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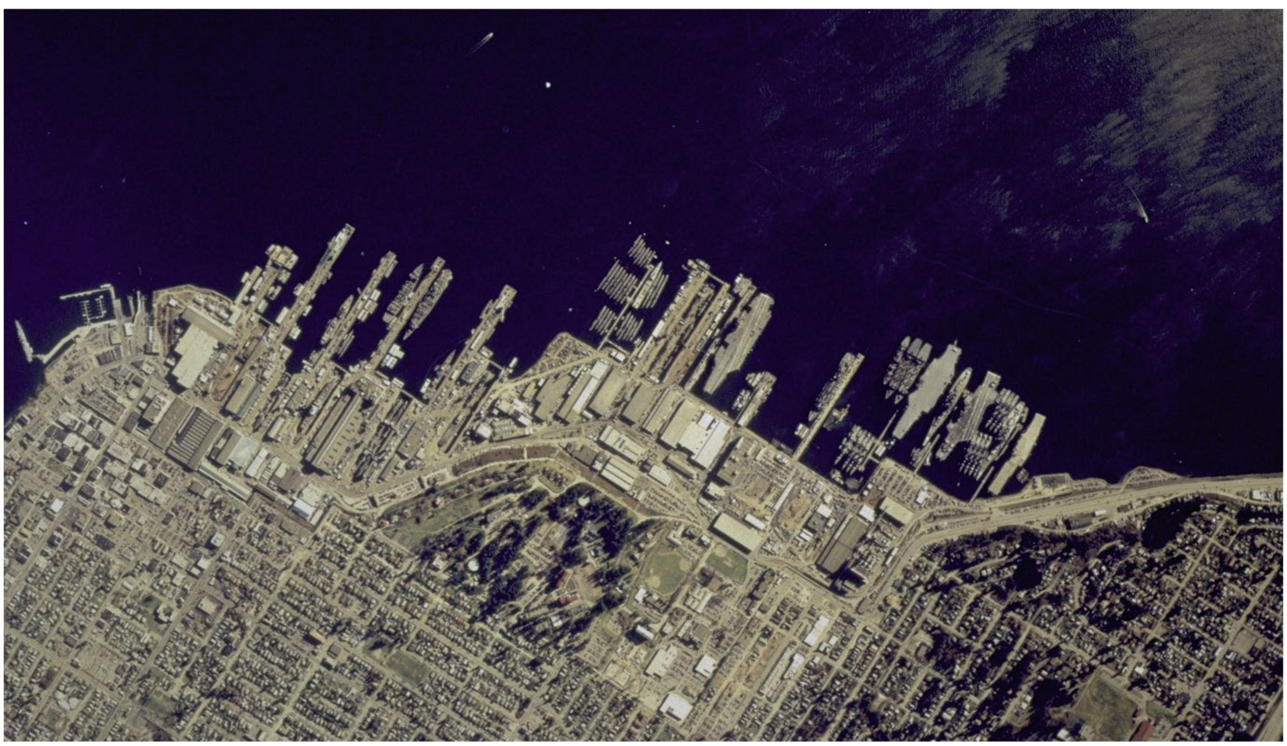
Naval Facilities Engineering Systems Command

FINAL
October 2022

Fifth Five-Year Review

Puget Sound Naval Shipyard Complex Superfund Site
EPA ID WA2170023418
Bremerton Naval Complex
Bremerton, Washington

United States Department of the Navy
Naval Facilities Engineering Systems Command Northwest
Engineering Field Activity, Northwest
1101 Tautog Circle
Silverdale, WA 98315-1101



Naval Facilities Engineering Systems Command

Naval Facilities Engineering Systems Command Northwest
Silverdale, WA

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DCN: LBJV-5006-4073-0003

Prepared for:
United States Department of the Navy
Naval Facilities Engineering Systems Command Northwest
Engineering Field Activity, Northwest
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Fifth Five-Year Review

Puget Sound Naval Shipyard Complex Superfund Site
EPA ID WA2170023418
Bremerton Naval Complex, Bremerton, Washington

October 2022

This signature sheet documents the U.S. Department of the Navy acceptance of the Fifth Five-Year Review Report for the Puget Sound Naval Shipyard Complex Superfund Site, Naval Base Kitsap-Bremerton, at the Bremerton Naval Complex.

