto the aerial photograph or field sketch.
7. At the conclusion of each day, download all digital photographs onto the dedicated field laptop (if not done in the field) and label each digital file (electronic photograph as described in Step 4 above).

5.9 TIMING OF FIELDWORK

As mentioned in Section 2.2, field work is anticipated to occur in late May to late July 2020. This time period corresponds with growth and blooming of plants and/or when most plants show key features needed for identification. In addition, favorable tidal cycles are needed to visit sites during low tides when mud flats are most exposed (Figures 8, 9, 10).

The biological survey field work at Keyport OU 1 is proposed for May 26-28, 2020. Personnel conducting the field-portion of the biological survey will need to obtain security passes. As much paperwork as possible will be completed ahead of time for Defense Biometric Identification System badge clearance. Staff will visit the NBK Keyport badging office the day prior to field work to pick up the badges.

Data collected at Keyport OU 1 will be used to refine the potential indicator plant and animal species list with the workgroup after the May biological survey. Specifically, the workgroup has chosen June 17, 2020 to meet and review/comment on preliminary biological survey results from Keyport OU 1.

The refined list will be used to inform the biological survey efforts at the reference site(s). The biological survey at the potential reference site(s) is anticipated to occur either July 6-8, 2020 and/or July 20-22, 2020.

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Poulsbo, Liberty Bay, Puget Sound, Washington
47.7250° N, 122.6380° W

May 2020

Day	High	Low	High	Low	High	Phase	Sunrise	Sunset	Moonrise	Moonset
Fri 01	12:58 AM PDT 11.2 ft	7:23 AM PDT 6.8 ft	11:28 AM PDT 8.3 ft	6:26 PM PDT 0.4 ft			5:52 AM PDT	8:23 PM PDT	1:03 PM PDT	3:28 AM PDT
Sat 02	1:51 AM PDT 11.4 ft	8:21 AM PDT 5.6 ft	12:58 PM PDT 8.4 ft	7:33 PM PDT 0.9 ft			5:50 AM PDT	8:25 PM PDT	2:21 PM PDT	4:00 AM PDT
Sun 03	2:34 AM PDT 11.7 ft	9:06 AM PDT 4.1 ft	2:18 PM PDT 8.9 ft	8:35 PM PDT 1.4 ft			5:48 AM PDT	8:26 PM PDT	3:41 PM PDT	4:27 AM PDT
Mon 04	3:11 AM PDT 12.0 ft	9:47 AM PDT 2.5 ft	3:29 PM PDT 9.7 ft	9:32 PM PDT 2.1 ft			5:47 AM PDT	8:28 PM PDT	5:02 PM PDT	4:52 AM PDT
Tue 05	3:45 AM PDT 12.2 ft	10:27 AM PDT 0.8 ft	4:33 PM PDT 10.6 ft	10:25 PM PDT 2.9 ft			5:45 AM PDT	8:29 PM PDT	6:25 PM PDT	5:17 AM PDT
Wed 06	4:19 AM PDT 12.4 ft	11:07 AM PDT −0.7 ft	5:33 PM PDT 11.3 ft	11:17 PM PDT 3.9 ft			5:44 AM PDT	8:30 PM PDT	7:48 PM PDT	5:42 AM PDT
Thu 07	4:54 AM PDT 12.4 ft	11:48 AM PDT −1.9 ft	6:30 PM PDT 11.9 ft			Full Moon	5:42 AM PDT	8:32 PM PDT	9:11 PM PDT	6:10 AM PDT
Fri 08		12:08 AM PDT 4.9 ft	5:30 AM PDT 12.2 ft	12:30 PM PDT −2.7 ft	7:26 PM PDT 12.2 ft		5:41 AM PDT	8:33 PM PDT	10:30 PM PDT	6:44 AM PDT
Sat 09		1:01 AM PDT 5.8 ft	6:09 AM PDT 11.8 ft	1:13 PM PDT −2.9 ft	8:22 PM PDT 12.4 ft		5:39 AM PDT	8:34 PM PDT	11:43 PM PDT	7:23 AM PDT
Sun 10		1:58 AM PDT 6.5 ft	6:50 AM PDT 11.1 ft	1:58 PM PDT −2.7 ft	9:18 PM PDT 12.3 ft		5:38 AM PDT	8:36 PM PDT		8:12 AM PDT
Mon 11		3:00 AM PDT 6.9 ft	7:37 AM PDT 10.3 ft	2:45 PM PDT −2.0 ft	10:16 PM PDT 12.1 ft		5:37 AM PDT	8:37 PM PDT	12:45 AM PDT	9:08 AM PDT
Tue 12		4:12 AM PDT 7.1 ft	8:29 AM PDT 9.4 ft	3:35 PM PDT −1.0 ft	11:16 PM PDT 11.8 ft		5:35 AM PDT	8:38 PM PDT	1:36 AM PDT	10:11 AM PDT
Wed 13		5:39 AM PDT 6.8 ft	9:33 AM PDT 8.5 ft	4:30 PM PDT 0.1 ft			5:34 AM PDT	8:40 PM PDT	2:16 AM PDT	11:17 AM PDT
Thu 14	12:16 AM PDT 11.6 ft	7:07 AM PDT 6.1 ft	10:53 AM PDT 7.7 ft	5:30 PM PDT 1.2 ft		Last Quarter	5:33 AM PDT	8:41 PM PDT	2:47 AM PDT	12:24 PM PDT
Fri 15	1:11 AM PDT 11.4 ft	8:12 AM PDT 5.2 ft	12:23 PM PDT 7.4 ft	6:35 PM PDT 2.1 ft			5:31 AM PDT	8:42 PM PDT	3:13 AM PDT	1:29 PM PDT
Sat 16	1:57 AM PDT 11.3 ft	8:59 AM PDT 4.1 ft	1:53 PM PDT 7.5 ft	7:40 PM PDT 3.0 ft			5:30 AM PDT	8:43 PM PDT	3:35 AM PDT	2:33 PM PDT
Sun 17	2:32 AM PDT 11.2 ft	9:34 AM PDT 3.1 ft	3:09 PM PDT 8.1 ft	8:39 PM PDT 3.7 ft			5:29 AM PDT	8:45 PM PDT	3:55 AM PDT	3:37 PM PDT
Mon 18	3:02 AM PDT 11.1 ft	10:03 AM PDT 2.2 ft	4:10 PM PDT 8.7 ft	9:32 PM PDT 4.4 ft			5:28 AM PDT	8:46 PM PDT	4:13 AM PDT	4:40 PM PDT
Tue 19	3:27 AM PDT 11.1 ft	10:28 AM PDT 1.2 ft	5:00 PM PDT 9.4 ft	10:18 PM PDT 5.1 ft			5:27 AM PDT	8:47 PM PDT	4:32 AM PDT	5:43 PM PDT
Wed 20	3:52 AM PDT 11.0 ft	10:52 AM PDT 0.4 ft	5:43 PM PDT 10.1 ft	11:00 PM PDT 5.8 ft			5:26 AM PDT	8:48 PM PDT	4:51 AM PDT	6:48 PM PDT
Thu 21	4:17 AM PDT 10.9 ft	11:18 AM PDT −0.5 ft	6:23 PM PDT 10.7 ft	11:41 PM PDT 6.4 ft			5:25 AM PDT	8:49 PM PDT	5:13 AM PDT	7:54 PM PDT
Fri 22	4:43 AM PDT 10.8 ft	11:47 AM PDT −1.2 ft	7:00 PM PDT 11.2 ft			New Moon	5:24 AM PDT	8:51 PM PDT	5:39 AM PDT	9:01 PM PDT
Sat 23		12:22 AM PDT 6.9 ft	5:11 AM PDT 10.6 ft	12:19 PM PDT −1.7 ft	7:37 PM PDT 11.5 ft		5:23 AM PDT	8:52 PM PDT	6:09 AM PDT	10:06 PM PDT
Sun 24		1:04 AM PDT 7.2 ft	5:41 AM PDT 10.4 ft	12:55 PM PDT −2.0 ft	8:17 PM PDT 11.8 ft		5:22 AM PDT	8:53 PM PDT	6:48 AM PDT	11:08 PM PDT
Mon 25		1:48 AM PDT 7.5 ft	6:14 AM PDT 10.2 ft	1:35 PM PDT −2.2 ft	8:59 PM PDT 11.9 ft		5:21 AM PDT	8:54 PM PDT	7:35 AM PDT	
Tue 26		2:36 AM PDT 7.6 ft	6:51 AM PDT 9.8 ft	2:18 PM PDT −2.0 ft	9:46 PM PDT 11.9 ft		5:20 AM PDT	8:55 PM PDT	8:32 AM PDT	12:04 AM PDT
Wed 27		3:31 AM PDT 7.6 ft	7:37 AM PDT 9.4 ft	3:05 PM PDT −1.7 ft	10:35 PM PDT 11.9 ft		5:19 AM PDT	8:56 PM PDT	9:38 AM PDT	12:52 AM PDT
Thu 28		4:34 AM PDT 7.3 ft	8:36 AM PDT 8.9 ft	3:56 PM PDT −1.0 ft	11:25 PM PDT 11.9 ft		5:18 AM PDT	8:57 PM PDT	10:51 AM PDT	1:31 AM PDT
Fri 29		5:43 AM PDT 6.6 ft	9:53 AM PDT 8.3 ft	4:52 PM PDT −0.1 ft		First Quarter	5:18 AM PDT	8:58 PM PDT	12:06 PM PDT	2:03 AM PDT
Sat 30	12:13 AM PDT 11.9 ft	6:51 AM PDT 5.5 ft	11:23 AM PDT 7.9 ft	5:53 PM PDT 1.0 ft			5:17 AM PDT	8:59 PM PDT	1:24 PM PDT	2:31 AM PDT
Sun 31	12:59 AM PDT 12.0 ft	7:48 AM PDT 4.0 ft	12:54 PM PDT 8.0 ft	6:57 PM PDT 2.2 ft			5:16 AM PDT	9:00 PM PDT	2:42 PM PDT	2:56 AM PDT

NOT FOR NAVIGATION

U.S. NAVY	**Figure 8** **May 2020 Tide Table**	CTO N4425519F4180 Biological Survey Work Plan

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Poulsbo, Liberty Bay, Puget Sound, Washington
47.7250° N, 122.6380° W

June 2020

Day	High	Low	High	Low	High	Phase	Sunrise	Sunset	Moonrise	Moonset
Mon 01	1:40 AM PDT 12.2 ft	8:36 AM PDT 2.3 ft	2:22 PM PDT 8.6 ft	8:03 PM PDT 3.3 ft			5:16 AM PDT	9:01 PM PDT	4:01 PM PDT	3:19 AM PDT
Tue 02	2:20 AM PDT 12.3 ft	9:20 AM PDT 0.6 ft	3:40 PM PDT 9.5 ft	9:06 PM PDT 4.4 ft			5:15 AM PDT	9:02 PM PDT	5:21 PM PDT	3:43 AM PDT
Wed 03	2:57 AM PDT 12.4 ft	10:03 AM PDT −1.0 ft	4:47 PM PDT 10.5 ft	10:06 PM PDT 5.4 ft			5:15 AM PDT	9:03 PM PDT	6:42 PM PDT	4:09 AM PDT
Thu 04	3:35 AM PDT 12.4 ft	10:44 AM PDT −2.3 ft	5:47 PM PDT 11.4 ft	11:04 PM PDT 6.2 ft			5:14 AM PDT	9:04 PM PDT	8:03 PM PDT	4:39 AM PDT
Fri 05	4:13 AM PDT 12.2 ft	11:26 AM PDT −3.1 ft	6:41 PM PDT 12.1 ft			Full Moon	5:14 AM PDT	9:04 PM PDT	9:20 PM PDT	5:14 AM PDT
Sat 06		12:00 AM PDT 6.7 ft	4:54 AM PDT 11.8 ft	12:08 PM PDT −3.4 ft	7:32 PM PDT 12.5 ft		5:13 AM PDT	9:05 PM PDT	10:28 PM PDT	5:58 AM PDT
Sun 07		12:56 AM PDT 7.1 ft	5:37 AM PDT 11.3 ft	12:51 PM PDT −3.3 ft	8:20 PM PDT 12.6 ft		5:13 AM PDT	9:06 PM PDT	11:26 PM PDT	6:51 AM PDT
Mon 08		1:54 AM PDT 7.2 ft	6:22 AM PDT 10.6 ft	1:35 PM PDT −2.8 ft	9:07 PM PDT 12.5 ft		5:12 AM PDT	9:07 PM PDT		7:53 AM PDT
Tue 09		2:53 AM PDT 7.1 ft	7:12 AM PDT 9.8 ft	2:20 PM PDT −2.0 ft	9:53 PM PDT 12.3 ft		5:12 AM PDT	9:07 PM PDT	12:12 AM PDT	8:59 AM PDT
Wed 10		3:57 AM PDT 6.8 ft	8:07 AM PDT 9.0 ft	3:06 PM PDT −1.0 ft	10:38 PM PDT 12.1 ft		5:12 AM PDT	9:08 PM PDT	12:47 AM PDT	10:07 AM PDT
Thu 11		5:06 AM PDT 6.3 ft	9:10 AM PDT 8.2 ft	3:54 PM PDT 0.2 ft	11:21 PM PDT 11.8 ft		5:12 AM PDT	9:08 PM PDT	1:16 AM PDT	11:15 AM PDT
Fri 12		6:15 AM PDT 5.6 ft	10:23 AM PDT 7.5 ft	4:45 PM PDT 1.5 ft		Last Quarter	5:12 AM PDT	9:09 PM PDT	1:40 AM PDT	12:20 PM PDT
Sat 13	12:03 AM PDT 11.6 ft	7:15 AM PDT 4.6 ft	11:47 AM PDT 7.1 ft	5:40 PM PDT 2.8 ft			5:11 AM PDT	9:09 PM PDT	2:00 AM PDT	1:25 PM PDT
Sun 14	12:42 AM PDT 11.4 ft	8:03 AM PDT 3.6 ft	1:20 PM PDT 7.2 ft	6:41 PM PDT 4.1 ft			5:11 AM PDT	9:10 PM PDT	2:19 AM PDT	2:28 PM PDT
Mon 15	1:19 AM PDT 11.3 ft	8:42 AM PDT 2.5 ft	2:50 PM PDT 7.8 ft	7:46 PM PDT 5.2 ft			5:11 AM PDT	9:10 PM PDT	2:38 AM PDT	3:31 PM PDT
Tue 16	1:53 AM PDT 11.1 ft	9:14 AM PDT 1.5 ft	4:03 PM PDT 8.7 ft	8:50 PM PDT 6.1 ft			5:11 AM PDT	9:11 PM PDT	2:56 AM PDT	4:35 PM PDT
Wed 17	2:26 AM PDT 11.0 ft	9:44 AM PDT 0.5 ft	4:58 PM PDT 9.6 ft	9:48 PM PDT 6.7 ft			5:11 AM PDT	9:11 PM PDT	3:17 AM PDT	5:41 PM PDT
Thu 18	2:57 AM PDT 10.9 ft	10:13 AM PDT −0.4 ft	5:43 PM PDT 10.4 ft	10:39 PM PDT 7.2 ft			5:11 AM PDT	9:11 PM PDT	3:41 AM PDT	6:47 PM PDT
Fri 19	3:29 AM PDT 10.8 ft	10:44 AM PDT −1.2 ft	6:21 PM PDT 11.0 ft	11:25 PM PDT 7.6 ft			5:11 AM PDT	9:12 PM PDT	4:09 AM PDT	7:54 PM PDT
Sat 20	4:01 AM PDT 10.7 ft	11:18 AM PDT −1.9 ft	6:56 PM PDT 11.5 ft			New Moon	5:12 AM PDT	9:12 PM PDT	4:45 AM PDT	8:59 PM PDT
Sun 21		12:08 AM PDT 7.8 ft	4:35 AM PDT 10.6 ft	11:55 AM PDT −2.4 ft	7:31 PM PDT 11.9 ft		5:12 AM PDT	9:12 PM PDT	5:29 AM PDT	9:58 PM PDT
Mon 22		12:51 AM PDT 7.8 ft	5:12 AM PDT 10.5 ft	12:34 PM PDT −2.7 ft	8:07 PM PDT 12.1 ft		5:12 AM PDT	9:12 PM PDT	6:24 AM PDT	10:50 PM PDT
Tue 23		1:34 AM PDT 7.7 ft	5:54 AM PDT 10.3 ft	1:16 PM PDT −2.7 ft	8:45 PM PDT 12.3 ft		5:12 AM PDT	9:12 PM PDT	7:29 AM PDT	11:32 PM PDT
Wed 24		2:22 AM PDT 7.4 ft	6:41 AM PDT 10.0 ft	2:01 PM PDT −2.5 ft	9:25 PM PDT 12.4 ft		5:13 AM PDT	9:12 PM PDT	8:40 AM PDT	
Thu 25		3:13 AM PDT 6.9 ft	7:36 AM PDT 9.6 ft	2:46 PM PDT −1.8 ft	10:05 PM PDT 12.4 ft		5:13 AM PDT	9:12 PM PDT	9:56 AM PDT	12:07 AM PDT
Fri 26		4:09 AM PDT 6.2 ft	8:40 AM PDT 9.0 ft	3:35 PM PDT −0.8 ft	10:46 PM PDT 12.5 ft		5:14 AM PDT	9:12 PM PDT	11:13 AM PDT	12:36 AM PDT
Sat 27		5:10 AM PDT 5.2 ft	9:55 AM PDT 8.4 ft	4:26 PM PDT 0.6 ft	11:28 PM PDT 12.5 ft		5:14 AM PDT	9:12 PM PDT	12:30 PM PDT	1:02 AM PDT
Sun 28		6:12 AM PDT 3.9 ft	11:21 AM PDT 8.0 ft	5:23 PM PDT 2.2 ft		First Quarter	5:15 AM PDT	9:12 PM PDT	1:47 PM PDT	1:25 AM PDT
Mon 29	12:10 AM PDT 12.4 ft	7:11 AM PDT 2.4 ft	12:56 PM PDT 8.1 ft	6:27 PM PDT 3.9 ft			5:15 AM PDT	9:12 PM PDT	3:05 PM PDT	1:48 AM PDT
Tue 30	12:53 AM PDT 12.4 ft	8:05 AM PDT 0.8 ft	2:34 PM PDT 8.8 ft	7:38 PM PDT 5.3 ft			5:16 AM PDT	9:12 PM PDT	4:24 PM PDT	2:12 AM PDT

U.S. NAVY	**Figure 9** **June 2020 Tide Table**	CTO N4425519F4180 Biological Survey Work Plan

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Poulsbo, Liberty Bay, Puget Sound, Washington
47.7250° N, 122.6380° W

July 2020

Day	High	Low	High	Low	High	Phase	Sunrise	Sunset	Moonrise	Moonset
Wed 01	1:36 AM PDT 12.3 ft	8:54 AM PDT −0.6 ft	3:59 PM PDT 9.8 ft	8:52 PM PDT 6.4 ft			5:16 AM PDT	9:12 PM PDT	5:42 PM PDT	2:39 AM PDT
Thu 02	2:19 AM PDT 12.1 ft	9:40 AM PDT −1.8 ft	5:05 PM PDT 10.9 ft	10:01 PM PDT 7.0 ft			5:17 AM PDT	9:11 PM PDT	6:59 PM PDT	3:11 AM PDT
Fri 03	3:03 AM PDT 11.9 ft	10:24 AM PDT −2.6 ft	5:59 PM PDT 11.7 ft	11:03 PM PDT 7.3 ft			5:18 AM PDT	9:11 PM PDT	8:11 PM PDT	3:50 AM PDT
Sat 04	3:48 AM PDT 11.6 ft	11:08 AM PDT −3.0 ft	6:45 PM PDT 12.2 ft			Full Moon	5:18 AM PDT	9:11 PM PDT	9:13 PM PDT	4:38 AM PDT
Sun 05		12:00 AM PDT 7.3 ft	4:34 AM PDT 11.3 ft	11:50 AM PDT −3.1 ft	7:27 PM PDT 12.4 ft		5:19 AM PDT	9:10 PM PDT	10:04 PM PDT	5:36 AM PDT
Mon 06		12:52 AM PDT 7.2 ft	5:21 AM PDT 10.8 ft	12:33 PM PDT −2.8 ft	8:05 PM PDT 12.4 ft		5:20 AM PDT	9:10 PM PDT	10:44 PM PDT	6:40 AM PDT
Tue 07		1:41 AM PDT 6.9 ft	6:09 AM PDT 10.3 ft	1:15 PM PDT −2.2 ft	8:41 PM PDT 12.3 ft		5:21 AM PDT	9:09 PM PDT	11:16 PM PDT	7:49 AM PDT
Wed 08		2:30 AM PDT 6.6 ft	6:59 AM PDT 9.7 ft	1:56 PM PDT −1.4 ft	9:15 PM PDT 12.2 ft		5:22 AM PDT	9:09 PM PDT	11:42 PM PDT	8:57 AM PDT
Thu 09		3:20 AM PDT 6.1 ft	7:51 AM PDT 9.1 ft	2:38 PM PDT −0.4 ft	9:49 PM PDT 12.0 ft		5:23 AM PDT	9:08 PM PDT		10:05 AM PDT
Fri 10		4:10 AM PDT 5.5 ft	8:48 AM PDT 8.4 ft	3:19 PM PDT 0.8 ft	10:23 PM PDT 11.8 ft		5:23 AM PDT	9:07 PM PDT	12:04 AM PDT	11:10 AM PDT
Sat 11		5:02 AM PDT 4.8 ft	9:52 AM PDT 7.8 ft	4:02 PM PDT 2.2 ft	10:58 PM PDT 11.6 ft		5:24 AM PDT	9:07 PM PDT	12:24 AM PDT	12:15 PM PDT
Sun 12		5:55 AM PDT 4.0 ft	11:08 AM PDT 7.4 ft	4:49 PM PDT 3.6 ft	11:35 PM PDT 11.3 ft	Last Quarter	5:25 AM PDT	9:06 PM PDT	12:42 AM PDT	1:18 PM PDT
Mon 13		6:46 AM PDT 3.1 ft	12:38 PM PDT 7.4 ft	5:44 PM PDT 5.1 ft			5:26 AM PDT	9:05 PM PDT	1:00 AM PDT	2:21 PM PDT
Tue 14	12:12 AM PDT 11.1 ft	7:33 AM PDT 2.2 ft	2:21 PM PDT 8.0 ft	6:53 PM PDT 6.3 ft			5:27 AM PDT	9:04 PM PDT	1:20 AM PDT	3:26 PM PDT
Wed 15	12:51 AM PDT 10.8 ft	8:15 AM PDT 1.2 ft	3:49 PM PDT 8.9 ft	8:12 PM PDT 7.2 ft			5:28 AM PDT	9:04 PM PDT	1:42 AM PDT	4:32 PM PDT
Thu 16	1:31 AM PDT 10.6 ft	8:56 AM PDT 0.3 ft	4:47 PM PDT 9.8 ft	9:26 PM PDT 7.7 ft			5:29 AM PDT	9:03 PM PDT	2:09 AM PDT	5:38 PM PDT
Fri 17	2:12 AM PDT 10.5 ft	9:35 AM PDT −0.6 ft	5:30 PM PDT 10.6 ft	10:23 PM PDT 7.9 ft			5:30 AM PDT	9:02 PM PDT	2:41 AM PDT	6:44 PM PDT
Sat 18	2:52 AM PDT 10.5 ft	10:14 AM PDT −1.4 ft	6:04 PM PDT 11.2 ft	11:09 PM PDT 7.9 ft			5:31 AM PDT	9:01 PM PDT	3:21 AM PDT	7:46 PM PDT
Sun 19	3:33 AM PDT 10.5 ft	10:53 AM PDT −2.0 ft	6:36 PM PDT 11.6 ft	11:49 PM PDT 7.7 ft			5:32 AM PDT	9:00 PM PDT	4:12 AM PDT	8:42 PM PDT
Mon 20	4:16 AM PDT 10.6 ft	11:34 AM PDT −2.5 ft	7:07 PM PDT 11.9 ft			New Moon	5:33 AM PDT	8:59 PM PDT	5:14 AM PDT	9:29 PM PDT
Tue 21		12:29 AM PDT 7.4 ft	5:01 AM PDT 10.7 ft	12:16 PM PDT −2.8 ft	7:40 PM PDT 12.2 ft		5:35 AM PDT	8:58 PM PDT	6:25 AM PDT	10:07 PM PDT
Wed 22		1:10 AM PDT 6.9 ft	5:50 AM PDT 10.7 ft	12:59 PM PDT −2.7 ft	8:13 PM PDT 12.4 ft		5:36 AM PDT	8:57 PM PDT	7:41 AM PDT	10:39 PM PDT
Thu 23		1:55 AM PDT 6.2 ft	6:42 AM PDT 10.4 ft	1:43 PM PDT −2.1 ft	8:48 PM PDT 12.5 ft		5:37 AM PDT	8:55 PM PDT	9:00 AM PDT	11:06 PM PDT
Fri 24		2:44 AM PDT 5.4 ft	7:40 AM PDT 10.0 ft	2:28 PM PDT −1.2 ft	9:24 PM PDT 12.6 ft		5:38 AM PDT	8:54 PM PDT	10:19 AM PDT	11:30 PM PDT
Sat 25		3:36 AM PDT 4.4 ft	8:44 AM PDT 9.5 ft	3:14 PM PDT 0.3 ft	10:02 PM PDT 12.6 ft		5:39 AM PDT	8:53 PM PDT	11:37 AM PDT	11:53 PM PDT
Sun 26		4:32 AM PDT 3.3 ft	9:57 AM PDT 8.9 ft	4:04 PM PDT 2.0 ft	10:42 PM PDT 12.4 ft		5:40 AM PDT	8:52 PM PDT	12:55 PM PDT	
Mon 27		5:31 AM PDT 2.2 ft	11:23 AM PDT 8.5 ft	5:00 PM PDT 3.9 ft	11:24 PM PDT 12.2 ft	First Quarter	5:42 AM PDT	8:51 PM PDT	2:13 PM PDT	12:16 AM PDT
Tue 28		6:32 AM PDT 1.0 ft	1:04 PM PDT 8.7 ft	6:09 PM PDT 5.6 ft			5:43 AM PDT	8:49 PM PDT	3:30 PM PDT	12:42 AM PDT
Wed 29	12:11 AM PDT 11.9 ft	7:31 AM PDT −0.1 ft	2:50 PM PDT 9.4 ft	7:33 PM PDT 6.8 ft			5:44 AM PDT	8:48 PM PDT	4:46 PM PDT	1:12 AM PDT
Thu 30	1:02 AM PDT 11.6 ft	8:28 AM PDT −1.0 ft	4:10 PM PDT 10.4 ft	9:00 PM PDT 7.3 ft			5:45 AM PDT	8:47 PM PDT	5:58 PM PDT	1:47 AM PDT
Fri 31	1:56 AM PDT 11.3 ft	9:20 AM PDT −1.6 ft	5:07 PM PDT 11.3 ft	10:12 PM PDT 7.4 ft			5:47 AM PDT	8:45 PM PDT	7:02 PM PDT	2:31 AM PDT

NOT FOR NAVIGATION

U.S. NAVY	**Figure 10** **July 2020 Tide Table**	CTO N4425519F4180 Biological Survey Work Plan

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6. DATA COMPILATION AND REPORTING

The following sections describe the general procedures to be used for data compilation and reporting.

6.1 DATA COMPILATION

This section outlines the general procedures to be used to compile the biological survey field reconnaissance data.

- Hardcopies of the biological survey data forms, marked-up aerial photographs and maps, and other field notes for each survey area will be assembled into a project notebook and organized by location and by date. A quality control check for completeness of biological survey data forms will be done to ensure a complete set of hardcopy data. Missing information will be reconstructed from field logbooks and photographs if needed.
- The GPS coordinate data will be compiled within a master database for Keyport OU 1 and each reference site surveyed. Each record will include fields for unique reference IDs, positional IDs, and survey coordinates in latitude and longitude. An example of fields defining the positional IDs for a reference site is provided in Table 3.

Table 3: Examples of Exposure Area/Reference Site Positional IDs

Reference Site ID	Positional ID	Latitude	Longitude	Description
HA	01-1	North-south position	East-west position	North end of mud flat habitat
HA	01-2	North-south position	East-west position	Cluster of baldhip rose plants
HA	01-3	North-south position	East-west position	Clam bed

HA Haley State Park

- GPS waypoints files will be downloaded, checked for completeness, and compared to the positional IDs noted for photographs and biological survey data forms. The GPS waypoints will then be converted to the geographic information system (GIS) coordinate system and used to create maps in the reporting task.
- Digital file IDs for photographs will be cross-checked against the content shown on whiteboards in the photograph. Any extra or duplicate photographs will be purged (removed) from project directory. The final digital folder will be a sequence of files (electronic photographs) that illustrate each survey area to assist field staff with locating plant and animal species and setting up future sampling efforts.

6.2 REPORTING

Reporting of biological survey field efforts will be concise and include the following:

- A brief narrative description of the biological survey activities at Keyport OU 1 and documenting the reference site(s) that were visited, when the work was completed, and how it was conducted (including any deviations from the BSWP).
- GIS-prepared maps (aerial photograph as base map) showing spatial data collected during the biological survey, and any hand drawn notes.
- Copies of biological survey data forms with collected data (such as location IDs and sketches)
- Photographs

- Electronic copies of the entire report, including native files used to generate the report (e.g., survey data in Excel format, digital photographs)

The results of the biological survey will be included as an appendix to the HHRA/ERA QAPP.

7. REFERENCES

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URS. 2009. *Haley Property Vegetation Survey Report*. Prepared for the Washington State Parks and Recreation Commission. March.

WDFW. Priority Habitats and Species. Available at: https://wdfw.wa.gov/species-habitats/at-risk/phs

WDFW. SalmonScape. Available at: https://apps.wdfw.wa.gov/salmonscape

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Appendix A:
Project Team Meeting Summaries

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NBK Keyport OU 1 Area 1 Regulator/Stakeholder Kickoff Meeting

Final Meeting Summary

October 9, 2019

Team Members in Attendance

Carlotta Cellucci	NAVFAC NW, Navy RPM
Harry Craig	US EPA, Project Manager (via telecom)
Mahbub Alam	Ecology, Project Manager
John Evered	Ecology, Risk Assessor

Support Personnel

JoAnn Grady	Grady and Associates, Team Facilitator
Jennifer Corack	NAVFAC LANT, Human Health Risk Assessor (via telecom)
Jason Speicher	NAVFAC LANT, Ecological Risk Assessor (via telecom)
Debbie Rodenhizer	AECOM, Project Manager
Josie Smith	AECOM, Deputy Project Manager and Field Lead
Jill Hedgecock	AECOM, Ecological Risk Assessor (via telecom)
Laura Scheffler	AECOM, Human Health Risk Assessor
Jeff Walker	AECOM, Biologist
Nicole Rangel	AECOM, Human Health Risk Assessor, Meeting Notetaker

Attachments

Attachment A – Meeting Agenda
Attachment B – Presentation Slides
Attachment C – Figure 1

Agreements:

1. The following changes will be made to the slide presentation (Attachment B):
    a. Title page - Date will be updated to October 9, 2019.
    b. Slide 8 (second bullet) - The word “potential” will be added before “target species…”
    c. Slide 14 – “cm” will be changed to “inches”.
    d. Slide 19 – An open circle will be added under the Outdoor Worker column for sediment exposures in the Marsh Pond/Creek.
    e. Slide 24 – The end of the first sentence will be updated to “…~0.5 miles to the northeast”
    f. Side 26 – Marsh will be update to Marsh Pond.
    g. Slide 32 – Under the Burrowing Mammals column a closed circle will be added to the Ingestion/Biota prey pathway in the Nonpaved Areas.
    h. Slide 36 -A Berries/Vegetation column will be added under Media for the Area 1 Surface Water Bodies portion of the table.
    i. Slide 38 – a soil gas column will be added

Action Items:

1. Ms. Cellucci will send out the meeting location address in future meeting invites.

2. Ms. Cellucci will email a simplified project schedule ("Gant chart") to the project team.
3. Ms. Cellucci will email the "USGS Model Report" to the team.
4. Ms. Smith will email the link to the Washington State Department of Fish and Wildlife (WDFW) habitat viewer to the team. (Completed during meeting)
5. AECOM will review the Fish and Wildlife Priority Habitat and Species List website and the Coastal Atlas for possible reference areas.
6. Ms. Cellucci will find out what the potential exposures are for the outdoor worker to sediment; when and how often is the Marsh treated for invasive species.
7. Ms. Cellucci will find out what portions of the Installation Natural Resource Management Plan she can release and then email those portions out to the team.
8. Doodle polls for the upcoming workgroup meetings will be sent out by AECOM (Ms. Scheffler or Ms. Hedgecock).

Meeting Discussion

Introduction

After all team members announced their presence, Ms. Grady asked if there were any changes or additions to the agenda. Mr. Alam had no comments but requested that the meeting materials be sent out before the meeting. Ms. Cellucci apologized and said it was her intention to send them out before the meeting, but there were too many last-minute changes, therefore they were not sent out. Mr. Evered requested that the address of meeting locations be sent out to the group. Ms. Cellucci agreed to do so for future meetings. Ms. Cellucci then reviewed the agenda for the meeting (Attachment A). She stated that the project is a 3-year long project due to the limited sampling dates. She then stated that the purpose of the coming year (2019-2020) was to develop the work plan for the biological survey. She then listed the project steps chronologically: write plan, review plan, conduct survey in June, review the data from the survey to determine which target species (plants/animals) to sample for in the exposure areas, determine how to evaluate data to be sampled for risk assessment, develop the sampling and analysis plan for the risk assessment sampling, sample for risk assessment in June 2021, and complete the entire project by early 2022. Mr. Evered then asked if there was a schedule chart showing the steps and timeline. Ms. Cellucci said she did have one, but because it is too complicated (too detailed), she would send out a more simplified schedule or "Gant Chart."

Ms. Cellucci then went over the purpose of the Keyport Landfill re-evaluation (Slide 4, Attachment B) highlighting that there has been new information uncovered in the last 4 years of sampling: contamination is deeper, concentrations are at higher levels, and studies have shown that a larger portion of the Marsh area has been impacted. She further stated that the team needs to determine if the baseline risk assessment conclusions are still valid or if additional risk characterization is necessary. She also noted that there are emerging contaminants on the site, but did not believe they would impact the risk assessment. She mentioned that groundwater modeling will be completed to assess whether there are additional receptors (offsite receptors to groundwater). Mr. Alam asked if he could see the USGS modeling report. Ms. Cellucci replied that she would send out the modeling report to the team for review. Ms. Cellucci then presented the objectives of the project (Slide 4, Attachment B), the key elements of the ROD remedial actions (Slide 5, Attachment B), and summary of ROD chemicals of concern (COCs) (Slide 6, Attachment B). Ms. Cellucci highlighted that 1,4-Dioxane was added to the ROD COCs in groundwater because it was found in the North Plantation in 2006; and has been included in monitoring since 2011. Mr. Evered then asked if PFAS has been analyzed for in groundwater samples. Ms. Cellucci responded yes, PFAS was sampled at every hot spot. However, none of the concentrations

exceeded the lifetime health advisory. She further stated that as the site is not used for drinking water and there are no vetted ecological risk numbers for PFAS yet, it will be not be added to the risk assessment at this time.

Biological Survey

Mr. Walker reviewed the goals of the biological survey (Slide 8, Attachment B). He discussed the mapping of site habitat (Slide 8, Attachment B) and the target species data needs (Slide 9, Attachment B). He noted that during the August site visit several different types of biological communities were found, such as forest, marsh, and mudflats, which will be further refined during mapping of the site. He also mentioned that the survey team would be identifying and mapping the eagle nest.

Mr. Walker then reviewed the target species data needs (Slide 10, Attachment B). Ms. Cellucci stated that there may be a need for two sampling events as berries are not available in June, but most likely are available in August or September. Mr. Walker responded that the number of field events would depend on the target plant chosen. Ms. Cellucci requested that the workgroups consider seasonality in discussions of the biological survey workplan. Mr. Walker noted that in the month of June the field team will be able to identify the abundance of plants. Ms. Cellucci also requested that during the workgroup meetings the team identify when the particular part of the plant to be used is available. Mr. Walker responded that a preliminary plant list (Fall list) was made during the last site visit which will be used as a starting point. Ms. Smith noted that in June plants are viable and green, therefore it is a good month for plant identification, even if berries are not present. Ms. Cellucci noted that some plants such as skunk cabbage, that may be used for medicinal purposes by the tribes, are very seasonal (only seen in spring). Mr. Walker responded that in June they would be able to see the leaves of skunk cabbage. He then stated that in determination of wet and dry weights (how many berries needed for a valid sample), the team could buy berries from the store in lieu of picking them. Mr. Evered then asked if blackberries are a typical receptor. Ms. Hedgecock responded yes. Ms. Corack then added that the species are driven by the conceptual site model (CSM) and most sites do not have enough berries (abundance) for reasonable maximum exposure (RME). Ms. Cellucci responded that there are tons of blackberries, as the Himalayan blackberry is a very invasive species on the site and prolific in the area. Mr. Walker noted abundance also depends on the different exposure areas of the site (distribution); however, he agreed that if blackberries were chosen as the target species, there would be enough on the site.

Mr. Walker then reviewed the reference area criteria (Slide 11, Attachment B). He stated that choosing a reference area may be challenging as it may be difficult to find only one for vegetation. Ms. Cellucci further noted that there was no marsh area at Penrose Point State Park. Ms. Smith responded that there is a marshy prairie area located in the upland beach area of Penrose Point. However, she was not sure if it was included within the park boundary. Mr. Alam asked if the on-site Marsh was freshwater. Ms. Cellucci responded only part of the Marsh is freshwater as the northern portion of the Marsh Pond up to the tide gate is brackish (where mussels were seen), the southern portion of the Marsh Pond is relatively fresh, and the southern Marsh Creek area is all freshwater.

Ms. Scheffler then presented Figure 1 (Attachment C) to show the different exposure areas of the Marsh Pond and stated Exposure Area 7 (North Marsh Creek) is estuarine, Exposure Area 8 (Marsh Pond) is mostly freshwater although there is saltwater influence, and Exposure Area 9 (South Marsh Creek) is all freshwater. Mr. Walker noted that based on salt-tolerant plants seen growing in the Marsh Pond, saltwater influence extends into the Marsh Pond. Ms. Scheffler pointed on the map where the tide gate was located and noted the location was the point of saltwater entry. Ms. Cellucci agreed, stating that

the tide gate is not water tight as it only controls levels (when the water level reaches 3 feet it closes) so it does feed saltwater into the area. Ms. Hedgecock then mentioned that in the supplemental 1995/1996 study, reference locations were from Carr Inlet (for the Marsh) and Agate Pass (for the tissue). Ms. Scheffler recommended using the Ecology Bold Data, however Mr. Evered said the "Bold" data is only for marine. Mr. Evered mentioned Tolmie State Park (which is located in Nisqually Ridge) as a possible reference location as it has been used before. He also recommended using the Washington State Department of Fish and Wildlife (WDFW) habitat viewer to locate marshes around the area. Ms. Cellucci requested that the link to the WDFW website be sent out. Ms. Smith replied she would email it to the team. Mr. Evered also mentioned Ecology's Coastal Atlas as another possible source to use.

Human Health Risk Assessment

Ms. Scheffler reviewed the previous human health risk evaluations performed at Area 1 (Slide 13, Attachment B). She then went over the baseline risk assessment approach (Slide 14, Attachment B) and stated the objective of the project is to evaluate whether there is unacceptable risk beyond what was identified in the baseline and supplemental risk assessments. She noted that "cm" should be "inches" for the soil exposure medium on slide 14 and she would correct the error. Ms. Scheffler then gave a brief summary of the baseline results (Slides 15 thru 18, Attachment B) highlighting the following:

- For the current/future resident receptor, no soil or groundwater exposures were quantified in the baseline. However, in the ROD, groundwater exposure was quantified for a drinking water scenario, which resulted in the only unacceptable risk for the residential scenario. This was due to TCE, TCA, and chlorinated VOCs.
- For the current/future worker scenario, soil exposures were quantified based on data collected from shallower depth intervals for surface soil (0-2 inches) and root zone soil (2-15 inches), rather than the usual 0-2 feet. Only the indoor air pathway resulted in unacceptable risk based on air samples collected from within the buildings that used to be located on the landfill.
- For the current/future recreational receptor, soil was not quantified for the same reason as the current future resident receptors (note: there is no current access to the site and the landfill cover will prevent future exposures). None of the pathways evaluated resulted in unacceptable risks.
- For the current/future subsistence receptor, ingestion of shellfish was only evaluated for Dogfish Bay where no unacceptable risks were found. Ms. Scheffler noted that the ingestion rate for the subsistence receptor was 132 g/day, but the Suquamish rate is 495 g/day. She further stated that the baseline risk assessment applied a fraction ingested from site factor of 0.25, which the Suquamish has never agreed to use. A fraction ingested from site factor of 1 is typically used.