10/11/2022

Richard N. Massie
Captain, U.S. Navy
Commanding Officer, Naval Base Kitsap

Date

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Executive Summary

As lead agency for environmental cleanup of the Puget Sound Naval Shipyard Complex Superfund Site, referred to as the Bremerton Naval Complex (BNC) National Priorities List (NPL) site, Bremerton, Washington, the U.S. Department of the Navy (Navy) has completed this fifth five-year review of the remedial actions at Operable Unit (OU) A, OU B Marine, OU B Terrestrial, OU D, and OU Naval Supply Center (NSC), pursuant to Section 121(c) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the National Oil and Hazardous Substances Pollution Contingency Plan (Title 40 of the Code of Federal Regulations, Part 300). The purpose of this five-year review is to evaluate the performance of the selected remedial actions in the applicable Records of Decision (RODs) and Cleanup Action Plan (CAP) at BNC and ensure they remain protective of human health and the environment.

This review is required because contaminants have been left in place at BNC at levels greater than allowed for unlimited use and unrestricted exposure.

This fifth five-year review was prepared in accordance with Navy/Marine Corps Policy for Conducting Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Statutory Five-Year Reviews (Navy, 2011b) and the U.S. Environmental Protection Agency's (USEPA's) Comprehensive Five-Year Review Guidance (USEPA, 2001). This review is considered a statutory, rather than a policy, review. The triggering action for this review was the execution by the Navy of the fourth five-year review on 12 October 2017. In accordance with Navy guidance, this review covers the entire BNC, including both CERCLA and non-CERCLA sites. This review was conducted using data reported between January 2017 and January 2022.

There are six OUs at BNC. This report covers the remedies selected in the signed RODs for the five CERCLA OUs: OU A, OU B Marine, OU B Terrestrial, OU D, and OU NSC. OU C is a petroleum-contaminated site. CERCLA does not address petroleum as a contaminant. Petroleum releases are addressed in Washington State under Subchapter IX of the Resource Conservation and Recovery Act and the Washington State Model Toxics Control Act (MTCA). However, the Navy, as a matter of policy, follows the CERCLA process to the maximum extent practical at non-NPL sites. Additionally, because remedies for the sites include institutional controls (ICs) through land-use restrictions, a five-year review for OU C is required pursuant to Navy policy and a periodic review by the Washington State Department of Ecology (Ecology) is required pursuant to MTCA. A cleanup action plan under MTCA was executed for OU C in 2007, and this five-year review includes an assessment of the OU C remedy protectiveness to address the periodic MTCA review requirements.

Since the fourth five-year review for BNC in October 2017, the Navy has completed 6 of the 14 actions recommended by that review, with 6 actions ongoing and 2 actions pending. Ongoing and pending recommendations are carried forward with updated recommendation statements in this review. Some recommendations for BNC are provided by the stakeholders, which consist of the USEPA, Ecology, the Washington State Department of Natural Resources, and the Suquamish Tribe. The Navy is working closely with the stakeholder group to make progress on these outstanding recommendations.

This five-year review concludes the remedies at OU C, OU D, and OU NSC are functioning as intended. Remedies for OU A and OU B Terrestrial are not functioning as intended by the RODs. The Navy is engaged with stakeholders to develop remedy repair designs at OU A Charleston Beach and OU B Terrestrial Segment 4. The remedy for OU B Marine is deferred until additional information is obtained, and the remedy is not functioning as intended. A focused feasibility study is being implemented to identify a remedy for OU B Marine addressing mercury source control and additional remedial actions for total mercury in sediment to reduce human health risks. The ROD for OU B Marine specified mercury cleanup levels only for sediment dredging and disposal, and not long-term monitoring cleanup levels; however, until sources of mercury are confirmed and source control is in place, the Navy considers the remedy not functioning.

No changes in applicable or relevant and appropriate requirements (ARARs) have affected the remedy protectiveness for OU A, OU C, OU D, or OU NSC since the last five-year review. Surface water quality standards (Ecology, 2019) were revised since the last five-year review. In those cases where toxicity data or cleanup levels have changed since the RODs were signed, the changes do not negatively impact the protectiveness to human health and the environment as long as the ICs preventing exposure remain in place and ongoing monitoring is continued until COC concentrations in groundwater and surface water are below the applicable remediation goals (RGs).

Concentrations of chemicals in groundwater remain above the RGs specified in the RODs for OU A, OU B Terrestrial, and OU NSC and specified in the Cleanup Action Plan for OU C; therefore, a reevaluation of the fate and transport modeling will be completed. Although some of the RGs might be lower if calculated today, the remedy components continue to protect against exposures, just as they did at the time the RODs were signed. ICs preventing exposure and ongoing monitoring will need to continue until concentrations of chemicals of concern in groundwater are below the RGs.

Table ES-1 provides answers to the technical assessment questions and protectiveness evaluations performed on each of the individual OUs. OU B Terrestrial is currently considered “Not Protective” due to some erosion of the shoreline at Segment 4. A protectiveness determination of the remedies at OU B Marine cannot be made at this time and will be deferred until further information is obtained; studies have been initiated to address data gaps before the protectiveness of the remedy can be assessed with respect to mercury in sediment.

If a protectiveness determination of “Deferred” is applicable, protectiveness determinations will be made for the site as a whole and the individual OUs following collection and evaluation of the necessary additional information. A determination for OU B Marine will be delayed due to upcoming Multi-Mission Dry Dock (M2D2)/Shipyard Infrastructure Optimization Plan (SIOP) activities that will need to be completed prior to additional characterization of sediment at OU B Marine.

Table ES-1: Technical Assessment and Protectiveness Summary

<table>
<tr><th>Operable Unit</th><th>Question A:
Is the remedy functioning as intended by the decision document?</th><th>Question B:
Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of the decision document still valid?</th><th>Question C:
Has any other information come to light that could call into question the protectiveness of the remedy?</th><th>Protectiveness Determination</th></tr>
<tr><td rowspan="2">OU A</td><td>No</td><td>Yes</td><td>Yes</td><td>Deferred</td></tr>
<tr><td colspan="4">Protectiveness Statement: A protectiveness determination of the remedy for OU A is deferred based on the interim erosion protection measures being implemented at Charleston Beach and lead concentrations in soil along the shoreline that exceed the RCRA Hazardous Waste Criteria. A 30% BOD for shoreline repairs for OU A Charleston Beach and OU B Terrestrial Segment 4 was prepared. The BOD will be updated in the 60%, 90%, and 100% design phases. The Charleston Beach remedy repair will include the collection of additional soil samples, which will be used in the follow-on study. At the completion of the additional sampling, the protectiveness of the remedy for OU A will be reevaluated.</td></tr>
<tr><td rowspan="2">OU B Marine</td><td>No</td><td>Yes</td><td>Yes</td><td>Deferred</td></tr>
<tr><td colspan="4">Protectiveness Statement: A protectiveness determination of the remedy for OU B Marine is deferred until further information is obtained. The protectiveness of the OU B Marine remedy remains in question because of ongoing sources of mercury to OU B Marine. Mercury is a COC for OU B Marine. The magnitude and effects of the mercury source in the Outfall 15 drainage basin, and the potential mercury source located between Dry Docks 5 and 6 where groundwater discharges directly to Sinclair Inlet, are not sufficiently understood. Source control evaluations are incomplete, and a remedy has not been selected for mercury in the marine environment. The Navy is engaged with stakeholders to develop a focused feasibility study and identify a remedy for OU B Marine that addresses mercury source control and considers additional remedial actions for total mercury in sediment to reduce human health risk. At the completion of the additional sampling event and the mercury source control evaluation, the protectiveness of the remedy for OU B Marine will be reevaluated.</td></tr>
<tr><td rowspan="2">OU B Terrestrial</td><td>No</td><td>No</td><td>Yes</td><td>Not Protective</td></tr>
<tr><td colspan="4">Protectiveness Statement: The remedy implemented at OU B Terrestrial is currently not protective, based on the recently observed shoreline erosion at Segment 4. Additionally, based on recommendations from the 2019 protectiveness evaluation, groundwater monitoring results for TCE will be compared to the current regulatory level (0.7 μg/L) to ensure protection of human health, which also affects the protectiveness of the remedy. Evaluations of OU B Terrestrial as a source of mercury to the marine environment are incomplete. At the completion of the source control evaluation, the protectiveness of the remedy for OU B Terrestrial will be reevaluated. In the interim, the pathways for human exposure are being controlled through ICs that control access to the site, control excavation in contaminated areas, prevent the consumption of groundwater, and limit activities on site to industrial use.</td></tr>
</table>

Table ES-1: Technical Assessment and Protectiveness Summary (continued)