Mr. Evered asked if risks were reevaluated using the ingestion rate of 495g/day and the fraction ingested factor of 1.0. Ms. Scheffler responded that she had not recalculated risks, but then gave a ballpark estimate of 2×10^{-4}.

Ms. Scheffler then presented the proposed human health conceptual site model (CSM) (Slide 19, Attachment B). She stated that if the assumption that institutional controls remain in place at the site then the exposures to the excavation worker, indoor worker, and future resident can be considered incomplete; as institutional controls prevent digging, maintenance of the remedy falls under OSHA controls, no buildings can be built or occupied on the site on a regular basis, there are no risks to current industrial workers around the landfill (per the 2019 vapor intrusion study), and land use controls prevent future residential development. Therefore, the receptors would include an outdoor worker (occasional maintenance of the site such as brush control), recreational user, and subsistence user. She noted that

the only difference between the recreational user and subsistence user would be the exposure factors used. Ms. Scheffler stated that not all areas of the landfill have a cover nor are paved, so there are still exposed soil areas. She then stated that the previous baseline risk assessment did not do an evaluation of the habitat within the Marsh Creek and Marsh Pond system; meaning the exposures were not adequately characterized for those areas (the baseline only looked at clam tissue in tide flats and Dogfish Bay). She further stated that recent data has shown significant contamination remaining in this area.

Mr. Evered asked to confirm that there were no groundwater exposures to the recreational user. Ms. Scheffler confirmed there were none and added that the surface water pathway was considered insignificant for the recreational user because there would be no significant ingestion of surface water and the surface water dermal pathway is insignificant in comparison to sediment and tissue ingestion pathways. Mr. Evered then asked if there were exposures of the outdoor worker to sediment. Mr. Speicher said there is vegetative management performed at the site but not on a regular basis. Ms. Corack asked if we could find out when, where, and how often there is maintenance for the vegetation in sediment. Ms. Cellucci stated there is also spraying of approved herbicides to control the blackberries. Ms. Scheffler suggested adding an open circle to the proposed human health CSM for the Marsh Pond/Creek area under the outdoor worker. She suggested an open circle be included for the outdoor worker, because the outdoor worker sediment exposures would be low compared to the recreational and subsistence user. Mr. Craig then asked if there were any exposures in the asphalt pad area where there is currently motorcycle training classes. Ms. Scheffler replied the training is done on top of the cover so there are no exposures to soil. Ms. Cellucci said the only exposure pathway would be vapor intrusion to outdoor air, but that pathway did not result in unacceptable risk in the baseline risk assessment. Mr. Craig then asked if this was the same area of the high methane concentrations under the asphalt. Ms. Cellucci replied yes, but methane was being evaluated in a different project. She also mentioned that the remedy would most likely be a venting system such a french drain.

Ecological Risk Assessment

Ms. Hedgecock presented an overview of the 1993 baseline ecological risk assessment (BERA) and the 1995/1996 supplemental ecological risk assessment (see Slide 21 of Attachment B). As ecological risk assessment (ERA) procedures were still under development at the time of the baseline study, Ms. Hedgecock stated that, instead of the SMS criteria that would be used today, the BERA used ERLs and ERMs as sediment benchmarks. She also noted that there are now soil gas screening criteria for burrowing mammals which did not exist at the time of the BERA. She added that the Otto Fuel Area was evaluated as a separate AOC from the other terrestrial areas of the site and the Marsh Creek was not evaluated. Ms. Hedgecock then reviewed the 1993 BERA approach, listing the receptors, sampling media, and bioassay tests evaluated at the site (Slide 22, Attachment B). She then reviewed the historic BERA CSM (Slide 23, Attachment B) noting there was no terrestrial CSM presented in the BERA for Area 1, but she reviewed the terrestrial CSM for other parts of the naval base. Ms. Hedgecock then presented the 1993 terrestrial receptors (Slide 24, Attachment B) highlighting that no T&E species were identified in the BERA; however, there is a known bald eagle nest near the site. Ms. Cellucci noted that the bald eagle is to the northeast of the site not to the south as presented in the slide. Ms. Hedgecock further commented that Canada geese were not evaluated in Area 1, but they do currently exist on site as geese feces were seen during the site visit. In addition, Ms. Cellucci commented that she has viewed them at the site. Ms. Cellucci said she had additional information to send out regarding the different species that exist on the site from the Natural Resource and Management Plan. However, she first needs to identify which parts of the report she can release.

Ms. Hedgecock then presented the terrestrial, marsh, tide flats, and Dogfish Bay results of the BERA (Slides 25 thru 28, Attachment B). Ms. Hedgecock noted that there are no VOC benchmarks, however soil gas benchmarks for burrowing mammals are a way to evaluate VOCs. Ms. Hedgecock then presented the 1995/1996 results of the supplemental study (Slides 29 through 31, Attachment B) noting that only the aquatic receptors were evaluated in the study. Ms. Scheffler noted the discrepancy of Marsh Pond vs. Marsh between the BERA and supplemental study slides. Ms. Hedgecock stated both should say Marsh Pond. Ms. Hedgecock then presented the proposed ecological CSM (Slide 32 of Attachment B) noting the addition of semi-aquatic birds and burrowing animals. Mr. Evered then asked why there were no exposures for burrowing mammals by ingestion of prey as they eat worms. Ms. Hedgecock agreed to add a "closed" circle under the "Burrowing Mammals" column for ingestion/biota prey pathway of the non-paved areas. Ms. Cellucci asked why there was a closed circle for ingestion (surface water/sediment) of the floating algae, free swimming invertebrates and fish, as well. Ms. Hedgecock replied that aquatic benchmarks were used for the evaluation. Ms. Scheffler clarified that floating algae, free swimming invertebrates, and fish are evaluated by the ambient water quality criteria for direct contact, which distinguishes it from water drinking animals such as a bird (not living in the water). Ms. Hedgecock further clarified that the direct contact pathway for "fish" covers all exposures except bioaccumulation.

Mr. Alam asked if bioaccumulation would be evaluated for fish. Ms. Hedgecock replied that bioaccumulation is usually evaluated by looking at concentrations in prey or bioaccumulation in the food chain such as birds and mammals, but there are limitations because of the tools available to do so (i.e. critical tissue levels are limited to toxic responses as a result of bioaccumulation and uncertain). Mr. Alam asked if bioaccumulation would be compared to the reference area, such as fish tissue PCB concentrations. Mr. Speicher said shellfish would be better than fish for evaluation of bioaccumulation, because shellfish have better site fidelity versus fish that typically have a much larger home range. Ms. Hedgecock agreed and added that another good measure could be a longer duration bioaccumulation bioassay using shellfish as it is usually considered the worst-case scenario. Ms. Scheffler further responded to Mr. Alam adding that it would be optimal to sample the same tissue data from the site and the reference area to evaluate potential background interference. Ms. Hedgecock agreed for metals, but Mr. Alam stated there are background levels for PCBs too.

Schedules

Ms. Grady inquired about the dates for the upcoming workgroup meetings, anticipating a full schedule of meetings for the majority of the project team members. Ms. Rodenhizer replied that she had tentatively held October 23, 2019 and November 6, 2019 for the two (2 hour) workgroup meetings for the biological survey. Ms. Cellucci stated that she would like to combine the project team meeting with one of the Adaptive Site Management meetings in mid-November to minimize the need for an additional day of meetings for the project team members. There was a lengthy discussion of the project team member's commitments in November and Ms. Cellucci suggested November 13th, 2019 for the project team meeting. Ms. Cellucci also requested the workgroup meetings be scheduled before this date, as well. Ms. Scheffler asked if there was a big rush to schedule the workgroup meetings or the team meeting as the biological survey will not be performed until June. It was agreed that there was no rush and a doodle poll would be sent out by AECOM for the workgroup meetings. The project team meeting date is still to be determined.

Proposed Exposure Areas/Data Compilation Results/Potential Site and Reference Area Data Needs

Ms. Scheffler presented the nine proposed exposure areas on Figure 1 (Slide 34, Attachment B). She stated that the areas were divided based on habitats, surface features, contaminant sources, and contamination present. She noted that the areas listed may not necessarily be evaluated separately. Ms. Scheffler gave a description of each of the exposure areas:

- Exposure Area 1a: paved and therefore no complete exposures exist, therefore no risk will be evaluated.
- Exposure Area 1b: the western area of the landfill that is unpaved and lined with trees.
- Exposure Area 2: the unpaved upland area where the former incinerator and burn pit were located and where high PCB and TPH concentrations have been found in soil and groundwater. Ms. Scheffler stated a more comprehensive list of analytes in addition to the ROD COCs will performed at this site.
- Exposure Area 3: North Plantation
- Exposure Area 4: South Plantation
- Exposure Area 5: Dogfish Bay
- Exposure Area 6: Tide flats
- Exposure Area 7: North Marsh Creek (estuarine with tidal influence from tide flats)
- Exposure Area 8: Marsh Pond (unique ecosystem)
- Exposure Area 9: South Marsh Creek and Marsh (freshwater)

Ms. Scheffler then reviewed the documents available for the data compilation study and listed the type of analysis performed for each (Slide 35, Attachment B). Ms. Scheffler presented a simple table summarizing available data to clearly show what data is currently missing (Slide 31, Attachment B) and highlighting that soil (both surface and subsurface), berries and vegetation, and tissue data in the Marsh or Marsh Creek is lacking for the site. Ms. Scheffler also presented a more detailed data summary that showed number of locations and analysis types. Mr. Evered asked if the PCB data listed was for aroclors. Ms. Scheffler responded that PCB congener data is available for the more recent sampling investigation for sediment, porewater, and surface water. She stated that the purpose of the table was to show the holes where we lack data to characterize exposures and the details of the analytical needs will be further discussed during the workgroup meetings.

Ms. Scheffler presented a table showing all the potential data needs of the upcoming HHRA/ERA study (Slide 38, Attachment B). She stated that the table is a starting point for upcoming discussions in the future workgroup meetings. She highlighted that surface soil data and soil data (down to 6 feet for evaluating burrowing mammals) was lacking in Exposure Area 1b. In reference to burrowing mammals, Ms. Cellucci asked if soil gas data would be needed. Ms. Scheffler replied that she would add a soil gas column to the table. Mr. Speicher added that soil gas data would only be needed for chlorinated VOCs and BTEX compounds.

Ms. Scheffler then highlighted the additional analyses listed for the Exposure Area 2 (Unpaved Upland Area) as compared to the other unpaved areas (Exposure Areas 1b, 3, and 4) due to the historical uses of the area and the new information from recent sampling (high PCB and TPH concentrations). Ms. Scheffler added that dioxins were also added to soil in Exposure Area 2 because of the historical presence of the incinerator and burn pit. She suggested possibly holding surface water and groundwater samples for dioxin analyses and analyzing them only if dioxins were found in soil. Ms. Cellucci then suggested having soil sampled for dioxin in the next upcoming long-term monitoring (LTM)

sampling in 2020. Mr. Alam suggested analyzing PCB congeners and dioxins together as it is more cost efficient. Ms. Smith noted that the holding times for dioxins and PCBs were both one year for water samples. Ms. Scheffler replied that no holding times would be required if soil would be sampled for dioxins during the LTM. Mr. Alam asked if Ms. Hedgecock thought PCB Congener data would be needed. Ms. Scheffler replied that the details of analyses would be further developed in workgroup meetings. Ms. Hedgecock replied that (in her opinion) PCB congener analyses were beneficial in tissue, however PCB congeners analyses were not worth the expense in soil. Ms. Scheffler then added that additional analyses (in addition to the ROD COCs) was also added to the Exposure Area 6 (Tide Flats) and Exposure Area 7 (North Marsh Creek) because of their proximity to the unpaved Upland Area. She noted that more data is also needed for the Exposure Area 8 (Marsh Pond) and Exposure Area 9 (South Marsh Creek) to characterize chlorinated VOCs and metals which were historically chemicals of interest (COIs); however, PCBs have not historically been found so they were excluded. She added that as mussels were seen in the North Marsh Creek area, tissue analyses was also added for Exposure Area 7 (North Marsh Creek).

Ms. Scheffler then reviewed the background/reference data needs of the HHRA/ERA study (Slide 39, Attachment B). She believed that obtaining the reference data would be challenging and expensive as there were several media and habitats at the site. Ms. Smith noted that there may be background marine surface water data from near the site. Ms. Scheffler believed background values were required for metals, as well as for PCBs. Ms. Smith noted that reference areas may need to be divided based on the needs of the HHRA versus the ERA.

Ms. Cellucci reviewed all action items before adjourning the meeting.

KEYPORT PROJECT TEAM MEETING
Keyport OU 1 Kick-Off Meeting
October 9, 2019
Telecommunication
Teleconference Call-In Number: 1-866 692 3580; Code: 593 456 117#

DRAFT AGENDA

Team Members

Carlotta Cellucci	NAVFAC Project Manager	Harry Craig	US EPA Project Manager
Mahbub Alam	Ecology Project Manager	Denice Taylor	Suquamish Tribe Project Manager

Support Personnel

John Evered	Ecology Risk Ass.	Josie Smith	AECOM Asst. PM
Joe Goulet	EPA Eco. Risk Ass.	Jill Hedgecock	AECOM Eco. Risk Ass.
Jason Speicher	LANT Eco. Risk Ass.	Nicole Rangel	AECOM Note Taker
Jenn Corack	LANT HH Risk Ass	Jeff Walker	AECOM Biologisty
Debbie Rodenhizer	AECOM PM	JoAnn Grady	Grady & Assoc. Facilitator

10:00 - 10:05
Introductions

- Approve agenda (JoAnn)

10:05 – 12:00 (Carlotta, Jeff, Laura, Jill)

- **Power Point Presentation**
  - Background (Carlotta/Laura/Jill)
  - Biological Survey (Jeff)
  - Human Health Review and CSM (Laura)
  - Ecological Risk Review and CSM (Jill)
  - Proposed Exposure Areas (Laura/Jill)
  - Summary of Available Data (Laura/Jill)
  - Potential Data Needs (Laura)

1:00 - 3:00 – Discussion and Meeting Wrap-up

- Review Agreements
- Next steps
- Adjourn

NBK Keyport OU1, Area 1 Regulator/Stakeholder Kick-Off Meeting

October 9, 2019

Outline

- **Purpose and Objective**
- **Biological Survey Approach**
  - Goals
    - Map Site Habitat
    - Target Species Data Needs
    - Reference Area Criteria
- **Human Health Risk Assessment**
  - Summary of Previous HHRAs
  - Proposed HH Receptors & Exposure Pathways
- **Ecological Risk Assessment**
  - Summary of Baseline and Supplemental ERA
  - Proposed Eco Receptors & Exposure Pathways (Upland & Aquatic)
- **Proposed Exposure Areas (HH and Eco)**
- **Summary of Available Data**
- **Potential Site and Reference Area Data Needs**

PURPOSE AND OBJECTIVE

Purpose and Objective of Keyport Landfill Re-Evaluation

- Purpose:
  - Consider new information revealed during the 2017 Phase II Site Recharacterization and the current 2019 Source Investigation activities;
  - Evaluate whether unacceptable risk exists to current and/or anticipated future receptors beyond what was identified in the baseline and supplemental HH and Eco RAs based on new information and current understanding of remedy effectiveness;
  - Evaluate whether RAOs adequately address all unacceptable risk or if additional measures are needed to protect human and ecological health.

- Objective:
  - Refine the CSM based on current conditions and anticipated future land use;
  - Identify any additional data needs to characterize risks to human and ecological receptors;
  - Characterize risks for current and anticipated future receptors using relevant data.

ROD Remedial Actions – Key Elements

- PCB-impacted sediment removal
- Phytoremediation (N. and S. Plantation) to address TCE-impacted groundwater
- Repair and maintenance of landfill cover to minimize direct exposure
- Long term monitoring
  - Groundwater
  - Surface water/sediment
  - Clam tissue
- Land use controls
  - prohibit construction of occupied buildings over landfill
  - restrict activities that involve digging or construction at the landfill that could cause exposure to contaminants in soil, groundwater, or vapor
  - prohibit construction of groundwater drinking wells
  - control the use of the site such that NBK Keyport will remain a secure facility limiting access to individuals with bona fide business with the Navy or invitees

Summary of ROD COCs

Soil	Groundwater	Surface Water	Sediment	Clam Tissue
VOCs	1,1-DCA 1,2-DCA 1,1-DCE cis-1,2-DCE trans-1,2-DCE PCE 1,1,1-TCA TCE VC PCBs (1,4-dioxane added after ROD)	1,1-DCA 1,2-DCA 1,1-DCE cis-1,2-DCE trans-1,2-DCE PCE 1,1,1-TCA TCE VC PCBs	1,1-DCA 1,2-DCA 1,1-DCE cis-1,2-DCE trans-1,2-DCE PCE 1,1,1-TCA TCE VC PCBs	1,1-DCA 1,2-DCA 1,1-DCE cis-1,2-DCE trans-1,2-DCE PCE 1,1,1-TCA TCE VC PCBs

BIOLOGICAL SURVEY APPROACH

Slide revised since Oct. 9th meeting
Goals of Biological Survey

- **Map habitats to aid in distribution of samples across site**
- **Collect information on potential target species to determine viability for sampling**
- **Collect similar information for reference sites**
- **Overall goal is to refine list of target species for sampling**

Map Site Habitat

- **Broadly characterize the vegetation community on the site (e.g. forest, salt marsh, mudflat)**
- **Map concentrated occurrences of potential target species to understand distribution across site**
- **Note incidental wildlife observations**
- **Take photographs of vegetation community**

Target Species Data Needs

- Identify abundance across site: High, Medium, or Low
- Identify abundance of target plant parts (leaf, bark, berry, root, etc)
- Identify abundance of target animals (if applicable) – focus on mollusks present in multiple habitats
- Determine seasonal availability of target plant part and/or target animal
- Collect representative sample mass for plant and animal – determine wet and dry weights
- Take photographs of target species

Reference Area Criteria

- **Potentially survey up to two additional reference areas for compatibility with site**
  - **Vegetation community**
  - **Target species**
  - **Target mass**
- **Perform mapping similar to that at site**

HUMAN HEALTH RISK

Previous Human Health Risk Evaluations

- 1993 Baseline Human Health Risk Assessment
  - Unacceptable risks to on-site building workers through inhalation of indoor vapors
  - Unacceptable risks to future residents using the on-site groundwater as drinking water
- 1995/1996 Supplemental Data Assessment that augmented the 1993 Baseline HHRA conclusions
  - No unacceptable risk to off-site residents using intermediate aquifer groundwater as drinking water, based on conclusion that landfill contaminants will not migrate off-site in intermediate aquifer.
  - No unacceptable risk associated with ingestion of clams from tide flats or Dogfish Bay, but acknowledged uncertainty associated with bioaccumulation potential of PCBs and potential continued release of PCBs to marine system
- 1996 ATSDR Health Consultation Follow-up
  - No unacceptable risk associated with ingestion of clams for recreational, commercial, or subsistence harvesters from tide flats or Dogfish Bay, but acknowledged uncertainty associated with bioaccumulation potential of PCBs and potential continued release of PCBs to marine system
- 2019 VI Study
  - No unacceptable risk due to vapor intrusion to industrial workers of occupied buildings East of Bradly Road and beyond the landfill boundary

Slide revised since Oct. 9th meeting

Baseline Risk Assessment Approach

- Receptors
  - Current Nearby Residents/Future Residents
  - Current/Future Workers
  - Recreational Users/Site Visitors/Trespassers
  - Subsistence Shellfish Harvesters
- Exposure Medium
  - Groundwater
  - Soil (0 to 15 inches)
  - Sediments (Marsh [future only], Tide flats [future only], Dogfish [current/future])
  - Surface Water (Marsh [future only], Tide flats [future only], Dogfish [current/future])
  - Clam Tissue (Tide flats [future only], Dogfish [current/future])

Results – Current/Future Residents

Receptor	Media	Pathway Quantified 1993 HHRA?	Data Used to Evaluate	Results
Current Nearby Residents/Future Residents	Surface Water	Yes	Dogfish Bay surface water	CR: -- HI: 0.000003
	Marine Sediment	Yes	• Current: DogFish Bay • Future: Tideflats and Dogfish Bay (based on water body with highest concentration).	CR: 1e-7 HI: 0.000004
	Fish/shellfish	Yes	• Current: Dogfish Bay clams • Future: Tideflats and Dogfish Bay clams (based on water body with highest concentration).	CR: 1e-5 HI: 0.1
	Soil	No	Not quantified: • Current: No current residents onsite • Future: landfill material at Area 1 will never be removed, precluding future residential use.	--
	Groundwater	Yes (only in the ROD)	Not quantified in RA: • Current: No current drinking water wells onsite • Future: landfill material at Area 1 will never be removed, precluding future residential use; off-site groundwater not impacted Evaluated in the ROD	CR: 2e-2 HI: 20

Results – Current/Future Worker

Receptor	Media	Pathway Quantified 1993 HHRA?	Data Used to Evaluate	Results
Current/Future Worker	Indoor Air	Yes	Ambient Air samples from on-site bldgs	CR: 3e-4 HI: 2
	Outdoor Air	Yes	• Emission flux measurements and dispersion modeling. • Particulates based on Area 1 surface soil using Particulate Emission Factor approach.	CR: 3e-6 HI: 0.0008
	Soil	Yes	Area 1 Surface Soil (0-2 in) and root-zone soil (2-15 in).	CR: 7e-7 HI: 0.00009

Results – Current/Future Recreational User

Receptor	Media	Pathway Quantified 1993 HHRA?	Data Used to Evaluate	Results
Current/Future Recreational User, Site Visitor, and Trespasser	Surface Water (Dogfish Bay/Marsh)	Yes	• Current: Dogfish Bay Future: Dogfish Bay and Marsh (evaluated separately)	CR: 5e-7 HI: 0.0006
	Sediment (Marine/Marsh)	Yes	• Current: DogFish Bay • Future: Marsh (evaluated separately); and Tideflats and Dogfish Bay (based on water body with highest conc.)	CR: 5e-6 HI: 0.04
	Soil	No	Not quantified: • Current: No access to site. • Future: Fence and landfill cover prevents exposure.	--
	Fish/Shellfish	Yes	• Current: Dogfish Bay clams • Future: Tideflats and Dogfish Bay clams (based on water body with highest conc.)	CR: 1e-5 HI: 0.1

Results – Current/Future Subsistence

Receptor	Media	Pathway Quantified 1993 HHRA?	Data Used to Evaluate	Results
Current /Future Subsistence	Fish/Shellfish	Yes	Current and Future: Dogfish Bay clam. Note: Based on EPA 1991 SDEF IR of 132 g/d and FI of 0.25	CR: 1e-5 HI: 0.1

Slide revised since Oct. 9th meeting

Proposed HH CSM

Area	Media	Current/ Future	Future				
		Outdoor Worker	Excavation Worker[a]	Indoor Worker[b]	Rec User, visitor	Subsistence	Future Resident[c]
Marsh Pond/Creek	Surface Water	--	--	--	○	○	--
	Sediment	○	--	--	●	●	--
	Biota (Fish/shellfish)	--	--	--	●	●	--
	Biota (Berries/vegetation)	--	--	--	●	●	--
Dog Fish Bay	Surface Water	--	--	--	○	○	--
	Sediment	--	--	--	●	●	--
	Biota (Fish/shellfish)	--	--	--	●	●	--
Tideflats	Surface Water	--	--	--	○	○	--
	Sediment	--	--	--	●	●	--
	Biota (Fish/shellfish)	--	--	--	●	●	--
Nonpaved Areas (including Upland Area)	Soil	●	--	--	●	●	--
	Groundwater	--	--	--	--	--	--
	Biota (Berries/vegetation)	--	--	--	●	●	--
	Indoor Air	--	--	--	--	--	--
	Outdoor Air	○	--	--	○	○	--

○ Complete yet insignificant pathway
● Complete pathway to be reevaluated
-- Incomplete pathways based on no exposure.

[a] Institutional controls prevent subsurface soil disturbing activities at the site. However, if subsurface soil disturbing activities do occur, the appropriate OSHA and HAZWOPPER safety controls should be implemented.

[b] Institutional controls prevent future construction of buildings on the former landfill site. Therefore, there are no complete exposure pathways for future indoor workers.

[c] Institutional controls prevent future residential use of the site. Therefore, there are no complete exposure pathways for future residents.

ECOLOGICAL RISK

Baseline and Supplemental ERA Summary

- 1993 Baseline Risk Assessment Summary
  - 1993 ERA procedures still under development (ERL/ERM)
  - Area 1 habitat split into terrestrial (Otto Fuel Area), Marsh, Tide Flats, and Dogfish Bay
  - Overall Area 1 BERA conclusion = localized risk to receptors in Marsh, Tide Flats, Dogfish Bay from OCP, DEHP from sediment & Sb and Hg in SW
- Supplemental 1995/1996 ERA – (ROD)
  - Additional GW, sediment, tissue data & more bioassays
  - Methods (no bkgd, 1/3 bench screen, tissue-effects org)
  - Bioassays (amphipod in Marsh Pond – MA09)
  - English sole (dietary PCB risk from inv & clam diet)
  - Upper trophic - surf scoter & PG, sandpiper (marsh only)
  - PCBs identified as main COC

1993 Baseline ERA Approach

- Terrestrial and Aquatic Receptors
- Exposure Medium
  - Soil (surface at 0-2 in and root zone at 2 to 15 in)
  - Sediments (0-2 (>10) cm, 10-12 (10-14) cm, Marsh, Tide Flats, Dogfish Bay)
  - Surface Water (Marsh, Tide Flats, Dogfish Bay)
  - Seep (Marsh Creek)
  - Clam Tissue (Oysters in Dogfish Bay)
- Bioassay Tests
  - Terrestrial (earthworm, algae as soil elutriate)
  - Aquatic (Tide Flats, Dogfish Bay - amphipod, echinoderm larvae, polychaete)

Historic Baseline ERA CSM

- The Area 1 portion of baseline ERA focused on aquatic habitats. Other CSMs in Baseline ERA were reviewed for relevance to Keyport upland habitats.
    - Area 1 (only Marsh, Tide Flats & Dogfish Bay CSM presented)
    - ROD only includes an Aquatic Receptor (transport) CSM

Slide revised since Oct. 9th meeting
1993 Terrestrial Receptors (Other Areas)

T&E species – none known for Area 1 (Bald Eagle nest ~0.5 miles to the northeast)

Receptors Evaluated in Other Areas (Areas 1, 2, 3 and 5) - Summarized for Preliminary Terrestrial CSM Development

- Townsend's Vole (Areas 1 & 2)
- Mallard (Area 1)
- Canada Goose (Areas 3 & 5)

1993 Results - Terrestrial

Receptor/Test Organism	Media/Data Used	Toxicity Measurement	Results
Plants & Soil Invert	Surface & RZ	Benchmarks	<benchmarks
Plants	Qualitative	Visual Observations	No stressed veg.
Algae	Soil Elutriate	Bioassay	No toxicity
Earthworm	Soil	Bioassay	No toxicity
Mallard	Soil	TRV	HQs<1
Vole	Soil	TRV benchmarks	HQs<1

Slide revised since Oct. 9th meeting
1993 Results – Marsh Pond

Receptor/Test Organism	Media/Data Used	Toxicity Measurement	Results
Aquatic life	Surface Water	Benchmarks	Cu, Hg
Aquatic life	Qualitative	Visual Observations	Presence of chironomids
Benthic inv. (polychaete)	Sediment	Benchmarks	Pest./SVOCs
Benthic inv. (polychaete)	Modelling	Bioaccumulation	Potential risk
Amphipod	Sediment	Acute Bioassay (1)	Toxicity <CSL
Echinoderm	Sediment	Acute Bioassay (1)	No toxicity
Polychaete	Sediment	Chronic Bioassay (1)	No toxicity

1993 Results - Tide Flats

Receptor/Test Organism	Media/Data Used	Toxicity Measurement	Results
Aquatic life	Surface Water	Benchmarks	Sb
Benthic inv. (polychaete)	Sediment	Benchmarks	Pest./SVOCs
Benthic inv. (polychaete)	Modelling	Bioaccumulation	Potential risk
Fish (English Sole)	Surface Water	Benchmarks	Sb, Fe
	Polychaete/Clam Prey Tissue Modelling	Benchmarks	HQ 1.5 or less
Amphipod	Sediment	Acute Bioassay (1)	Toxicity <CSL
Echinoderm	Sediment	Acute Bioassay (1)	No toxicity
Polychaete	Sediment	Chronic Bioassay (1)	No toxicity
Pigeon Guillemot	Fish Prey Tissue Modelling	Avian TRV	Pesticides

1993 Results - Dogfish Bay

Receptor/Test Organism	Media/Data Used	Toxicity Measurement	Results
Aquatic life	Surface Water	Benchmarks	Sb, Hg
Benthic inv. (polychaet	Sediment	Benchmarks	DEHP
Benthic inv. (polychaet	Modelling	Bioaccumulation	Potential risk
Shellfish	Tissue	Bioaccumulation	Metals/SVOCs
Fish (English Sole)	Surface Water	Benchmarks	Hg
Amphipod	Sediment	Acute Bioassay (1)	Toxicity <CSL
Echinoderm	Sediment	Acute Bioassay (1)	No toxicity
Polychaete	Sediment	Chronic Bioassay (1)	No toxicity
Pigeon Guillemot	Fish Prey and Surface Water	Avian TRV	Low risk

1995/96 Results – Marsh Pond

Receptor/Test Organism	Media/Data Used (No. samples)	Toxicity Measurement	Results
Aquatic Organisms	Groundwater/SW	Aquatic Benchmarks	Minimal risk
Benthic inv.	Sediment (2+Dup)	SQS Benchmarks	No toxicity
Amphipod (*Euhaustorius*)	Sediment (2+Dup)	Acute Bioassay	Toxicity
Echinoderm (sea urchin)	Sediment (2+Dup)	Acute Bioassay	No toxicity
Polychaete (*Neanthes*)	Sediment (2+Dup)	Chronic Bioassay	No toxicity
Bioassay Ref - Carr Inlet			
Tissue Ref - Agate Pass			

1995/96 Results – Tide Flats

Receptor/Test Organism	Media/Data Used (No. samples)	Toxicity Measurement	Results
Aquatic Organisms	Groundwater/SW	Aquatic Benchmarks	Minimal risk
Benthic inv.	Sediment (3+Dup)	SQS Benchmarks	No toxicity
Littleneck Clams	Round 3 Tissue (3)	Tissue Screening	No toxicity
Amphipod (*Ampelisca*)	Sediment (3)	Acute Bioassay	No toxicity
Echinoderm (sea urchin)	Sediment (3)	Acute Bioassay	No toxicity
Polychaete (*Neanthes*)	Sediment (3)	Chronic Bioassay	No toxicity*
Bioassay Ref - Carr Inlet			
Tissue Ref - Agate Pass			
*Reduced growth, but no SMS exceedances			

1995/96 Results – Dogfish Bay

Receptor/Test Organism	Media/Data Used (No. samples)	Toxicity Measurement	Results
Aquatic Organisms	Groundwater/SW	Aquatic Benchmarks	Minimal risk
Benthic inv.	Sediment (3)	SQS Benchmarks	No toxicity
Littleneck Clams	Round 3 Tissue (3)	Tissue Screening	(Ag) No toxicity
Amphipod (*Ampelisca*)	Sediment (2)	Acute Bioassay	No toxicity
Echinoderm (sea urchin)	Sediment (2)	Acute Bioassay	No toxicity
Polychaete (*Neanthes*)	Sediment (2)	Chronic Bioassay	No toxicity
Bioassay Ref - Carr Inlet			
Tissue Ref - Agate Pass			

Slide revised since Oct. 9th meeting

Proposed Eco CSM

		Current and Future Terrestrial Receptors				Current and Future Aquatic Receptors		
Area	Pathway/Media	Terrestrial Plant and Soil Invertebrates	Semi-Aquatic Birds[a]	Terrestrial Birds and Nonburrowing Mammals	Burrowing Mammals	Floating algae, Free-swimming Invertebrates and Fish	Sediment Benthos	Aquatic Birds and Mammals
Marsh Pond/Creek, Dog Fish Bay, Tide flats	Direct Contact[b]/Surface Water or Porewater	--	--	--	--	●	○	--
	Direct Contact/Sediment	--	--	--	--	○	●	--
	Incidental Ingestion/Surface Water & Sediment	--	●	--	--	--	--	●
	Dermal Contact/Surface Water & Sediment	--	--	--	--	--	--	○
	Ingestion/Biota Prey (e.g., Fish/shellfish)	--	●	--	--	--	●	●
Nonpaved Areas (including Upland Area)	Direct Contact/Surface Soil (0-2 feet)	●	--	--	--	--	--	--
	Incidental Ingestion[b]/Surface Soil (0-2 feet)	--	●	●	●	--	--	--
	Incidental Ingestion[c]/Subsurface Soil (0-6 feet)	--	--	--	●	--	--	--
	Ingestion/Biota prey (e.g., vegetation, invertebrates, small birds/mammals)	--	●	●	●	--	--	--
	Inhalation/Burrow Air	--	--	--	●	--	--	--

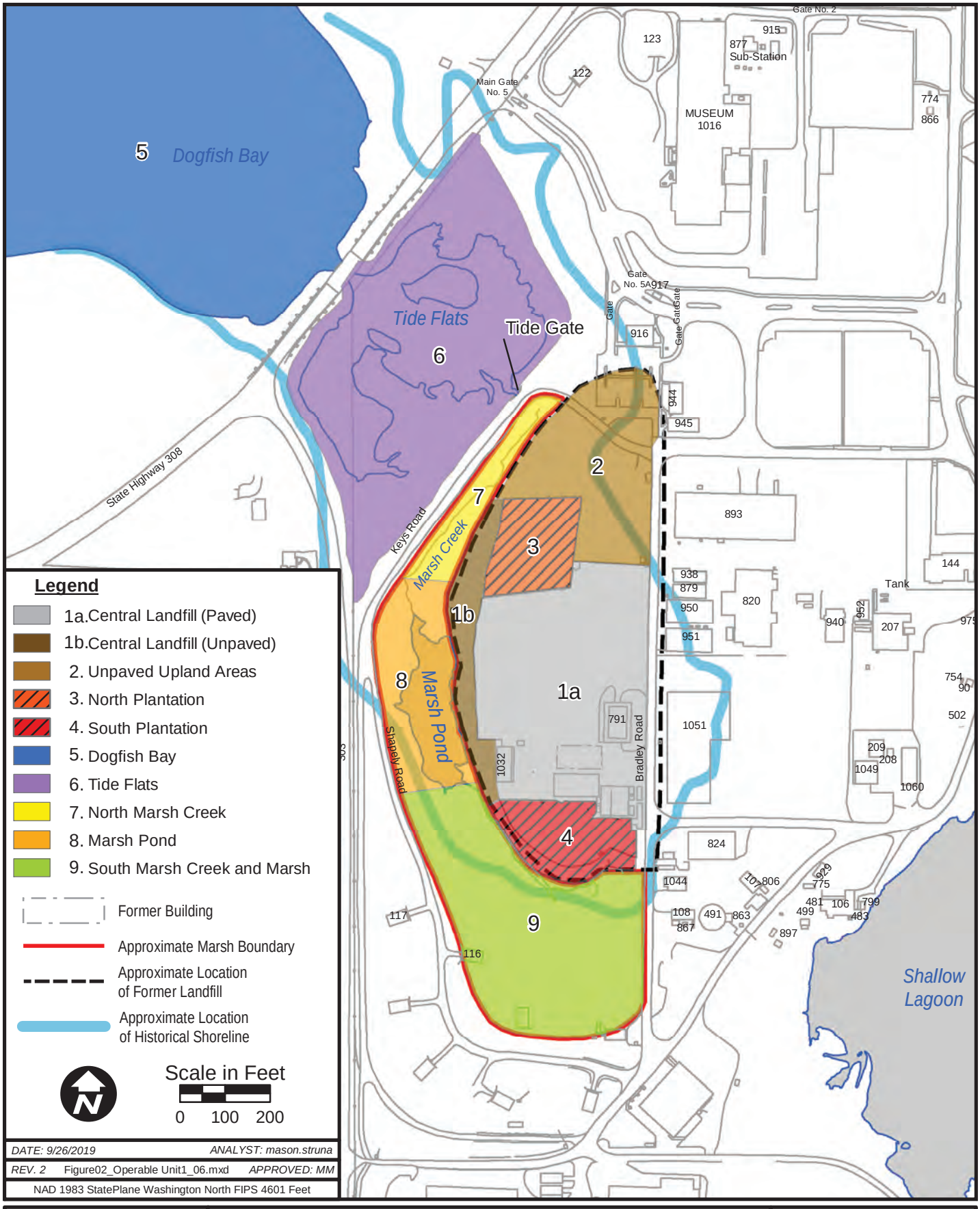
○ Complete yet insignificant pathway
● Complete pathway to be reevaluated
-- Incomplete pathways based on no exposure.

[a] For example, Canada geese.
[b] Direct contact is uptake for plants and dermal exposure and ingestion for other aquatic species.
c Dermal contact is not considered complete for birds and mammals due to feathers and fur that minimizes exposure.