Operable Unit	Question A: Is the remedy functioning as intended by the decision document?	Question B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of the decision document still valid?	Question C: Has any other information come to light that could call into question the protectiveness of the remedy?	Protectiveness Determination
OU C	Yes	Yes	No	Protective
	Protectiveness Statement: The remedy implemented at OU C currently protects human health and the environment. The cleanup action implemented under the state MTCA regulations continues to prevent migration of free- and dissolved-phase petroleum hydrocarbons from affecting Dry Dock 6 and Sinclair Inlet in order to protect human health and the environment. ICs remain in place to prohibit activities that interfere with monitoring activities and prevent release of petroleum hydrocarbons.			
OU D	Yes	Yes	No	Protective
	Protectiveness Statement: The remedy implemented at OU D is protective of human health and the environment. Exposure pathways and infiltration pathways that could increase contaminant migration and result in unacceptable risks are being controlled and monitored. The conditions and COC concentrations found today in groundwater are similar to those at the time the ROD was executed. Conditions at the time of ROD execution were found not to pose unacceptable risks to human health and the environment as long as exposures and contaminant migration were controlled.			
OU NSC	Yes	Yes	No	Protective
	Protectiveness Statement: The remedy implemented at OU NSC is protective of human health and the environment. Exposure pathways and infiltration pathways that could increase contaminant migration and result in unacceptable risks are being controlled and monitored. The conditions and COC concentrations found today in groundwater are similar to those at the time the ROD was executed. Conditions at the time of ROD execution were found not to pose unacceptable risks to human health and the environment as long as exposures and contaminant migration were controlled.			
Sitewide	NA	NA	NA	Not Protective
	Protectiveness Statement: An overall protectiveness determination of the remedies for the BNC site is not protective based on the OU B Terrestrial protectiveness statement. Following collection and evaluation of the necessary additional information, protectiveness determinations will be made for the site as a whole and the individual OUs. A determination for OU B Marine will be delayed due to upcoming M2D2/SIOP activities that will need to be completed prior to additional characterization of sediment at OU B Marine.			

Abbreviations:
BOD = basis of design
COC = chemical of concern
IC = institutional control
MTCA = Model Toxics Control Act
NA = not applicable
OU = operable unit
RAO = remedial action objective
ROD = Record of Decision

Table ES-2: Five-Year Review Summary Form

SITE IDENTIFICATION		
Site Name: Puget Sound Naval Shipyard Complex		
EPA ID: WA2170023418		
Region: 10	**State:** WA	**City/County:** Kitsap
SITE STATUS		
NPL Status: Final		
Multiple OUs? Yes	**Has the site achieved construction completion?** Yes	
REVIEW STATUS		
Lead agency: Other Federal Agency ***[If "Other Federal Agency," enter Agency name]*:** U.S. Department of the Navy		
Author name (Federal or State Project Manager): Joy Gryzenia and Phil Nenninger		
Author affiliation: Naval Facilities Engineering Systems Command Northwest		
Review period: 4/14/2021 – 8/11/2022 (*Start and end dates associated with the preparation of this FYR report*).		
Date of site inspection: 8/3/2021		
Type of review: Statutory		
Review number: 5		
Triggering action date: 10/12/2017		
Due date *(five years after triggering action date)*: 10/12/2022		

Table ES-3: Issues and Recommendations

OU(s) without Issues/Recommendations Identified in the Five-Year Review:
• *OU C*

OU(s): A, B Marine, B Terrestrial, D, NSC	**Issue Category: Changed Site Conditions**			
	Issue: Conceptual Site Model			
	Recommendation: Reevaluate fate and transport modeling assumptions and results to update the CSM and determine if terrestrial groundwater remedies remain protective of human health and the marine environment. Findings will be documented in an independent report, which is expected to be completed by December 2025 and a summary will be included in the next FYR report.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	Navy	USEPA/State	Estimated 2025

OU(s): A, B Marine, B Terrestrial, D, NSC	**Issue Category: Monitoring**			
	Issue: LTM frequency			
	Recommendation: After the fate and transport model is updated, the LTM sampling frequency/schedule will be reevaluated and adjusted, if necessary, to ensure that data collected can be used to update the CSM and subsequently the LTM plan.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	Navy	USEPA/State	By the next FYR

OU(s): A, B Marine, B Terrestrial	**Issue Category: Monitoring**			
	Issue: LTM network			
	Recommendation: Review previous LTM data to optimize the monitoring network and list of COCs based on previous LTM analytical data and the updated fate and transport model.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	Navy	USEPA/State	By the next FYR

Table ES-3: Issues and Recommendations (continued)

OU(s): A	**Issue Category: Site Access/Security**			
	Issue: Signage			
	Recommendation: Repair and/or replace faded and fallen over “No Trespassing” signs along shoreline.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
Yes	Yes	Navy	USEPA/State	Estimated 2023

OU(s): B Terrestrial	**Issue Category: Remedy Performance**			
	Issue: Shoreline			
	Recommendation: Develop a plan to stabilize the shoreline along Segment 4, while considering actions needed in light of the USGS finding that groundwater discharges to surface water in this area. Involve both the OU B Marine and BNC Terrestrial teams in planning for action along Segment 4. This action pertains to an emergency action repair. (Note: Plan is currently in progress.)			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
Yes	Yes	Navy	USEPA/State	October 2022

OU(s): A B Terrestrial	**Issue Category: Remedy Performance**			
	Issue: Shoreline			
	Recommendation: Implement the plan to stabilize the shoreline along Charleston Beach and Segment 4. This action pertains to the longer term repair of the shoreline.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
Yes	Yes	Navy	USEPA/State	August 2024

Table ES-3: Issues and Recommendations (continued)

<table>
<tr><th rowspan="3">OU(s):
A</th><th colspan="4">Issue Category: Changed Site Conditions</th></tr>
<tr><td colspan="4">Issue: Lead concentration in soil</td></tr>
<tr><td colspan="4">Recommendation: After the implementation of the Charleston Beach remedy repair, complete a follow-up study to analyze the remaining lead concentrations in soil that are greater than the RCRA hazardous waste criteria and the potential impacts to human health and the environment.</td></tr>
<tr><th>Affect Current Protectiveness</th><th>Affect Future Protectiveness</th><th>Party Responsible</th><th>Oversight Party</th><th>Milestone Date</th></tr>
<tr><td>Yes</td><td>Yes</td><td>Navy</td><td>USEPA/State</td><td>December 2025</td></tr>
</table>

<table>
<tr><th rowspan="3">OU(s):
B Terrestrial</th><th colspan="4">Issue Category: Operations and Maintenance</th></tr>
<tr><td colspan="4">Issue: Stormwater Outfalls</td></tr>
<tr><td colspan="4">Recommendation: Complete stormwater system and outfall repairs to ensure OU B Marine is not subjected to additional contamination and that it is not recontaminated once a remedy for mercury is implemented. (Note: Contract for repairs in Outfall 15 drainage basin has been awarded; repairs to the Outfall 15 flapper valve are currently planned to be awarded in FY 2024.)</td></tr>
<tr><th>Affect Current Protectiveness</th><th>Affect Future Protectiveness</th><th>Party Responsible</th><th>Oversight Party</th><th>Milestone Date</th></tr>
<tr><td>Yes</td><td>Yes</td><td>Navy</td><td>USEPA/State</td><td>November 2023</td></tr>
</table>

<table>
<tr><th rowspan="3">OU(s):
B Marine</th><th colspan="4">Issue Category: Remedy Performance</th></tr>
<tr><td colspan="4">Issue: Mercury contamination</td></tr>
<tr><td colspan="4">Recommendation: Finalize the FFS, complete the Source Control Action Plan, which is included as Appendix A of the FFS, and prepare a new ROD or ROD amendment based on recent mercury data and implement a remedy for mercury at OU B Marine.</td></tr>
<tr><th>Affect Current Protectiveness</th><th>Affect Future Protectiveness</th><th>Party Responsible</th><th>Oversight Party</th><th>Milestone Date</th></tr>
<tr><td>Yes</td><td>Yes</td><td>Navy</td><td>USEPA/State</td><td>TBD (in consult with the Navy)</td></tr>
</table>

Table ES-3: Issues and Recommendations (continued)

OU(s): **A,** **B Terrestrial,** **NSC,** **D**	**Issue Category: Remedy Performance**			
	Issue: Groundwater regulatory levels			
	Recommendation: After the fate and transport model is updated, the arsenic, mercury, and TCE remedial goals will be updated to 5, 0.025, and 0.7 µg/L, respectfully, and will be formalized in a decision document. These revisions do not affect protectiveness other than TCE at OU B Terrestrial.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	Navy	USEPA/State	By the Next FYR

OU(s): **B Marine**	**Issue Category: Institutional Controls**			
	Issue: Navy Internal Coordination on M2D2 and SIOP			
	Recommendation: The Navy CERCLA program team and Project Management Office (PMO) will continue to coordinate on upcoming M2D2/SIOP plans and implementation to protect remedies in place.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	Navy	USEPA/State	By the Next FYR

Abbreviations:
BNC = Bremerton Naval Complex
COC = chemical of concern
CSM = conceptual site model
LTM = long-term monitoring
Navy = United States Department of the Navy
OU = operable unit
ROD = Record of Decision
TBD = to be determined
USEPA = U.S. Environmental Protection Agency
USGS = U.S. Geological Survey

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Acronyms and Abbreviations

% .... percent
µg/kg .... microgram per kilogram
µg/L .... microgram per liter
§........ Section

AFFF .... aqueous film-forming foam
ARAR .... applicable or relevant and appropriate requirement
AWA .... area-weighted average

bgs .... below ground surface
BHC .... benzene hexachloride
BNC .... Bremerton Naval Complex
BOD .... Basis of Design