PROPOSED EXPOSURE AREAS

DATA COMPILATION RESULTS

POTENTIAL SITE AND REFERENCE AREA DATA NEEDS



U.S. NAVY	**Figure 1** **Exposure Areas**	NBK Keyport

Data Compilation - Available Resources

- LTM Data (all samples analyzed for cVOCs, PCBs, and 1,4-dioxane [groundwater only])
  - Groundwater
  - Sediment/Surface Water/Seep
  - Clam Tissue
- 2017 Site Recharacterization, Phase II
  - Subsurface soil (target cVOCs, with a handful of samples also analyzed for the full VOC list, PCBs, SVOCs, and/or petroleum)
  - Groundwater (target cVOCs, with a handful of samples also analyzed for PFAS and 1,4-dioxane)
  - Porewater and surface water (target cVOCs)
  - Sediment (PCBs)
- 2019 Source Investigation
  - Groundwater (target cVOCs, PCBs, TPH, 1,4-dioxane)
  - Subsurface soil (target cVOCs, PCBs, TPH, 1,4-dioxane)
  - Porewater and surface water (target VOCs, PCBs)
  - Sediment (PCBs)

Slide revised since Oct. 9th meeting

Summary of Available Data

Area 1 Surface Water Bodies	Media				
	Surface Water	Sediment	Porewater	Clam Tissue	Berries/Vegetation
Dogfish Bay	x	x	--	x	--
Tide flats	x	x	--	x	--
Marsh	x	x	x	--	--
Marsh Creek	x	x	x	--	--

Area 1 Land Area	Media			
	Surface Soil	Subsurface Soil (2 to 6 feet bgs)	Berries/Vegetation	
North Plantation	--	--	--	
Unpaved upland area	--	x	--	
Central Landfill (Unpaved area)	--	--	--	
South Plantation	--	--	--	

Summary of Available Data

Area 1 Surface Water Body		Locations and Analysis							
		Surface Water/Seep		Sediment		Porewater		Clam Tissue	
Dogfish Bay		DB-14 (1)	VOCs	DB-05, DB-07, DB-08 (3)	PCBs, pesticides, metals	--	--	DB-05, DB-07, DB-08 (3)	PCBs, Metals
Tideflats		TF-19 (1)	VOCs	TF-18, TF-20, TF-21, TF-22 (4)	PCBs, pesticides, metals	--	--	TF-21, TF-18, TF-20 (3)	PCBs, Metals
Marsh Pond		MA-11, SW1-13, SW1-14 (3)	VOCs	MA-11 (1)	PCBs, pesticides, cVOCs, Metals	PW1-1, PW1-05 thru PW1-09, PW1-20, PW1-21, PW1-22 (9)	VOCs	--	--
Marsh Creek	North of Pond	MA-09, SW1-15 thru SW1-20 (8) 1 seep sample at SP1-1	VOCs, PCBs (SP1-1 and SW1-18 thru SW1-20)	MA-09, MA-14, SP1-1, MA-19, MA-21, MA-22, MA-23 (7)	PCBs, pesticides, cVOCs, Metals	PW1-23 thru PW1-27 (5)	VOCs (PW1-23, PW1-24); PCBs (PW1-25 thu PW1-27)	--	--
	South of Pond	MA-12, SW1 thru SW1-12 (13)	VOCs	MA-10 (1)	PCBs,, Metals	PW1-02 thru PW1-04, PW1-10 thru PW1-19, PW1-28, and PW1-29 (15)	VOCs	--	--

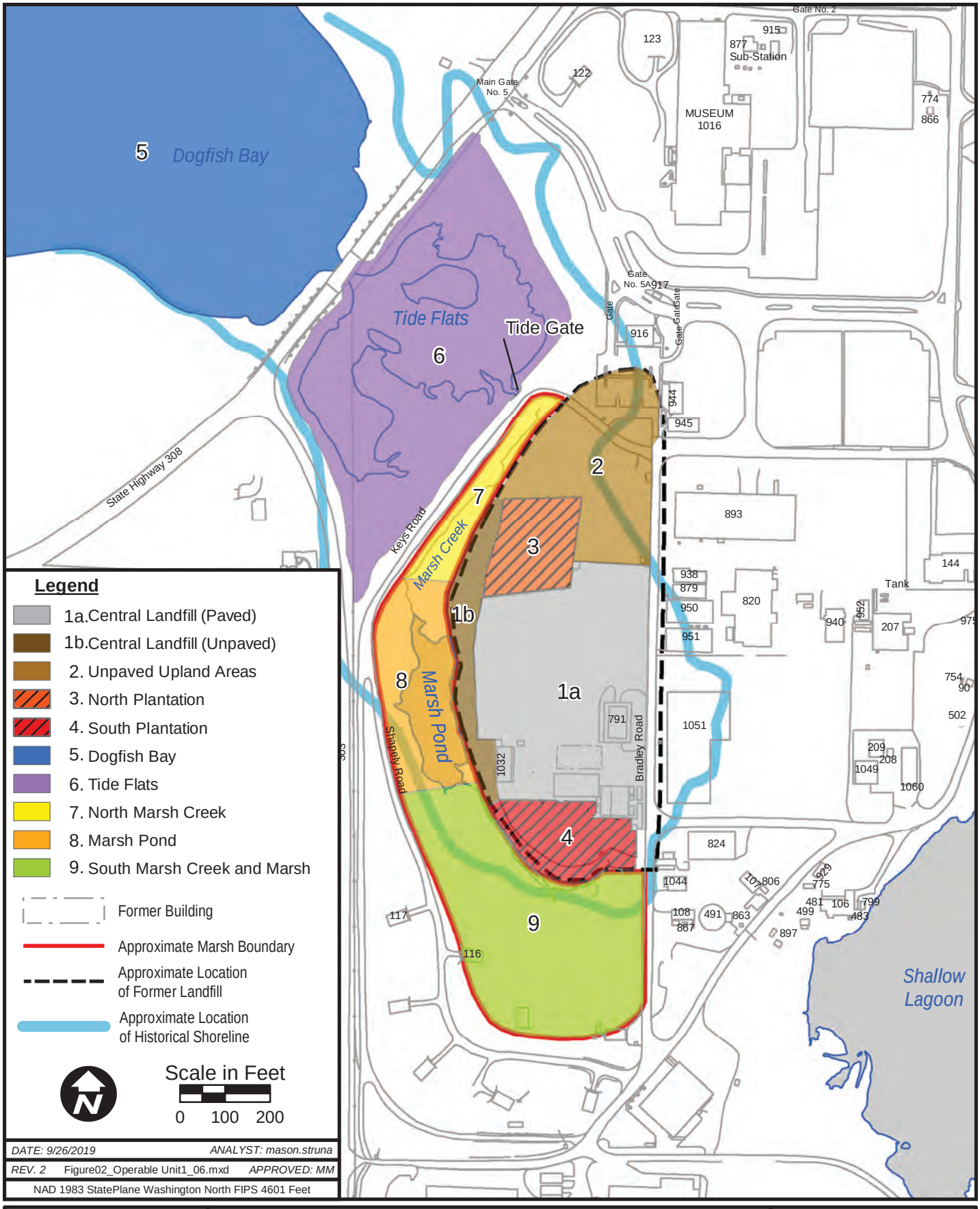
Slide revised since Oct. 9th meeting

Potential Data Needs
(to be discussed in workgroup meetings)

Exposure Area	SS <2 ft bgs; SB 2-6 ft bgs	Soil Gas (2-6 ft bgs)	Sediment	Surface Water/Seep/Pore Water	Sediment Bioassays	Fish/Shellfish	Berries/Vegetation (Biosurvey indicator)
1a - Central Landfill (paved)	--		--	--	--	--	--
1b - Central Landfill (unpaved)	cVOCs PCBs	cVOCs	--	--	--	--	cVOCs PCBs
2 - Unpaved Upland Area	metals VOCs SVOCs/PAHs TPH PCBs dioxins	VOCs	--	--	--	--	metals SVOCs/PAHs PCBs
3 - N. Plantation	cVOCs PCBs	cVOCs	--	--	--	--	--
4 - S. Plantation	cVOCs PCBs	cVOCs	--	--	--	--	--
5 - Dogfish Bay	--	--	Physical Parameters PCBs	--	Yes	Mussels and Clams: PCBs	--
6 - Tide Flats	--	--	Physical Parameters metals cVOCs SVOCs/PAHs PCBs	metals cVOCs SVOCs/PAHs PCBs	Yes	Mussels and Clams: metals PAHs PCBs	--
7 - N. Marsh Creek	--	--	Physical Parameters metals cVOCs SVOCs/PAHs PCBs	metals cVOCs SVOCs/PAHs PCBs	Yes	Mussels: metals PAHs PCBs	metals PAHs PCBs
8 - Marsh Pond	--	--	Physical Parameters cVOCs metals	cVOCs Metals	Yes	Biosurvey indicator : metals	metals
9 - S. Marsh Creek	--	--	Physical Parameters cVOCs metals	cVOCs Metals	Yes	Biosurvey indicator : metals	metals

Reference Area Data Needs

- Multiple reference areas needed to accommodate all habitat types
- Background/reference Data Could Include:
  - Marine Sediment (use BOLD Data)
  - Marine Surface Water
  - Estuarine Sediment/Surface Water
  - Fresh Water Surface water
  - Baseline soil & stream sediments – BSVs (Table 2-1) from URS 1993
  - Marine tissue (mussels)
  - Berries/vegetation
  - Sediment bioassay reference stations



U.S. NAVY	**Figure 1** **Exposure Areas**	NBK Keyport

N4425519F4180
NBK Keyport OU 1 Area 1 Biological Survey Workplan Meeting #1 (via telecon)
Final Meeting Notes

October 29, 2019

Team Members in Attendance:

Denise Taylor	Suquamish Tribe
Alison O'Sullivan	Suquamish Tribe
Jennifer Corack	NAVFAC LANT, Human Health Risk Assessor
Jason Speicher	NAVFAC LANT, Ecological Risk Assessor
Mahbub Alam	Ecology, Project Manager
John Evered	Ecology, Risk Assessor
Jill Hedgecock	AECOM, Ecological Risk Assessor
Laura Scheffler	AECOM, Human Health Risk Assessor
Jennifer Pretare	AECOM, Biologist
Jeff Walker	AECOM, Biologist
Nicole Rangel	AECOM, Human Health Risk Assessor, Meeting Notetaker

Attachments:

Attachment A – Meeting Agenda
Attachment B – Plant Species List

Action Items:

1. Ms. Pretare/Mr. Walker will send out the criteria for Reference Area selection for the project team's review and input.
2. Ms. Pretare/Mr. Walker will identify 3 possible Reference Areas (ranked by selection criteria) to present to the team in the next workgroup meeting.
3. Ms. Taylor and Ms. O'Sullivan will review the preliminary plant list (developed from the August 2019 site visit) and give feedback to the team before the next workgroup meeting.
4. Ms. Scheffler will schedule the next workgroup meeting once all team members have sent back their availability.

Meeting Discussion

Introduction

After Ms. Scheffler announced the presence of all meeting attendees, she stated the purpose of the meeting was to discuss the development of the biological survey workplan. She then reviewed the status of the project ("where we are in the process") stating we were in the beginning stages as the project would take approximately 2-3 years to complete and the biological survey workplan is the first stage of the project. She reviewed the general project steps in chronological order: Biological Survey Workplan, Biological Survey (June 2020), Sampling and Analysis Plan/Ecological Risk Assessment and Human Health Risk Assessment (ERA/HHRA) Workplan, Sampling for ERA/HHRA (June 2021), HHRA/ERA

completed (June 2022). Ms. Scheffler then stated the goals of the biological survey were to determine the presence and abundance of both aquatic and upland biota and to select indicator species for the HHRA/ERA. She added that the objective of the biological survey was to collect sufficient information to identify biota that are present in sufficient abundance to be viable indicators species. She stated the meeting at hand will discuss the development of the workplan to perform the biological survey.

Ms. Pretare and Mr. Walker then introduced themselves as biologists noting their background experience in wildlife/aquatics and botany/wetlands, respectively. Ms. O'Sullivan, a new member of the team, introduced herself as a biologist for the Suquamish tribe with a focus on land use issues and impacts to natural resources. Ms. Pretare asked if there were any changes or additions to the agenda (see Attachment A). There were no comments or changes to the meeting agenda. Mr. Walker then reviewed the revised biological survey goals from the October 9th meeting:

- Map habitats to aid in distribution of samples across site
- Collect information on potential target species to determine viability for sampling
- Collect similar information for reference sites
- Overall goal is to refine list of potential target species for sampling

Ms. Pretare then went over the process and considerations to accomplish the goals which were presented as a bulleted list on the agenda (see Attachment A). She emphasized that the bullets were for points of discussion and she was expecting feedback from the team. She also noted that the workplan would provide more details on the listed processes and considerations.

Seasonality Considerations

Ms. Pretare started the discussion by stating a major consideration of the biological survey would be seasonality as there will only be one site visit (mobilization effort). She said the survey team is targeting field work during the late spring/summer season, but the exact time of year will be narrowed down. She stated a couple factors to consider in seasonality would be the blooming time of plants or when the plants are identifiable, and when the tidal cycles are favorable (when looking for mollusks). She explained that they would be looking at tide charts to identify low tide periods during daylight hours to adequately access the shoreline while simultaneously looking at plant seasonality.

Ms. Pretare reemphasized that the mobilization effort would need to be a very specific time (within the blooming season) which would be defined in the workplan within a two- to four-week window. She asked if there were any comments. Mr. Alam had concerns about capturing blooming plants in the spring and fruits in the summer/late fall with only one mobilization effort. Ms. Pretare explained that there was a difference between the survey work and sampling work. She stated that the survey work would be planned when most plants are identifiable, but the sampling work would be planned when plant parts can be obtained. Mr. Walker further stated that during the workplan they will be looking for plants that are viable, as an example - noting blackberries do not have to be ripe to determine viability. Mr. Alam inquired about the animal species on the site, and if there was any indication of what animals were present and when they were present. Ms. Pretare responded that the purpose of the workplan and survey was to determine the species options. She stated that mollusks were high on the potential target species list, but they have not ruled out other species. Mr. Speicher noted that abundance or type of indicator species may not be the same in all the exposure areas. He also emphasized the importance of having enough abundance during sampling. Ms. Scheffler agreed that there may be

different animal tissue from one side of the marsh to the other due to salinity differences in the water bodies.

In discussion of plant seasonality, Mr. Walker presented the preliminary plant list (see Attachment B) from the initial August 2019 site visit as a "first step" for discussion. He noted that there was no plant abundance established for these plants yet. Ms. Scheffler believed the list could be narrowed down based on utilization or consumption by receptors of the ERA/HHRA. Ms. Pretare noted that there are other considerations to factor when refining the list such as mass, compositing, and reference areas. Ms. Hedgecock thought it would be better to work backwards with the plant list for the ERA stating once the indicator species has been chosen, the plants they ingest would be chosen. Ms. Scheffler and Ms. Taylor both agreed it was better to wait until the next workgroup meeting to discuss the plant list as the team needs more time to review it.

Potential Reference Area Considerations

Mr. Speicher emphasized that finding representative reference areas for the freshwater, estuarine, and saltwater wetland areas may be difficult. Ms. Pretare replied that although they had reviewed the online web applications of Washington State Department of Ecology's Coastal Atlas and Washington State Department of Fish and Wildlife (WDFW) priority habitat and species (PHS) viewer, more desktop studies were needed to narrow down reference area sites. Mr. Walker added that the most limiting habitat to find was the salt marsh, therefore they are specifically looking for public lands around Puget Sound that have salt marsh with a freshwater input (similar to Keyport). Mr. Speicher asked if by the next meeting the biological survey team could have a list of possible reference areas. Ms. Pretare replied yes, but as she was hoping there would be more input from the team, she opened the topic up for discussion. Ms. Taylor requested to see the list of factors used to develop the preliminary list of reference area sites as the Suquamish Tribe may have additional factors to consider. Mr. Speicher added that a good reference area would not have major industrial inputs so a more residentially surrounded area may be a better candidate. Mr. Alam suggested performing an investigation to see if any contaminated sites were located nearby and therefore recommended using the online web application "What's In My Neighborhood". The project team agreed that the criteria for the reference area selection would be sent out before the next workgroup meeting for the project team's input. The project team also agreed that in the next workgroup meeting the biological survey team will present a list of possible reference area sites based on the criteria to select them.

Analytical Considerations

Mr. Speicher stated that the mass of plant or tissue material will vary based on what analytes will be tested for; therefore, the analysis will need to be known prior to determining how much dry weight is needed to determine mass in the field. Ms. Pretare clarified that labs require different amounts of tissue for different analyses. She stated the amount collected in the field is dependent on water weight because the lab dries the samples. She added that the survey team may take some preliminary samples and dry them (with a food dehydrator) to estimate amount of wet weight needed for the required dry weight by the lab. Mr. Walker then asked when the risk assessment team would know what analytes would be tested for. Ms. Scheffler responded that she did not think that would be needed at this point. Ms. Pretare responded that they could estimate the mass needed by using the greatest mass possibly needed for analysis ("a worst case scenario"). Mr. Speicher agreed with this approach. Ms. Pretare noted that mass required by labs was reasonable and rarely impossible to obtain. She also emphasized there were other considerations of the survey such as compositing and spatial distribution that are

affected by the mass required (i.e. how many plants of the same species can be collected for a sample that are spatially nearby each other or how far can the plants be from each other). Ms. Hedgecock mentioned another way to address the quantity issue is to prioritize analyses in a sampling plan (if there is a shortage of sample mass). Ms. Pretare also agreed with the recommended approach.

Habitat Mapping

Ms. Pretare moved onto discussion of the 2nd bullet "At what scale will habitat be mapped; desktop mapping in advance of field work" (see Attachment A). Mr. Speicher recommended viewing the Integrated Natural Resource Management Plan for preliminary maps as a starting point. He believed there was a biological survey performed under this plan, therefore some of the information needed may already be available. Ms. Scheffler noted there were delays in receiving the report related to "release of privileged information". Ms. Pretare said she would follow-up with Carlotta to obtain portions of the Natural Resource Management Plan, as there were issues with the release of privileged information.

Ms. Pretare then moved on to the 3rd bullet "Biological Survey will confirm desktop mapping and then focus on locating concentrated areas of limited number of species" (see Attachment A). She emphasized the importance of knowing target plant species prior to the biological survey because as part of the survey fieldwork GPS points will be mapped to identify target plant locations for sampling. In relation to mapping, Ms. Pretare followed the discussion to bullet 5 (attachment A) "Potential need for composting samples; consideration for spatial distribution of multiple plants or animal samples" noting that the total amount of samples collected may be limited by the spatial area.

Ms. Scheffler asked if there will be a field form included in the workplan with the categories discussed. Ms. Pretare replied yes and stated that the field forms will be project specific and include categories of abundance (high, medium, or low). Ms. Scheffler then asked if the field forms could be presented in the next workgroup meeting. Ms. Pretare replied that the forms will be included in the draft workplan which will be reviewed. In relation to abundance, Ms. Taylor stated that she thought abundance should be based on sampling requirements not subjectively categorized as low, medium, and high. She also noted that Carlotta sent out the preliminary results from the thermal imaging report that shows where groundwater discharges to the stream and suggested the information be considered when looking at how the habitat varies across the project site.

Ms. O'Sullivan asked if sampling plots would be in transects or random. Mr. Walker responded that sampling depends on what is available and from his experience transects are not useful and would be difficult as the project areas are small and often samples need to be composited. Ms. Pretare also noted that safety is also a consideration in identifying sampling locations. Ms. O'Sullivan then requested that photographs be taken of the sampling plots. Mr. Walker replied that photos would be taken during the survey and during sampling. Ms. O'Sullivan clarified that she would like photos of where composites would be taken.

Reporting

Ms. Pretare then went over the last bullet "Reporting: How information obtained during the biological survey will be organized and documented" stating that the workplan will present how the information such as spatial data, maps, photographs, and forms will be organized.

Wrap-up

Mr. Walker reviewed the action items of the meeting. Ms. Scheffler indicated she would send out a meeting invite for the 2nd biological survey workplan workgroup meeting as soon as she had all of the responses to the scheduling poll. Ms. Pretare adjourned the meeting.

KEYPORT PROJECT MEETING
Keyport OU 1 Biological Survey Workplan Workgroup Meeting #1
October 29, 2019
Telecommunication
Teleconference Call-In Number: 1-866 692 3580; Code: 593 790 063#

DRAFT AGENDA

Meeting Invitees

Carlotta Cellucci	NAVFAC Project Manager
Jason Speicher	LANT Eco. Risk Ass.
Jenn Corack	LANT HH Risk Ass
Mahbub Alam	Ecology Project Manager
John Evered	Ecology Risk Ass.
Harry Craig	US EPA Project Manager
Denice Taylor	Suquamish Tribe PM
Alison O'Sullivan	Suquamish Tribe
Laura Scheffler	AECOM HH Risk Ass.
Jeff Walker	AECOM Biologist
Jenny Pretare	AECOM Biologist
Jill Hedgecock	AECOM Eco. Risk Ass.
Nicole Rangel	AECOM Note Taker

AGENDA

10:00 - 10:15

- Introductions
- Where we are in the process (Laura)
- Goals and objectives for this meeting (Laura)
- Review agenda (Jenny)

10:15 – 11:45 (Jeff, Jenny)

- Review biological survey goals from Oct. 9th meeting (Jeff)
  - Habitat Map
  - Target species
  - Reference sites
- How to achieve biological survey goals? The Work Plan will provide detailed description of the following:
  - Seasonality considerations; what is the best possible time of year to achieve goals? Considerations for plants and animals and tidal cycles for mollusks.
  - At what scale will habitat be mapped; desktop mapping in advance of field work
  - Biological survey will confirm desktop mapping and then the focus on locating concentrated areas of a limited number of species
  - Collect and weigh 'wet' tissue samples in field; dry and weigh again in office; back calculate mass needed per sample for field collection
  - Coordinate with lab on tissue weight question to confirm approach
  - Potential need for compositing samples; consideration for spatial distribution of multiple plant or animal samples comprising one sample
  - Potential target species; in addition, target part of plant (berries, shoots, leaves, etc)
  - Reference area desktop review and identification of most suitable candidates
  - Forms, equipment and supplies to be used
  - Reporting: How information obtained during biological survey will be organized and documented

11:45 – 12:00 noon – Discussion and Meeting Wrap-up

- Review Agreements
    - Agreements from Oct. 9 Meeting: AECOM will review the Fish and Wildlife Priority Habitat and Species List website and the Coastal Atlas for possible reference areas.
- Next steps
- Adjourn

Attachment: Plant Species Observed During Site Visit on August 8, 2019

Family	Scientific name	Common name	Synonym	Native/ Introduced	Noxious Weed Status
TREES					
Betulaceae	*Alnus rubra*	red alder		n	
Pinaceae	*Picea sitchensis*	Sitka spruce		n	
Pinaceae	*Pseudotsuga menziesii* var. *menziesii*	Douglas-fir		n	
Rhamnaceae	*Frangula purshiana* var. *purshiana*	cascara	*Rhamnus p.*	n	
Rosaceae	*Prunus* sp.	cherry		i	
Rosaceae	*Sorbus aucuparia*	European mountain-ash		i	Monitor
Salicaceae	*Populus* sp.	hybrid poplar		i	
Salicaceae	*Salix lasiandra* var. *lasiandra*	Pacific willow		n	
Salicaceae	*Salix scouleriana*	Scouler's willow		n	
Sapindaceae	*Acer macrophyllum*	big-leaf maple		n	
SHRUBS					
Adoxaceae	*Sambucus racemosa* var. *arborsecens*	red elderberry		n	
Aquifoliaceae	*Ilex aquifolium*	English holly		i	Monitor
Araliaceae	*Hedera helix*	English ivy		i	Class C
Berberidaceae	*Mahonia aquifolium*	tall Oregon-grape	*Berberis a.*	n	
Betulaceae	*Corylus cornuta* ssp. *californica*	beaked hazelnut		n	
Caprifoliaceae	*Lonicera* sp.	honeysuckle		n	
Fabaceae	*Cytisus scoparius*	Scot's broom		i	Class B
Rosaceae	*Crataegus monogyna* var. *monogyna*	English hawthorn		i	Class C
Rosaceae	*Oemleria cerasiformis*	osoberry		n	
Rosaceae	*Rosa nutkana* ssp. *nutkana*	Nootka rose		n	
Rosaceae	*Rubus bifrons*	Himalayan blackberry	*R. discolor, R. armeniacus*	i	Class C
Rosaceae	*Rubus laciniatus*	cut-leaf blackberry		i	Class C
Rosaceae	*Rubus parviflorus*	thimbleberry		n	
Rosaceae	*Rubus spectabilis*	salmonberry		n	
Rosaceae	*Rubus ursinus*	trailing blackberry/dewberry		n	
HERBS					
Amaranthaceae	*Atriplex* sp.	orache			
Amaranthaceae	*Sarcocornia perennis*	pickleweed	*Salicornia p.*	n	
Apiaceae	*Daucus carota*	Queen Anne's-Lace		i	Class C
Apiaceae	*Heracleum maximum*	cow parsnip	*H. lanatum*	n	
Apiaceae	*Oenanthe sarmentosa*	water-parsley		n	
Asparagaceae	*Maianthemum dilatatum*	false lily-of-the-valley		n	
Asteraceae	*Achillea millefolium*	common yarrow		n	
Asteraceae	*Cirsium arvense*	Canadian thistle		i	Class C
Asteraceae	*Cirsium vulgare*	bull thistle		i	Class C
Asteraceae	*Crepis capillaris*	smooth hawksbeard		i	

Family	Scientific name	Common name	Synonym	Native/ Introduced	Noxious Weed Status
Asteraceae	*Grindelia integrifolia*	Puget Sound gumweed		n	
Asteraceae	*Hypochaeris radicata*	hairy cat's-ear		i	Class C
Asteraceae	*Jacobaea vulgaris (=Senecio jacobaea)*	tansy ragwort		i	Class B
Asteraceae	*Leontodon saxatilis* ssp. *saxatilis*	lesser hawkbit	*L. nudicaulis*	i	
Asteraceae	*Leucanthemum vulgare*	ox-eye daisy	*Chrysanthemum l.*	i	Class C
Asteraceae	*Mycelis muralis*	wall lettuce		i	Monitor
Asteraceae	*Sonchus arvensis* ssp. *arvensis*	perennial sow-thistle		i	Class C
Asteraceae	*Symphyotrichum subspicatum*	Douglas's aster	*Aster s.*	n	
Asteraceae	*Tanacetum vulgare*	common tansy		i	Class C
Asteraceae	*Taraxacum officinale*	common dandelion		i	
Caryophyllaceae	*Cerastium fontanum* ssp. *vulgare*	common chickweed	*C. vulgatum*	i	
Caryophyllaceae	*Spergularia* sp.	sandspurry		n	
Convolvulaceae	*Calystegia sepium*	hedge bindweed		i	
Convolvulaceae	*Convolvulus arvensis*	field bindweed		i	Class C
Convolvulaceae	*Cuscuta pacifica* var. *pacifica*	salt mash dodder	*C. salina*	n	
Fabaceae	*Lathyrus latifolius*	everlasting peavine		i	Monitor
Fabaceae	*Lotus corniculatus*	bird's-foot-trefoil		i	
Fabaceae	*Trifolium pratense*	red clover		i	
Fabaceae	*Trifolium repens*	white clover		i	
Hypericaceae	*Hypericum perforatum* ssp. *perforatum*	common st. john's-wort		i	Class C
Juncaginaceae	*Triglochin maritima*	seaside arrow-grass		n	
Lamiaceae	*Prunella vulgaris* var. *lanceolata*	selfheal		n	
Lamiaceae	*Stachys* sp.	hedge nettle		n	
Onagraceae	*Epilobium ciliatum*	fringed willowherb		n	
Papaveraceae	*Dicentra formosa* ssp. *formosa*	Pacific bleeding heart		n	
Plantaginaceae	*Plantago lanceolata*	English plantain		i	
Plantaginaceae	*Plantago major*	common plantain		i	
Plantaginaceae	*Plantago maritima*	seaside plantain		n	
Plantaginaceae	*Veronica americana*	American speedwell		n	
Polygonaceae	*Persicaria maculosa*	spotted lady's-thumb		i	
Polygonaceae	*Rumex acetosella*	sheep sorrel		i	
Polygonaceae	*Rumex crispus*	curly dock		i	
Polygonaceae	*Rumex obtusifolius*	bitter dock		i	
Polygonaceae	*Rumex occidentalis* var. *occidentalis*	western dock		n	
Ranunculaceae	*Ranunculus repens*	creeping buttercup		i	
Rosaceae	*Geum macrophyllum*	large-leaf avens		n	
Rosaceae	*Potentilla anserina* ssp. *pacifica*	Pacific silverweed		n	
Rubiaceae	*Galium trifidum*	small bedstraw		n	

Family	Scientific name	Common name	Synonym	Native/ Introduced	Noxious Weed Status
Solanaceae	*Solanum dulcamara*	bittersweet nightshade		i	
Typhaceae	*Typha latifolia*	common cattail		n	
Urticaceae	*Urtica dioica*	common nettle		n	
GRASSES, SEDGES, RUSHES					
Cyperaceae	*Bolboschoenus maritimus* ssp. *paludosus*	maritime bulrush	*Scirpus m.*	n	
Cyperaceae	*Carex lyngbyei*	Lyngbye's sedge		n	
Cyperaceae	*Carex obnupta*	slough sedge		n	
Cyperaceae	*Schoenoplectus acutus*	hardstem bulrush	*Scirpus a.*	n	
Juncaceae	*Juncus balticus* ssp. *ater*	Baltic rush		n	
Juncaceae	*Juncus effusus*	common rush		n	
Poaceae	*Agrostis* sp.	bentgrass		?	
Poaceae	*Dactylis glomerata*	orchardgrass		i	
Poaceae	*Distichlis spicata*	saltgrass		n	
Poaceae	*Elymus repens*	quackgrass	*Agropyron r.*	i	
Poaceae	*Holcus lanatus*	velvetgrass		i	
Poaceae	*Phalaris arundinacea*	reed canarygrass		i	Class C
Poaceae	*Schedonorus arundinaceus*	tall fescue	*Festuca arundinacea*	i	
FERNS, HORSETAIL					
Athyriaceae	*Athyrium filix-femina* ssp. *cyclosorum*	western lady fern		n	
Dennstaedtiaceae	*Pteridium aquilinum* ssp. *pubescens*	western brackenfern		n	
Dryopteridaceae	*Polystichum munitum*	sword fern		n	
Equisetaceae	*Equisetum telmateia* ssp. *braunii*	giant horsetail		n	

N4425519F4180
NBK Keyport OU 1 Area 1 Biological Survey Workplan Meeting #2 (via telecon)

December 18, 2019

Team Members in Attendance:

Denice Taylor	The Suquamish Tribe
Alison O'Sullivan	The Suquamish Tribe
Joe Goulet	US EPA, Ecological Risk Assessor
Jason Speicher	NAVFAC LANT, Ecological Risk Assessor
Laura Wood	NAVFAC LANG, Biologist
Mahbub Alam	Ecology, Project Manager
John Evered	Ecology, Risk Assessor
Jill Hedgecock	AECOM, Ecological Risk Assessor
Laura Scheffler	AECOM, Human Health Risk Assessor
Jennifer Pretare	AECOM, Biologist
Jeff Walker	AECOM, Biologist
Josie Smith	AECOM, Deputy PM, Meeting Notetaker

Attachments:

Attachment A – Meeting Agenda
Attachment B – Potential Reference Sites
Attachment C – Target Species Selection Criteria

Agreements from the 12/18/2019 meeting:

1. All agreed on the Goals and Objectives as written.
2. All agreed to move forward with the Biological Survey Work Plan outline as written.

Action Items from 12/18/2019 meeting:

1. AECOM will move forward with Biological Survey Work Plan using the outline shared with the workgroup.
2. AECOM will send the full list of potential reference sites to the team for review, including the revised screening criteria.
3. The data collection form will be modified to add % cover and define the data to be collected on marine organisms (such as numerical count and size measurements).

Meeting Discussion

Introduction

The meeting participants introduced themselves. Laura Wood, a biologist of NAVFAC Atlantic is a new participant in the work group.

Ms. Scheffler then reviewed the Biological Survey Goals and Objectives from the first Work Group meeting held on 10/29/2019 as printed in the Draft Agenda for this meeting (see Attachment A). In summary, the goals are to perform a pedestrian survey and observations to determine which potential indicator plant and animal species are present at the site in sufficient quantity to be targeted for collection and analysis during the field event in 2021, with the resulting data feeding in to the ecological and human health risk assessments.

Ms. Scheffler then reviewed the status of action items from the first Work Group meeting held on 10/29/2019.

1. Ms. Pretare/Mr. Walker sent out the criteria for Reference Area selection for the project team's review and input on 11/7/2019.
2. Ms. Pretare/Mr. Walker have identified 2 possible Reference Areas to be presented to the team during this workgroup meeting.
3. Ms. Taylor and Ms. O'Sullivan reviewed the preliminary plant list (developed from the August 2019 site visit) but deferred providing feedback at this point in the process.
4. Ms. Scheffler scheduled this workgroup meeting with input from team members regarding their availability.

Ms. Scheffler then discussed the Objectives of this meeting, which are to come to final consensus on the Biological Work Plan Outline and the Biological Survey Approach.

Ms. Scheffler then asked if there were any modifications or additions to the draft agenda. No additional items or modifications to the agenda were identified and the agenda was accepted as is.

Ms. Pretare and Mr. Walker then reviewed the Biological Survey Work Plan outline. They discussed the need for consensus on the outline in order to have the Draft Plan ready for the group to review in February or March 2020. This will allow the team to have the final Work Plan ready before the 2020 field season. Ms. Pretare asked if the team wished to discuss or comment on the outline, and whether any items of concern for the work group are missing from the outline. Ms. Taylor asked about section 2.6.5 Plant and Animal Tissue Collection, and whether analytical data will be obtained during the Survey. Ms. Pretare responded that only small amounts of tissue will be collected during the survey to determine the amount of wet weight tissue required for each potential target species, and this information would only be used to inform the team in selecting target species to be collected and analyzed for the risk assessments in 2021. It was suggested that at least a couple of different types of plant parts (eg. leaves, stems, berries, roots) be identified in the work plan for collection and subsequent wet/dry weight measurements).

Mr. Speicher wondered what differentiated the Section 2.2 and 2.6.8 Schedules. Ms. Pretare responded that Section 2.2 would discuss the overall project schedule, whereas section 2.6.8 would provide more detail on the specifics of the field work, such as tidal cycles.

There were no further comments from the group on the Biological Survey Work Plan outline.

Mr. Walker then lead a discussion of the Draft Biological Survey Collection Form and noted that the form was important as the information collected will be important for target species selection and asked the team if there was any additional information that should be collected during the survey. Ms. Scheffler asked if forms will be completed for each exposure area. Ms. Pretare responded that data will be

collected for all areas except the paved portion of the Landfill, where no potential target species would be present. Mr. Walker asked again of there were anything else needed on the form and stated that it will be important to have input from the team as the form will be used to feed data to the Biological Survey Report. Joe Goulet and Jason Speicher stated they had no further input. Ms. Taylor replied that she would be listening for now and would provide input if she noted any major issues with the form.

Mr. Walker then began a discussion of potential reference sites and reviewed the criteria that were used in the selection process. Two sites have been identified that meet the proposed selection criteria, Taylor Bay Park and Tolmie State Park. Mr. Walker then asked if there were any other selection criteria the team would like considered. Mr. Evered noted that he had provided a link to the Washington State EIM data repository and wondered if EIM information had been considered in the reference site screening process. Mr. Walker responded that they had looked at EIM, and it had been inadvertently left off of the meeting materials (October 29, 2019 Action Item #1 memo). Ms. O'Sullivan asked that the full list of reference sites that were screened using the selection criteria be sent to her, Mr. Evered, and Ms. Taylor. Mr. Walker agreed to send the full list of reference sites to the team for review. Mr. Speicher asked if the references sites were in the same geological unit (parent source material) as the OU 1 site and noted that this would be an important consideration because naturally occurring arsenic concentrations could differ significantly. Mr. Walker responded that this was not considered. Ms. Taylor asked whether the degree of urbanization in the vicinity of the reference sites had been considered. Mr. Walker responded that the general proximity to urban areas was considered but specific distances were not. Ms. O'Sullivan noted that Tolmie State Park is close to Olympia and Ms. Taylor added that the level urbanization would be important due to potential non-point source contamination. Ms. O'Sullivan also noted that it would be important to look at the Asarco Smelter plume for southern sites. Mr. Evered noted that the Ecology website is a good source of information on the Asarco Smelter plume.

Mr. Walker then summarize the additional factors that the team had identified that should be considered in reference site selection

1. Distance from Keyport
2. Location relative to the Asarco Smelter Plume
3. Similarity of the reference site and Keyport geological units (parent material)
4. Distance of the reference site from urbanization and whether it is within an urban growth area (UGA)

Ms. Pretare and Mr. Walker then discussed the attributes of the two potential reference sites (see Attachment B). Mr. Walker asked if there was any further input from the team for these potential reference sites. Mr. Walker asked Ms. Taylor and Ms. O'Sullivan to considered the density of the residential areas to the south and east of Tolmie State Park. Ms. O'Sullivan stated that it would be important to know if the site is inside an urban growth area (UGA) and noted that the adjacent urban density appears higher when looking at a wider view of the surrounding area. Mr. Walker asked if drainage would be a consideration when looking at the urban density of the surrounding area, and whether density would be of less consideration if the gradient was away from a potential reference site. Ms. O'Sullivan responded that it would depend on the drainage system. For example, there are heavy metals in Henderson Inlet clam tissue.

Ms. O'Sullivan reiterated that the team should review the whole list of potential reference sites that were screened before concurring on sites. Mr. Walker stated that the list may have to be refined in a second round of screening. Mr. Speicher noted that there may be additional balancing factors, but a

shortened list of potential reference sites will be needed. Mr. Alam suggested looking at county GIS maps to determine whether the potential reference sites are within a UGA, whether there are contaminated sites, and stormwater system boundaries. Mr. Walker stated that those could be looked at for a narrowed list of sites. Mr. Alam determined from an internet search that Tolmie State Park was not within an UGA but is close to the Lacey UGA.

Ms. Pretare asked if there was any further discussion and noted that there would be additional work to do in screening potential reference sites and that the complete list of potential reference sites and revisions based on the additional screening factors will be provided to the team in January of 2020. Ms. Pretare also reminded the team that they would have an opportunity to comment further on the reference site selection in the Draft Biological Survey Work Plan. Ms. Scheffler asked if based on the current discussion will one reference site be identified, or will it be a shorter list of sites. Ms. Pretare responded they will need to take the sites through the screening process ideally leading to selection of two sites. Mr. Walker then added that those sites would be visited during the Biological Survey in summer 2020 to confirm that the species needed are actually there.

Mr. Walker then began a discussion of the Draft Criteria for Use in Selecting Target Species for the Biological Survey (see Attachment C). Ms. Scheffler said that the criteria were important to determine indicator species and that species of Tribal significance would be of highest interest for the risk assessments, especially for the human health risk assessment. Ms. Scheffler also noted several factors to be considered for species selection including where plants are growing, water content which is e important for considering the volatile organic compounds (VOCs) pathway, and the potential of a species to bioaccumulate PCBs. Another focus will be whether the species is resident or transient, which would affect it's exposure at the site.

Ms. Taylor said that for ingestion, what is there would have to be looked at first, and resource switching considered. The Tribe will have to see what is there (after the Survey is complete) to determine significance. Ms. Scheffler noted that plants with higher significance to The Tribe could be focused on by the field team. Ms. Taylor replied that The Tribe could not provide relative importance until after the survey. Ms. Hedgecock said that if anything stands out that is useful information for the field team. Mr. Walker then said that 100 plant species were observed in the August Site walk and asked how to get the info needed for the next step. Do we need information for every species? Any feedback now would be helpful. Ms. Taylor noted that lipid content and seasonality should be considered when determining the timing of collection, for example shellfish lipid content is highest in the spring before spawning. Ms. Scheffler reiterated that the list is meant to prioritize indicator species so information relevant to the ERA/HHRA evaluation can be collected and how to the get the right input. Ms. Taylor stated that the list cannot be narrowed, and the selection criteria cannot be considered before the biological survey. Ms. Pretare responded that since the species list cannot be narrowed the team would choose a few representative species to collect for dry weight determination, and that berry vs. leaf vs. bark would dry differently. Mr. Walker added that species with similar characteristics will be evaluated to provide the volume requirements and how much to collect. Ms. Scheffler said that during the biological survey as much information as possible would be collected within the time allowed in the field.

Discussion Wrap up

Ms. O'Sullivan asked if sample plots or percent cover would be used to extrapolate populations. Mr. Walker agreed that % cover might be a better description for plants but would not be needed for wildlife. Ms. Hedgecock mentioned shellfish, and Ms. Taylor said that estimating clam bands would be sufficient. Ms. Pretare added that the biological survey would only be looking at whether there are sufficient amounts of species for samples and abundance mapping would not be done. For example, no extensive digging would be done during the survey, but the team might count clam siphon holes or dig a few individuals to check the sized of the organisms. The biological survey team will be focusing on visual observations and gross abundance vs formal abundance studies. Ms. O'Sullivan asked that if abundance would be estimated as low, medium or high, the meaning of those terms should be described. Ms. Pretare noted that there will always be some uncertainty and abundance is intuitive, and the team can start to narrow from there. Ms. Taylor said that other detailed observations should be made, and if there are data gaps that will have to be addressed later. Ms. Pretare responded that whether there is enough tissue present is the most important factor for the biological survey. Ms. Taylor said that for clams more information may have to be collected. Ms. Scheffler said that the team may need to be more flexible in the field with regards to certain species, mussels for example, and collect more information and focus on more in the field. Ms. O'Sullivan again stressed that more information may be needed depending on how the information will be used for risk assessment and that there may have to be multiple sampling events. Mr. Speicher stated that the information gathered during the biological survey is only going to be used to inform field collection of samples for analysis. Ms. Taylor expressed concern that the team ensure there will be enough information to inform the production of the Field Work Plan and the risk assessments and noted that additional information may be required for approval of the QAPP. Ms. Scheffler stated that the Navy RPM, Carlotta Cellucci is committed to produce a QAPP that is agreed to by everyone so data gaps will be considered and if further investigation is needed address that. Mr. Speicher agreed with Ms. Taylor that additional data may be needed for the QAPP.

Ms. Scheffler said that the data collection form would be modified to add % cover and define the data to be collected on marine organisms and asked if there were any other changes to the form. There was no response from the team. Ms. Scheffler then stated that production of the biological Survey Work Plan could be started once the reference area selection is figured out and asked if another meeting or call was needed. Mr. Walker then said that the biological survey team would like to have any further input on criteria or the long list of reference areas before the Biological Survey Work Plan is produced. Moving forward into January 2020, AECOM will send the team the revised list of selection criteria for the reference sites, the long list of reference sites that were screened, and the notes for this meeting.

KEYPORT PROJECT MEETING
Keyport OU 1 Biological Survey Workplan Workgroup Meeting #2
December 18, 2019
Telecommunication
Teleconference Call-In Number: 1-866 692 3580; Code: 599 431 279#

DRAFT AGENDA

Meeting Invitees

Carlotta Cellucci	NAVFAC Project Manager
Jason Speicher	LANT Eco. Risk Ass.
Jenn Corack	LANT HH Risk Ass
Mahbub Alam	Ecology Project Manager
John Evered	Ecology Risk Ass.
Harry Craig	US EPA Project Manager
Joe Goulet	US EPA Eco. Risk Ass.
Denice Taylor	Suquamish Tribe PM
Alison O'Sullivan	Suquamish Tribe
Laura Scheffler	AECOM HH Risk Ass.
Jeff Walker	AECOM Biologist
Jenny Pretare	AECOM Biologist
Jill Hedgecock	AECOM Eco. Risk Ass.
Nicole Rangel	AECOM Note Taker

AGENDA

10:00 - 10:15

- Introductions
- Where we are in the process (Laura)
    - Review of Biological Survey Goal and Objective from Work Group Meeting #1 and Obtain Consensus
        - Biological Survey Goal: To determine the presence and abundance of biota (aquatic and upland) at the site to allow future selection of indicator species for HHRA/ERA
        - Biological Survey Objective: To conduct pedestrian surveys and visual observation at the site and 2-3 potential reference areas. Surveys would identify the habitat, aquatic and upland biota presence/absence and map concentrations of individuals as time allows. Targeted information would be collected on the abundance of each biota, and availability of various plant parts to allow identification of viable indicator species for impacts to the various contaminated media at the site.
    - Action Items from WG Meeting #1
        - Ms. Pretare/Mr. Walker will send out the criteria for Reference Area selection for the project team's review and input – Sent to team November 7.
        - Ms. Pretare/Mr. Walker will identify 3 possible Reference Areas (ranked by selection criteria) to present to the team in the next workgroup meeting.
        - Ms. Taylor and Ms. O'Sullivan will review the preliminary plant list (developed from the August 2019 site visit) and give feedback to the team before the next workgroup meeting.
        - Ms. Scheffler will schedule the next workgroup meeting once all team members have sent back their availability.

- Goals and objectives for this meeting (Laura)

- Review agenda (Jenny)

10:15 – 11:45 (Jeff, Jenny)

- Draft biological survey workplan outline
  - Walk through draft outline and respond to questions
- Plant list:
  - Discuss any feedback received from workgroup participants on HHRA target plant species
  - Discuss potential ERA target plant species
  - Discuss potential target species selection criteria
- Draft biological survey data form:
  - Walk through form and respond to questions
- Proposed reference sites:
  - Discuss reference site selection criteria
  - Discuss proposed reference sites

11:45 – 12:00 noon – Discussion and Meeting Wrap-up

- Review Agreements
- Next steps
- Adjourn

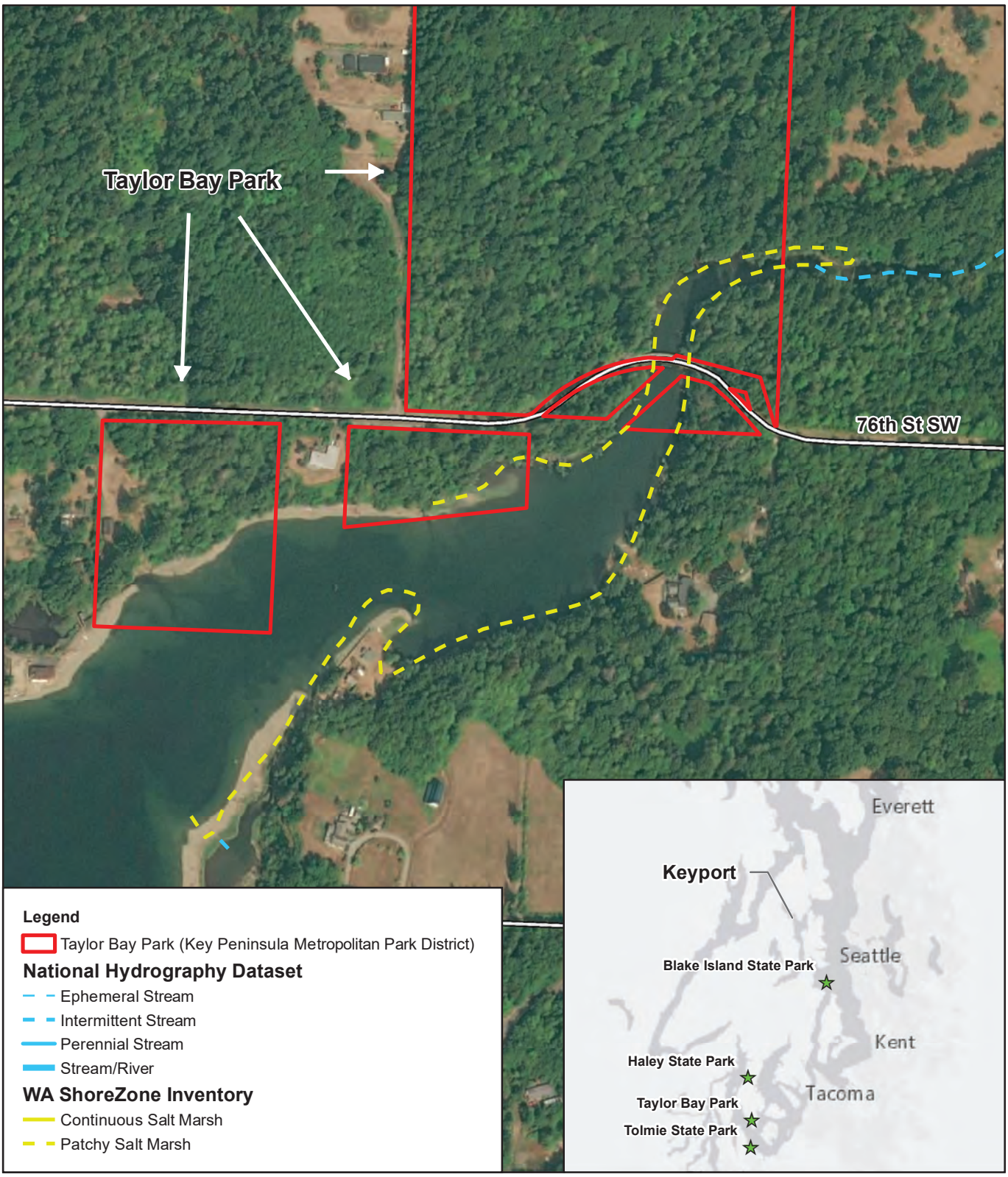
Attachments:
Draft Biological Survey Workplan Outline
Target Species Selection Criteria
Draft Biological Survey Data Form
Draft Reference Sites and Selection Criteria

Potential Reference Areas

Attached are figures of two potential reference sites. These parks that made it through the desktop analysis – they had salt marsh and evidence of mudflats - are publicly owned, had freshwater source, were over 1mi from a cleanup site, and 0.25 mi from assessed sediment/water:

1- **Taylor Bay Park** is owned by Key Peninsula Metropolitan Park District with over 1,200 feet of shoreline access to the bay. Aerial imagery indicates the presence of a tidal mud flat, and the parks website indicates that it contains: "…wetlands, a significant pocket estuary, mudflats, lagoon, salt marshes, a small creek, a larger creek, forested uplands, riparian areas, and patches of open meadows.". A freshwater intermittent stream flows into the bay, as indicated by Salmonscape, although the parks page describes two creeks flowing into the bay. It is 2.24 mi from the nearest cleanup site, as indicated by the 'What's in my neighborhood?' mapper. It is also 0.7 mi from the nearest assessed water/sediment, as indicated by the EIM mapper. Patchy fringe salt marsh (similar to the patchy fringe salt marsh mapped at Keyport) is mapped along the north and south portions of the bay. It is located roughly 47 mi from Keyport as the crow flies.

2- **Tolmie State Park** is a 154-acre developed State Park with 1,800 feet of shoreline access and is popular for clamming and recreation. The State Parks website indicates the presence of salt marsh and 'flats'. Aerial imagery indicates the presence of a tidal mud flat. A freshwater intermittent stream is mapped by Salmonscape leading into the salt marsh. The park is 1.13 mi from the nearest cleanup site as indicated by the 'What's in my neighborhood?' mapper, and 0.31 mi from the nearest assessed water/sediment as indicated by the EIM mapper. A patchy fringe of salt marsh is located throughout the shoreline of the park. The park is located roughly 45 mi from Keyport as the crow flies.



Sources: Esri, HERE, Garmin, © OpenStreetMap contributors, and the GIS user community
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

250 0 250 500
SCALE IN FEET

AECOM

TAYLOR BAY PARK

POTENTIAL REFERENCE SITE
KEYPORT OU 1 HHRA/ERA
PIERCE COUNTY, WASHINGTON

Document Path: J:\DCS\Projects\ENV\Environmental\Navy Salt Marsh Research\GIS\MXD\Taylor_Bay3.mxd

Sources: Esri, HERE, Garmin, © OpenStreetMap contributors, and the GIS user community
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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SCALE IN FEET

AECOM

TOLMIE STATE PARK

POTENTIAL REFERENCE SITE
KEYPORT OU 1 HHRA/ERA
THURSTON COUNTY, WASHINGTON

Document Path: J:\DCS\Projects\ENV\Environmental\Navy Salt Marsh Research\GIS\MXD\Tolmie.mxd

Draft Criteria for Use in Selecting Target Species for the Biological Survey

1. Species has Suquamish Tribe Significance (i.e., potential for ingestion)
2. Species has Ecological Significance (i.e., potential food source for upper trophic organism)
3. Species with relatively high water content, which is potentially significant for chlorinated VOC uptake from surface water
4. Species with the potential for bioaccumulation of PCBs (limited area)
5. Tissue has high fat content
6. Species mobility/extent of home range (for animal species only)

Keyport OU 1
Biological Survey Work Plan Project Team Meeting
February 4, 2020
Final Summary

Team Members in Attendance:

Carlotta Cellucci	NAVFAC Project Manager
Mahbub Alam	Ecology Project Manager
Harry Craig	US EPA Project Manager
Denice Taylor	Suquamish Tribe Project Manager
Joann Grady	Grady & Associates, Meeting Facilitator

Support Personnel:

John Evered	Ecology Risk Assessor
Joe Goulet	US EPA Ecological Risk Assessor
Alison O'Sullivan	Suquamish Tribe
Debbie Rodenhizer	AECOM Project Manager
Josie Smith	AECOM Deputy Project Manager
Laura Scheffler	AECOM HH Risk Assessor
Jeff Walker	AECOM Biologist
Jenny Pretare	AECOM Biologist
Jill Hedgecock	AECOM Ecological Risk Assessor
Nicole Rangel	AECOM Note Taker

Attachments:

Attachment A – Meeting Agenda
Attachment B – Potential Reference Sites
Attachment C – Potential Biological Survey Approaches
Attachment D – Next Steps
Attachment E – Keyport Schedule of Reviews

Agreements from the 2/04/2020 meeting:

1. All project team members agreed on the agreements made during the October 29, 2019 and December 18, 2019 meetings.
2. The selection categories will be prioritized in the following order for the selection of reference area sites:
    a. Ownership of the land (with preference to public land or land owned by the Great Peninsula Conservatory).
    b. Is there a freshwater input via a stream?
    c. How close is area to contaminated waters from 'What's in my Neighborhood' website. (Distance in Miles to Cat 4/5 Assessed Water/Sediment for a Connected Waterway).
    d. How close is area to contaminated sites from 'What's in my Neighborhood' website (Distance from closest site to closest portion of shoreline with salt marsh – miles, minimum distance = 0.25 miles).
    e. Asarco Plume - Predicted arsenic concentration by category at the location of the reference area site.

   f. Distance from Keyport site.
3. Biological Survey Approach 2 will be used, with the agreed upon caveat that a review of preliminary data and additional workgroup meetings will be held, with a goal of narrowing down potential indicator species. Separate mobilizations would occur later in the summer of 2020 to potential reference area site(s) and will be conducted in a stepped approach, first determining if potential indicator species are present, followed by a broader investigation if enough of the potential indicator species are present.

Action Items from 2/04/2020 meeting:

1. AECOM will include in the agenda and meeting minutes that the Suquamish Tribe responded with feedback on February 3rd, 2020 to the potential reference areas sent out via email by AECOM on January 29, 2019. (Completed)
2. Ms. Cellucci will send out the three selected reference area sites for team review before the internal draft work plan is completed. (Completed - Revised reference area selection spreadsheet with top 4 reference site noted was sent to team on February 11, 2020)
3. Ms. Cellucci agreed to send out a Gantt chart with general milestones and schedules for the Keyport project site to the project team. (Completed - Gantt chart sent on February 6, with and updated version sent on February 12, 2020)

Meeting Discussion

Introduction and Meeting Purpose

Ms. Grady initiated the meeting by having all meeting participants introduce themselves and asked if everyone had all materials needed for the meeting and noted that the "Next Steps" handout will be emailed during the meeting for later discussion. She then asked if there were any questions. No team members had questions. Ms. Cellucci then discussed "where in the process" the project was in. She stated the project direction was to complete the biological survey in 2020. The objective of the meeting was to get closer to completing the internal draft biological survey work plan so the actual biological survey could occur in June 2020. She stated the data received during the biological survey will feed into the human health and ecological risk assessment work plan and will be used to select indicator species for the human health and ecological risk assessment.

Ms. Cellucci stated the goal of the meeting was to select a short list of reference area sites. Based on new input from Ms. O'Sullivan, the decision on the short list may need to be postponed as Ms. O'Sullivan sent out seven additional potential reference areas located in Kitsap County. Ms. Cellucci stated that she believed three of the sites were viable to keep on the list and noted that they were all accessible as most were county parks or owned by the Great Peninsula Conservatory. Ms. Cellucci said she had contacted the Great Peninsula Conservatory and they confirmed access would not be a problem on their properties. She then stated that she would like to get a short list of references areas for the biological survey work plan and that the selection process needed to be confirmed during the meeting. She stated that agreement has been made on the selection criteria, but the priority of the selection criteria still needs to be reviewed and discussed by all team members. She believed that once the team agreed on how/what parameters take precedent, AECOM will be able to proceed with the internal draft biological survey work plan.

Ms. Cellucci indicated that although agreements were made during the workgroup meetings, not all project team members were present during the workgroup meetings. Therefore, all previous agreements need to be reviewed and agreed to by all project team members. Ms. Grady requested vocal agreements by everyone after each agreement was read by Ms. Pretare.

Review Previous Agreements

The following agreements were agreed to by all project team members (note: changes to original agreements identified in bold font):

- October 29, 2019 - Biological Survey Work Plan Workgroup Meeting #1
    - No Agreements.
- December 18, 2019 – Biological Survey Work Plan Workgroup Meeting #2
    - Agreed to the following Goals and Objectives:
        - Biological Survey Goal: To determine the presence and **relative** abundance of biota (aquatic and upland) at the site to allow future selection of indicator species for HHRA/ERA
        - Biological Survey Objective: To conduct pedestrian surveys and visual observation at the site and 2-3 potential reference areas. Surveys would identify the habitat, aquatic and upland biota presence/absence, and map concentrations of individuals as time allows. Targeted information would be collected on the **relative** abundance of each biota, and availability of various plant parts to allow identification of viable indicator species for impacts to the various contaminated media at the site.
    - Agreed to move forward with the biological survey work plan outline as presented in the meeting.

Ms. Cellucci pointed out the scope for this project did not include a gridded quantitative biological survey and the biological survey is purely in support of the ERA/HHRA. She added the team is trying to determine what is abundant and important enough to act as an indicator species. Ms. Taylor requested, and it was agreed upon, that the word 'relative' be added before abundance in the goals and objectives. Mr. Goulet did not like the term indicator species, but rather receptors. However, he agreed with the language at this point in the project. Ms. Hedgecock concurred with Mr. Goulet. Ms. Cellucci noted that as risk assessment field work is scheduled for June 2021, some species may not be available (i.e. berries). As some samples may need to be collected in September, she stated that she can incorporate additional data collection into her long-term monitoring (LTM) contract. Ms. Grady asked if there were any questions or comments before moving on to the subject of Action Items. No comments or questions were received.

Review Action Items

Ms. Pretare reviewed the following action items from the October 29, 2019 and December 18, 2019 meetings followed by the status of the action items (in bold) and corrections in bold and italicized font:

- October 29, 2019 - Biological Survey Work Plan Workgroup Meeting #1
    - Ms. Pretare/Mr. Walker will send out the criteria for Reference Area selection for the project team's review and input: **Completed – Sent to Team on November 7, 2019**

  - Ms. Pretare/Mr. Walker will identify 3 possible Reference Areas (ranked by selection criteria) to present to the team in the next workgroup meeting: **Completed – Presented to Team on December 18, 2019 during 2nd Workgroup Meeting**
  - Ms. Taylor and Ms. O'Sullivan will review the preliminary plant list (developed from the August 2019 site visit) and give feedback to the team before the next workgroup meeting**: Deferred – Tribe stated during the 2nd Workgroup Meeting that they wanted to wait until after the Biological Survey is complete to provide input on the plant list**
  - Ms. Scheffler will schedule the next workgroup meeting once all team members have sent back their availability: **Completed – 2nd Workgroup Meeting scheduled for December 18, 2019**
- December 18, 2019 – Biological Survey Work Plan Workgroup Meeting #2
  - AECOM will move forward with Biological Survey Work Plan using the outline shared with the workgroup: **In Progress – AECOM is moving forward with the biological survey work plan using the outline shared with the group**
  - AECOM will send the full list of potential reference area sites to the team for review, including the revised screening criteria: **Completed – Table including the full list of potential reference area sites, the additional/revised screening criteria identified during the 1st Work Group Meeting, and a ranking of the sites sent to Team on January 29, 2020. *Ms. O'Sullivan of the Suquamish Tribe added feedback on the additional reference area sites to be considered on February 3rd, 2020.***
  - The data collection form will be modified to add % cover and define the data to be collected on marine organisms (such as numerical count and size measurements): **In Progress – AECOM will include the revised form in the biological survey work plan**

Ms. Taylor requested that it be noted in the agenda and meeting minutes that the Suquamish Tribe responded with feedback on February 3rd, 2020 to the potential reference areas sent out via email by AECOM on January 29, 2019. Ms. Grady asked if there were any other comments or additions to the action items. No one had further comments or changes.

Reference Site Selection

Ms. Pretare reviewed the reference area site selection criteria (see Attachment B). She presented the different screening criteria by two different classes: the ecological baseline criteria and the workgroup criteria. The ecological criteria included the following:

1. Does area contain a salt marsh?
2. Does area have mud/tide flats area?
3. Is the location of marsh/tide flat area within the site?
4. Is there freshwater input via a stream?

The following additional criteria added by the workgroup:

5. How close is area to contaminated sites from 'What's in my Neighborhood' website (Distance from closest site to closest portion of shoreline with salt marsh – miles, minimum distance = 0.25 mile).
6. How close is area to contaminated waters from 'What's in my Neighborhood' website. (Distance in miles to Cat 4/5 Assessed Water/Sediment for a Connected Waterway).
7. Proximity to urbanization (Estimated in GIS to Center of nearest City/Town)
8. Asarco Plume - Predicted arsenic concentration by category at the location of the reference area site.

Ms. Cellucci then presented the order of prioritization that she had asked AECOM to use to evaluate the potential reference areas that resulted in the spreadsheet prepared for the meeting:

1. Is there a freshwater input via a stream?
2. How close to contaminated waters from 'What's in my Neighborhood' website. (Distance in Miles to Cat 4/5 Assessed Water/Sediment for a Connected Waterway).
3. How close is area to contaminated sites from 'What's in my Neighborhood' website (Distance from closest site to closest portion of shoreline with salt marsh - miles minimum distance = 0.25 mile).

Ms. Cellucci noted that she also eliminated areas that were in Hood Canal, as she believed the Hood Canal was not comparable to the Puget Sound (septic input and lack of tidal exchange). Ms. O'Sullivan agreed and stated she did not include any sites in the Hood Canal as possible reference areas. Ms. Cellucci asked Ms. O'Sullivan if she agreed with the priority of criteria presented or if anyone else wanted to change the order of the criteria or had any other priorities to add. Ms. Taylor inquired about adding the Asarco plume to the prioritization. She asked why the team would choose a reference area site where there is a known contamination, as it would complicate the project. Ms. Cellucci responded that the Asarco arsenic plume is endemic and the lowest arsenic concentrations are where soil has been reworked (not pristine). Mr. Alam agreed with Ms. Taylor and said, at the minimum, the team should include the category with a preference of selecting sites "under 20 ppm" or "outside contaminated area". Ms. Cellucci agreed to add the Asarco plume category with the preferences suggested as priority number 4.

Ms. Taylor suggested adding a 5th category of "distance from the Keyport site". Ms. O'Sullivan agreed that this category could be used as a tie breaker for reference area selection. Ms. Smith asked why this category should be used, what was the rationale for the distance to Keyport? Ms. Cellucci responded that the sites closer to the Keyport site would have similar environments. Ms. Taylor added that the closer sites would also have similar geology. Ms. Cellucci highlighted that ownership of the land is the highest priority for accessibility to the reference area site so this should be added as the first priority for the reference area site selection. It was then agreed that the reference area site selection categories would be prioritized in the following order:

1 Ownership of the land (with preference to public land or land owned by the Great Peninsula Conservatory).
2 Is there a freshwater input via a stream?
3 How close to contaminated waters from 'What's in my Neighborhood' website. (Distance in miles to Cat 4/5 Assessed Water/Sediment for a Connected Waterway).
4 How close is area to contaminated sites from 'What's in my Neighborhood' website (Distance from closest site to closest portion of shoreline with salt marsh – miles, minimum distance = 0.25 mile).
5 Asarco Plume - Predicted arsenic concentration by category at the location of the reference area site.
6 Distance from Keyport site.

Ms. Grady asked if there were any comments. Mr. Alam asked if proximity to a pond was used as an ecological factor in selection. Mr. Walker responded no, it was not. Ms. Cellucci asked what would be sampled in the pond in addition to water, as no mussels were seen in pond (as the water may be too

fresh). Mr. Alam asked if the team had information on the status of the saltwater location. Ms. Cellucci said that she believed a saltwater wedge could be mapped geophysically and then stated that the additional work may be added as a modification to the (Battelle) contract (to find the salt water location). Battelle has done some initial evaluation of selected data with Environmental Sequence Stratigraphy (ESS) and found the same channel that Battelle found when trying to map the surface of the clay layer (aquitard). Ms. Cellucci stated that she believes adding ESS will be beneficial and is talking to EXWC about adding this.

Ms. Cellucci asked the risk assessors if they thought a reference area with a pond was needed. Ms. Hedgecock responded that if fish was present in pond that it may be a priority, but she did not believe this was a priority for the Keyport site. Mr. Alam added that if there is no pond at the reference area site then intermittent freshwater should be ruled out. Ms. Cellucci agreed that Tier 2 sites (see Attachment B) would be eliminated. Ms. Taylor then asked how the additional potential sites sent by Ms. O'Sullivan would be incorporated into the selection. Ms. Cellucci responded that the sites would be added to the table and evaluated using the selection criteria agreed upon by the team. Then, the top three sites would be selected and added to the internal draft biological survey. She then noted the table would be an appendix to the work plan. Ms. Cellucci requested that the reference area site selection be sent out before the completion of the internal draft biological survey work plan and if there was disagreement on the selection, this could be resolved during a telecon. Ms. Cellucci agreed to send out the selected reference area sites before the completion of the internal draft biological survey work plan. Ms. Taylor noted that Ms. O'Sullivan can be contacted if there are any questions on her added list of potential reference areas. Ms. O'Sullivan confirmed she could be contacted directly by AECOM with questions.

Scope of Biological Survey

Ms. Cellucci reviewed the scope of the biological survey. She stated the original scope of the survey had the following steps: perform the biological survey of the site and reference areas and then determine indicator species. She believed the order of the steps may be inefficient and expensive. Therefore she suggested that a better option may be to survey the site, present the data to the team and select priority species and possible indicator species, and then survey the reference area sites. Ms. Pretare presented the two different biology survey approaches and the advantages and disadvantages of each (Attachment C).

In response, Mr. Alam stated that abundance may also be a factor in choosing the approach as the indicator species may not be abundant from "damage" due to site contamination. Ms. Cellucci responded that risk assessment must be based on what is at the site; the indicator species must be based on what we can sample at the site. Ms. Taylor agreed with Mr. Alam stating that the team needs to look at both the reference area site and the project site because indicators of contamination may be missed if the focus is only on the Keyport site (no preliminary comparison can be made). She further stated she would have a problem if the reference area site survey had different tidal availability than the project site survey. Therefore, she leaned toward Approach 1. Ms. Taylor emphasized that a better overall comparison could be made by Approach 1, as choosing the indicator species is not the only factor of the evaluation as "it is about getting the best match". In response to Ms. Taylor's concern on seasonality, Ms. Cellucci replied that the time between the two different surveys would be not significant as the project site survey would be done in June 2020 followed shortly by the reference area survey in late July 2020. She further commented on Approach 1 that, if indicator species are selected for the Keyport site that are not located in the reference areas, the project may be derailed and additional biological surveys would be necessary.

Mr. Goulet commented that it may be helpful to review examples of the types of species we are looking at. He gave an example of shorebirds which would not be sampled, but just modeled for predicted values based on media present at the site (whether toxic or not); therefore, stating that not everything is required to be seen on the site. Ms. Hedgecock stated that in her view indicator species to be sampled are plant tissues, clams/shellfish (not raccoons, etc.). Mr. Goulet replied that indicator species translates to either a receptor with a direct risk or a pathway to another organism. Ms. Cellucci responded that at Area 8 the team used clams as an indicator species to represent the "seafood basket," so indicator species the way she is using the term represents a species that can represent an entire biological assemblage. Ms. Cellucci asked if Himalayan berries can represent all berries. Mr. Goulet responded there are two types of toxicity: 1) toxicity to plants from soil and 2) toxicity from plants as a pathway of contaminants to humans or ecological receptors; therefore, he stated that soil would be sampled to determine plant toxicity and plants would be sampled for concentrations that may be potentially toxic to other organisms. Ms. Cellucci asked if we would be selecting a particular plant to represent the biological assemblage. Mr. Goulet suggested using toxicity values (for site chemicals) known to be harmful for plants and determine the levels that are toxic to plants. Another line of evidence would be that plants do grow on the project site.

Ms. Cellucci stated she had reservations regarding proceeding with Approach 1. Ms. Taylor suggested for Approach 2 that the focus on target species should be removed and the survey should look at relative abundance and the presence of different organisms, etc. In other words, look at a broader picture. Ms. Cellucci suggested that the team perform a first level review of the reference area assessing whether the site has the selected indicator species in sufficient abundance and, if present, then identify the general biology of the site. If the reference area site is missing the selected indicator species, then move on to the next reference area site. Mr. Evered asked if there would be a small-scale survey and then a full-scale survey as to which Ms. Cellucci responded that the reference area survey would be done on the same day. If the target species was found, then the biological survey would move forward the same day. Mr. Goulet commented that a good reference area would not have a lot of chemicals in the plants. Mr. Evered then asked if mammals would be looked at during the survey. Ms. Hedgecock and Mr. Goulet confirmed they would be, but most likely they would be modeled (no collection of tissue) and emphasized that they are not required to be on the site.

Ms. Grady asked if there were additional comments. Mr. Alam asked if there were any impacts to the schedule. Ms. Cellucci replied that two workgroup meetings would be needed, one in early July and one in late July. Mr. Alam stated he would be on vacation during the second workgroup meeting so he would have to hand off the project details (biological survey parameters) to Mr. Evered (or his replacement). It was agreed that Approach 2 with caveats would be used for the biological survey. This would include a biological survey at Keyport, followed by review of preliminary data and additional workgroup meetings with a goal of narrowing down potential indicator species. Separate mobilizations would occur later in the summer of 2020 to potential reference area site(s), which will have a stepped approach of first determining if potential indicator species are present, followed by a broader investigation if enough of the potential indicator species are present.

Discussion and Meeting Wrap-up

Ms. Cellucci reviewed the agreements made during the meeting. Ms. Grady asked for the team's confirmation on the agreements. All were confirmed and agreed upon.

Ms. Smith commented that the last window for low tide is the week of July 20th, 2020.

Ms. Cellucci provided a brief update on the Adaptive Site Management project, stating that she received an email from EPA requesting a three-week review, to which she responded that the team would need the full four weeks allotted, but at this point she has not received the draft plan.

Next Steps/Schedule

(Team members that stayed for the schedule review included Carlotta Cellucci, Mahbub Alam, Harry Craig, Denice Taylor, JoAnn Grady, John Evered, Debbie Rodenhizer, Jenny Pretare, Nicole Rangel)

Ms. Cellucci presented the upcoming project schedules for all Keyport sites and reviewed 'next steps' and schedules for upcoming project meetings (Attachment D). She stated she would like to have recurring bimonthly meetings on Thursdays during the months of April, May, June, and July. The members of the Keyport team reviewed the 'next steps' table, row by row, to determine priority, whether meetings can be in person or via telecon, and dates and time of the pertaining meetings. The "next steps" table was updated based on priority and meeting schedules were agreed upon by all team members present (see Attachment D). Ms. Taylor requested that a flow chart be sent out showing the general schedule, but also noted that exact dates would not have to be shown. Ms. Cellucci agreed to send out a Gantt chart with general milestones and schedules to the project team (see Attachment E).

The following vacations of project team members were also noted during the meeting:

Mahbub Alam - June 30, 2020 to Aug. 14, 2020
JoAnn Grady - May 28, 2020 to June 9, 2020
Carlotta Cellucci - June 14, 2020 to July 5, 2020
Harry Craig - April 23, 2020 thru May 18, 2020

AGENDA
Keyport OU 1 Biological Survey Work Plan Project Team Meeting
February 4, 2020
In Person or Telecommunication
AECOM Seattle: 1111 3rd Ave, Suite 1600, Seattle WA 98101
Conference Room: Hemlock
Teleconference Call-In Number: 1-877-286-5733; Code: 948 924 910#

Team Members

Carlotta Cellucci	NAVFAC Project Manager
Mahbub Alam	Ecology Project Manager
Harry Craig	US EPA Project Manager
Denice Taylor	Suquamish Tribe PM

Support Personnel

Jenn Corack	LANT HH Risk Ass
John Evered	Ecology Risk Ass.
Joe Goulet	US EPA Eco. Risk Ass.
Alison O'Sullivan	Suquamish Tribe
Debbie Rodenhizer	AECOM PM
Josie Smith	AECOM Deputy PM
Laura Scheffler	AECOM HH Risk Ass.
Jeff Walker	AECOM Biologist
Jenny Pretare	AECOM Biologist
Jill Hedgecock	AECOM Eco. Risk Ass.
Nicole Rangel	AECOM Note Taker

AGENDA

9:00 - 9:15 Introductions and Meeting Purpose

- Introductions
- Where we are in the process (Carlotta)
- Goals and objectives for this meeting (Carlotta)
- Review agenda (Carlotta)

9:15 – 9:30 Review Previous Agreements (Jenny and Jeff)

- October 29, 2019 - Biological Survey Workplan Workgroup Meeting #1
    - No Agreements
- December 18, 2019 – Biological Survey Workplan Workgroup Meeting #2
    - Agreed to the following Goals and Objectives:
        - Biological Survey Goal: To determine the presence and abundance of biota (aquatic and upland) at the site to allow future selection of indicator species for HHRA/ERA
        - Biological Survey Objective: To conduct pedestrian surveys and visual observation at the site and 2-3 potential reference areas. Surveys would identify the habitat, aquatic and upland biota presence/absence and map concentrations of individuals as time allows. Targeted information would be collected on the abundance of each biota, and availability of various plant parts

to allow identification of viable indicator species for impacts to the various contaminated media at the site.

- Agreed to move forward with the Biological Survey Work Plan outline as presented in the meeting.

9:30 – 10:00 Review Action Items (Laura, Jenny, and Jeff)

- October 29, 2019 - Biological Survey Workplan Workgroup Meeting #1
  - Ms. Pretare/Mr. Walker will send out the criteria for Reference Area selection for the project team's review and input: Completed – Sent to Team on November 7, 2019
  - Ms. Pretare/Mr. Walker will identify 3 possible Reference Areas (ranked by selection criteria) to present to the team in the next workgroup meeting: Completed – Presented to Team on December 18, 2019 during 2nd Workgroup Meeting
  - Ms. Taylor and Ms. O'Sullivan will review the preliminary plant list (developed from the August 2019 site visit) and give feedback to the team before the next workgroup meeting: Deferred – Tribe stated during the 2nd Workgroup Meeting that they wanted to wait until after the Biological Survey is complete to provide input on the plant list
  - Ms. Scheffler will schedule the next workgroup meeting once all team members have sent back their availability: Completed – 2nd Workgroup Meeting scheduled for December 18, 2019
- December 18, 2019 – Biological Survey Workplan Workgroup Meeting #2
  - AECOM will move forward with Biological Survey Work Plan using the outline shared with the workgroup: In Progress – AECOM is moving forward with the Biological Survey Work Plan using the outline shared with the group
  - AECOM will send the full list of potential reference sites to the team for review, including the revised screening criteria: Completed – Table including the full list of potential reference sites, the additional/revised screening criteria identified during the 1st Work Group Meeting, and a ranking of the sites sent to Team on January 29, 2020. Ms. O'Sullivan of the Suquamish Tribe ~~added~~ provided feedback on the additional reference sites to be considered on February 3rd, 2020.
  - The data collection form will be modified to add % cover and define the data to be collected on marine organisms (such as numerical count and size measurements): In Progress – AECOM will include the revised form in the Biological Survey Work Plan

10:00 – Noon Additional Agreements that Need to be Made (Carlotta, Jenny, and Jeff)

- Reference Site Selection (Table Sent to Team on January 29, 2020) (Jenny and Jeff)
- Scope of Biological Survey (Carlotta)
- Discuss Advantages and Disadvantages of Biological Survey Approaches (Jenny and Jeff)
  - Approach #1 - Biological Survey at Keyport, followed closely in time by Reference Site surveys, review and present all results to workgroup at end of the field work
  - Approach #2 - Biological Survey at Keyport, followed by review of preliminary data and additional workgroup meetings with a goal of narrowing down potential indicator species. Separate mobilizations later to potential Reference Site(s)

Noon – 12:30 – Discussion and Meeting Wrap-up (JoAnn, Carlotta)

- Review Agreements
- Update on Adaptive Site Management
- Next steps

- Adjourn

Keyport OU 1 Biological Survey Work Plan
Potential Reference Site Screening
Date: 1/29/2020

SCREENING PRIORITY - **1 - MUST CONTAIN FRESHWATER INPUT, PREFER YEAR ROUND FLOW** **3 - SORTED BY DESCENDING DISTANCE** **2 - ELIMINATED IF IT OCCURS WITHIN A CATEGORY 4/5 WATER**

	GENERAL INFORMATION				ECOLOGICAL CRITERIA				ADDITIONAL CRITERIA FROM WORKGROUP			
RECOMMENDED TIER	**Site Name**	**Ownership**	**County**	**Distance to Keyport OU1 - Miles**	**Salt Marsh (Y/N) - Note: Salt Marsh at the Keyport is Classified as "Fringe (Patchy)"**	**Mud/Tide Flat (Y/N/ - Notes)**	**Location of Marsh/Tide Flat**	**Freshwater Input**	**Contaminated Sites from What's in my Neighborhood (Distance from closest site to closest portion of shoreline with salt marsh - miles). Minimum Distance = 0.25 miles.**	**Contaminated Waters from What's in my Neighborhood: Distance in Miles to Cat 4/5 Assessed Water/Sediment for a Connected Waterway.**	**Proximity to Urbanization (Estimate in GIS to Center of nearest City/Town)**	**Asarco Plume - Predicted Arsenic Concentration**
TIER 1 - CONTAINS YEAR ROUND FRESHWATER INPUT, SALT MARSH *AND* TIDAL MUD FLATS	Haley State Park	State Parks	Pierce	34.3	Y - Fringe (patchy and continuous)	Potentially - lagoon has outlet to salt water but cannot be certain from aerial photo	Along Haley Lagoon	Yes	2.2 miles (awaiting cleanup, gasoline, petroleum other)	1.55 (Category 5 water: DO)	9.73 miles to Gig Harbor	Under 20 ppm
	Penrose Point State Park	State Parks	Pierce	31.4	Y- Fringe (patchy)	Yes	West side of park	Yes	1.17 miles (awaiting cleanup, gasoline, petroleum other)	0.15 (Category 5 waters: multiple locations)	9.15 miles to Bremerton	Under 20 ppm
	Skookum Inlet Natural Area Preserve	WA DNR	Mason	47.0	Y - Fringe (continuous)	Y - Aerial imagery indicates muddy tidelands		Yes	0.63 miles (awaiting cleanup, benzene, lead, metals, gasoline, diesel, petroleum other, other non-halogenated organics, polycyclic aromatic hydrocarbons)	1.25 (Category 5 waters: DO)	5.27 miles to Shelton	Outside of contaminated area
	Crescent Creek Park	Gig Harbor Parks	Pierce	24.6	Y - Fringe (Patchy)	Y - Aerial imagery indicates muddy tidelands	All around edge of Gig Harbor	Yes - Crescent Creek connects to Gig Harbor	<1 mile. 11 cleanup sites within 1 mile; closest are Conan Vacant Property (awaiting cleanup, petroleum - diesel) and Eagle Quest (no further action, arsenic)	0.62 (Category 4C: fish and shellfish habitat)	Less than 0.5 mile to neighborhood in Gig Harbor	Under 20 ppm
TIER 2 - CONTAINS INTERMITTENENT FRESHWATER INPUT, SALT MARSH *OR* MUD FLAT	Taylor Bay Park	Key Peninsula Parks	Pierce	46.6	Y	Y - shoreline along both sides of		Yes - intermittent	2.43 miles (awaiting cleanup, diesel, gasoline)	0.72 (Category 5 water: DO)	8.28 miles to Steilacoom	Under 20 ppm
	Blake Island State Park	State Parks	Kitsap	12.4	Y- Fringe (patchy)	Y - Aerial imagery indicates limited muddy tidelands	Small patch on NW corner of island	Yes - intermittent stream	2.35 miles (Southworth Stage - cleanup started, metals - other, metals priority pollutants, pesticides - unspecified, petroleum products unspecified)	1 (Category 5 water: DO)	4.0 miles to West Seattle	Under 20 ppm
	Harstine Island State Park	State Parks	Mason	35.6	Potentially - Fringe (continuous along Fudge Point and patchy on east shoreline)	Y	Along shoreline	Yes - intermittent	1.84 miles (complete cleanup, benzene, gasoline, diesel, other non-halogenated organics)	0.25 (Category 5 water: DO)	11.23 miles to Shelton	Outside of contaminated area
	Tolmie State Park	State Parks	Thurston	45.2	Y - Fringe (patchy)	Y - Aerial imagery indicates muddy tidelands	Along the coast, very small	Yes - intermittent	1.13 miles (complete cleanup, arsenic and lead)	0.31 (Category 5 water: bacteria)	5 miles to Lacey	40.1 ppm to 100 ppm
	Quilcene Bay WDFW Tidelands	WDFW Manages	Jefferson	14.0	Y - Bed[1] (continuous)	Y	Northern portion of bay is all marsh	Yes - intermittent streams and perennial streams connect to Puget Sound	0.87 mile (Heisel property - no further action, petroleum other)	0.27 mi (Category 5 water: temperature, Cat 4: fish and shellfish habitat)	11.87 miles to Poulsbo	Outside of contaminated area
	Hope Island Marine State Park	State Parks	Mason	38.7	Y - Fringe (continuous)	Potenially - depending on tides	Along southern shore of the island	Yes - intermittent	0.75 mile (awaiting cleanup, petroleum products)	2.6 miles from nearest Category 4 water	8.49 miles to Shelton	Outside of contaminated area
	Burfoot Park	Thurston County Parks	Thurston	47.8	Y - Fringe (patchy)	Potentially - there is a lagoon but it is separated from the water by a	South portion of park, along the beach	Yes - intermittent	0.5 mile (complete cleanup, petroleum gasoline)	0.6 mile from nearest Category 5 water: DO	6 miles to Lacey	Outside of contaminated area
	Maury Island Marine Park	King County Parks	King	25.5	Y - Fringe (patchy)	N - Aerial imagery does not indicate muddy tidelands	Along the coast of the park	Yes - intermittent stream	<1 mile. 2 cleanup sites within 1 mile. (Tacoma Smelter Plume area - cleanup started, arsenic, lead, metals priority pollutants and Bonneville Broadcasting - cleanup started, petroleum - other)	3.7 miles from nearest Category 5: bacteria	4.09 miles to Des Moines	Over 100 ppm
	Blakely Harbor Park	Bainbridge Isl Parks	Kitsap	8.8	Y- Fringe (patchy)	Y - Aerial imagery indicates muddy tidelands	Periphery of the little harbor	Yes - two intermittent/ephemeral streams are in the mapped saltmarsh area	<1 mile. (Within Blakely Harbor Park - awaiting cleanup, conventional contaminants, inorganic and organic, dioxin/dibenzofuran compounds, lead, metals - other, other deleterious substances); (5 cleanup sites within 1 mile)	0.83 mile from nearest Category 5 sediment site and waters: bacteria	2.11 miles to downtown Bainbridge Island	Under 20 ppm
TIER 3 - ELIMINATED (REASON HIGHLIGHTED IN GRAY)	Jarrell Cove State Park	State Parks	Mason	34.4	Y - Fringe (patchy)	N	Salt marsh along shoreline	Potentially - freshwater input to bay, but not directly where salt marsh is	0.15 mile (complete cleanup, benzene, gasoline, diesel, other non-halogenated organics)	--	11.38 miles to Shelton	Outside of contaminated area
	Priest Point Park	City of Olympia	Thurston	53.4	Y - Fringe (continuous)	Y	Along beach to the south portion of the park	Potentially - freshwater input to bay, but not directly where salt marsh is	1.03 mile (cleanup started, petroleum)	0 (Category 5 water: DO, dioxin)	1 mile to Olympia	Outside of contaminated area
	West Bay Park	City of Olympia	Thurston	48.3	Y - Fringe (patchy)	Y - Aerial imagery indicates muddy tidelands	Along inner shoreline, parallel to W Bay Drive	Not where salt marsh is mapped	--	--	Less than 0.5 mile (within Olympia)	Outside of contaminated area
	Shine Tidelands State Park	State Parks	Jefferson	11.5	Y - Fringe (continuous)	Y - Ecology maps a "beach" here. Also is apparently popular for clamming, indicating a sandy/muddy shoreline	Continuous fringy salt marsh is mapped adjacent to the north side of the Hood Canal Bridge, and patchy marsh is mapped on the NE corner of "Hood Head"	No - not where salt marsh is mapped	--	--	10.77 miles to Poulsbo	Outside of contaminated area
	Right Smart Cove State Park	State Parks	Jefferson	12.3	Y - Fringe (patchy)	Y - Aerial imagery indicates muddy tidelands	Patchy salt marsh mapped around the coastline of the park	No - A stream flows into the lagoon but there does not appear to be a connection to saltwater (Right Smart Cove)	--	--	10.40 miles to Silverdale	Outside of contaminated area
	Nelson Park	Poulsbo Parks	Kitsap	3.3	Y - Fringe (patchy)	Y - Aerial imagery indicates muddy tidelands	Immediately adjacent to the park, and to the north in the Poulsbo Fish Park	No	--	--	0.74 miles to Poulsbo	Outside of contaminated area
	Old Mill State Park	Kitsap County Parks	Kitsap	4.9	Y - Fringe (continuous)	Y - Aerial imagery indicates limited muddy tidelands	NE end of park, and east along "clear creek"	No	--	--	Less than 0.5 mile to Silverdale	Outside of contaminated area
	Stretch Point State Park	State Parks	Mason	34.0	Y - Fringe (continuous)	N	Along shoreline	No	--	--	11.28 miles to Gig Harbor	Outside of contaminated area
	Kitsap County Guillemot Cove Nature Preserve	Kitsap County Nature Preserve	Kitsap	15.1	Y -Fringe (patchy)	Y - Aerial imagery indicates muddy tidelands	Patchy fringe salt marsh mapped along coastline of park	Yes - Boyce Creek (stream/perennial) flows into Puget Sound	2.35 miles (on other side of Hood Canal, petroleum - diesel)	0 (Category 5 water: DO, Category 4C water: fish and shellfish habitat, Category 4B water: bacteria)	13.20 miles to Bremerton	Under 20 ppm
	Woodard Bay Natural Resources Conservation Area	WA DNR	Thurston	42.2	Y - Fringe (patchy)	N - Appears to just be the creek, not sure about tidal influence	Salt marsh is along both banks of Woodard Creek	Yes	2.12 miles (complete cleanup, petroleum products and polycyclic aromatic hydrocarbons)	0 (Category 4A water: bacteria, pH, temperature)	6.5 miles to Lacey	Under 20 ppm
	Kennedy Creek Natural Area Preserve	WA DNR	Mason	51.5	Y - Fringe (patchy)	Y	Along coast for entire preserve	Yes	2.47 miles (awaiting cleanup, benzene, diesel, gasoline, polycyclic hydrocarbons, other non-halogenated organics)	0 (Category 5 water: DO, Category 4A water: bacteria)	8.14 miles to Shelton	Outside of contaminated area
	Nisqually Wildlife Refuge	USFWS	Pierce	44.5	Y - Fringe (continuous)	Y - Aerial imagery indicates muddy tidelands	Along the coast and the Nisqually River	Yes - Leschi Slough and several streams connect to Puget Sound	1.5 miles (Lot 10 Center Plaza Williamson Place - no further action, arsenic)	0 (Category 5 and 4A water: bacteria, Category 5 water: PCBs,)	3 miles to Lacey	40.1 ppm to 100 ppm
	Dosewallips State Park	State Parks	Jefferson	12.7	Y - Fringe (continuous)	Y - Aerial imagery indicates muddy tidelands	All along coast within park	Yes - Dosewallips River and Walkers Creek and three intermittent streams to the north	0.67 mile (Brinnon General Store - cleanup started, metals priority pollutants, non-halogenated solvents, petroleum products - unspecified, petroleum - other)	0 (Category 5 waters for temperature in park)	12.48 miles to Poulsbo	Outside of contaminated area
	Belfair State Park	State Parks	Mason	23.2	Y - Fringe (continuous and patchy)	Y	Along shoreline for entire park	Yes	0.25 mile (cleanup started, gasoline)	0 (Category 5 waters for bateria in park)	14.5 miles to Bremerton	Outside of contaminated area
	Dabob Bay Natural Areas Preserve	DNR manages the area	Jefferson	13.3	Y - Bed[1] (Patchy)	Y	Extensive salt marsh located here	Yes - intermittent stream flows into Tarboo Bay	2.37 miles (Olympic Testing Lab Quilcene, metals priority pollutants)	0 (Category 5 water: DO, bacteria, temperature)	11.35 miles to Poulsbo	Outside of contaminated area

KEYPORT PROJECT MEETING
Keyport OU 1 Biological Survey Workplan Regulator/Stakeholder Meeting
February 4, 2020

Advantages and Disadvantages of Biological Survey Approaches

Approach 1 – Biological Survey at Keyport, followed closely in time by reference site surveys, review and present all results to workgroup at end of the field work.