CAD .... confined aquatic disposal
CAP .... cleanup action plan
CERCLA ...... Comprehensive Environmental Response, Compensation, and Liability Act
CFR .... Code of Federal Regulations
CH2M .... CH2M HILL, Inc.
CLARC .... Cleanup Levels and Risk Calculation
cm .... centimeter
COC .... chemical of concern
cPAH .... carcinogenic polycyclic aromatic hydrocarbon
CSL .... cleanup screening level
CSM .... conceptual site model

DDD .... dichlorodiphenyldichloroethane
DDE .... dichlorodiphenyldichloroethene
DDT .... dichlorodiphenyltrichloroethane
DMMP .... Dredge Material Management Program
DNR .... (Washington State) Department of Natural Resources
DoD .... U.S. Department of Defense
DRC .... Dispute Resolution Committee

Ecology .... Washington State Department of Ecology
ESD .... Explanation of Significant Differences

FFS .... Focused Feasibility Study
FS .... feasibility study
FYR .... Five Year Review

Acronyms and Abbreviations (continued)

geomean .... geometric mean

HQ .... hazard quotient

IC .... institutional control
IMF .... Intermediate Maintenance Facility
IRIS .... Integrated Risk Information System

JRS .... Joint Resolution Statement

LOQ .... limit of quantitation
LTM .... long-term monitoring
LUC .... land use control

M2D2 .... Multi-Mission Dry Dock
MCUL .... minimum cleanup level
mg/kg .... milligram per kilogram
mg/kg OC .... milligram per kilogram of organic carbon
mg/L .... milligrams per liter
MHHW .... mean higher high water
MOA .... memorandum of agreement
MTCA .... Model Toxics Control Act

NAVFAC NW .... Naval Facilities Engineering Systems Command Northwest
Navy .... United States Department of the Navy
NAWQC .... National Ambient Water Quality Criteria
NBK .... Naval Base Kitsap
NPL .... National Priorities List
NSC .... Naval Supply Center

O&M .... operations and maintenance
OC .... organic carbon
OSWER .... Office of Solid Waste and Emergency Response
OU .... operable unit

PAH .... polycyclic aromatic hydrocarbon
PAL .... Project Action Limit
PCB .... polychlorinated biphenyl
PCE .... tetrachloroethene
PFAS .... per- and polyfluoroalkyl substances

Acronyms and Abbreviations (continued)

PMP .... petroleum management plan
PQL .... practical quantitation limit
PSNS .... Puget Sound Naval Shipyard

QSM .... Quality Systems Manual

RAO .... remedial action objective
RCRA .... Resource Conservation and Recovery Act
RG .... remediation goal
RI .... remedial investigation
ROD .... record of decision
RPM .... Remedial Project Manager
RSL .... Regional Screening Level

SBP .... sub-bottom profiling
SCO .... sediment cleanup objective
SIOP .... Shipyard Infrastructure Optimization Plan
SMS .... Washington State Sediment Management Standard
SQS .... Washington State Sediment Quality Standards
SVOC .... semivolatile organic compound

TBC .... to be considered
TCE .... trichloroethene
TCLP .... toxicity characteristic leaching procedure
TEF .... toxicity equivalent factor
TPH .... total petroleum hydrocarbons
TTEC .... total “toxicity equivalent” concentration

USEPA .... U.S. Environmental Protection Agency
USGS .... U.S. Geological Survey

VOC .... volatile organic compound

WAC .... Washington Administrative Code
WQC .... water quality criteria

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1.0 Introduction

The purpose of this Five-Year Review (FYR) report is to evaluate whether the remedies implemented at the Puget Sound Naval Shipyard Complex (PSNS) Superfund Site (U.S. Environmental Protection Agency [USEPA] Site ID WA2170023418) are functioning as intended by the respective Records of Decision (RODs) and Cleanup Action Plan (CAP) and remain protective of human health and the environment. The methods, findings, and conclusions of reviews, and recommendations are documented in FYR reports such as this one. In addition, this FYR report identifies issues found during the FYR process, if any, and documents recommendations to address them.

The U.S. Department of the Navy (Navy) is preparing this FYR pursuant to Navy/Marine Corps Policy; the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section (§)121(c), as amended by the Superfund Amendments and Reauthorization Act and consistent with the National Oil and Hazardous Substances Pollution Contingency Plan (Title 40 of the Code of Federal Regulations [CFR] §300.430(f)(4)(ii)); and USEPA policy. In accordance with guidance noted above, a FYR is required for sites where remedial action is selected which results in hazardous substances, pollutants, or contaminants remaining in place at levels that do not allow for unlimited use and unrestricted exposure. This FYR also provides information to the Washington State Department of Ecology (Ecology) for the periodic review pursuant to Washington Administrative Code (WAC) 173-340-420.