Advantage: All sites surveyed (Keyport and Reference) in the same season, making them more readily comparable. Eliminates the argument that some species might not have been detected due to seasonal differences.

Advantage: Takes advantage of daytime low tides during June-July 2020 timeframe.

Disadvantage: May not have any idea from the project team of preferred indicators species prior to survey of reference sites. Therefore, there is a risk that while reference sites may have some of the same species as the Keyport site, they may not have the indicator species.

Disadvantage: Given the large number of species at the sites, may not get enough targeted information during field visits.

Approach 2 – Biological survey at Keyport, followed by review of preliminary data and additional workgroup meetings with a goal of narrowing down potential indicator species. Separate mobilizations would occur later in the summer of 2020 to potential reference area site(s) which will have a stepped approach of first determining if potential indicator species are present, followed by a broader investigation if enough of the potential indicator species are present.

Advantage: Could review/discuss the species found at Keyport site with workgroup, building consensus.

Advantage: Could focus the Reference Site surveys on a more targeted set of species (possible indicator species), thereby reducing the amount of field effort and increasing likelihood that we'll know if the reference sites actually contain indicator species.

Disadvantage: Risk that the project team would not be willing to concur on possible indicator species based on preliminary data and graphics for Keyport.

Disadvantage: May push reference site surveys farther out in time, or in a different season. Might not be comparable to survey season at Keyport.

Disadvantage: Need to summarize Keyport survey VERY quickly, and then schedule review meetings with group.

Disadvantage: Low tides during daylight hours won't occur after August 2020.

Next Steps:

Report	Site	Contractor/ Agency	Project Team Review	Associated Meeting	Comments	Priority	Type of Meeting	Meeting Date/Time
ASM 30% Plan	OU 1	EPA	20-Feb		Out of my hands			
OU 2 Area 8 Draft Eco Risk Assessment Addendum	OU2 Area 8	AECOM	20-Mar	CRM/April	PoP = 7/25/20	x	Call	April 2, 2020; 9:00am-11:00am
OU 1 Draft Groundwater Modeling Plan	OU 1	Battelle	20-Mar	CRM/April	Max 1 Month Extra	x	In Person	May 21, 2020; 9:30am-2pm
Keyport OU 2, Area 2 Long-Term Monitoring Report	OU2 Area 8	AECOM	20-Mar		PoP = 9/12/20.	Skip	NA	NA
ASM 60% Plan	OU 1	EPA	20-Apr		Out of my hands			
Keyport OU 1 Long-Term Monitoring Report	OU 1	LTM	20-Apr		PoP = 9/12/20	x		
OU 1 Draft HHRA/ERA Biological Survey Plan	OU 1	AECOM	20-Apr	CRM/~~May~~late April	No Leeway	x	In Person (at AECOM)	April 22, 2020; 9:30am-2pm
OU 2 Area 8 Draft VI Report	OU2 Area 8	Battelle	20-Apr	CRM/May	PoP = 7/28/20 (May be 3 weeks leeway)	x (for Mahbub)	E-mail or short call (if needed)	
Keyport OU 2, Area 8 Long-Term Monitoring Report	OU2 Area 8	LTM	20-May		PoP = 9/12/20			
Keyport IC Report	Sitewide	LTM	20-May		PoP = 9/12/20			
Keyport Draft Fifth Five-Year Review	Sitewide	Battelle	20-May	CRM/June	Max 1 Month Extra	x	1. Preliminary Review Meeting (draft will not be available): In Person (at Batelle) 2. CRM: In Person	1. April 9, 2020; 9:30am-3:30pm 2. August 20, 2020; 9:30am-3:30pm
ASM 90% Plan	OU 1	EPA	20-Jun	PTM/June	Out of my hands			
OU 1 Draft Landfill Venting Report	OU 1	Battelle	20-Jun	CRM/July	No Leeway – feed design		Call	Tentative. TBD.
OU 1 Draft Source Investigation Report	OU 1	Battelle	~~6/20/2020~~ Sept. 2020	CRM/~~July~~ late Oct. 2020	Max 2.5 Months Extra	x	In Person	October. Date and time TBD
ASM 100% Plan	OU 1	EPA	20-Jul		Out of my hands			
Keyport OU 1 O&M Report	OU 1	LTM	20-Jul		PoP = 9/12/20			
Keyport Draft LTM QAPP/QCP	Sitewide	LTM	20-Jul	Scope/May CRM/Aug	Tentative - schedule will be tight after award to allow for completion of the field effort during FY20…	x	1. Scope: In Person (EA or EPA in Seattle). Invite Michael from Batelle. 2. CRM: Call	1. June 11, 2020; TBD by office availability. 2. Sept 24, 2020; 9am - 12pm

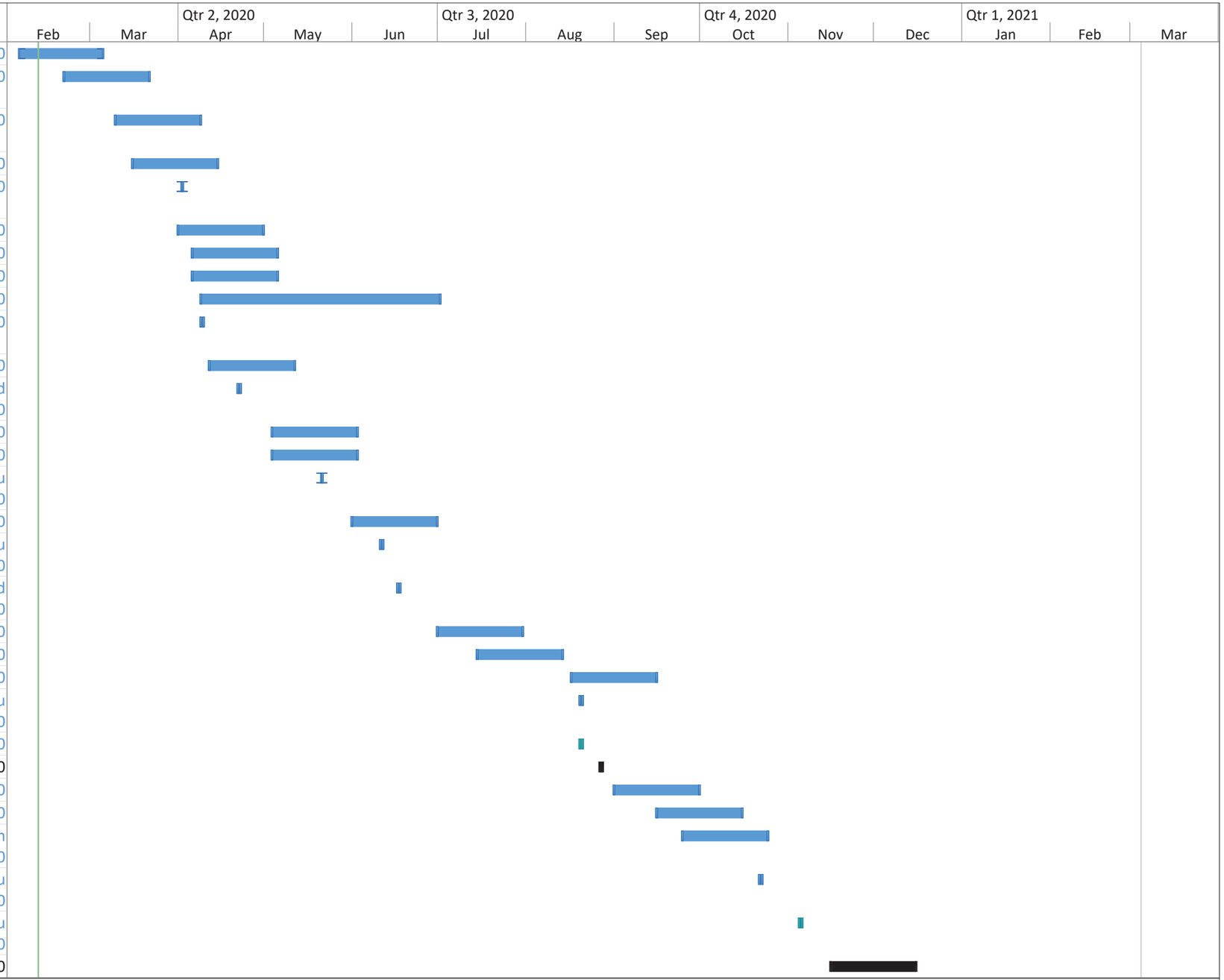
Next Steps:

Report	Site	Contractor/ Agency	Project Team Review	Associated Meeting	Comments	Priority	Type of Meeting	Meeting Date/Time
OU 1 Draft Final Landfill Venting Report W/Spec. (Tentative)	OU 1	Battelle	20-Aug	CRM/Sept	PoP = 11/21/20		In Person	Tentative. TBD.
OU 1 Draft Groundwater Modeling Report	OU 1	Battelle	20-Oct	CRM/Nov	PoP = 1/31/21	x	In Person?	TBD.

Vacations:

Mahbub Alam - June 30, 2020 to Aug. 14, 2020
JoAnn Grady - May 28, 2020 to June 9, 2020
Carlotta Cellucci - June 14, 2020 to July 5, 2020
Harry Craig - April 23, 2020 thru May 18, 2020

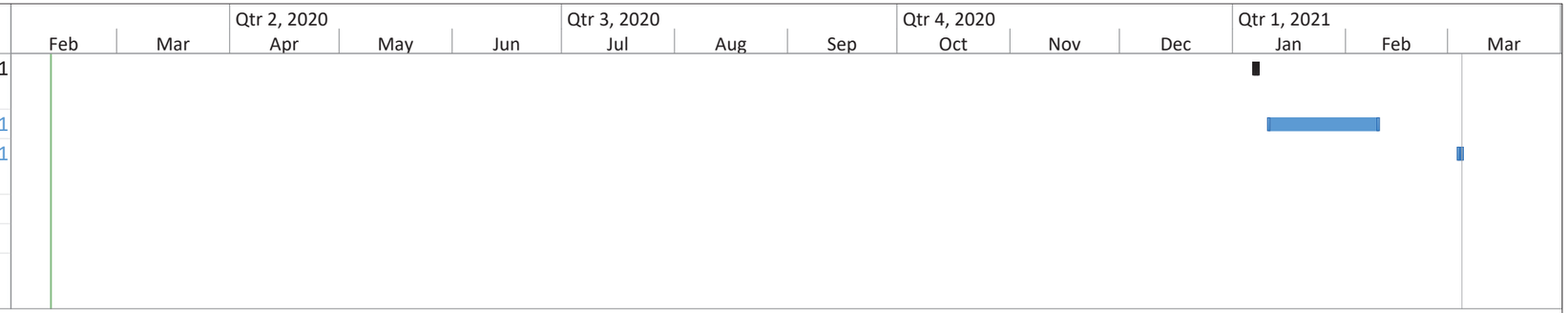
ID	Task Name	Duration	Start	Finish
1	ASM 30% Plan	30 edays	Wed 2/5/20	Fri 3/6/20
2	OU 2 Area 8 Draft Eco Risk Assessment Addendum	30 edays	Fri 2/21/20	Sun 3/22/20
3	OU 1 Draft HHRA/ERA Biological Survey Plan	30 edays	Tue 3/10/20	Thu 4/9/20
4	Keyport OU 2, Area 2 Draft LTM Rep	30 edays	Mon 3/16/20	Wed 4/15/20
5	OU 2 Area 8 Eco Risk Assessment Addendum Comment Resolution	1 day	Thu 4/2/20	Thu 4/2/20
6	ASM 60% Plan	30 edays	Wed 4/1/20	Fri 5/1/20
7	Keyport OU 1 Draft Monitoring Rep	30 edays	Mon 4/6/20	Wed 5/6/20
8	OU 2 Area 8 Draft VI Report	30 edays	Mon 4/6/20	Wed 5/6/20
9	Keyport Draft Fifth Five-Year Report	60 days	Thu 4/9/20	Wed 7/1/20
10	Keyport Fifth Five-Year Report Summary Meeting	1 day	Thu 4/9/20	Thu 4/9/20
11	OU 1 Draft Groundwater Modeling	30 edays	Sun 4/12/20	Tue 5/12/20
12	OU 1 HHRA/ERA Biological Survey Plan Comment Resolution Meeting	1 day	Wed 4/22/20	Wed 4/22/20
13	Keyport OU 2, Area 8 Draft LTM Rep	30 edays	Mon 5/4/20	Wed 6/3/20
14	Keyport Draft IC Report	30 edays	Mon 5/4/20	Wed 6/3/20
15	OU 1 Groundwater Modeling Plan Comment Resolution Meeting	1 day	Thu 5/21/20	Thu 5/21/20
16	ASM 90% Plan	30 edays	Mon 6/1/20	Wed 7/1/20
17	Biological Survey Summary and Indicator Species Selection	1 day	Thu 6/11/20	Thu 6/11/20
18	HHRA/ERA Indicator Species Meeting (Tent.)	1 day	Wed 6/17/20	Wed 6/17/20
19	Keyport OU 1 Draft O&M Plan	30 edays	Wed 7/1/20	Fri 7/31/20
20	ASM 100% Plan	30 edays	Wed 7/15/20	Fri 8/14/20
21	OU 1 Draft Landfill Venting Report	30 edays	Mon 8/17/20	Wed 9/16/20
22	Keyport Draft Fifth Five-Year Report Comment Resolution	1 day	Thu 8/20/20	Thu 8/20/20
23	Area 8 Supplimental RI Scoping Mee	1 day	Thu 8/20/20	Thu 8/20/20
24	Keyport LTM QAPP/QCP Scoping Me	1 day	Thu 8/27/20	Thu 8/27/20
25	OU 1 Draft Source Investigation Rep	30 edays	Tue 9/1/20	Thu 10/1/20
26	OU 1 Draft Groundwater Modeling	30 edays	Wed 9/16/20	Fri 10/16/20
27	OU 1 Draft Final Landfill Venting Report W/Spec.	30 edays	Fri 9/25/20	Sun 10/25/20
28	OU 1 Source Investigation Report Comment Resolution Meeting	1 day	Thu 10/22/20	Thu 10/22/20
29	OU 1 Groundwater Modeling Report Comment Resolution	1 day	Thu 11/5/20	Thu 11/5/20
30	Keyport Draft LTM QAPP/QCP	30 edays	on 11/16/20	ed 12/16/20



Project: Upcoming Project Team R
Date: Wed 2/12/20

Task	Project Summary	Inactive Milestone	Manual Summary Rollup	Deadline	
Split	External Tasks	Inactive Summary	Manual Summary	Progress	
Milestone	External Milestone	Manual Task	Start-only	Manual Progress	
Summary	Inactive Task	Duration-only	Finish-only		

ID	Task Name	Duration	Start	Finish
31	Keyport LTM QAPP/QCP Comment Resolution	1 day	Thu 1/7/21	Thu 1/7/21
32	Area 8 Supplimental RI Draft	30 edays	Mon 1/11/21	Wed 2/10/21
33	Area 8 Supplimental RI Comment Resolution Meeting	1 day	Thu 3/4/21	Thu 3/4/21
34				
35	Blue - Project Team Reviews			
36	Black - Unworkable Schedules due to team member vacation			



Project: Upcoming Project Team R
Date: Wed 2/12/20

Task	Project Summary	Inactive Milestone	Manual Summary Rollup	Deadline	
Split	External Tasks	Inactive Summary	Manual Summary	Progress	
Milestone	External Milestone	Manual Task	Start-only	Manual Progress	
Summary	Inactive Task	Duration-only	Finish-only		

Keyport OU 1
Biological Survey Work Plan Project Team Meeting
April 28, 2020
Final Summary

Team Members in Attendance:

Carlotta Cellucci	NAVFAC Project Manager
Mahbub Alam	Ecology Project Manager
Harry Craig	US EPA Project Manager
Denice Taylor	Suquamish Tribe Project Manager

Support Personnel:

Laura Wood	Navy Biologist
John Evered	Ecology Risk Assessor
Joe Goulet	US EPA Ecological Risk Assessor
Debbie Rodenhizer	AECOM Project Manager
Josie Smith	AECOM Deputy Project Manager
Jeff Walker	AECOM Biologist
Jenny Pretare	AECOM Biologist
Jill Hedgecock	AECOM Ecological Risk Assessor
Laura Scheffler	AECOM HH Risk Assessor
Joann Grady	Grady & Associates, Meeting Facilitator
Nicole Rangel	AECOM Note Taker

Attachments:

Attachment A – Meeting Agenda
Attachment B – Keyport OU 1 Draft Biological Survey Work Plan - Comments and Responses
Attachment C – Potential Reference Site Screening Table
Attachment D – Upcoming Keyport Project Team Reviews and Meetings Schedule

Agreements:

1. All project team members agreed on the Navy's responses to Ecology's comments, as revised during this meeting.
2. All project team members agreed on the Navy's responses to Suquamish comments, as revised during this meeting (pending review of the redlined Keyport OU 1 Draft Biological Survey Work Plan Comments and Responses and the pertaining text of the Keyport OU 1 Draft Biological Survey Work Plan).

Action Items:

1. Ms. Pretare will contact Ms. O'Sullivan to verify that the two areas on Indianola Preserve screened out as possible reference areas were the actual areas indicated by Ms. O'Sullivan.

2. If there are changes regarding Indianola Preserve, the changes will be incorporated as redlines in the Keyport OU 1 Draft Biological Survey Work Plan Comments and Responses and sent out to the team.
3. If the Indianola Preserve is found to be a viable reference site, the rationale will be included in an email so the team may review.
4. The redlined Keyport OU 1 Draft Biological Survey Work Plan Comments and Responses will be submitted by AECOM on May 1, 2020 (pending communication with Ms. O' Sullivan).
5. Ecology, EPA, and Suquamish Tribe will review the redlined Keyport OU 1 Draft Biological Survey Work Plan Comments and Responses by May 6, 2020.

Meeting Discussion

Introduction and Meeting Purpose

Ms. Grady announced all meeting participants and Ms. Cellucci checked on the status of the attendee's health regarding the Coronavirus pandemic. Ms. Grady then asked if there were any additions or changes to the meeting agenda. As no team members had any changes, Ms. Cellucci opened discussions regarding the Ecology and Suquamish Tribe Comments on the Keyport OU 1 Draft Biological Survey Work Plan and the Navy's Responses to them.

Review Ecology Comments

Ms. Cellucci asked if Mr. Evered and Mr. Alam agreed with the Navy's responses. They both stated that they were satisfied with the responses. Ms. Rodenhizer then asked if Mr. Evered could be more specific on what he meant by "what was found during the EIM/what's in my neighborhood query" in John Evered's Comment No. 1 (Attachment B). He responded that he would like a couple of sentences describing the analysis: such as how far the reference area is from a contaminated site, did sampling occur on the site, and if sampling occurred were the samples "clean." As all agreed on the Navy responses to Ecology comments, Ms. Cellucci then lead the discussion to the Suquamish Tribe comments and the Navy's responses.

Review Suquamish Tribe Comments

Ms. Cellucci asked if Ms. Taylor agreed with the Navy's responses. Ms. Taylor responded that she would like to see the entire screening table as the Navy noted in their response to Suquamish Comment 1. Ms. Cellucci replied that it was sent out as part of the meeting materials (Attachment C). Ms. Pretare noted that the last four rows were cut off in the PDF format so an excel version of the table was sent out.

Regarding the Navy's response to Suquamish Tribe Comment No. 2 (Attachment B), Ms. Taylor stated that for Indianola Preserve (as discussed in the last meeting) Ms. O'Sullivan thought the team was looking at the wrong site. Therefore, AECOM should contact Ms. O'Sullivan by email or phone. Ms. Pretare agreed to contact Ms. O'Sullivan but requested that the use of the Indianola Preserve as a reference site be discussed by the team during the meeting. Ms. Taylor approved the discussion; however, she noted that Ms. O'Sullivan has visited the Indianola Preserve and would have the best information. Ms. Pretare indicated that there were two different preserves present at Miller Bay. One is located on the east side of the bay and one on the west side. She then stated that the preserve on the west side (Miller Bay) was screened out because it did not have shoreline access. However, she would confirm this information with Ms. O'Sullivan. She further stated that the east side preserve was

surrounded by residential development. Therefore, this preserve was likely to be screened out even though proximity to residential development is not a formal screening criterium. She explained the rationale by stating that although Crescent Creek Park was initially a top choice candidate for a reference area, the team agreed that the area was not a good candidate due to the adjacent residential development. Although Ms. Pretare agreed to talk to Ms. O'Sullivan, she emphasized that the additional information would not likely change the results of the report or the reference area selection. Ms. Cellucci responded that the team should check with Ms. O'Sullivan to ensure that the team is looking at the intended area. Ms. Pretare agreed, and will share any new information with the entire work group.

Ms. Rodenhizer noted that "proximity to residential development" is not a selection criterium and then asked the team if the criteria should be considered. Ms. Cellucci responded that she felt areas near residential development should be avoided. Mr. Evered agreed, stating areas not in proximity to residential development were preferable. Ms. Taylor stated that the criteria used for reference selection was "proximity to urban areas"; therefore, the degree of residential development depends on how it qualifies as an urban area (using the urban criteria). As Ms. Cellucci knew of few areas not on septic systems on the Kitsap Peninsula, and she voiced concerns of endemic issues related to septic leakage causing biological and other types of contamination. Ms. Taylor responded that issues regarding whether an area is served by public utility or whether there is discharge from septic fields should be discussed with Ms. O'Sullivan.

Ms. Taylor wanted to ensure that the information presented in the Work Plan accurately portrays the Suquamish Tribe's input and the selection process. She further stated that if Indianola Preserve is found to be a promising reference area, it should be considered because it is located closer to the site. However, she then reemphasized that she was not pushing the team to choose it as the reference area, but she wanted to ensure the process for the reference area selection is complete and accurate.

Ms. Smith then asked how the changes based on Ms. O'Sullivan's comments would be incorporated into the final comment resolution. Ms. Cellucci responded that any changes should be incorporated as redlines in the Keyport OU 1 Draft Biological Survey Work Plan Comments and Responses and sent out to the team. Ms. Pretare requested Ms. O'Sullivan's phone number. Ms. Taylor suggested that Ms. Pretare email Ms. O'Sullivan first and then let Ms. O'Sullivan decide what communication method she would prefer.

Regarding the Navy's response to Suquamish Tribe Comment No. 2 (Attachment B), Ms. Taylor requested that a reference be added to the statement. Ms. Pretare asked if Ms. Taylor wanted the website added as a citation. Ms. Taylor clarified that she wanted a reference added in the statement of the actual text.

Regarding the Navy's response to Suquamish Tribe Comment No. 3 (Attachment B), Ms. Taylor asked why the Navy decided to remove the criteria. Ms. Cellucci responded that she did not understand the significance for biological criteria. Ms. Smith stated that from her memory of the team's discussion, Mr. Speicher said that the screening was in reference to different background metal concentrations based on geological formation. Ms. Wood then clarified that Mr. Speicher's rationale was to ensure arsenic concentrations in parent rock were similar between the site and reference area. However, because of the larger issue of the smelter arsenic plume, it was fine to exclude the criteria. Ms. Taylor requested that the reasoning of why the screening criteria was dropped be described in the Navy's response to Suquamish Comment No. 3. Ms. Cellucci agreed.

With regard to the Navy's response to Suquamish Comment No. 4, Ms. Taylor stated that she did not believe that the comparison of Area 8 (OU 2) to OU 1 was useful due to the two very different habitats. Ms. Cellucci agreed and stated she would change the words "can be" to "will" in the response (Attachment B). Regarding Suquamish Comment No. 5, Ms. Smith asked the team to clarify if there were other mollusks than mussels. Ms. Taylor responded that currently indicator species had not yet been selected and clarified Comment No. 5 was a problem related to "word search". It was agreed that it was better to keep terms regarding species more generic. Ms. Grady asked if there were any more comments, and Ms. Taylor responded that she had no further comments.

Review any Additional EPA Comments

Ms. Cellucci asked if the EPA had any additional comments on the Keyport OU 1 Draft Biological Survey Work Plan. Mr. Craig stated he had no additional comments on the Keyport OU 1 Draft Biological Survey Work Plan.

Meeting Wrap-up

Review Agreements

Ms. Cellucci requested that the redlined Keyport OU 1 Draft Biological Survey Work Plan Comments and Responses be submitted by AECOM on Friday, May 1, 2020. Ms. Rodenhizer noted that the submittal date depended on when communication with Ms. O'Sullivan will happen. Ms. Pretare stated that she would begin redlines after the meeting, therefore Friday would be an acceptable submittal date (if Ms. O'Sullivan could be contacted by then). Ms. Cellucci then requested that the agencies (Ecology/EPA/Suquamish Tribe) review the redlines by Wednesday, May 6, 2020. All agencies agreed. Mr. Alam added that if the Indianola Preserve is found to be a viable reference site that the rationale be included in an email so the team may review it.

Update on Adaptive Site Management

Ms. Cellucci then gave an update on the *Adaptive Site Management* stating that comments were submitted by her and Mr. Alam. Ms. Taylor commented that she had not yet reviewed the 60% ASM Plan.

Next Steps/Schedule

Ms. Cellucci presented the Gantt chart with upcoming project team meetings (Attachment D). Mr. Alam asked if the LTM Plan had been awarded. Ms. Cellucci responded no, but the RFP had been sent out. Mr. Alam then announced he cancelled his vacation plans for the summer. As Ms. Cellucci also cancelled her summer vacation, she stated that she would reschedule some meetings in June since they were not constricted by vacations any longer. Ms. Smith then asked if hard copies of the Biological Survey Work Plan would be sent out. Ms. Cellucci responded that only electronic copies will be sent out, but also noted that hard copies were needed for the field team. Mr. Alam requested one hard copy of the final Work Plan when it was possible (when offices were open). Ms. Cellucci reassured the Team that hard copies would be sent, once it was possible.

The following future meeting dates were announced:

1. June 9, 2020 – Five Year Review Meeting with Michael Meyer and Battelle
2. June 11th, 2020 - OU 1 Biological Survey Work Plan Meeting: Presentation of Biological Survey Results and Discussion of Indicator Species (before site visit to reference area[s]).

AGENDA
Keyport OU 1 Biological Survey Work Plan Project Team Meeting
April 28, 2020
Telecommunication
Teleconference Call-In Number: 1-877-286-5733; Code: 453 585 583#

Team Members

Carlotta Cellucci	NAVFAC Project Manager
Mahbub Alam	Ecology Project Manager
Harry Craig	US EPA Project Manager
Denice Taylor	Suquamish Tribe PM

Support Personnel

Jason Speicher	Navy Eco. Risk Ass.
Laura Wood	Navy Biologist
John Evered	Ecology Risk Ass.
Joe Goulet	US EPA Eco. Risk Ass.
Alison O'Sullivan	Suquamish Tribe
Debbie Rodenhizer	AECOM PM
Josie Smith	AECOM Deputy PM
Jeff Walker	AECOM Biologist
Jenny Pretare	AECOM Biologist
Jill Hedgecock	AECOM Eco. Risk Ass.
Laura Scheffler	AECOM HH Risk Ass.
JoAnn Grady	Team Facilitator
Nicole Rangel	AECOM Note Taker

AGENDA

9:30 - 9:45 Introductions and Meeting Purpose

- Introductions
- Status Check (Carlotta)
- Review agenda (JoAnn)

9:45 – 10:15 Review Ecology Comments (Jenny/Jeff/Carlotta)

10:15 – 11:15 Review Suquamish Tribe Comments (Jenny/Jeff/Carlotta)

11:15 – 11:30 – Review any Additional EPA Comments (Jenny/Jeff/Carlotta)

11:30 – 11:45 – Meeting Wrap-up (JoAnn, Carlotta)

- Review Agreements
- Update on Adaptive Site Management
- Next steps – See attached
- Adjourn

Keyport OU 1 Draft Biological Survey Work Plan - Comments and Responses
2/27/2020

Commentor	Comment	Response
Ecology Comments		
1 - Mahbub Alam	I agree with the reference site selection order of preference except that the 4 on the list "Crescent Creek Park" should be avoided as much as possible given the proximity to an urban population	Agreed; if other work group members are in agreement, an additional statement to that effect will be inserted in Section 4.5.4
1 - John Evered	I think it would be beneficial to add a very brief discussion on the presence/absence of chemical or biological sampling data in each of the four potential reference areas. It is assumed that there is no issue with significant contamination as the sites would not have made it past the screening process in section 4.2, but I think it would be good to describe what was found during the EIM/what's in my neighborhood query	Some of the information is in Appendix B; however, that information will also be included in the body of the text, in Section 4.5.

Keyport OU 1 Draft Biological Survey Work Plan - Comments and Responses
2/27/2020

Commentor	Comment	Response
Suquamish Tribe Comments		
1 - Suquamish Tribe	Reference area evaluation: The Tribe provided the names of several areas closer to Keyport for consideration as reference areas. Please confirm that the following areas were evaluated: Harper Estuary (owned by Kitsap Parks) and Indianola Preserve estuary (owned by Kitsap County). If they were evaluated, please provide the rationale for why they are no longer being considered. In particular, Indianola Preserve is public land and meets the criteria for both estuary and stream environments. Also, the description in the appendix lists Guillemot Cove Nature Preserve as having patchy marsh environment. Alison believes that the marsh areas are more extensive and shouldn't be characterized as "patchy".	These potential reference areas were added to the bottom of the screening table in Appendix B; however, the print area was not adjusted to allow printing, so they were not included in the PDF print version in error. A revised file has been provided again for review at the comment resolution meeting. In regard to Indianola Preserve, (also called Miller Bay Preserve or Cowling Creek Center Nature Preserve?), it did not appear to have access to the shoreline from what could initally be seen on the internet. Upon closer look; it was determined that the correct location may not have been evaluated. The biological survey team would like to review this location again during the comment resolution meeting. The Salt Marsh designation for Guillemot Cove can be adjusted, however it was screened out due to nearby Cat 4/5 waters.
2 - Suquamish Tribe	Section 4.2: Provide a reference or citation for use of a concentration of 20 ppm lead as a screening value related to the Asarco smelter plume.	20 ppm was the lowest value category available on the Ecology web site mapping tool.

Keyport OU 1 Draft Biological Survey Work Plan - Comments and Responses
2/27/2020

Commentor	Comment	Response
Suquamish Tribe Comments - Continued		
3 - Suquamish Tribe	Section 4.2: It appears the recommendation to consider geologic formation as a screening criteria for reference areas was dropped. Please explain that rationale.	This screening criteria was originally suggested by the Navy, and removed by the Navy after further consideration.
4 - Suquamish Tribe	Section 4.6.2: It is doubtful that Keyport Area 8 habitat and species are going to be relevant for the OU 1 mudflats and/or Dogfish Bay.	This information seemed relevant given the close proximity (<1.0 mile) of OU1 and Area 8, however it can be removed.
5 - Suquamish Tribe	Section 5: It appears there are several places were the word mussels is used instead of mollusk. We haven't yet specified any indicator species.	Agreed. Change will be made throughout the document.

Appendix B:
Biological Survey Work Plan Comments and Responses

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Keyport OU 1 Draft Biological Survey Work Plan - Comments and Responses
2/27/2020, revised 5/13/20

Commentor	Comment	Response
Ecology Comments		
1 - Mahbub Alam	I agree with the reference site selection order of preference except that the 4 on the list "Crescent Creek Park" should be avoided as much as possible given the proximity to an urban population	Agreed; an additional statement to that effect will be inserted in Section 4.5.4
1 - John Evered	I think it would be beneficial to add a very brief discussion on the presence/absence of chemical or biological sampling data in each of the four potential reference areas. It is assumed that there is no issue with significant contamination as the sites would not have made it past the screening process in section 4.2, but I think it would be good to describe what was found during the EIM/what's in my neighborhood query	Some of the information is in Appendix D; however, information will also be included in the body of the text, in Section 4.5, as requested.
Suquamish Tribe Comments		
1 - Suquamish Tribe	Reference area evaluation: The Tribe provided the names of several areas closer to Keyport for consideration as reference areas. Please confirm that the following areas were evaluated: Harper Estuary (owned by Kitsap Parks) and Indianola Preserve estuary (owned by Kitsap County). If they were evaluated, please provide the rationale for why they are no longer being considered. In particular, Indianola Preserve is public land and meets the criteria for both estuary and stream environments. Also, the description in the appendix lists Guillemot Cove Nature Preserve as having patchy marsh environment. Alison believes that the marsh areas are more extensive and shouldn't be characterized as "patchy".	These potential reference areas were added to the bottom of the screening table in Appendix D; however, the print area was not adjusted to allow printing, so they were not included in the PDF print version in error. A revised file was provided for review at the comment resolution meeting and will be included in the final report. In regard to Indianola Preserve, the biological survey team reviewed this location again, and updated the screening matrix with new information for the correct location. The Salt Marsh designation for Guillemot Cove has been adjusted, however it was screened out due to nearby Cat 4/5 waters. The ownership for Harper Estuary Preserve has been updated to Kitsap Parks and DNR.
2 - Suquamish Tribe	Section 4.2: Provide a reference or citation for use of a concentration of 20 ppm lead as a screening value related to the Asarco smelter plume.	20 ppm was the lowest value category available on the Ecology web site mapping tool. This information will be provided in the work plan.

Keyport OU 1 Draft Biological Survey Work Plan - Comments and Responses
2/27/2020, revised 5/13/20

Commentor	Comment	Response
3 - Suquamish Tribe	Section 4.2: It appears the recommendation to consider geologic formation as a screening criteria for reference areas was dropped. Please explain that rationale.	This screening criteria was originally suggested by the Navy, and removed by the Navy after further consideration. The geologic parent material is not thought to contribute relevant information to the screening of reference sites, based on the types of contamination at the Keyport OU 1 site.
Suquamish Tribe Comments - Contnued		
4 - Suquamish Tribe	Section 4.6.2: It is doubtful that Keyport Area 8 habitat and species are going to be relevant for the OU 1 mudflats and/or Dogfish Bay.	This information seemed relevant given the close proximity (<1.0 mile) of OU 1 and Area 8, however it will be removed.
5 - Suquamish Tribe	Section 5: It appears there are several places were the word mussels is used instead of mollusk. We haven't yet specified any indicator species.	Agreed. Change made throughout the document.

Appendix C:
Field Personnel Resumes

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AECOM

Jennifer (Jenny) Pretare

Field Team Leader, Biologist

Education

PhD, Environmental Science, Policy and Management, University of California, Berkeley, 2000

BS, Environmental Studies, The Evergreen State College, 1993

Years of Experience

With AECOM: 18

With Other Firms: 2

Training

Certified Project Manager, 2010

Oregon Spotted Frog workshop at the Society for Wetland Scientist annual meeting (2015).

Yellow-billed Cuckoo Survey Training – Southern Sierra Research Station (2014).

Biological Assessment Writing – U.S. Fish and Wildlife Service, Portland, Oregon (2015)

WSDOT Advanced Training for Biological Assessment Authors (2011, 2013, 2016)

OSHA 510 – 30 hour training in Standards for the Construction Industry (2011).

Wildlife Hazard Management – FAA endorsed training for biologists working on Airports (2010)

Portland State University: Introduction to River Restoration, Part I: Physical Processes (2008)

California Burrowing Owl Symposium (2004)

Wetland Training Institute: 16 Hour 2002 Nationwide Permits Complete (2002)

40-hour OSHA HAZWOPER certification (2002), 8-hour refresher valid through 6-25-2020

Wetland Training Institute: 40 Hour Wetland Delineation Course (2001)

First Aid/CPR Trained

Dr. Pretare has more than 20 years of experience as a biologist, with an emphasis on field studies, wildlife, wetlands, tissue sampling, and permitting. Dr. Pretare is a wildlife technical specialist and has worked on projects throughout the western US and Pacific Region. Dr. Pretare has supervised work in remote and logistically complex sites, include areas with unexploded munition, hazardous materials, and controlled access. She has passed numerous DoD background checks and holds a current FEMA contractor badge. Dr. Pretare is trained in OSHA 30-hour construction health and safety, First Aid/CPR and 40-hour HAZWOPER. She had supervised numerous field sampling efforts, including media such as: mussels, clams, benthic invertebrates, fish, crayfish, plants, sediment, surface water, and porewater.

Select Project Experience

Confidential Client, Pre-Design Investigation, Lower Willamette River, Oregon. Project Manager, Field Coordinator and Technical Lead. AECOM was the prime consultant for a multi-party client at the Portland Harbor Superfund Site. AECOM developed and wrote a Quality Assurance Project Plan, Data Quality Management Plan and 8 Field Sampling Plans aimed and re-baselining contaminant levels at the Site. Once approved by USEPA, AECOM implemented the 8 field studies over the course of 1 year, including: surface sediment, subsurface sediment, surface water, sediment traps, porewater, fish tissue, fish radio telemetry and bathymetry. The project team included 6 subconsultants, 3 labs, and 1 cooperating agency; AECOM functioned as a single point of contact for all procurement and invoicing, health and safety, and project logistics and coordination. AECOM operated a dedicated sample processing facility located adjacent to the site where more than 1,400 individual samples in total were processed, stored, packaged, and shipped. AECOM provided chemistry and data management processes for the duration of the program, including lab oversight and SharePoint site administration. Dr. Pretare was the AECOM project manager for this investigation, overall field coordinator, technical lead for the fish tissue study, and overall site safety officer for 70+ staff and 8 subconsultants.

Teck American Incorporated, Phase 3 Sediment Study, Upper Columbia River, Washington (2019-present). Project Manager, Field Supervisor. AECOM was the prime consultant for sediment, porewater, and benthic invertebrate sampling project including 36 days of in-water work in northeast Washington and British Columbia, Canada. Up to 8 research vessels and 40 field staff were mobilized at any given time, including 3 subcontractors. Dr. Pretare's responsibilities included overall field logistics,

scheduling, and implementation of the field sampling program, health and safety oversight, daily progress reporting to the client's technical team, operating a sample processing facility and sample transportation to two laboratories, data consolidation and reporting.

Teck American Incorporated, Plant Tissue Study, Upper Columbia River, Washington (2017-2018). Project manager and field supervisor. This was an upland plant tissue study focused on species (plants, mushrooms and lichen) used by Native American tribes in traditional uses. AECOM performed field habitat reconnaissance during August 2017, and subsequently sampled during 3 seasons of 2018. Field work was done in collaboration with Colville Confederated Tribes and USEPA Region 10 oversight.

Teck American Incorporated, Sediment Facies Mapping, Upper Columbia River, Washington (2018-2019). Project manager and field supervisor. AECOM implemented this study across 38 miles of the UCR to collect high-resolution data used to identify and map sediment grain size fractions and texture. To that end, AECOM assembled a team of 3 technical subcontractors and provided overall planning, logistics and health and safety for the field effort. The team collected bathymetry and backscatter using multibeam echosounder; vertical velocity profile measurements via acoustic Doppler current profiler; underwater imagery using drop-frame camera and video equipment. AECOM managed collection, transfer and daily upload processes for nearly 1.4 TB of raw data.

Teck American, Incorporated. Macroinvertebrate Tissue Study Field Sampling, Upper Columbia River, Washington (2016). Dr. Pretare was the project manager for two 5-week remote field deployments to collect freshwater mussels and crayfish on a 180-mile stretch of the Columbia River in northeastern Washington. Responsible for overall field logistics, safe operation of 4 research vessels, scientific collection permits, sample chain of custody and transport, and collection of sample mass targets.

U.S. Navy, Northwest Training and Testing Area SEIS and Biological Assessment, Fisheries Support, Washington (2017-present). AECOM is providing fisheries technical support to the U.S. Navy during their 5-year review of environmental impacts of training and testing activities performed of the coast of Washington and Oregon. The AECOM team is updating the status of ESA listed fish in the marine project area, as well as 6 key Navy installations in the Puget Sound region. Dr. Pretare is the project manager for this task.

U.S. Navy, Adak Former Naval Complex Biological and Cultural Resource Surveys, Adak, Alaska (2011-2013). Field Supervisor and wildlife technical lead. This Navy project involved the ongoing removal of munitions and explosives of concern at Operable Unit (OU) B 2 at the former Adak Naval Complex. Studies were conducted to meet the substantial permit requirements under CERCLA Comprehensive Environmental

Response, Compensation and Liability Act of 1980). Dr. Pretare was the task lead for 10-person field crew conducting a 600-acre wetland delineation, threatened and endangered species surveys (Kittlitz's murrelet and Aleutian shield fern), and cultural resource survey. Site safety plan was successfully executed to avoid risk from remote field conditions, extreme weather, and unexploded munitions. Dr. Pretare also developed and wrote the Work Plan, Biological Assessment, and Wildlife Habitats Reports. This project received an "Exceptional" performance rating by the Navy.

U.S. Army Corps of Engineers Portland District, Tillamook, Oregon, South Jetty Repair Project (2015-2017). Dr. Pretare is the task lead for a Biological Assessment involving effects to snowy plover and coho salmon from this jetty cap project. She is also a contributing author to the NEPA EA. This project involves the evaluation of impacts from the construction of a jetty cap, marine offloading facility, staging areas and haul routes.

U.S. Army Corps of Engineers Portland District, Coos Bay, , North Spit Western Snowy Plover Site Management Plan and Biological Assessment, Coos Bay, Oregon (2014-2016). Senior author for site management plan and Biological Assessment to protect and recover endangered western snowy plovers and critical habitat in coastal Oregon. Activities encompassed within the plan included recreation, law enforcement, public outreach, predator control, population monitoring and invasive vegetation removal.

U.S. Army Corps of Engineers Portland District, North Jetty Repair Project, Coos Bay, Oregon (2014-2016). Senior author for a NEPA EA and BA for this jetty repair project, including an in-water loading facility, truck and barge haul routes, staging and 17 acres of estuary fill. AECOM is also preparing a non-wetland waters mitigation plan for the 17 acres of fill in Coos Bay.

U.S. Coast Guard, James Island Bar Light Expansion Project, Quillayute River Station, La Push, Washington (2013-2014). Dr. Pretare authored the biological resources section of the NEPA EA for this project which increases and improves the amount of lighting at the Quillayute Marina. She also completed the ESA review and Biological Assessment for the project, which included leatherback sea turtle critical habitat and Essential Fish Habitat for numerous Pacific species. This project was rated as "Exceptional" by the USCG.

FEMA, Disaster 1628 (flooding); Sonoma County, California (2008-2009). Evaluated six disaster sites for potential federally endangered species habitat and wrote four Biological Assessments. Species surveyed and evaluated included California red-legged frog, salt marsh harvest mouse, California clapper rail and multiple salmonid species.

FEMA Region 10, Oregon, Washington and Idaho (2010-2011). Pre-disaster hazard mitigation grants technical assistance. Performed analysis of impacts to avian species and Migratory Bird Treaty Act compliance for forest thinning fire mitigation activities. Project sites in Idaho, Washington and Oregon.

U.S. Navy, Bremerton Naval Hospital, Bremerton, Washington (2007). Dr. Pretare conducted a federal endangered species evaluation and general biological survey at the 50-acres Hospital. Habitats included mixed coniferous/deciduous forest, marine, intertidal, wetland, and developed areas. The draft document was accepted without comment and the client is using it as a template for similar studies at other Naval facilities. This report was rated as “Exceptional” by the Navy.

WSDOT, Industrial Way/Oregon Way Intersection Project, Longview, WA (2016-2017). Project manager and lead author for Biological Assessment in support of ESA consultation. The analysis is primarily associated with stormwater runoff effects to listed fish in the mainstem of the lower Columbia River. The analysis is primarily associated with stormwater runoff effects to listed fish in the mainstem of the lower Columbia River. The site includes a complex network of artificially built and maintained ditches, requiring a detailed analysis of water flow paths, stormwater detention ponds, pumping regimes, and levee locations and heights in order to understand potential access routes for ESA listed fish.

Shell Puget Sound Refinery Crude by Rail Project, Anacortes, WA (2013-2014). This rail expansion project is located on the shores of Puget Sound in the Padilla Bay estuary. Prepared Biological Assessment for multiple listed salmonids species, marbled murrelet, and killer whale. Conducted bald eagle nest monitoring and permitting under the Bald and Golden Eagle Protection Act. Dr. Pretare was an expert witness for Shell regarding impacts to great blue heron and bald eagle at a Skagit County legal hearing.

FEMA, Kittitas County Wildfire Risk Reduction Project, Cle Elum, Washington (2014). Dr. Pretare authored the EA biology sections for this project, and a Biological Assessment for ESA consultation on northern spotted owl, steelhead trout and bull trout. The project focuses on the removal of dead and dying vegetation around residential areas to create ‘defensible space’ for wildfire.

FEMA, Central Oregon Wildfire Risk Reduction Project, Oregon (2014). For a 3 county area in central Oregon, Dr. Pretare reviewed ESA-listed species such as bull trout, Oregon spotted frog, and northern spotted owl. Conducted site visits to multiple rural residential housing developments.

U.S. Army Reserves, Natural Resource Surveys, 88th Regional Support Command, Nationwide (2012-2013). Conducted surveys at four Washington sites to identify and map potential sensitive natural resources. Surveys included photo and video documentation, GIS for major landmarks and natural resources, and review of all major federal regulations affecting the Army installations.

USFS, BLM, and Washington DNR, Buckhorn Exploration Project EIS, Okanogan County, Washington (2012-2014).

Prepared an EIS for a gold exploration project in north-central Washington. Dr. Pretare is the task lead for wildlife, aquatic resource, forestry and grazing discipline reports and EIS sections. Dr. Pretare has provided technical review of Northern Goshawk and Great Gray Owl survey results conducted by a third-party consultant. She is leading the coordination effort between multiple agency biologists for technical content, impact assessment and mitigation proposal for EIS. Lead author for Biological Assessment, including grizzly bear and Canada lynx.

BP, Cherry Point Refinery, Whatcom County, Washington (2006-2009). Task manager for two multi-year 100+acre wetland restoration projects. Developed planting plan, coordinated design and engineering, monitored construction, developed as-built documentation. As of 2015 one site is successfully meeting Year 6 performance criteria under ACOE and Ecology permits; the other is meeting Year 4 monitoring requirements. Natural Areas Management Plan (2009). Dr. Pretare was the task manager for a management plan and report encompassing 1,170 acres of undeveloped land owned by the refinery. She was also the task manager a 180-acre wetland delineation and report in 2009.

Kinder Morgan, Natural Gas Pipeline Project, Concord to Sacramento, California (2003-2004). Wrote and implemented the Burrowing Owl Mitigation Plan, and conducted pre-construction surveys. Conducted field surveys for special status Branchiopoda species, amphibians, and rare plants.

OTHER EXPERIENCE

U.S. Fish and Wildlife Service, Midway Atoll Naval Air Facility / National Wildlife Refuge, Pacific Islands (1991-1992). Refuge biologist at Midway which included monitoring and maintenance activities at the world's largest Laysan Albatross colony. Duties included removing seabirds from the runway and other military facilities as needed. Conducted monk seal and green sea turtle surveys.

U.S. Fish and Wildlife Service, Hart Mt. National Wildlife Refuge, Oregon (1992). Conducted bird surveys and collected vegetation data in riparian areas in support of an Environmental Impact Statement on cattle grazing and management on refuge lands.

The Nature Conservancy, Ordway Preserve, Leola, South Dakota (2015). Conducted sharp-tailed grouse lek surveys over 7,800 prairie pothole preserve.

Jeff Walker, PWS

Botanist and Wetland Scientist

Education

BS, Botany and Environmental Studies, University of Washington, 1995
Wetland Science and Management Certification, University of Washington, 2000

Areas of Expertise

Permitting
Botany
Wetland Science
Threatened & Endangered Species
Project Management
NEPA, SEPA, and ESA Compliance
Wetland Restoration Design and Construction

Licenses/Registrations

Professional Wetland Scientist, #1485, 2005

Years of Experience

With AECOM	20
With Other Firms	4

Professional Associations

Society of Wetland Scientists

Training and Certifications

AECOM Project Manager

Mr. Walker has more than 24 years of experience as a botanist and over 20 years of experience as a wetland scientist, ecologist, and permit specialist. He has successfully acquired wetland and environmental permits and approvals for numerous projects across the Pacific Northwest. He has conducted wetland delineations and reconnaissance investigations, directed vascular and nonvascular plant surveys, performed monitoring of rare plant populations, and conducted noxious weed surveys. Mr. Walker has designed, inspected, and monitored several wetland mitigation projects. He has experience writing NEPA and SEPA EIS documents and conducted ESA consultations for large projects regarding federal- and state-listed Threatened and Endangered species. Mr. Walker develops permit documents, wetland reports, impact assessments, compensatory wetland mitigation plans, monitoring reports, conservation assessments, and vegetation restoration plans.

Experience

Teck American Incorporated, Upper Columbia Plant Tissue Study, Stevens County, Washington. Conducted field sampling of plant materials on Confederated Colville Tribe allotments near Northport, Washington. Tasks included study design, plant identification, field mapping with GPS units, and preparation of a reconnaissance and summary reports. Also reviewed and contributed to the Quality Assurance Project Plan and Field Sampling Plan.

U.S. Navy, Service Pier Extension in Hood Canal, Kitsap County, Washington. Assisted the U.S. Navy with permitting documents for a proposed extension to the existing service pier in Hood Canal. The extension would provide two additional berths for maintenance of existing homeported and visiting submarines. Task manager for JARPA and In-Lieu Fee Use Plan preparation.

U.S. Navy, Naval Hospital Bremerton, Bremerton, Washington. Conducted wetland reconnaissance and cultural plant survey on tidally-influenced wetland on shorelines of Naval Hospital Property. The site has been analyzed for possible remedial action due to the presence of subsurface metal anomalies from past use. The wetland and botanical work was completed in support of clean-up negotiations between regulatory agencies and the Navy. Project included coordination with the Suquamish Tribe, as well as an impact analysis of three remedy alternatives.

Western Federal Lands Highway Division, Olympic Hot Springs Road Rehabilitation Project, Clallam County, Washington. Project manager in 2018 for wetland study of four preliminary alternative

alignments to improvement the roadway so flooding and flood damage from the Elwha River would be less frequent. The project area is located in the Olympic National Park and contains hillslope seeps, perennial and intermittent streams, and wetlands within the dynamic river floodplain, which is changing rapidly after dam removal. AECOM completed field work and a subsequent wetland and stream report within a short time frame to accommodate an agency meeting. In 2019, AECOM delineated the chosen alternative, as well as a proposed mitigation site. This work also included verification of previous wetland and stream delineations along Olympic Hot Springs Road.

National Oceanic and Atmospheric Administration, Mukilteo Research Station Environmental Assessment, Mukilteo, Washington. Task lead for environmental assessment biological sections and supporting reports for the removal and replacement of facilities at the NMFS Mukilteo Research Station. The work included analysis of placement of water intake lines and removal of a pier in marine shoreline and subtidal areas. Successfully received permits for geotechnical investigations on the marine shoreline. Currently working on permits for construction.

Quinault Indian Nation, Wetland Climate Change Vulnerability Assessment, Grays Harbor County, Washington. Project manager for a climate change vulnerability assessment focused on wetlands on the Quinault Indian Reservation. The goal of the assessment was to better understand how wetland habitat types on the Reservation may be vulnerable to climate change. The assessment described forecasted climate change on the Olympic Peninsula, defining key climate variables selected to assess wetland vulnerability. The wetland habitats on the reservation were described and assessed in relation to climate change with specific attention paid to stakeholder concerns. Finally management implications and future opportunities were identified.

Washington State Parks and Recreation Commission, 2017 Vegetation Surveys. Project Manager and survey lead for vegetation surveys in eight selected state parks. The vegetation survey work included vegetation community mapping, rare plant surveys, noxious weed surveys, and identification of restoration opportunities. Produced a survey report for each park and a GIS database and shapefiles of all data collected in the field. The project included field work in remote areas, GPS navigation and data collection, and identification of over 500 different plant species. The selected state parks include several large, diverse properties in the San Juan Islands, Whidbey Island, on the Long Beach Peninsula, and Centennial Trail in Spokane.

Boeing Lake Habitat and Wetland Assessments, Everett, Washington. Conducted a wetland delineation and habitat assessment along the perimeter of Boeing Lake. In addition, mapped plant aquatic communities in the lake. This task included working from a boat and identifying all aquatic plants encountered. Wrote two reports summarizing field efforts, which included a complete aquatic plant species list.

Teck American Incorporated, Upper Columbia Macroinvertebrate Study, Stevens and Ferry Counties, Washington. Conducted field sampling of crayfish and freshwater mussels in the Upper Columbia River (Lake Roosevelt) and on the Sanpoil River on Colville Reservation.

Tasks included mussel and crayfish survey, collection, identification, measurement, and packaging for shipment to a lab. Work included boat travel, working in remote areas, and following strict decontamination procedures to handle specimens.

U.S. Navy, Adak Former Naval Complex Biological and Cultural Resource Surveys, Adak, Alaska. Wetland task lead for 600-acre wetland delineation and supporting report. The project involves the ongoing removal of munitions and explosives of concern at Operable Unit (OU) B 2 at the former Adak Naval Complex. These studies were conducted to meet the substantial permit requirements under CERCLA (Comprehensive Environmental Response, Compensation and Liability Act of 1980). Field work included wetland delineations and threatened and endangered species surveys for Aleutian shield fern (*Polystichum aleuticum*). Found three Alaska state sensitive species (*Antennaria dioica*, *Listera convallarioides*, and *Sieversia pentapetala*) during surveys. Completed wetland delineation report and contributed to the wildlife habitats report. In addition, drafted agency notification letters on behalf of the Navy.

U.S. Coast Guard, Quillayute River Station, James Island Bar Light Expansion Project, La Push, Washington. Conducted field assessment of vegetation communities on James Island. Contributed to the biological resources section of the EA for this project which increases and improves the amount of lighting at the Quillayute Marina.

88th Regional Support Command, U.S. Army Reserves, Natural Resource Surveys, Snohomish and Clark Counties. Conducted surveys at three Washington sites to identify and map potential sensitive natural resources. Surveys included photo and video documentation, GIS for major landmarks and natural resources (including wetlands and weeds), and review of all major federal regulations affecting the Army installations.

BPA Cultural Plant Survey, Maupin, Oregon. Conducted a field survey for plants of traditional importance for the Warm Springs tribes for a transmission line expansion project. Tasks included identification of several Lomatium species as well as other early spring species. Led the field identification and mapping effort.

U.S. Navy, Charleston Beach Remedy Repair, Bremerton, Washington. Assisted the Navy with design of a remedy repair for a pocket beach south of the naval shipyard. Completed planting plans, specification, and a basis of design report for the beach and shoreline plantings. The plans also included weed removal directions for Himalayan blackberry, Scot's broom, and butterfly bush.

Fort Casey, Washington State Parks and Recreation Commission, Golden Paintbrush Vegetation Community Monitoring, Island County, Washington. Project Manager and survey lead for vegetation monitoring project. Fort Casey State Park contains a naturally-occurring population of golden paintbrush (*Castilleja levisecta*). In recent years, the Washington State Parks and Recreation Commission (WSPRC) began efforts to enhance the golden paintbrush population by augmenting it with new plants and testing several vegetation control methods. As part

of these enhancement efforts, measured the distribution and cover of common plant species at Fort Casey State Park and to measure in detail the composition and cover of plant species immediately surrounding select golden paintbrush individuals. Completed the monitoring and a report that included methodology, observations, and recommendations for future monitoring and augmentation activities.

AECOM

Glen Mejia

Biologist

Education

BA, Environmental Studies and Biology, University of California - Santa Cruz, 1995

Years of Experience

With AECOM: 10
With Other Firms: 10

Training

Biological Assessment Training for Transportation Projects, Qualified Senior Writer, WSDOT, 2010 - present

Qualification Program for ESA Effects Compliance, ODOT, Qualified Biologist, ODOT, 2016-present

Forage Fish Spawning Beach Survey Certification, 2019

40-hour OSHA HAZWOPER certification (2016), 8-hour refresher (2020)

Principles of Electrofishing WA, Qualified Crew Leader (500+ hours)

Marbled Murrelet Marine Monitoring Protocol, Certified Observer, USFWS 2013-present

Wildlife Crossing and Habitat Connectivity Field Course, WSDOT

NEPA: Overview and Refresher Course

Overview of Approaches for ESA Compliance Seminar

Migratory Bird Treaty Act Compliance Workshop, USFWS

Glen is a biologist with 20 years of specialized experience in field, lab, data collection, data analysis, and reporting methodologies and protocols for a number of special status fish and wildlife species. He specializes in technical studies related to habitat analysis for special status fish and wildlife; protocol-level surveys for these species and their habitats; habitat assessments and impacts analysis. Glen has conducted biological sampling of fish, macroinvertebrate, and plant tissue for environmental toxicity analyses. He has conducted shellfish surveys in Hood Canal, Kitsap Peninsula, and Whidbey Island.

Select Project Experience

US Naval Facilities Engineering Command, Naval Base Kitsap at Bangor, Jackson Park Housing Complex, WA. Biologist. Collected . clam tissue on the beach at Bremerton Naval Hospital under DO/CTO JP01.

US Naval Facilities Engineering Command, Nearshore Functional Assessment Tool User Manual, Bangor, WA. Lead Field Biologist. Collected marine riparian, intertidal wetland, intertidal non-wetland, and subtidal ecological data including shellfish sampling at 98 samples sites in Hood Canal in support of the development of a nearshore functional assessment tool. Field work involved extensive access coordination, work in remote areas, and strict adherence to field protocols.

US Naval Facilities Engineering Command, Site Reconnaissance Petroleum Sites and Ohl Lake, Amchitka Island, AK. Lead Biologist. Collected tissue samples in accordance with ADEC Field Sampling Guidance for environmental toxicity analyses. Fish tissue samples included Dolly Varden and three-spined stickleback, Plant tissue included sedge fruit, seeds of grasses, smartweeds, purslane, and timothy and were collected by hand. Invertebrates collected included arthropods, amphipods, mollusks, aquatic worms. Sampling included minnow traps, angling, and kicknet.

US Naval Facilities Engineering Command, Naval Base Kitsap at Bangor and Naval Strategic Systems Program, Service Pier Extension, Bangor, WA. Prepared an incidental harassment authorization application for the proposed pier extension in Hood Canal to comply with the Marine Mammal Protection Act, National Marine Sanctuaries Act, and Navy regulations. Eight species of marine mammals have been documented within the waters surrounding Naval Base Kitsap Bangor: humpback whale, gray whale, transient killer whale, harbor porpoise, Dall's porpoise, Steller sea lion, California sea lion, and harbor seal.

US Naval Facilities Engineering Command Northwest. Pier and Support Facilities for Transit Protection System U.S. Coast Guard Air Station/Sector Field Office Port Angeles, WA. Biologist responsible for project compliance with the Marine Mammal Protection Act (MMPA) for construction of a pier and support facilities at the U.S. Coast Guard (USCG) Air Station/Sector Field Office Port Angeles. Marine mammal species addressed included: harbor porpoise, Steller sea lion, California sea lion, northern elephant seal, and harbor seal.

Confidential Client, Pre-Design Investigation, Lower Willamette River, OR. Biologist. Performed angling surveys for collection of smallmouth bass tissue samples for chemical analysis in the lower Willamette River as part of the RI/FS for the Portland Harbor Superfund Study Area.

Teck American Incorporated, Phase 3 Sediment Study, Upper Columbia River, Washington. Field Biologist. Supported geologists for collection of sediment and benthic invertebrate samples in northeast Washington and British Columbia, Canada..

Teck American Incorporated, Plant Tissue Study, Upper Columbia River, WA. Field Biologist. Conducted field sampling to collect plant tissue focused on species (plants, mushrooms and lichen) used by Native American tribes in traditional uses..

Teck American, Inc., Macroinvertebrate Tissue Study, Upper Columbia River, WA. Field Biologist. Conducted field sampling to collect freshwater mussels and crayfish on a 180 mile stretch of the Columbia River in northeastern Washington Remedial Investigation/Feasibility Study (RI/FS). Tasks included mussel and crayfish survey, collection, identification, measurement, and packaging for shipment to a lab. Work included boat travel, working in remote areas, and following strict decontamination procedures to handle specimens.

Lower Willamette Group, Portland Harbor Collection of Fish for Tissue Analysis, Portland, OR. Field Biologist. Performed fish sampling for chemical analysis in the lower Willamette River as part of the RI/FS for the Portland Harbor Superfund Study Area. Performed extensive use of boat electrofishing to collect a variety of fish species throughout the Portland Harbor.

PacifiCorp, Klamath Hydroelectric Project, Klamath County, OR; and Siskiyou County, CA. Field Biologist. Conducted fish and macroinvertebrate sampling on 60 miles of the Upper Klamath River along the JC Boyle full-flow reach from Klamath Falls, Oregon to Copco, California. Study focused on providing a baseline for existing aquatic community as part of the Klamath Hydroelectric Project Relicensing. Performed extensive use of boat and backpack electrofishing, and angling to collect a variety of fish species throughout the Upper Klamath River.

AECOM

Linda Howard

Biologist

Education
B.S., Environmental Science and Conservation Biology, University of Washington, June 2005

Years of Experience
With AECOM: 13
With Other Firms: 2

Training
Know Your Grasses Workshop (2019)

Using the Credit-Debit Method for Estimating Mitigation Needs (2015)

Using the Revised Wetland Rating System (2014) in Western Washington (2015)

Planning for Sea Level Rise in Washington (2014)

Invertebrate Identification and Stream Flow Duration Workshop at Society of Wetland Scientists, Pacific Northwest Chapter Regional Conference (2012)

Reviewing Wetland Mitigation and Monitoring Plans (2012)

Using the Field Indicators for Hydric Soil. (2011)

Designing Compensatory Mitigation and Restoration Projects (2008)

First Aid/CPR Trained

40-hour OSHA HAZWOPER certification (2016), 8-hour refresher (2019), valid through 7-19-2020

Linda is a biologist with 1**5** years of experience conducting field studies, environmental impact analysis and preparing environmental compliance and permitting documentation for projects throughout the Pacific Northwest. She has conducted sampling of macroinvertebrate, plant tissue, and porewater for environmental toxicity analysis and has participated in the development of field reconnaissance plans, field sampling work plans and sampling reports. Linda has conducted bird surveys, vascular plant surveys, tree surveys, noxious weed surveys, rare plant surveys, habitat assessments, and wetland delineations and rapid wetland functional assessments throughout Washington and Oregon.

Select Project Experience

Teck American Incorporated, Phase 3 Sediment Study, Upper Columbia River, Washington. Field Biologist. Supported geologists for collection of sediment and benthic invertebrate samples and participated in porewater sampling in northeast Washington.

Teck American Incorporated, Plant Tissue Study, Upper Columbia River, Ferry County, Washington. Field Biologist. Surveyed and collected plant tissue samples in upland sampling areas on tribal allotments in the Upper Columbia River study area. Plant survey activities included pedestrian survey of sampling areas, collecting GPS data on target species, documenting presence and abundance on data forms, taking representative photos, and maintaining a field log book in accordance with the field reconnaissance plan. Plant tissue collection activities included collecting, weighing, measuring, photographing, and packaging plant tissue samples for shipment to lab, collecting GPS data, completing sample data forms, and maintaining a field log book in accordance with the field sampling and analysis plan.

Teck American, Incorporated. Macroinvertebrate Tissue Study Field Sampling, Upper Columbia River, Washington (2016). Field Biologist. Collected and processed crayfish and mussels in the Upper Columbia River (Lake Roosevelt). Field activities included surveying, collecting, identifying, weighing, measuring, photographing, and packaging crayfish and mussel samples for shipment to lab, collecting GPS data, completing sample data forms, and maintaining a field log book in accordance with the field sampling and analysis plan. Also conducted underwater camera surveys to identify offshore mussel collection locations for an underwater dive team. Field work included boat travel, work in remote areas, and following strict decontamination procedures for handling samples.

US Naval Facilities Engineering Command, Nearshore Functional Assessment Tool User Manual, Bangor, WA (2012-2014). Lead Biologist. In 2012, conducted wetland delineations, functional assessments, and bird surveys on candidate mitigation sites, and prepared baseline ecological assessment reports. In 2014, led a field team that conducted testing of the draft nearshore functional assessment tool at 100 study sites in Hood Canal. Field activities involved using the draft tool to assess habitat indicators in subtidal, intertidal, and marine riparian habitats for salmonids, forage fish, rockfish, shellfish, shorebirds, seabirds, riparian birds, native plants, marine mammals, and other nearshore habitat functions. Field activities included shellfish sampling study sites in in Hood Canal. Field work involved extensive access coordination, work in remote areas, and strict adherence to field protocols.

Bureau of Indian Affairs/Spokane Tribe of Indians, West Plains Mixed-Use Development Project, Washington. Lead Biologist. Responsible for coordination of field surveys, including a biological resources survey, wetland delineation, field surveys for two federally listed plants, and a site survey for the presence of potentially hazardous materials. Prepared a wetland delineation report to support the National Environmental Policy Act (NEPA) process and for use in permitting, and addressed vegetation and wetlands, wildlife and wildlife habitat, and federal and state threatened, endangered, and sensitive species, and hazardous materials in the environmental impact statement. Special status species: water howellia and Spalding's silene.

Seattle City Light, Environmental Site Assessment Lands Inventory, Washington. Field Biologist**.** Conducted a habitat assessment of 17 Seattle City Light parcels in the Skagit, Sauk, Cascade, and Told river basins in Skagit County that ranged in size from one to 1,300 acres. Field activities included vegetation association mapping, weed inventories, wildlife habitat assessments, rare plant habitat assessments, aquatic habitat assessments, and road and trespass inventories. Vegetation association mapping was conducted by interpreting aerial photographs and field verifying vegetation signatures. Wildlife habitat evaluation forms developed for the project were used in the field to assess habitat and record observed species. Aquatic habitat surveys used modified US Forest Service stream survey protocols. GPS data was collected in the field and all data was entered into a Geographic Information System and linked to site photographs and a detailed database. Field work included extensive access coordination, work in remote areas, using GPS to locate remote unmarked parcels, walking across uneven, steep, forested terrain, and following defined field protocols. Linda also contributed to field summary reports that included recommendations for management, restoration, weed control, and access control.

Paul Hamidi, PWS, CPSS

Senior Biologist

Education

MS, Forestry, University of Montana, 1993
BS, Forestry, University of Montana, 1988

Certifications

Certified Professional Soil Scientist
No. 15284, 2006
Professional Wetland Scientist
No. 1551, 2004
OSHA 40 Hour HAZWOPER Certification
August 2019

Training

Intro. & Advanced Hydric Soils, NRCS
Wetland Soils, North Carolina State Univ.
Wetland Delineation, USACE
Delineation Manual Supplement, USACE
Wetland Rating System, Ecology
Wetland Regulations, USACE
Wetland Vegetation, Univ. Washington
Groundwater Investigations, EPA
Wetland Functions and Values, WTI
Wetland Mitigation, Portland State Univ.
Wetlands Restoration, NRCS
Environmental Site Restoration, NWETC
Wetland Mitigation Design, Ecology
Mitigation Site Selection, Ecology
Estimating Mitigation Needs, Ecology
Stream Channel Design, Ecology
Determining OHWM, Ecology
Coastal Processes, Ecology

Years of Experience

With AECOM: 13
With Other Firms: 10

Professional History

2006–Present: URS/AECOM, Seattle
2003–2006: The Jay Group, Marysville
1999–2000: Pacific Rim Soil & Water, Olympia
1994–1998:US Army Corps of Engineers, Seattle
1991–1992: US Forest Service, Dillon, MT
1989–1990: Natural Resources Conservation Service, Deer Lodge, MT

Mr. Hamidi has 23 years of experience as an environmental scientist, with an emphasis on wetlands and soil resources. He works on projects throughout the western U.S. and Alaska. He has been involved in all phases of wetlands and aquatic resources delineation, assessment, mitigation and monitoring; soil survey and assessment; ecological inventory; vegetation mapping; fish and wildlife habitat evaluation; preparation of NEPA/SEPA documents; and permitting. He is senior biologist for projects in the energy, transportation, utilities, mining, and commercial sectors. He has contributed to the design of several successful wetland and habitat mitigation projects. As a Corps of Engineers project manager, Paul was responsible for reviewing mitigation projects throughout Washington. He taught soil science courses at the University of Montana and has provided hydric soils training through the NRCS and Corps of Engineers. He has been a certified Professional Wetland Scientist since 2004, and a Certified Professional Soil Scientist since 2006.

Project Experience

Teck American Incorporated, Plant Tissue Study, Upper Columbia River, Ferry County, Washington. Field Biologist. Surveyed and collected plant tissue samples in upland and riparian sampling areas on tribal allotments in the Upper Columbia River study area. Plant survey activities included pedestrian survey of sampling areas, collecting GPS data on target species, documenting presence and abundance on data forms, taking representative photos, and maintaining a field log book in accordance with the field reconnaissance plan. Plant tissue collection activities included collecting, weighing, measuring, photographing, and packaging plant tissue samples for shipment to lab, collecting GPS data, completing sample data forms, and maintaining a field log book in accordance with the field sampling and analysis plan.

Teck American Incorporated, Sediment Study, Upper Columbia River, Washington and British Columbia. Collected sediment samples for characterization of chemistry and benthic macroinvertebrates among several target sediment strata in the Upper Columbia River, including reference locations.

Department of the Navy, Naval Hospital, Bremerton, Washington. Task lead for soils assessment, wetland delineation, and functional assessment for freshwater and tidal wetlands within an area investigated for potential unexploded ordnance. Tidal wetlands were assessed using the Hydrogeomorphic (HGM) Assessment Guidebook for Tidal Wetlands of the Oregon Coast. Prepared impact assessment for remedial activities.

Former Adak Naval Complex, Adak Island, Alaska. Prepared report for wetland delineation on over 600 acres of a former Navy base in the Aleutian Islands. Classified and described 75 wetlands comprising over 117 acres. Assessed wetland functions and described unique environmental setting.

Washington State Parks, Vegetation Surveys, Pacific, Island and Skagit Counties, Washington. Classified and mapped vascular plant communities on State Park lands. Surveyed for rare plants and noxious weeds. Prepared descriptions of each community including distribution, plant species and ecological condition.

Shell, Puget Sound Refinery, Anacortes, Washington. Delineated and rated wetlands and streams on 200 acres for a rail project and related mitigation. Installed wells to assess downslope impacts from excavation. Evaluated sites for wetland and habitat restoration potential. Prepared wetland impact analysis, mitigation bank use plan, and an innovative mitigation plan to restore 100 acres of diked, drained and farmed estuarine habitat in Padilla Bay.

Home Depot, Port Orchard, WA. Analyzed project impacts, including indirect wetland and stream impacts; developed protocol for water-table monitoring to assess indirect impacts; delineated mitigation areas; evaluated potential of onsite and offsite mitigation areas; prepared conceptual and final mitigation plans to compensate for impacts through onsite and offsite wetland creation, restoration and enhancement; worked with regulatory agencies to obtain permits.

Confidential Client, Evaluation of Mine Remediation Alternatives, Chelan County, Washington. Conducted field assessments of fish and macroinvertebrate populations in a stream impacted by mining activities.

Washington State Department of Transportation, I-90 Snoqualmie Pass East Project, Kittitas County, Washington. Delineated wetlands and streams along 15-mile project corridor. Documented vegetation, soils and hydrology for wetlands and adjacent uplands. Rated wetlands using the Ecology rating system. Wetlands were also assessed using the Wetland Functions Characterization Tool for Linear Projects. Provided senior technical review of report. Task lead for preparation of Wetland Mitigation Site Assessment, and Wetland and Aquatic Resources Conceptual and Draft Mitigation Plans, which included impact assessment, mitigation sequencing, functional assessment, selection and design of compensatory mitigation sites, and monitoring design. The project incorporated a cutting-edge approach to wetland mitigation that emphasized watershed and landscape-based design for enhancing ecological connectivity along the project corridor. Contributed to wetlands section of the EIS.

Quinault Indian Nation, Wetland Inventory and Wetland Program Plan, Grays Harbor County, Washington. Developed wetland classification system and inventoried wetlands on over 200,000 acres of Quinault Indian Nation lands. Developed a Wetland Suitability Index and utilized ArcMap to model and remotely map and classify wetlands and streams. Assisted in preparation of a Wetland Program Plan for the reservation.

Western Federal Lands Highway Division, Olympic Hot Springs Road Rehabilitation Project, Olympic National Park, Washington. Task lead for delineation of wetlands and streams on 50 acres within the Elwha River Valley. Assessed impacts for alternative road alignments for one-mile section of road to be relocated outside of the floodplain.