This is the fifth FYR for the PSNS Superfund Site at the Bremerton Naval Complex (BNC) (Figure 1-1). BNC includes the Naval Base Kitsap (NBK) at Bremerton, the PSNS and Intermediate Maintenance Facility. BNC is located along the shoreline of Sinclair Inlet in Bremerton, Washington.

The triggering action for this statutory review is the completion of the last FYR (12 October 2017). This FYR was conducted from April 2021 through August 2022 using data reported between January 2017 and January 2022. This FYR is due on 12 October 2022.

There are six operable units (OUs) at BNC, and all six OUs are addressed in this FYR (Figure 1-2). As shown in Table 1-1, this FYR covers the remedies implemented in the signed RODs for the five CERCLA OUs: OU A, OU B Marine, OU B Terrestrial, OU D, and OU Naval Supply Center (NSC). OU C is a petroleum-contaminated site, and CERCLA does not address petroleum as a contaminant. Petroleum releases are addressed in Washington State under Subchapter IX of the Resource Conservation and Recovery Act (RCRA) and the state Model Toxics Control Act (MTCA). However, the Navy, as a matter of policy, follows the CERCLA process to the maximum extent practical at sites not listed on the National Priorities List (NPL). Additionally, because remedies for the sites include institutional controls (ICs) through land-use restrictions, a FYR for OU C is required pursuant to Navy policy, and a periodic review by Ecology is required pursuant to MTCA. A cleanup action plan under MTCA was executed for OU C in 2007, and this FYR includes an assessment of the OU C remedy protectiveness to address the periodic MTCA review requirements.

Table 1-1: Selected Remedies for each OU

OU	Remedy Implemented
OU A	Shoreline stabilization, upgraded cap, monitoring groundwater, and institutional controls
OU B Marine	Sediment dredging, confined aquatic disposal of unsuitable sediments, in situ capping, enhanced natural recovery, habitat restoration, shoreline stabilization, monitoring sediment and fish tissue, maintenance, and institutional controls
OU B Terrestrial	Paving, shoreline stabilization, comprehensive stormwater system restoration, monitoring groundwater, and institutional controls
OU C*	Monitoring groundwater and institutional controls
OU D	Capping, stormwater system cleaning and inspection, stormwater drain repairs, monitoring groundwater, and institutional controls
OU NSC	Pavement upgrades, stormwater drain cleaning, stormwater system repairs, monitoring groundwater, and institutional controls

Notes:
OU = Operable Unit; NSC = Naval Supply Center
* = Remedy addressed under Washington State under Subchapter IX of the Resource Conservation and Recovery Act (RCRA) and the state Model Toxics Control Act (MTCA).

The PSNS Superfund Site FYR was led by Joy Gryzenia and Phil Nenninger with Naval Facilities Engineering Systems Command Northwest (NAVFAC NW). Stakeholders who participated in the FYR process include Ms. Anne Christopher, USEPA; Mr. Mahbub Alam, Ecology; Ms. Bonnie Brooks, Ecology; Ms. Erika Shaffer, Washington State Department of Natural Resources (DNR); and Ms. Denice Taylor, Suquamish Tribe. A team from Liberty JV researched data and provided Applicable or Relevant and Appropriate Requirements (ARARs) expertise. The community was notified of the initiation of the FYR via the Public Notice (see Section 4.1). The review began on 14 April 2021.

1.1 Site Background

BNC is surrounded to the west and north by City of Bremerton commercial and residential areas, to the northeast by a Washington State Ferry System terminal, and to the southeast by Sinclair Inlet. The terrestrial portion of the site consists of a relatively flat, low-lying waterfront area created through gradual filling of tideland and marshes and a higher upland area connected to the waterfront area by a moderately steep escarpment.

Primary land uses at BNC have included the following:

- Heavy industry (shipbuilding, ship maintenance and repair, and ship conversion)
- Light industry (vehicle maintenance)
- Ship berthing/homeporting
- Commercial (providing for purchase of supplies, meals)
- Residential (officers' and other quarters)

The active industrial shipyard site contains approximately 380 acres of terrestrial area and 270 acres of submerged land along 11,000 feet of shoreline. The shoreline has been administratively divided into 49 segments as depicted on Figure 1-3. The Navy also owns approximately 1,000 acres of railroad area contiguous with the shipyard area. Current land use is much the same as it was historically. Ships have not been constructed at BNC since the early 1970s. Instead, the shipyard engages in ship and submarine maintenance, modernization, repair, inactivation, and recycling and provides technical and logistics support. BNC facilities include six major piers, six large dry docks, and more than 100 major buildings. Land use in the vicinity of BNC currently consists of commercial and residential districts in the City of Bremerton and, to the northeast, water transportation (Washington State Ferries terminal).