Appendix D:
Reference Site Screening Results Matrix

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Keyport OU 1 Biological Survey Work Plan
Potential Reference Site Screening
Date: 5/13/2020

	SCREENING PRIORITY -	1 - PUBLIC ACCESS AVAILABLE	6 - FOR USE AS A TIE-BREAKER					2 - MUST CONTAIN FRESHWATER INPUT WITH YEAR ROUND FLOW	3 - SORTED BY DESCENDING DISTANCE	5 - ELIMINATED IF IT OCCURS WITHIN A CATEGORY 4/5 WATER		4 - MUST BE UNDER 20 PPM	
		GENERAL INFORMATION				ECOLOGICAL CRITERIA			ADDITIONAL CRITERIA FROM WORKGROUP				
RANK	**Site Name**	**Ownership**	**County**	**Distance to Keyport OU1 - Miles**	**Salt Marsh (Y/N) - Note: Salt Marsh at the Keyport is Classified as "Fringe (Patchy)"**	**Mud/Tide Flat (Y/N/ - Notes)**	**Location of Marsh/Tide Flat**	**Freshwater Input**	**Contaminated Sites from What's in my Neighborhood (Distance from closest site to closest portion of shoreline with salt marsh - miles). Minimum Distance = 0.25 miles.**	**Contaminated Waters from Ecology Web Site EIM: Distance in Miles to Cat 4/5 Assessed Water/Sediment for a Connected Waterway.**	**Proximity to Urbanization (Estimate in GIS to Center of nearest City/Town)**	**Asarco Plume - Predicted Arsenic Concentration**	**Comments**
1	Haley State Park	State Parks	Pierce	34.3	Y - Fringe (patchy and continuous)	Potentially - lagoon has outlet to salt water but cannot be certain from aerial photo	Along Haley Lagoon	Yes	2.2 miles (awaiting cleanup, gasoline, petroleum other)	1.55 (Category 5 water: DO)	9.73 miles to Gig Harbor	Under 20 ppm	AECOM has performed previous vegetation surveys at this site for the State Parks, and has a detailed survey report. Salmonscape maps a Stream/Perennial waterbody flowing into Haley Lagoon, where salt marsh is mapped.
2	Quilcene Bay WDFW Tidelands	WDFW Manages	Jefferson	14.0	Y - Bed[1] (continuous)	Y	Northern portion of bay is all marsh	Yes - intermittent streams and perennial streams connect to Puget Sound	0.87 mile (Heisel property - no further action, petroleum other)	0.27 mi (Category 5 water: temperature, Cat 4: fish and shellfish habitat)	11.87 miles to Poulsbo	Outside of contaminated area	Popular for clamming. Several perennial streams are mapped by salmonscape leading into the salt marsh, including the Big and Little Quilcene Rivers.
3	Skookum Inlet Natural Area Preserve	WA DNR	Mason	47.0	Y - Fringe (continuous)	Y - Aerial imagery indicates muddy tidelands		Yes	0.63 miles (awaiting cleanup, benzene, lead, metals, gasoline, diesel, petroleum other, other non-halogenated organics, polycyclic aromatic hydrocarbons)	1.25 (Category 5 waters: DO)	5.27 miles to Shelton	Outside of contaminated area	Elson creek (Stream/Perennial) is mapped by Salmonscape as within the preserve, flowing into Little Skookum Inlet where salt marsh is mapped.
4	Crescent Creek Park	Gig Harbor Parks	Pierce	24.6	Y - Fringe (Patchy)	Y - Aerial imagery indicates muddy tidelands	All around edge of Gig Harbor	Yes - Crescent Creek connects to Gig Harbor	<1 mile. 11 cleanup sites within 1 mile; closest are Conan Vacant Property (awaiting cleanup, petroleum - diesel) and Eagle Quest (no further action, arsenic)	0.62 (Category 4C: fish and shellfish habitat)	Less than 0.5 mile to neighborhood in Gig Harbor	Under 20 ppm	Relatively small park Salmonscape maps Crescent Creek as connecting to Gig Harbor, flowing through the park and into salt marsh.
	Penrose Point State Park	State Parks	Pierce	31.4	Y- Fringe (patchy)	Yes	West side of park	No - See comments. Freshwater input does not appear within park boundaries.	1.17 miles (awaiting cleanup, gasoline, petroleum other)	0.15 (Category 5 waters: multiple locations)	9.15 miles to Bremerton	Under 20 ppm	AECOM has performed previous vegetation surveys at this site for the State Parks, and has a detailed survey report. Salmonscape maps a Stream/Perennial waterbody betweeen Bay Lake and Mayo Cove, where salt marsh is mapped. However, the freshwater input does not appear to be within park boundaries.
	Taylor Bay Park	Key Peninsula Parks	Pierce	46.6	Y	Y - shoreline along both sides of inlet		Yes - intermittent	2.43 miles (awaiting cleanup, diesel, gasoline)	0.72 (Category 5 water: DO)	8.28 miles to Steilacoom	Under 20 ppm	Discussed with Workgroup on 12/18/19 Salmonscape maps an intermittent stream that flows into saltmarsh
	Blake Island State Park	State Parks	Kitsap	12.4	Y- Fringe (patchy)	Y - Aerial imagery indicates limited muddy tidelands	Small patch on NW corner of island	Yes - intermittent stream	2.35 miles (Southworth Stage - cleanup started, metals - other, metals priority pollutants, pesticides - unspecified, petroleum products unspecified)	1 (Category 5 water: DO)	4.0 miles to West Seattle	Under 20 ppm	Very small patch of marsh Salmonscape does map an intermittent stream, but it does not flow quite to where salt marsh is mapped.
	Harstine Island State Park	State Parks	Mason	35.6	Potentially - Fringe (continuous along Fudge Point and patchy on east shoreline)	Y	Along shoreline	Yes - intermittent	1.84 miles (complete cleanup, benzene, gasoline, diesel, other non-halogenated organics)	0.25 (Category 5 water: DO)	11.23 miles to Shelton	Outside of contaminated area	Island accessible by bridge or boat…. May not contain salt marsh? Several intermittent streams are mapped within the park, and near/in the saltmarsh. Unclear if limited salt marsh is actually mapped in park boundaries.
	Tolmie State Park	State Parks	Thurston	45.2	Y - Fringe (patchy)	Y - Aerial imagery indicates muddy tidelands	Along the coast, very small	Yes - intermittent	1.13 miles (complete cleanup, arsenic and lead)	0.31 (Category 5 water: bacteria)	5 miles to Lacey	40.1 ppm to 100 ppm	Discussed with Workgroup on 12/18/19 One intermittent stream is mapped within the park leading to salt marsh by Salmonscape
	Hope Island Marine State Park	State Parks	Mason	38.7	Y - Fringe (continuous)	Potenially - depending on tides	Along southern shore of the island	Yes - intermittent	0.75 mile (awaiting cleanup, petroleum products)	2.6 miles from nearest Category 4 water	8.49 miles to Shelton	Outside of contaminated area	Only accessible by boat. This island looks relatively pristine in databases reviewed, and has very little development. One intermittent stream leading to salt marsh is mapped in the park by Salmonscape.
	Burfoot Park	Thurston County Parks	Thurston	47.8	Y - Fringe (patchy)	Potentially - there is a lagoon but it is separated from the water by a	South portion of park, along the beach	Yes - intermittent	0.5 mile (complete cleanup, petroleum gasoline)	0.6 mile from nearest Category 5 water: DO	6 miles to Lacey	Outside of contaminated area	One intermittent stream is mapped within the park by Salmonscape, leading to salt marsh
	Maury Island Marine Park	King County Parks	King	25.5	Y - Fringe (patchy)	N - Aerial imagery does not indicate muddy tidelands	Along the coast of the park	Yes - intermittent stream	<1 mile. 2 cleanup sites within 1 mile. (Tacoma Smelter Plume area - cleanup started, arsenic, lead, metals priority pollutants and Bonneville Broadcasting - cleanup started, petroleum - other)	3.7 miles from nearest Category 5: bacteria	4.09 miles to Des Moines	Over 100 ppm	Several intermittent streams are mapped within the park by Salmonscape leading to saltmarsh
	Blakely Harbor Park	Bainbridge Isl Parks	Kitsap	8.8	Y- Fringe (patchy)	Y - Aerial imagery indicates muddy tidelands	Periphery of the little harbor	Yes - two intermittent/ephemeral streams are in the mapped saltmarsh area	<1 mile. (Within Blakely Harbor Park - awaiting cleanup, conventional contaminants, inorganic and organic, dioxin/dibenzofuran compounds, lead, metals - other, other deleterious substances); (5 cleanup sites within 1 mile)	0.83 mile from nearest Category 5 sediment site and waters: bacteria	2.11 miles to downtown Bainbridge Island	Under 20 ppm	Appears to be managed by Bainbridge Island Parks Several intermittent streams are mapped within the park by Salmonscape leading to saltmarsh
	Jarrell Cove State Park	State Parks	Mason	34.4	Y - Fringe (patchy)	N	Salt marsh along shoreline	Potentially - freshwater input to bay, but not directly where salt marsh is	0.15 mile (complete cleanup, benzene, gasoline, diesel, other non-halogenated organics)	--	11.38 miles to Shelton	Outside of contaminated area	Island accessible by bridge or boat
	Priest Point Park	City of Olympia	Thurston	53.4	Y - Fringe (continuous)	Y	Along beach to the south portion of the park	Potentially - freshwater input to bay, but not directly where salt marsh is located	1.03 mile (cleanup started, petroleum)	0 (Category 5 water: DO, dioxin)	1 mile to Olympia	Outside of contaminated area	
	West Bay Park	City of Olympia	Thurston	48.3	Y - Fringe (patchy)	Y - Aerial imagery indicates muddy tidelands	Along inner shoreline, parallel to W Bay Drive	Not where salt marsh is mapped	--	--	Less than 0.5 mile (within Olympia)	Outside of contaminated area	
	Shine Tidelands State Park	State Parks	Jefferson	11.5	Y - Fringe (continuous)	Y - Ecology maps a "beach" here. Also is apparently popular for clamming, indicating a sandy/muddy shoreline	Continuous fringy salt marsh is mapped adjacent to the north side of the Hood Canal Bridge, and patchy marsh is mapped on the NE corner of "Hood Head"	No - not where salt marsh is mapped	--	--	10.77 miles to Poulsbo	Outside of contaminated area	

Keyport OU 1 Biological Survey Work Plan
Potential Reference Site Screening
Date: 5/13/2020

	SCREENING PRIORITY -	1 - PUBLIC ACCESS AVAILABLE	6 - FOR USE AS A TIE-BREAKER					2 - MUST CONTAIN FRESHWATER INPUT WITH YEAR ROUND FLOW	3 - SORTED BY DESCENDING DISTANCE	5 - ELIMINATED IF IT OCCURS WITHIN A CATEGORY 4/5 WATER		4 - MUST BE UNDER 20 PPM	
		GENERAL INFORMATION				ECOLOGICAL CRITERIA			ADDITIONAL CRITERIA FROM WORKGROUP				
RANK	**Site Name**	**Ownership**	**County**	**Distance to Keyport OU1 - Miles**	**Salt Marsh (Y/N) - Note: Salt Marsh at the Keyport is Classified as "Fringe (Patchy)"**	**Mud/Tide Flat (Y/N/ - Notes)**	**Location of Marsh/Tide Flat**	**Freshwater Input**	**Contaminated Sites from What's in my Neighborhood (Distance from closest site to closest portion of shoreline with salt marsh - miles). Minimum Distance = 0.25 miles.**	**Contaminated Waters from Ecology Web Site EIM: Distance in Miles to Cat 4/5 Assessed Water/Sediment for a Connected Waterway.**	**Proximity to Urbanization (Estimate in GIS to Center of nearest City/Town)**	**Asarco Plume - Predicted Arsenic Concentration**	**Comments**
	Right Smart Cove State Park	State Parks	Jefferson	12.3	Y - Fringe (patchy)	Y - Aerial imagery indicates muddy tidelands	Patchy salt marsh mapped around the coastline of the park	No - A stream flows into the lagoon but there does not appear to be a connection to saltwater (Right Smart Cove)	--	--	10.40 miles to Silverdale	Outside of contaminated area	
	Nelson Park	Poulsbo Parks	Kitsap	3.3	Y - Fringe (patchy)	Y - Aerial imagery indicates muddy tidelands	Immediately adjacent to the park, and to the north in the Poulsbo Fish Park	No	--	--	0.74 miles to Poulsbo	Outside of contaminated area	
	Old Mill State Park	Kitsap County Parks	Kitsap	4.9	Y - Fringe (continuous)	Y - Aerial imagery indicates limited muddy tidelands	NE end of park, and east along "clear creek"	No	--	--	Less than 0.5 mile to Silverdale	Outside of contaminated area	
	Stretch Point State Park	State Parks	Mason	34.0	Y - Fringe (continuous)	N	Along shoreline	No	--	--	11.28 miles to Gig Harbor	Outside of contaminated area	Only accessible by boat
	Kitsap County Guillemot Cove Nature Preserve	Kitsap County and/or Great Peninsula Conservancy	Kitsap	15.1	Y -Fringe (continuous)	Y - Aerial imagery indicates muddy tidelands	Patchy fringe salt marsh mapped along coastline of park	Yes - Boyce Creek (stream/perennial) flows into Puget Sound	2.35 miles (on other side of Hood Canal, petroleum - diesel)	0 (Category 5 water: DO, Category 4C water: fish and shellfish habitat, Category 4B water: bacteria)	13.20 miles to Bremerton	Under 20 ppm	This was one of the sites suggested by Alison on 2-3-20. 19235 NW Stavis Bay Road, Seabeck, WA. Open to the public per Greatpeninsula.org
	Woodard Bay Natural Resources Conservation Area	WA DNR	Thurston	42.2	Y - Fringe (patchy)	N - Appears to just be the creek, not sure about tidal influence	Salt marsh is along both banks of Woodard Creek	Yes	2.12 miles (complete cleanup, petroleum products and polycyclic aromatic hydrocarbons)	0 (Category 4A water: bacteria, pH, temperature)	6.5 miles to Lacey	Under 20 ppm	
	Kennedy Creek Natural Area Preserve	WA DNR	Mason	51.5	Y - Fringe (patchy)	Y	Along coast for entire preserve	Yes	2.47 miles (awaiting cleanup, benzene, diesel, gasoline, polycyclic hydrocarbons, other non-halogenated organics)	0 (Category 5 water: DO, Category 4A water: bacteria)	8.14 miles to Shelton	Outside of contaminated area	Contact for research projects is David Wilderman (Natural Areas Program Statewide Ecologist) david.wilderman@dnr.wa.gov.
	Nisqually Wildlife Refuge	USFWS	Pierce	44.5	Y - Fringe (continuous)	Y - Aerial imagery indicates muddy tidelands	Along the coast and the Nisqually River	Yes - Leschi Slough and several streams connect to Puget Sound	1.5 miles (Lot 10 Center Plaza Williamson Place - no further action, arsenic)	0 (Category 5 and 4A water: bacteria, Category 5 water: PCBs,)	3 miles to Lacey	40.1 ppm to 100 ppm	Wildlife refuge may be difficult to obtain permission for sampling
	Dosewallips State Park	State Parks	Jefferson	12.7	Y - Fringe (continuous)	Y - Aerial imagery indicates muddy tidelands	All along coast within park	Yes - Dosewallips River and Walkers Creek and three intermittent streams to the north	0.67 mile (Brinnon General Store - cleanup started, metals priority pollutants, non-halogenated solvents, petroleum products - unspecified, petroleum - other)	0 (Category 5 waters for temperature in park)	12.48 miles to Poulsbo	Outside of contaminated area	
	Belfair State Park	State Parks	Mason	23.2	Y - Fringe (continuous and patchy)	Y	Along shoreline for entire park	Yes	0.25 mile (cleanup started, gasoline)	0 (Category 5 waters for bateria in park)	14.5 miles to Bremerton	Outside of contaminated area	
	Dabob Bay Natural Areas Preserve	DNR manages the area	Jefferson	13.3	Y - Bed[1] (Patchy)	Y	Extensive salt marsh located here	Yes - intermittent stream flows into Tarboo Bay	2.37 miles (Olympic Testing Lab Quilcene, metals priority pollutants)	0 (Category 5 water: DO, bacteria, temperature)	11.35 miles to Poulsbo	Outside of contaminated area	Not state park, but DNR website does indicate that research can occur in these areas, as long as the ecologist is contacted for approval
	Miller Bay Preserve or Cowling Creek Center Nature Preserve [2]	Great Peninsula Conservancy	Kitsap		No shoreline	No shoreline	No shoreline	Yes					Bay appears to be lined with residences. Preserve is at: 20325 Miller Bay Rd NE, Poulsbo, WA 98370. Does not appear to have access to shoreline
	Curley Creek Tyner Preservie	Great Peninsula Conservancy	Kitsap	12.71	Just outside park boundaries - Fringe (patchy)	Y - Aerial imagery indicates limited muddy tidelands	North end of park appears to have a mud flat. The opposite side of SE Southworth Dr also appears to have mud flat where creek enters Puget Sound.	Yes - Curley Creek	Roughly 0.1 miles (Bayside Grocery - cleanup started, Benzene, non-halogenated solvents, petroleum gasoline)	0 (Multiple Category 5 waters in immediate vicinity [DO and Temp], Category 4C [Fish and shellfish habitat], Category 4B [Bacteria])	4.37 miles to Port Orchard	Under 20 ppm	This was one of the sites suggested by Alison on 2-3-20. 28 acres. No salt marsh actually within preserve boundaries. Preserve boundary does not appear to actually extend to Puget Sound, but stops short of the mouth of the creek.
	Harper Estuary	Kitsap County Park - Terrestrial area; DNR administers aquatic lands	Kitsap		Y	Y		Yes- stream present	0.35 miles to Petroleum and Benzene spill site; cleanup "in Process"	0 (Category 5 Water - appears to be Harper Bay or area adjacent)			This was one of the sites suggested by Alison on 2-3-20. Near Southworth ferry terminal, Port Orchard. https://www.pnwbeachcombing.com/field-reports/sk-harper-beach reports accessible for beachcombing at low tide. Lots of sea glass and bricks. Old brick factory across the street. There is a Harper Park across the street but it appears to be all terrestrial. Per Alison on 5-5-20, there is Kitsap County and DNR land (public) at this location.
	Gamble Bay estuary	No public land	Kitsap										This was one of the sites suggested by Alison on 2-3-20. There appears to be "Port Gamble Off-Reservation Trust Land" nearby but it's not on the shoreline.
	Indianola Waterfront and Woodland Preserve	Kitsap Co	Kitsap		Y	Y		Y - But Seasonal according to web site					Added to table 4/27/20. Appears to be in very close proximity to residential development. Residentail development in the area are on septic systems, as confirmed by the Suquamish Tribe. Therefore, this preserve is not suitable as a reference area.

[1] Note: "Bed" is defined as an area of marsh bottom supporting a heavy growth of marsh vegetation

[2] Note: This preserve was initially screened in lieu of Indianola Preserve due to it's proximity to Miller Bay. Since the 2/5/20 version, Indianola Preserve has been added to the list.

Gray Highlighting indicates criteria that eliminated site during screening

Appendix E:
Haley State Park – Additional Information

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Section 3 - Vegetation Communities

URS mapped distinct vegetation community polygons, including five different plant associations within the Haley Property. Vegetation community polygons are either a stand-alone plant association or mosaics of multiple plant associations. Table 3-1 lists the plant associations and/or cover types found on the Haley Property. Figures 3 and 4 illustrate the location of the vegetation community polygons. Note that these polygons may contain secondary or tertiary plant association inclusions that would be documented in the site profile for each polygon (Appendix C).

Table 3-1
Plant Associations of the Haley Property

Community Code	Scientific Name	Common Name	Reference	Status[1]	Amount[2]
ACMA-ALRU/POMU-TEGR	*Acer macrophyllum – Alnus rubra / Polystichum munitum – Tellima grandiflora*	Bigleaf maple – red alder / sword fern – fringecup	Chappell 2006	G2G3[3]S2	37%
ALRU-POTR/RUSP-SPDO/CAOB	*Alnus rubra – Populus tremuloides / Rubus spectabilis – Spiraea douglasii / Carex obnupta*	Red alder – quaking aspen / salmonberry – Douglas spiraea / slough sedge	None	None[4]	1%
ALRU/POMU	*Alnus rubra / Polystichum munitum*	Red alder / sword fern	Chappell 2006	G4S4	1%
PSME-ARME/VAOV	*Pseudotsuga menziesii – Arbutus menziesii / Vaccinium ovatum*	Douglas fir – Pacific madrone / evergreen huckleberry	Chappell 2006	G2S2	56%
RUSP-OPHO/LYAM	*Rubus spectabilis – Oplopanax horridus / Lysichiton americanus*	Salmonberry – devil's club / skunk cabbage	None	None[4]	1%

[1] Statuses of plant communities were received from Rex Crawford, Ecologist at WNHP; 2009
[2] Percentage of the total acreage of the park occupied by the plant association
[3] Two global values represents an intermediate status
[4] No status available because plant community designation is not described in guides

3.1 *Acer macrophyllum – Alnus rubra / Polystichum munitum – Tellima grandiflora* Forest

Distribution and Environment: This community is northwestern half of the Haley Property. This community has an intermediate global rank between 2 and 3 and has a state rank of 2.

Vegetation: The dominant tree in this community is bigleaf maple (*Acer macrophyllum*) with some western hemlock (*Tsuga heterophylla*) and western redcedar (*Thuja plicata*). Shrubs include red elderberry (*Sambucus racemosa*), salmonberry (*Rubus spectabilis*), evergreen huckleberry (*Vaccinium ovatum*), and cascara (*Rhamnus purshianus*). The herbaceous layer is dominated by sword fern (*Polystichum munitum*) with some cleavers (*Galium aparine*), western trillium (*Trillium ovatum*), and enchanter's nightshade (*Circaea alpina*).

Ecological Condition: On the Haley Property, this community type is represented by a young stand in good condition.

Notes: English holly (*Ilex aquifolium*) was observed in this community. This community also contains appropriate habitat for tall bugbane (*Cimicifuga elata*), which is discussed in Section 4.

Approximate Total Area: 66 acres

3.2 *Alnus rubra – Populus tremuloides* / *Rubus spectabilis – Spiraea douglasii* / *Carex obnupta* Forest

Distribution and Environment: This wetland community type was observed in two patches near the southern boundary of the Haley Property. This community did not match any of the descriptions in the plant association guides. Therefore, URS named this community based on the most common species observed.

Vegetation: The dominant trees in this community are red alder (*Alnus rubra*) and quaking aspen (*Populus tremuloides*). Shrubs include salmonberry and Douglas spiraea (*Spiraea douglasii*). Slough sedge (*Carex obnupta*) is the dominant herbaceous species.

Ecological Condition: On the Haley Property, this community type is represented by a very young stand in good condition.

Notes: This wetland type was observed in close proximity to recently clear-cut lands to the south. There are likely additional small patches of this community type within the *Pseudotsuga menziesii – Arbutus menziesii* / *Vaccinium ovatum* community. A formal delineation is needed to accurately map the boundaries of these wetlands.

Approximate Total Area: 1 acre

3.3 *Alnus rubra* / *Polystichum munitum* Forest

Distribution and Environment: This community type was observed in a patch on the eastern boundary of the Haley Property. This community has a global rank of 4 and a state rank of 4.

Vegetation: The dominant trees in this community are red alder and bigleaf maple, with some Douglas fir (*Pseudotsuga menziesii*). Western redcedar was observed in the understory along with evergreen huckleberry, red elderberry, dewberry (*Rubus ursinus*), and beaked hazelnut (*Corylus cornuta* var. *californica*). The herbaceous community is sparse but contains some sword fern and bracken fern (*Pteridium aquilinum*).

Ecological Condition: On the Haley Property, this community type is represented by a young stand in good condition.

Approximate Total Area: 2 acres

3.4 *Pseudotsuga menziesii – Arbutus menziesii / Vaccinium ovatum* Forest

Distribution and Environment: This community type is the most common community on the Haley Property. It was observed in two locations. Most of the community was observed in the southeast half of the property. However one additional patch is present hear the beach. This community has a global rank of 2 and has a state rank of 2.

Vegetation: Common trees in this community include Douglas fir, bigleaf maple, Pacific madrone (*Arbutus menziesii*), and western redcedar. Western hemlock, Pacific madrone, and western redcedar are present in the understory. Shrubs include evergreen huckleberry, red elderberry, dewberry, salal (*Gaultheria shallon*), and thimbleberry (*Rubus parviflorus*). The herbaceous community is sparse and includes sword fern, cleavers, and enchanter's nightshade.

Ecological Condition: On the Haley Property, this community type is represented by young to mature stands in good condition.

Notes: The community occurrence near the beach contains a large patch of English ivy (*Hedera helix*). This patch is near an old campsite. However, as a whole this community type is largely free of weed species. The few weed occurrences within the community are shown on Figure 5.

Approximate Total Area: 101 acres

3.5 *Rubus spectabilis – Oplopanax horridus / Lysichiton americanus* Wetland

Distribution and Environment: This wetland community is a linear riparian wetland located near the center of the Haley Property. This community did not match any of the descriptions in the plant association guides. Therefore, URS named this community based on the most common species observed.

Vegetation: The dominant woody species in this community are salmonberry and devils club (*Oplopanax horridus*). Herbaceous species include skunk cabbage (*Lysichiton americanus*), stinging nettle (*Urtica dioica*), and ladyfern (*Athyrium filix-femina*).

Ecological Condition: On the Haley Property, this community type is represented by a young stand in good condition.

Notes: The stream running through this wetland community drains to small estuary on the property.

Approximate Total Area: 2 acres

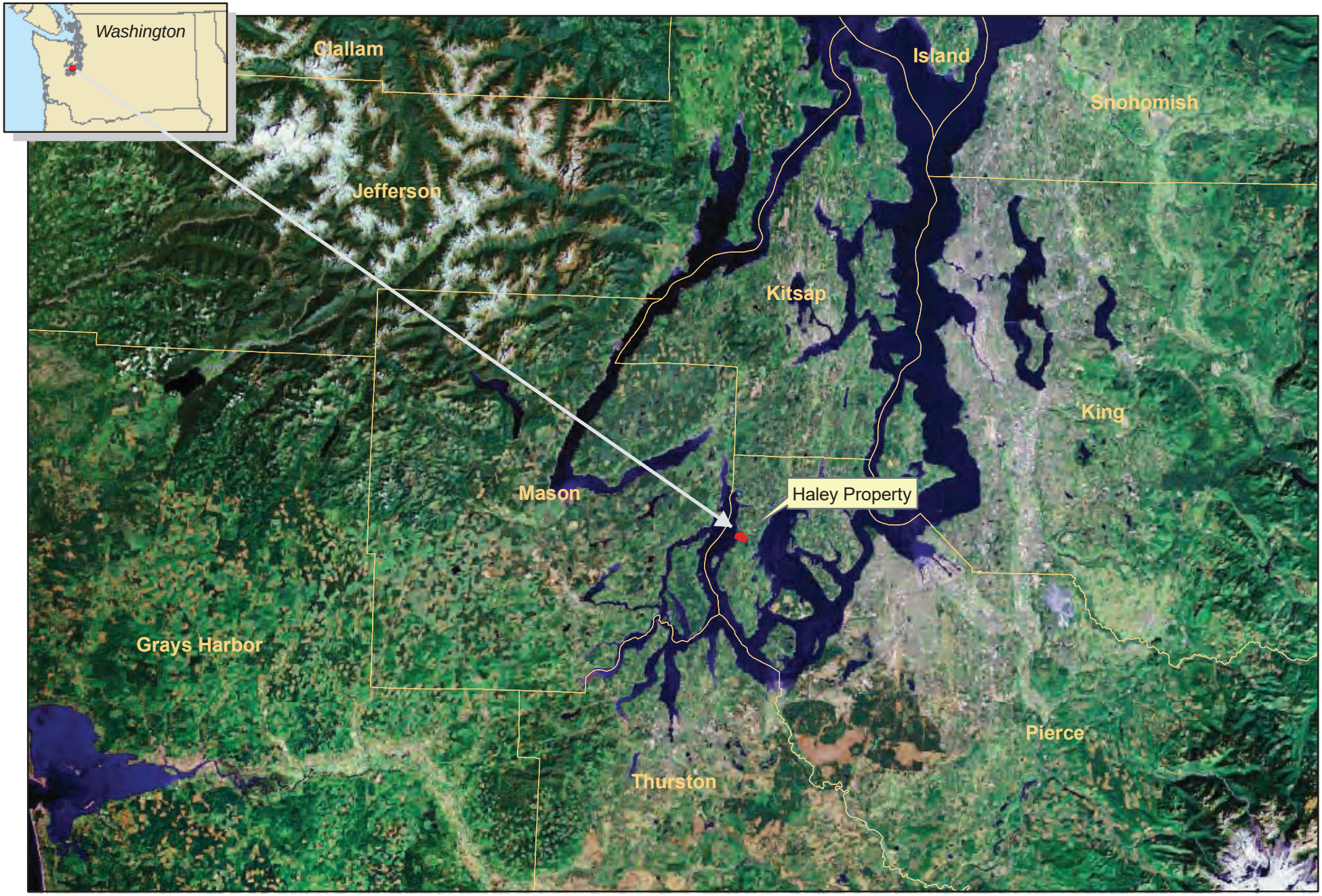

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Figure 1
Vicinity Map

URS

Park Boundary

County

Vegetation Surveys
Haley Property
Washington State Parks
and Recreation Commission

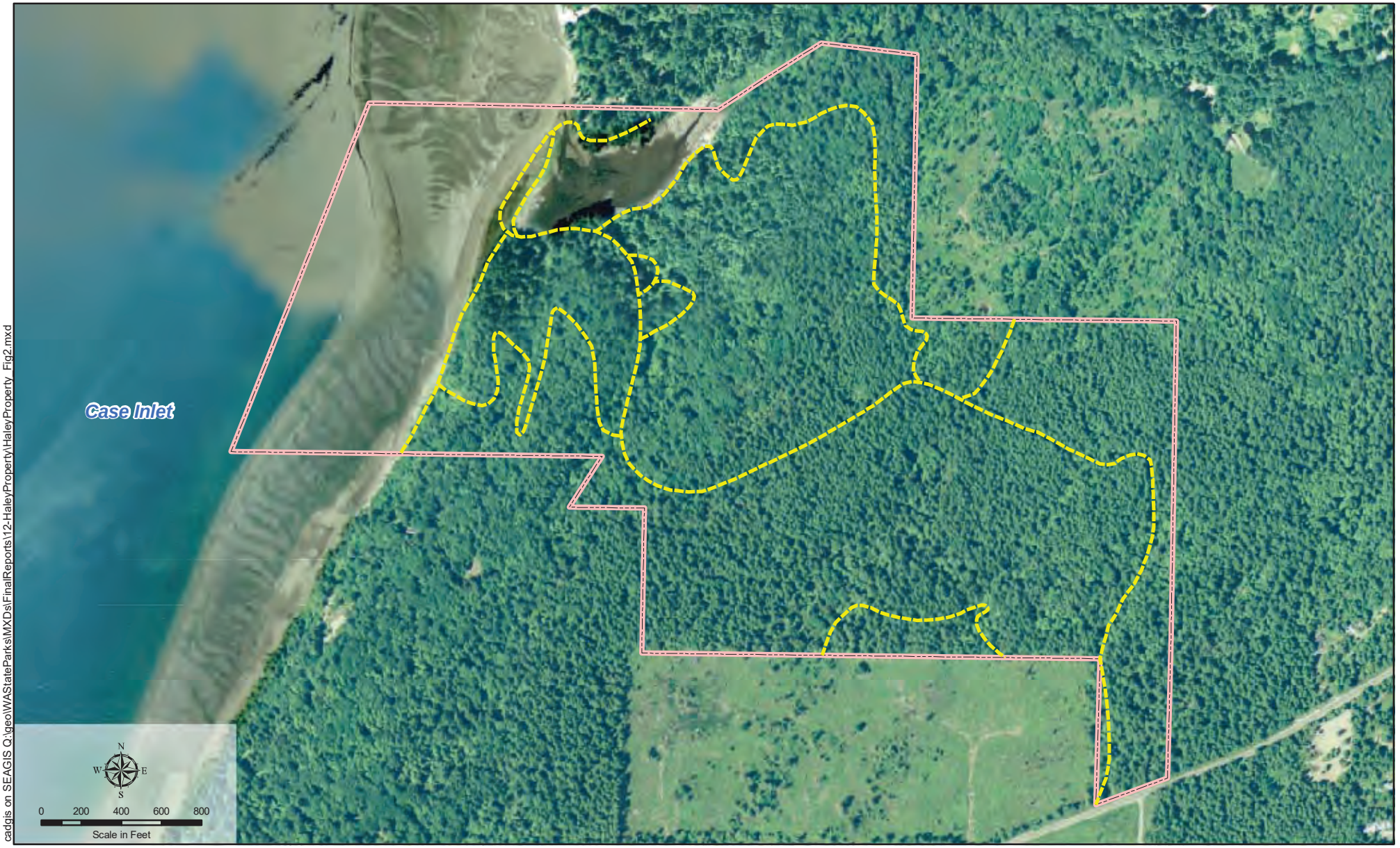

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Figure 2
Survey Routes

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Vegetation Surveys
Haley Property
Washington State Parks
and Recreation Commission

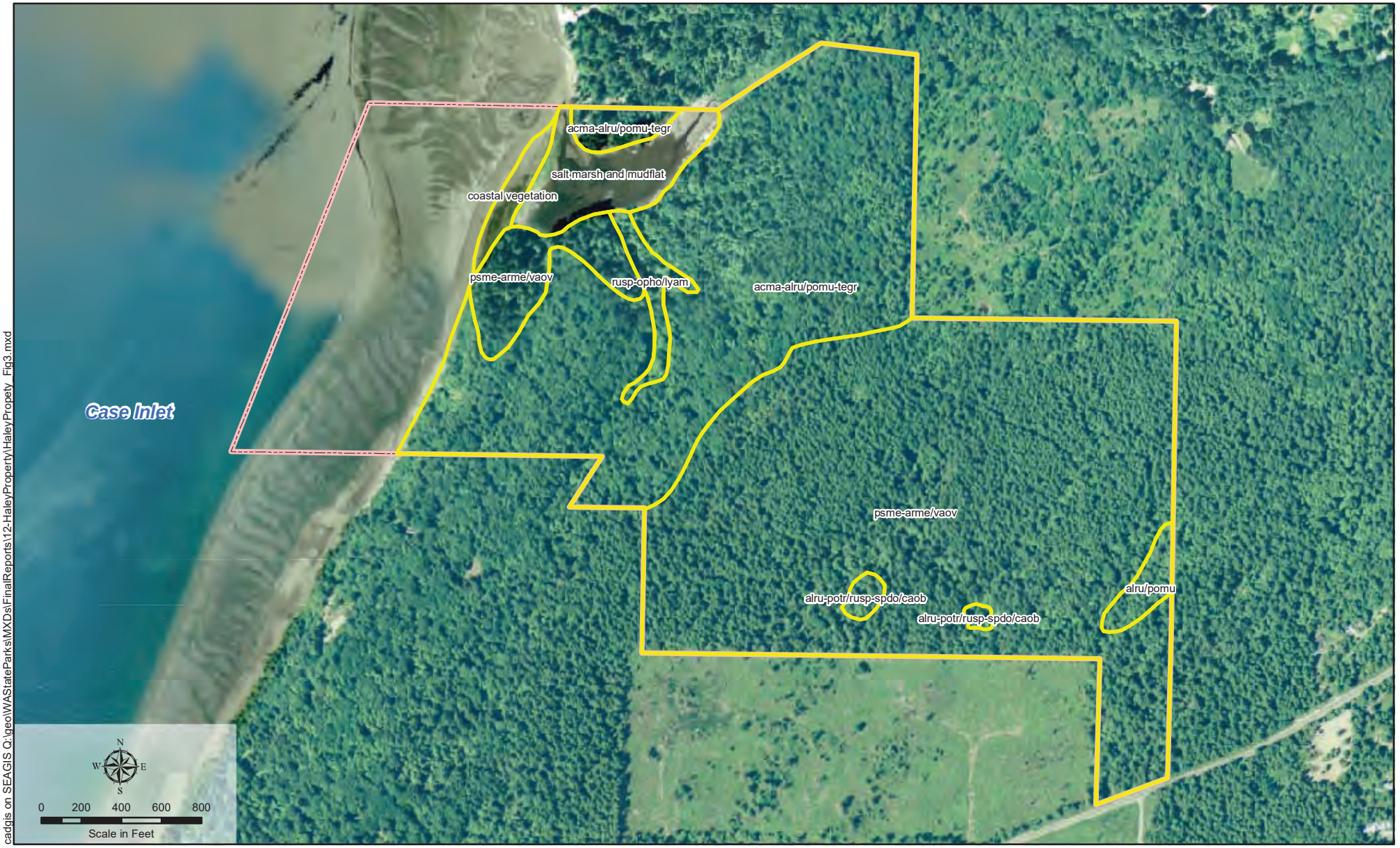

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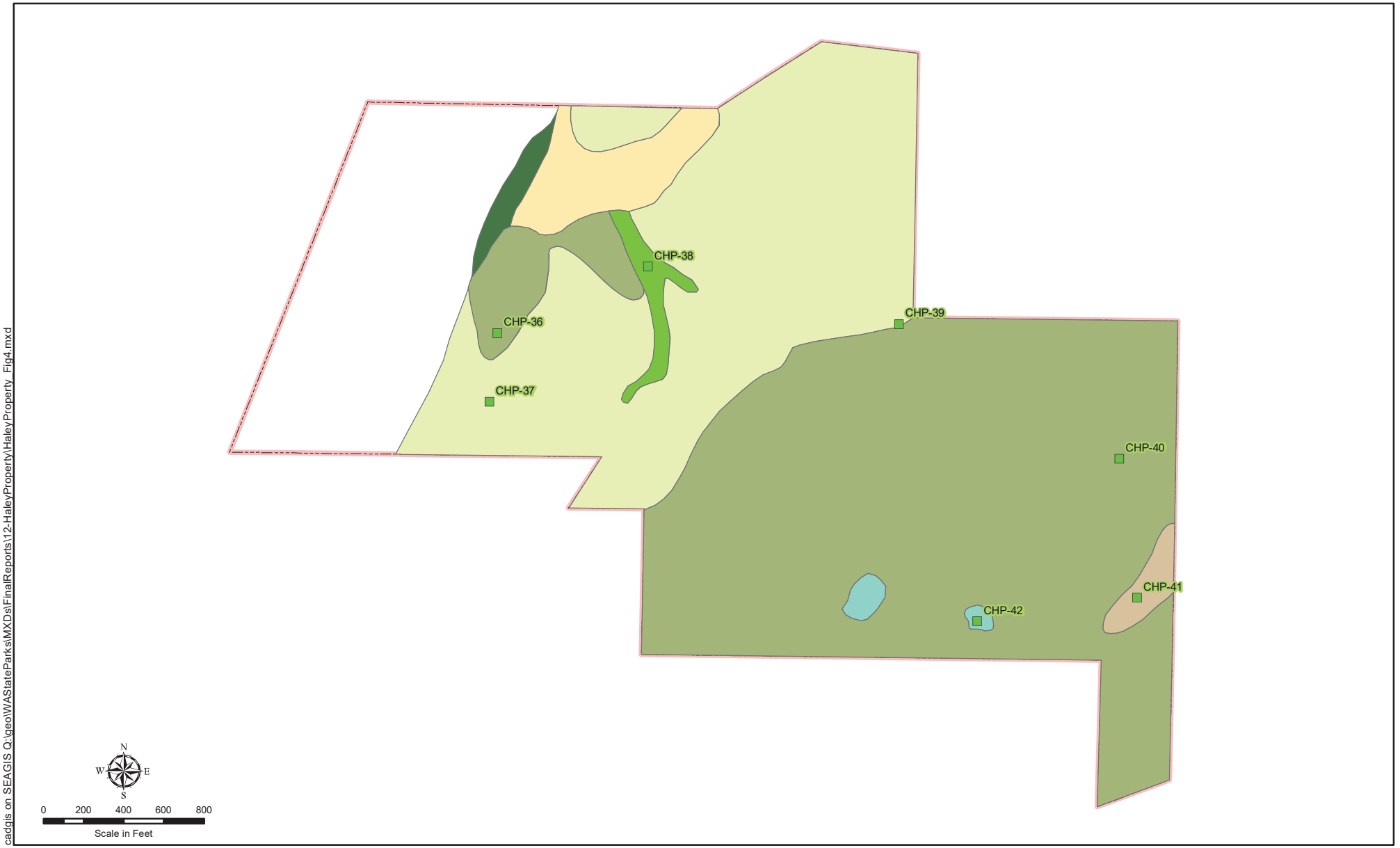
Figure 3
Plant Communities with Aerial Photo

URS

Plant Community Areas
Park Boundary

Vegetation Surveys
Haley Property
Washington State Parks
and Recreation Commission



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URS

Figure 4
Plant Communities

Vegetation Surveys
Haley Property
Washington State Parks
and Recreation Commission

Family	Species	Common Name	Hitchcock & Cronquist Synonym	N/I*	Status	CODE
Aceraceae	*Acer macrophyllum*	bigleaf maple		n		ACMA
Apiaceae	*Angelica* sp.	angelica		n		
Apiaceae	*Oenanthe sarmentosa*	Pacific water-parsley		n		OESA
Apiaceae	*Osmorhiza purpurea*	purple sweet-cicely		n		OSPU
Aquifoliaceae	*Ilex aquifolium*	English holly	(not in H&C)	i		ILAQ
Araceae	*Lysichiton americanus*	American skunk cabbage	*Lysichitum americanum*	n		LYAM
Araliaceae	*Hedera helix*	English ivy		i	Class C	HEHE
Araliaceae	*Oplopanax horridus*	devil's club	*O. horridum*	n		OPHO
Aristolochiaceae	*Asarum caudatum*	wild ginger		n		ASCA
Asteraceae	*Achillea millefolium*	common yarrow		n		ACMI
Asteraceae	*Adenocaulon bicolor*	pathfinder		n		ADBI
Asteraceae	*Ambrosia chamissonis*	silver bur ragweed	*A. c.* vars. *bipinnatisecta, chamissonis*	n		AMCH
Asteraceae	*Anaphalis margaritacea*	pearly everlasting		n		ANMA
Asteraceae	*Cirsium vulgare*	bull thistle		i	Class C	CIVU
Asteraceae	*Erechtites minima*	Australian burnweed		i		ERMI
Asteraceae	*Grindelia sp.*	gumweed		n		
Asteraceae	*Hieracium albiflorum*	white hawkweed		n		HIAL
Asteraceae	*Hypochaeris radicata*	hairy cat's-ear		i	Class B	HYRA
Asteraceae	*Jaumea carnosa*	fleshy jaumea		n		JACA
Asteraceae	*Lapsana communis*	common nipplewort		i		LACO
Asteraceae	*Mycelis muralis*	wall lettuce	*Lactuca muralis*	i		MYMU
Asteraceae	*Petasites frigidus* var. *palmatus*	sweet coltsfoot		n		PEFR
Asteraceae	*Senecio jacobaea*	tansy ragwort		i	Class B	SEJA
Asteraceae	*Sonchus oleraceus*	common sowthistle		i		SOOL
Asteraceae	*Taraxacum officinale*	common dandelion		i		TAOF
Berberidaceae	*Achlys triphylla*	vanilla leaf		n		ACTR
Berberidaceae	*Mahonia nervosa*	dull Oregon-grape	*Berberis nervosa*	n		MANE
Betulaceae	*Alnus rubra*	red alder		n		ALRU
Betulaceae	*Corylus cornuta* var. *californica*	beaked hazelnut		n		COCO
Blechnaceae	*Blechnum spicant*	deer fern		n		BLSP
Brassicaceae	*Cakile edentula*	American sea-rocket		i		CAED
Brassicaceae	*Cardamine sp.*	bittercress		?		
Brassicaceae	*Lepidium virginicum* var. *menziesii*	Virginia peppergrass		n		LEVI
Caprifoliaceae	*Linnaea borealis* var. *longiflora*	western twinflower		n		LIBO
Caprifoliaceae	*Lonicera ciliosa*	orange honeysuckle		n		LOCI
Caprifoliaceae	*Lonicera hispidula*	pink honeysuckle		n		LOHI
Caprifoliaceae	*Sambucus racemosa* var. *racemosa*	red elderberry		n		SARA
Caprifoliaceae	*Symphoricarpos albus*	common snowberry		n		SYAL
Caryophyllaceae	*Cerastium fontanum* ssp. *vulgare*	common mouse-ear chickweed	*C. vulgatum*	i		CEFO

*N/I = Native or Introduced

Caryophyllaceae	*Stellaria crispa*	crisped starwort		n		STCR
Caryophyllaceae	*Stellaria media*	common chickweed		i		STME
Chenopodiaceae	*Atriplex* sp.	atriplex		?		
Chenopodiaceae	*Salicornia virginica*	pickleweed		n		SAVI
Clusiaceae	*Hypericum calycinum*	Aaron's beard	(not in H&C)	i		HYCA
Crassulaceae	*Sedum acre*	mossy stonecrop		i		SEAC
Cupressaceae	*Thuja plicata*	western redcedar		n		THPL
Cyperaceae	*Carex hendersonii*	Henderson's sedge		n		CAHE
Cyperaceae	*Carex leptopoda*	slender-foot sedge	*C. deweyana* ssp. *leptopoda*	n		CALE
Cyperaceae	*Carex lyngbyei*	Lyngbye's sedge		n		CALY
Cyperaceae	*Carex obnupta*	slough sedge		n		CAOB
Dennstaedtiaceae	*Pteridium aquilinum* var. *pubescens*	bracken fern		n		PTAQ
Dryopteridaceae	*Athyrium filix-femina*	common ladyfern		n		ATFI
Dryopteridaceae	*Dryopteris expansa*	northern woodfern	*D. austriaca*	n		DREX
Dryopteridaceae	*Polystichum munitum*	western sword fern	*P. m.* var. *munitum*	n		POMU
Equisetaceae	*Equisetum arvense*	common horsetail		n		EQAR
Equisetaceae	*Equisetum telmateia var. braunii*	giant horsetail		n		EQTE
Ericaceae	*Arbutus menziesii*	Pacific madrone		n		ARME
Ericaceae	*Gaultheria shallon*	salal		n		GASH
Ericaceae	*Vaccinium ovatum*	evergreen huckleberry		n		VAOV
Ericaceae	*Vaccinium parviflorum*	red huckleberry		n		VAPA
Fabaceae	*Cytisus scoparius*	Scot's broom		i	Class B	CYSC
Fabaceae	*Lathyrus japonicus* var. *maritimus*	beach pea		n		LAJA
Fabaceae	*Vicia hirsuta*	hairy vetch		i		VIHI
Fabaceae	*Vicia nigricans* var. *gigantea*	giant vetch	*V. gigantea*	n		VINI
Geraniaceae	*Geranium robertianium*	Robert's geranium		i	Class B	GERO
Grossulariaceae	*Ribes bracteosum*	stink currant		n		RIBR
Hydrophyllaceae	*Nemophila parviflora*	small-flowered nemophila		n		NEPA
Juncaceae	*Juncus balticus* var. *vallicola*	Baltic rush		n		JUBA
Juncaceae	*Luzula parviflora*	small-flowered woodrush		n		LUPA
Juncaginaceae	*Triglochin maritima*	seaside arrowgrass	*T. maritimum*	n		TRMA
Lamiaceae	*Prunella vulgaris* ssp. *laneolata*	self-heal		n		PRVU
Liliaceae	*Maianthemum dilatatum*	false lily-of-the-valley		n		MADI
Liliaceae	*Maianthemum racemosum* ssp. *amplexicau*	feathery false lily of the valley	*Smilacina racemosa*	n		MARA
Liliaceae	*Prostartes hookeri* var. *oregana*	Hooker's fairy bells	*Disporum h.*	n		PRHO
Liliaceae	*Streptopus amplexifolius*	clasping twisted-stalk		n		STAM
Liliaceae	*Trillium ovatum* ssp. *ovatum*	Pacific trillium		n		TROV
Oleaceae	*Fraxinus latifolia*	Oregon ash		n		FRLA
Onagraceae	*Chamerion angustifolium*	fireweed	*Epilobium a.*	n		CHAN
Onagraceae	*Circaea alpina* ssp. *pacifica*	enchanter's nightshade		n		CIAL

*N/I = Native or Introduced

Onagraceae	*Epilobium ciliatum*	Watson's willowherb		n		EPCI
Orchidaceae	*Corallorhiza maculata*	spotted coralroot		n		COMA
Pinaceae	*Pseudotsuga menziesii*	Douglas-fir		n		PSME
Pinaceae	*Tsuga heterophylla*	western hemlock		n		TSHE
Plantaginaceae	*Plantago maritima*	seaside plantain		n		PLMA
Poaceae	*Aira praecox*	little hairgrass		i		AIPR
Poaceae	*Anthoxanthum odoratum*	sweet vernalgrass		i		ANOD
Poaceae	*Bromus carinatus*	California brome	*B. c.* var. *carinatus*	n		BRCA
Poaceae	*Bromus hordeaceus* ssp. *hordeaceus*	soft brome	*B. mollis*	i		BRHO
Poaceae	*Bromus tectorum*	cheat grass		i		BRTE
Poaceae	*Distichlis spicata*	saltgrass	includes *D. stricta*	n		DISP
Poaceae	*Holcus lanatus*	common velvetgrass		i		HOLA
Poaceae	*Hordeum brachyantherum* ssp. *brachyanth*	foxtail barley		n		HOBR
Poaceae	*Leymus mollis ssp. mollis*	American dunegrass	*Elymus m.*	n		LEMO
Poaceae	*Poa sp.*	bluegrass		?		
Poaceae	*Trisetum cernuum*	nodding trisetum		n		TRCE
Poaceae	*Vulpia myuros*	rattail fescue	*Festuca m.*	i		VUMY
Polygonaceae	*Rumex crispus*	curly dock		i		RUCR
Polypodiaceae	*Polypodium glycyrrhiza*	licorice fern		n		POGL
Portulacaceae	*Claytonia sibirica*	Siberian springbeauty	*Montia sibirica*	n		CLSI
Pteridaceae	*Adiantum aleuticum*	western maidenhair	*A. pedatum*	n		ADAL
Ranunculaceae	*Actaea rubra* ssp. *arguta*	red baneberry		n		ACRU
Ranunculaceae	*Ranunculus repens*	creeping buttercup	*R. r.* vars *pleniflorus, repens*	i		RARE
Ranunculaceae	*Ranunculus uncinatus*	little buttercup		n		RAUN
Rhamnaceae	*Ceanothus velutinus*	snowbush ceanothus		n		CEVE
Rhamnaceae	*Rhamnus purshiana*	cascara		n		RHPU
Rosaceae	*Ageratina anserina*	common silverweed	*Potentilla anserina* ssp. *pacifica*	n		AGAN
Rosaceae	*Geum macrophyllum*	large-leaved avens		n		GEMA
Rosaceae	*Holodiscus discolor*	oceanspray		n		HODI
Rosaceae	*Malus fusca*	western crabapple	*Pyrus f.*	n		MAFU
Rosaceae	*Oemleria cerasiformis*	osoberry		n		OECE
Rosaceae	*Rosa gymnocarpa*	wood rose		n		ROGY
Rosaceae	*Rosa nutkana*	Nootka rose		n		RONU
Rosaceae	*Rubus armeniacus*	Himalayan blackberry	*R. discolor*	i	Class C	RUAR
Rosaceae	*Rubus laciniatus*	evergreen blackberry		i	Class C	RULA
Rosaceae	*Rubus parviflorus* var. *parviflorus*	thimbleberry		n		RUPA
Rosaceae	*Rubus spectabilis* var. *spectabilis*	salmonberry		n		RUSP
Rosaceae	*Rubus ursinus* ssp. *macropetalus*	dewberry		n		RUUR
Rosaceae	*Spiraea douglasii*	hardhack		n		SPDO
Rubiaceae	*Galium aparine*	common bedstraw		n		GAAP

*N/I = Native or Introduced

Salicaceae	*Populus tremuloides*	quaking aspen		n		POTR
Salicaceae	*Salix lucida* ssp. *lasiandra*	Pacific willow	*S. lasiandra* var. *lasiandra*	n		SALU
Salicaceae	*Salix sp.*	willow		n		
Saxifragaceae	*Mitella caulescens*	leafy mitrewort		n		MICA
Saxifragaceae	*Tiarella trifoliata* var. *trifoliata*	three-leaf foamflower		n		TITR
Saxifragaceae	*Tiarella trifoliata* var. *trifoliata*	three-leaf foamflower		n		TITR
Saxifragaceae	*Tolmiea menziesii*	youth-on-age		n		TOME
Scrophulariaceae	*Veronica officinalis* var. *officinalis*	Paul's betony		i		VEOF
Scrophulariaceae	*Veronica serpyllifolia* var. *sepyllifolia*	thyme-leaved speedwell		i		VESE
Urticaceae	*Urtica dioica*	stinging nettle		n		URDI

*N/I = Native or Introduced

TRIP REPORT
Haley State Park

PUGET SOUND AND ISLANDS

TRIP REPORT BY:

tages-emily

HIKED: May 19, 2019

TYPE OF HIKE: Day hike

TRAIL CONDITIONS: Obstacles on trail:
Trees down across trail,
Muddy or wet trail,
Overgrown in places.

ROAD: Road suitable for all vehicles

BUGS: Bugs were not too bad

SNOW: Snow free


PACK IT IN-
PACK IT OUT
PLEASE!
CARRY OUT
ALL TRASH

This state park is unmarked with no visible signs from the road. We parked in the Jackson Lake parking lot and walked across Jackson Lake Road NW to enter into an unmarked trail with bushes on either side. The trail that we chose to follow round trip was about 3 miles and this led to the beach. The trail was through shady forests and the beach had no shade. We saw a snake on the trail, mushrooms, slugs and spiders. It was not a loop, we followed the same trail in and out. There were definitely other trails that we could have followed but have not tried those. There are a few Washington State Park trail signs farther in on the trail that say no camping, no fires, pack in and pack out. The trails were obviously not regularly maintained. The beach had many living and dead sand dollars. Also a view of the private water front properties farther down the beach.

3

Appendix F:
Quilcene Bay Tidelands – Additional Information

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Also in this section

Places to go

Wildlife areas (/places-to-go/wildlife-areas)

Water access areas (/places-to-go/water-access-sites)

Weekender report (/places-to-go/weekender)

Clam, mussel, and oyster beaches

QUILCENE BAY WDFW TIDELANDS

Clams, oysters and mussels open year-round

No restrictions on hours of harvest

The minimum size limit for clams on this beach is 1 1/2 inches

Department of Health beach status: Open (http://www.doh.wa.gov/CommunityandEnvironment/Shellfish/Growinc

Health status can change daily. Check on day of harvest.

Water Quality Comment: Water quality and shoreline conditions meet public health standards for recreational shellfish harvesting.

Updated: Mon, 10 Feb 2020 03:00:47 PDT

> **The minimum size limit for clams on this beach has been increased from 1 1/4 inches to 1 1/2 inches**

Harvest profile

This beach has a large population of Manila clams. There are also some native littleneck clams and eastern softshell clams on this beach, but they are not as abundant as the Manila clams.

(/places-to-go/shellfish-beaches)

Public fishing piers (/places-to-go/fishing-piers)

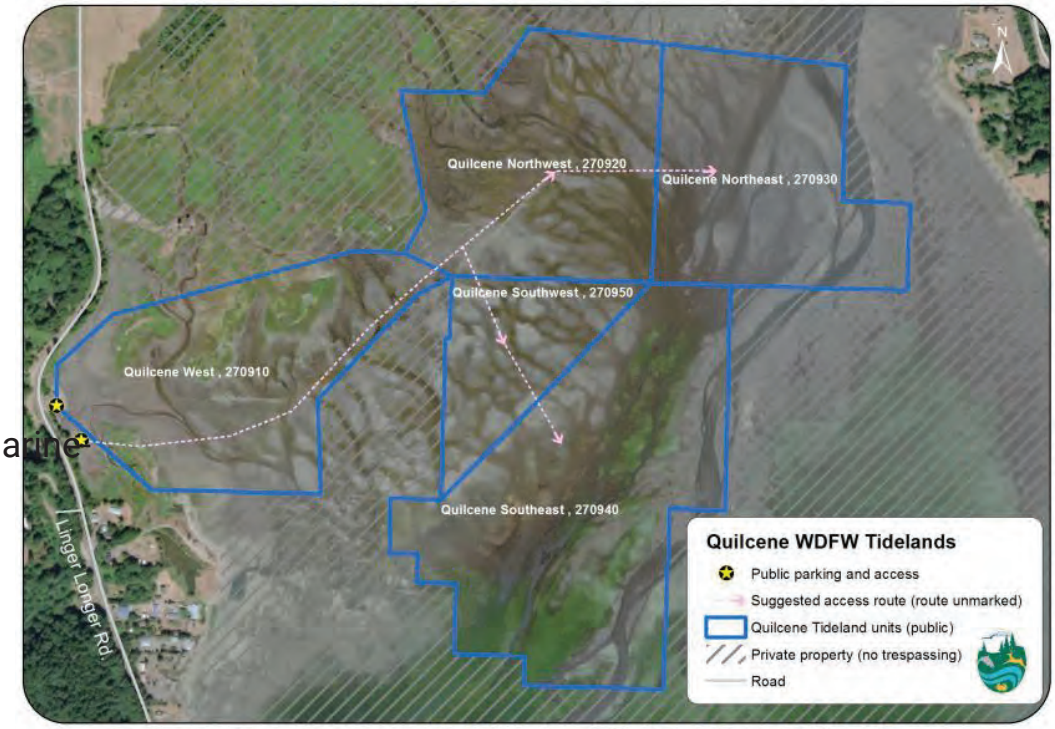
Marine areas (/fishing/locations/marine-areas)

License dealers (/licenses/dealers)

Lowland lakes (/fishing/locations/lowland-lakes)

High lakes (/fishing/locations/high-lakes)

Beach map



(https://wdfw.wa.gov/sites/default/files/2019-05/quilcene__access.jpg)

Disclaimer: Map areas identify approximate public property boundaries and should not be considered legal property boundaries. Many of these public beaches have no upland entrance and must be accessed by boat. Please respect adjacent private property. This map is provided for informational purposes only. The accuracy of this map is not guaranteed.

Directions

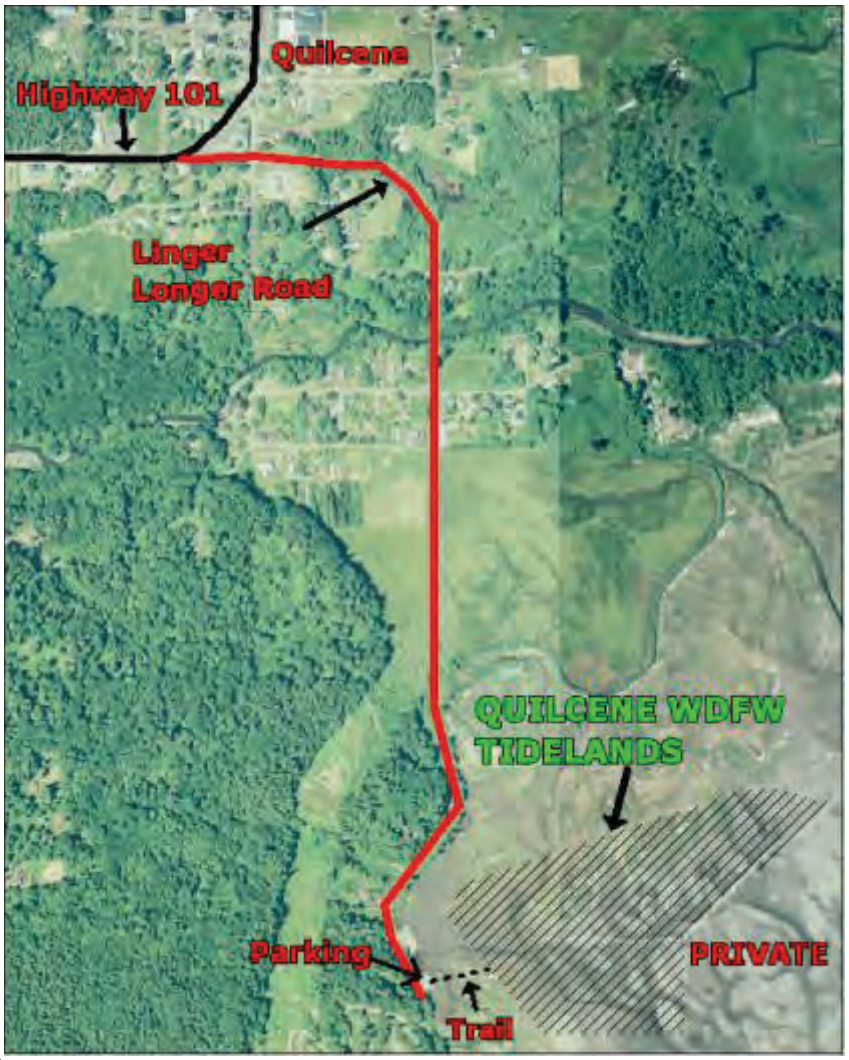
From the south, follow Highway 101 to Quilcene and turn right at the Whistling Oyster Tavern onto Linger Longer Road. Follow Linger Longer Rd. about one mile to the WDFW parking area on the left.

From the north, follow either Highway 101 or Center Road to Quilcene and turn left at the Whistling Oyster Tavern onto Linger Longer Road; follow about one mile to the WDFW parking area.

Facilities

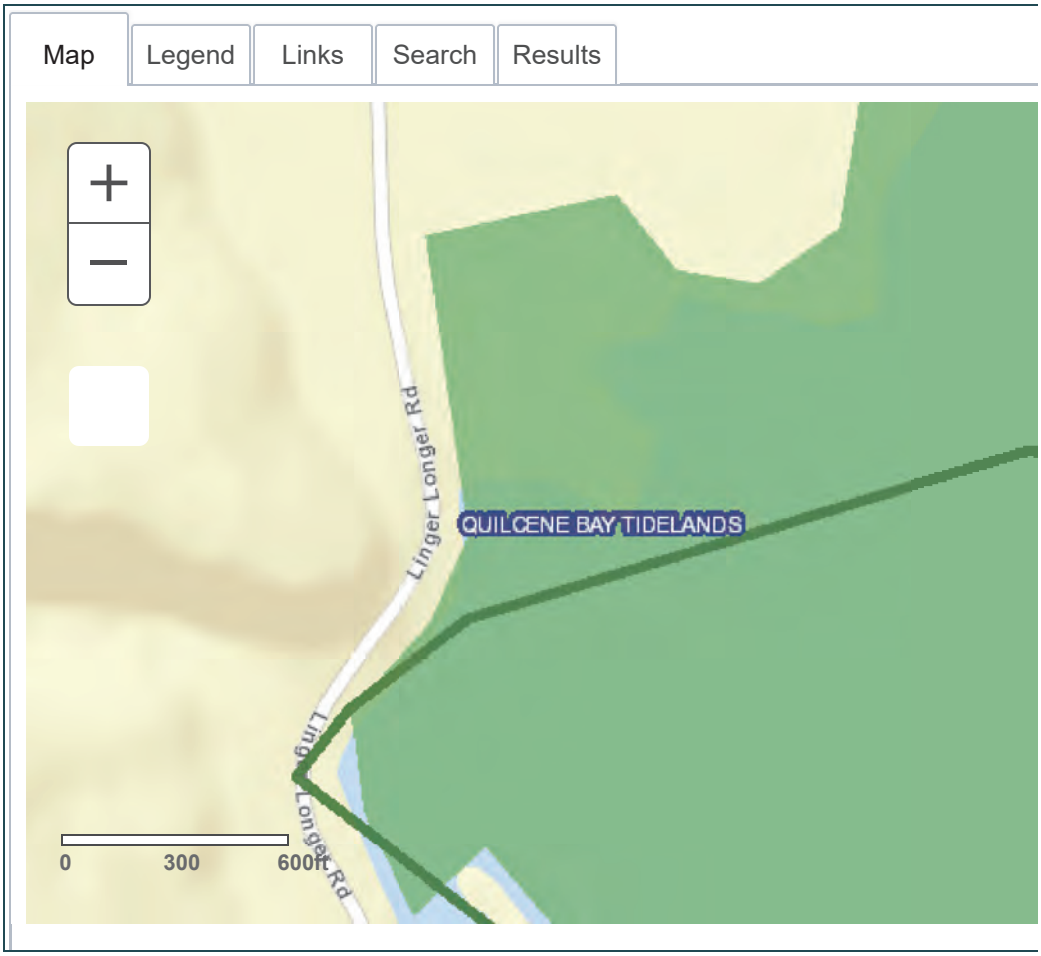
There are two connected parking lots for the Quilcene Bay Tidelands, both accessed from Linger Longer Road. Due to issues with a sinkhole, the southern parking lot has been blocked off to car access. **Harvesters are strongly encouraged to access the tidelands using the trail that leads east down the slope from the southern parking lot. Sticky mud below the slope of the northern lot can be very treacherous.** From the northern lot, walk south past the boulders blocking the connector road between the

two parking lots and down the gravel embankment. Follow the hard packed path out to the tidelands; don't stray outside the marked path or you'll end up in soft mud.



A vault toilet is located at the northernmost of the two small parking lots. There are no trash receptacles at this site. Please pack out your garbage. From the southernmost of the two parking lots, walk down the embankment and follow the marked path out to the tidelands; don't stray outside the marked path or you'll end up in soft mud. Private tideland boundaries adjacent to the WDFW tidelands are marked with white fiberglass posts.

Washington State Department of Health **Shellfish Safety Information**



About

Top tasks

Log in to the WILD licensing website (https://fishhunt.dfw.wa.gov/#/login)

Get razor clam information (/fishing/shellfishing-regulations/razor-clams)

Event Calendar (/get-involved/calendar)

Report a violation (/about/enforcement/report)

Submit a photo (/share)

WDFW

(/about)

Regional offices (/about/regional-offices)

Fish and Wildlife Commission (/about/commission)

Enforcement (/about/enforcement)

Public Records Requests (/about/administration/public-

Stay connected

WDFW

@thewdfw

WDFW Police

@WDFW

TheWDFW

WDFW Blog

Appendix G:
Keyport OU 1 Plant Species List

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Family	Scientific name	Common name	Synonym	Native/ Introduced	Noxious Weed Status
TREES					
Betulaceae	*Alnus rubra*	red alder		n	
Pinaceae	*Picea sitchensis*	Sitka spruce		n	
Pinaceae	*Pseudotsuga menziesii* var. *menziesii*	Douglas-fir		n	
Rhamnaceae	*Frangula purshiana* var. *purshiana*	cascara	*Rhamnus p.*	n	
Rosaceae	*Prunus* sp.	cherry		i	
Rosaceae	*Sorbus aucuparia*	European mountain-ash		i	Monitor
Salicaceae	*Populus* sp.	hybrid poplar		i	
Salicaceae	*Salix lasiandra* var. *lasiandra*	Pacific willow		n	
Salicaceae	*Salix scouleriana*	Scouler's willow		n	
Sapindaceae	*Acer macrophyllum*	big-leaf maple		n	
SHRUBS					
Adoxaceae	*Sambucus racemosa* var. *arborsecens*	red elderberry		n	
Aquifoliaceae	*Ilex aquifolium*	English holly		i	Monitor
Araliaceae	*Hedera helix*	English ivy		i	Class C
Berberidaceae	*Mahonia aquifolium*	tall Oregon-grape	*Berberis a.*	n	
Betulaceae	*Corylus cornuta* ssp. *californica*	beaked hazelnut		n	
Caprifoliaceae	*Lonicera* sp.	honeysuckle		n	
Fabaceae	*Cytisus scoparius*	Scot's broom		i	Class B
Rosaceae	*Crataegus monogyna* var. *monogyna*	English hawthorn		i	Class C
Rosaceae	*Oemleria cerasiformis*	osoberry		n	
Rosaceae	*Rosa nutkana* ssp. *nutkana*	Nootka rose		n	
Rosaceae	*Rubus bifrons*	Himalayan blackberry	*R. discolor, R. armeniacus*	i	Class C
Rosaceae	*Rubus laciniatus*	cut-leaf blackberry		i	Class C
Rosaceae	*Rubus parviflorus*	thimbleberry		n	
Rosaceae	*Rubus spectabilis*	salmonberry		n	
Rosaceae	*Rubus ursinus*	trailing blackberry/dewberry		n	
HERBS					
Amaranthaceae	*Atriplex* sp.	orache			
Amaranthaceae	*Sarcocornia perennis*	pickleweed	*Salicornia p.*	n	
Apiaceae	*Daucus carota*	Queen Anne's-Lace		i	Class C
Apiaceae	*Heracleum maximum*	cow parsnip	*H. lanatum*	n	
Apiaceae	*Oenanthe sarmentosa*	water-parsley		n	
Asparagaceae	*Maianthemum dilatatum*	false lily-of-the-valley		n	
Asteraceae	*Achillea millefolium*	common yarrow		n	
Asteraceae	*Cirsium arvense*	Canadian thistle		i	Class C
Asteraceae	*Cirsium vulgare*	bull thistle		i	Class C
Asteraceae	*Crepis capillaris*	smooth hawksbeard		i	

Family	Scientific name	Common name	Synonym	Native/ Introduced	Noxious Weed Status
Asteraceae	*Grindelia integrifolia*	Puget Sound gumweed		n	
Asteraceae	*Hypochaeris radicata*	hairy cat's-ear		i	Class C
Asteraceae	*Jacobaea vulgaris (=Senecio jacobaea)*	tansy ragwort		i	Class B
Asteraceae	*Leontodon saxatilis* ssp. *saxatilis*	lesser hawkbit	*L. nudicaulis*	i	
Asteraceae	*Leucanthemum vulgare*	ox-eye daisy	*Chrysanthemum l.*	i	Class C
Asteraceae	*Mycelis muralis*	wall lettuce		i	Monitor
Asteraceae	*Sonchus arvensis* ssp. *arvensis*	perennial sow-thistle		i	Class C
Asteraceae	*Symphyotrichum subspicatum*	Douglas's aster	*Aster s.*	n	
Asteraceae	*Tanacetum vulgare*	common tansy		i	Class C
Asteraceae	*Taraxacum officinale*	common dandelion		i	
Caryophyllaceae	*Cerastium fontanum* ssp. *vulgare*	common chickweed	*C. vulgatum*	i	
Caryophyllaceae	*Spergularia* sp.	sandspurry		n	
Convolvulaceae	*Calystegia sepium*	hedge bindweed		i	
Convolvulaceae	*Convolvulus arvensis*	field bindweed		i	Class C
Convolvulaceae	*Cuscuta pacifica* var. *pacifica*	salt mash dodder	*C. salina*	n	
Fabaceae	*Lathyrus latifolius*	everlasting peavine		i	Monitor
Fabaceae	*Lotus corniculatus*	bird's-foot-trefoil		i	
Fabaceae	*Trifolium pratense*	red clover		i	
Fabaceae	*Trifolium repens*	white clover		i	
Hypericaceae	*Hypericum perforatum* ssp. *perforatum*	common st. john's-wort		i	Class C
Juncaginaceae	*Triglochin maritima*	seaside arrow-grass		n	
Lamiaceae	*Prunella vulgaris* var. *lanceolata*	selfheal		n	
Lamiaceae	*Stachys* sp.	hedge nettle		n	
Onagraceae	*Epilobium ciliatum*	fringed willowherb		n	
Papaveraceae	*Dicentra formosa* ssp. *formosa*	Pacific bleeding heart		n	
Plantaginaceae	*Plantago lanceolata*	English plantain		i	
Plantaginaceae	*Plantago major*	common plantain		i	
Plantaginaceae	*Plantago maritima*	seaside plantain		n	
Plantaginaceae	*Veronica americana*	American speedwell		n	
Polygonaceae	*Persicaria maculosa*	spotted lady's-thumb		i	
Polygonaceae	*Rumex acetosella*	sheep sorrel		i	
Polygonaceae	*Rumex crispus*	curly dock		i	
Polygonaceae	*Rumex obtusifolius*	bitter dock		i	
Polygonaceae	*Rumex occidentalis* var. *occidentalis*	western dock		n	
Ranunculaceae	*Ranunculus repens*	creeping buttercup		i	
Rosaceae	*Geum macrophyllum*	large-leaf avens		n	
Rosaceae	*Potentilla anserina* ssp. *pacifica*	Pacific silverweed		n	
Rubiaceae	*Galium trifidum*	small bedstraw		n	

Family	Scientific name	Common name	Synonym	Native/ Introduced	Noxious Weed Status
Solanaceae	*Solanum dulcamara*	bittersweet nightshade		i	
Typhaceae	*Typha latifolia*	common cattail		n	
Urticaceae	*Urtica dioica*	common nettle		n	
GRASSES, SEDGES, RUSHES					
Cyperaceae	*Bolboschoenus maritimus* ssp. *paludosus*	maritime bulrush	*Scirpus m.*	n	
Cyperaceae	*Carex lyngbyei*	Lyngbye's sedge		n	
Cyperaceae	*Carex obnupta*	slough sedge		n	
Cyperaceae	*Schoenoplectus acutus*	hardstem bulrush	*Scirpus a.*	n	
Juncaceae	*Juncus balticus* ssp. *ater*	Baltic rush		n	
Juncaceae	*Juncus effusus*	common rush		n	
Poaceae	*Agrostis* sp.	bentgrass		?	
Poaceae	*Dactylis glomerata*	orchardgrass		i	
Poaceae	*Distichlis spicata*	saltgrass		n	
Poaceae	*Elymus repens*	quackgrass	*Agropyron r.*	i	
Poaceae	*Holcus lanatus*	velvetgrass		i	
Poaceae	*Phalaris arundinacea*	reed canarygrass		i	Class C
Poaceae	*Schedonorus arundinaceus*	tall fescue	*Festuca arundinacea*	i	
FERNS, HORSETAIL					
Athyriaceae	*Athyrium filix-femina* ssp. *cyclosorum*	western lady fern		n	
Dennstaedtiaceae	*Pteridium aquilinum* ssp. *pubescens*	western brackenfern		n	
Dryopteridaceae	*Polystichum munitum*	sword fern		n	
Equisetaceae	*Equisetum telmateia* ssp. *braunii*	giant horsetail		n	

Appendix H:
Example Biological Survey Field Form

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BIOLOGICAL SURVEY FORM

Project Name: Keyport OU 1 HHRA/ERA

Field Crew Initials:

Date:

Time:

Exposure Area/Reference Area :

[one per form]

Species	Species Name (common/scientific)	Organism Part	Specific Organsim Part Observed	Species Relative Abundance Across Exposure Area/ Reference Area [low=1-2, med=3-5, high=6-10]	Species Percent Cover Across Exposure Area/Reference Area	Comments, Including Health	Spatial Data Collected	Photos
Plant A	xxxx	shoots	[checkmark]	[low, med, high]	[percent]	[visible/significant herbivory, insect damage, disease, fungal infection, stress (e.g. discolored leaves)]	[yes/no and identifier]	[photo identifier]
		seeds						
		root						
Plant B	xxxx	berry						
Plant C	xxxx	leaves						
		nut						
Plant D	xxxx	stalk						
Animal E	xxxx	whole organism						
Animal F	xxxx	whole organism						

Appendix I:
Field Work Standard Operating Procedures

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STANDARD OPERATING PROCEDURES

STANDARD OPERATING PROCEDURE SOP-1

Recording Plant Locations

Scope and Applicability

This standard operating procedure (SOP) describes procedures used for recording plant and animal survey locations across the Naval Base Kitsap (NBK) Keyport Operable Unit 1 (OU1) Site and Reference Areas (hereafter the "Site"). Accurate station positioning is required to help ensure quality and consistency in collecting samples and in data interpretation and analysis. Station positioning must be both absolutely accurate in that it correctly defines a position by latitude and longitude, and relatively accurate in that the position must be repeatable. The methods described in this SOP should be usable for any hand-held global positioning system (GPS) unit; however, the owner's manual for any GPS unit used should be consulted and used to support this SOP.

Equipment and Materials

The following is a list of equipment and materials needed by the field sampling team:

- Hand-held GPS unit (e.g., Trimble GeoXH) or dGPS antenna paired with device such as an iPhone, iPad or field tablet.
- Spare batteries, mobile charger
- Charging unit.

A GPS hardware system, such as a Trimble GeoXH GPS (or equivalent device), should be used for recording reconnaissance locations and re-visiting these locations as needed. The standard projection method to be used during field activities is the horizontal datum of the North American Datum of 1983 (NAD83).

Positioning System Verification

GPS requires no calibration because all signal propagation is controlled by the U.S. government (the Department of Defense for satellite signals, and the U.S. Coast Guard and U.S. Forest Service for differential corrections). Verification of the accuracy of the GPS requires that coordinates be known for one (or more) horizontal control points within the study area. The GPS position reading at any given station can then be compared to the known control point. If possible, GPS accuracy should be verified at the beginning and at the end of each sampling day. and a point be taken at each location. This will be used during post-processing of data to confirm the accuracy of spatial data.

Station Location Procedures

Applicable geographic information systems (GIS) data layers (e.g., aerial photographs, topography, road) will be uploaded into the hand-held GPS unit(s) prior to the survey effort. A position will be recorded electronically at each location where plant and animal locations

are collected. Ancillary information will be recorded in the field logbook, and may include the personnel operating the GPS system, water depth of sample, and the time samples were collected.

A brief summary of procedures to record a specific survey location using a hand-held GPS unit are as follows:

- Turn on the unit, start up the GPS program(s), enable the GPS.
- Wait for it to acquire satellite lock.
- If recording a solitary point location, position the antenna over the sampling location and hold it steady and make sure not to block the satellites. Start recording the GPS location. If the data collection form is on the GPS unit save the geometry after it acquires the recommended number of satellite observations and edit the form filling out the required attributes, or save the location and edit the attribute information later. (site coordinates may also be noted on field forms or in the field logbook. Note that these coordinates may change slightly after the GPS data is postprocessed.
- Charge unit and batteries when not in use.

Upon completion of the survey effort, all data points will be downloaded from the GPS unit and displayed on a GIS map. Any survey locations outside of the originally defined survey areas will be mapped and described with supporting documentation in the field survey report.

STANDARD OPERATING PROCEDURE SOP-2

Field Documentation

Scope and Applicability

This standard operating procedure (SOP) presents the general information that will be documented for all plant and animal survey activities conducted by AECOM field personnel. Proper record keeping will be implemented in the field to ensure transparency and reproducibility of methods and procedures. Several types of field documents will be used for this purpose by field personnel.

Equipment and Materials

Equipment and materials used for this SOP are:

- Field logbook
- Field forms
- Black-ink pen
- Digital camera

Field Logbooks

During field survey events, field logbooks and field forms are used to record all daily field activities. The purpose of the field logbook is to thoroughly document the survey event to ensure transparency and reproducibility. The field logbook will contain survey-related information supplemental to the field forms. Any deviations from this BSWP that occur during survey (e.g., personnel, responsibilities, planned survey locations) and the reasons for these changes will be documented in the field logbook. Other types of information that may be included in the field logbook include the following:

- Project study name
- Name of person making entries and other field staff
- Onsite visitors, if any
- Observations made during survey and other details not entered onto the field form
- A record of site health and safety meetings, updates, and related monitoring

The field supervisor will maintain the field logbook and is responsible for ensuring that the field logbook and all field data forms are correct. Requirements for logbook entries will include the following:

- Entries will be made legibly with black (or dark) waterproof ink.

- Unbiased, accurate language will be used.
- Entries will be made while activities are in progress or as soon afterward as possible (the date and time that the notation is made should be documented, as well as the time of the observation itself).
- Each consecutive day's first entry will be made on a new, blank page.
- The field supervisor must sign and date the last page of each daily entry in the field logbook.
- When field activity is complete, the logbook will be entered into the NBK Keyport OU1 project file.

All logbook entries must be completed at the time any observations are made. Logbook corrections will be made by drawing a single line through the original entry, allowing the original entry to be read. The corrected entry will be written alongside the original. Corrections will be initialed and dated and may require a footnote for explanation.

Upon completion of the field reconnaissance event, the field supervisor will be responsible for submitting all field logbooks to be copied. A discussion of copy distribution is provided below.

Field Forms

Field data forms will be used to record the relevant reconnaissance information collected during a survey event. These forms will be filled out completely by the field team during survey and will include the following information:

- Location/Reference Area
- Field crew initials
- Date, Time
- Species name
- Target organism part (shoots, seeds, root, berry, leaves, nut, stalk, whole organism)
- Specific part of organism observed, species relative abundance, percent cover (for plants)
- General health of organism
- Spatial data identifier
- Photo identifier

Upon completion of the field survey event, the field supervisor will be responsible for submitting all field data forms to be copied. A discussion of copy distribution is provided below.

Photographs

Reference SOP-3 of the BSWP for procedures regarding digital photographs.

Distribution of Copies

Electronic scans of the field logbooks and field data forms will be made after completion of the field survey event and stored electronically in the project files for use by project staff. The original field logbooks and forms will be retained in the office.

STANDARD OPERATING PROCEDURE SOP-3

Digital Camera Use and Documentation Procedures

Purpose

The purpose of this standard operating procedure (SOP) is to describe the use of digital cameras and procedures for digital camera data management.

Scope and Applicability

This SOP is applicable to taking digital photographs and placing the digital data in a database. Digital photographs may be taken to document field activities, site conditions and features, and sampling locations.

Equipment and Materials

Equipment and materials for taking digital photographs are:

- Digital camera
- Spare batteries
- 12-volt charger
- Digital camera-carrying case and manual
- Field form
- Permanent marker
- Compass
- Personal computer

Typical Camera Features

- Save photographs (in standard mode) directly to a memory stick or comparable device
- Auto focus; manual focus available if required
- Zoom
- Brightness control
- Playback of photographs on camera screen
- Display of photograph number, date, and time
- Flash

- Timer
- Display showing time remaining on battery and remaining disk capacity
- Ability to protect and delete images that have been taken

Camera Use

Digital cameras will be used by the field team to document field activities. Each field team will be directly responsible for the camera and ensure that it is not exposed to excessive heat, cold, or moisture. The field team leader will be responsible for digital photograph documentation or for assigning documentation duties to a team member.

Digital photographs will be taken to document field activities and locations. Examples of field activities for which photo documentation will be useful include 1) location of target plant and animal species; and 2) station vicinity with associated reference points and compass directions noted.

Digital photographs will be collected at a high-pixel setting such that enlargements can be made with minimal degradation in picture quality.

Photograph Documentation

Field Team Responsibilities

Each field team will keep a daily hard copy log of all photographs. The following digital photograph data will be collected:

- Camera identifier (type, model, equipment number).
- Study location (ID) number—this information is obtained from the field team leader.
- Photograph number—record the number of the photograph and the photograph file name (as coded below).
- Date and time—as provided by the camera display.
- Description—the target of the photograph.

Notes: Record any other pertinent information (including coordinates of location where the photograph was taken [see above]).

Digital Photograph File Name

At the end of each field day, the member of the field team who is responsible for the camera will transfer the electronic data from the camera to the field operations computer. The folder structure will be as follows:

\\DATA\PHOTOS\YYYYMMDD\SURVEY AREA\file\[1, 2, 3, ...N]

The notation YYYYMMDD represents the year, month, and day. The survey area is the Exposure Unit and Reference Area surveyed. The individual files for the day (e.g., file 1, file 2, file N) will be placed within this folder using the default file identifier provided by the camera.

Transfer of Information and Archive

After the photograph disks have been uploaded, the original hard copy of the photograph log will be initialed and dated by the team member who downloaded the photographs, then archived by the field team leader.

Field Coordinator Responsibilities

The field team leader will be responsible for 1) reviewing electronic photographs and the logs as they are made available to ensure consistency and completeness of annotations; 2) collecting and archiving the hard copies of the photograph logs; 3) reviewing electronic photographs and the logs as they are made available to ensure consistency and completeness of annotations; and 4) notifying the field team leader of apparent inconsistencies and making recommendations for corrective action.

Key Checks and Items

Important checks for digital camera management are:

- Make sure the camera's battery is fully charged on a daily basis
- Keep extra memory sticks available
- To save battery life, use flash only when necessary
- Make sure the camera quality level is set at "best" or equivalent (high pixel)
- Review photograph records periodically to ensure that the electronic photographs and the data log agree
- Leave enough time at the end of the field day to transfer the data.