Some of the fill material historically used to expand the shipyard area is believed to have included wastes containing hazardous substances. BNC has been the site of substantial shipbuilding, ship repair and overhaul, and other fleet support services. Miscellaneous waste materials have been a normal by-product of shipyard industrial activities since the early 1900s. Before the establishment of environmental regulations, some wastes were disposed of at BNC using practices considered acceptable at the time, but which later were found to have resulted in adverse chemical impacts to soil and groundwater. The waste materials reportedly have included metal plating wastes, metal filings and shavings, transformers and other electrical components containing polychlorinated biphenyls (PCBs), batteries, acids, oxidizing materials, paint and paint chips, degreasing and cleaning solvents, miscellaneous materials from shipbuilding and ship demolition, and petroleum products. Disposal of wastes, particularly in conjunction with the placement of fill during shipyard expansion, as well as spills and leaks of industrial materials, has led to elevated levels of various chemicals in the subsurface.

Table 1-2 summarizes background information on OU A, OU B Marine, OU B Terrestrial, OU C, OU D, and OU NSC, including history of contamination, physical characteristics, primary threats, land and resource use, and removal actions performed. No removal actions were performed at OU A or OU B Marine prior to the signature of the RODs for these OUs. Removal actions were performed at OU B Terrestrial, OU D, and OU NSC prior to the signature of the RODs for these OUs, as well as at OU C prior to the finalization of the OU C CAP. More detailed site background information is included in the third FYR (Navy, 2012a). Figure 1-4 depicts the primary events in the chronology of BNC related to site discovery, investigation, and remediation.

Table 1-2: Summary of Background Information

OU A	
History of Contamination	• Fill placed from 1946 through early 1970s • Disposal of liquid wastes in unlined pits, copper slag grit, dredge spoils, open burning, construction debris, industrial waste • Oil sprayed to reduce dust on a former gravel surface
Physical Characteristics	• Located in the most southwestern portion of BNC, approximately 12 acres • Boundaries extend beyond BNC boundary but is still on Navy property • Consists of small intertidal area at Charleston Beach and adjacent upland approximately 10 feet above mean sea level • Shoreline includes armored segments and a pocket beach constructed as a non-CERCLA mitigation project. • Shallow groundwater is present above sea level, with flow toward Sinclair Inlet during low tide, and from Sinclair Inlet at high tide
Primary Threat	• Risk of contact with contaminated soil and potential release of contaminants to the marine environment (via groundwater transport or erosion of fill material)
Land and Resource Use	• Used for parking, with a railroad track transecting the northern portion • Groundwater is not a potential source of drinking water • Suquamish Tribe's Usual and Accustomed Fishing Area[1]
Remedial Actions Performed pre-ROD	None
OU B Marine	
History of Contamination	• Historical overwater shipyard activities • Transport of contaminants present in upland fill materials to the marine environment via stormwater and erosion • Historical shoreline spills and releases to the marine environment
Physical Characteristics	• All nearshore marine environment associated with BNC, reaching generally east and west along the shorelines of OUs A, NSC, B Terrestrial, and D and extending an average of approximately 1,500 feet outward into Sinclair Inlet (the exclusion zone for public access to shipyard waters) • Approximately 230 acres of subtidal land • Water depth approximately 40 feet • Moderately steep shorelines protected by a combination of riprap, gravel mixes, and seawalls
Primary Threat	• Human health risk associated with the presence of PCBs in marine tissues • Human health risk for subsistence consumers associated with the presence of mercury in marine tissues
Land and Resource Use	• Active overwater shipyard • Suquamish Tribe's Usual and Accustomed Fishing Area[1]
Remedial Actions Performed pre-ROD	None

Table 1-2: Summary of Background Information (continued)

OU B Terrestrial	
History of Contamination	• Miscellaneous wastes included in fill materials used in developing the shoreline area • Historical spills and releases from industrial operations • Off-site, upgradient source of tetrachloroethene (PCE) and trichloroethene (TCE)
Physical Characteristics	• All land area of BNC not included in other OUs, except north of Farragut Avenue in the western portion of BNC and north and northwest of Decatur Avenue in the eastern portion of the complex (approximately 200 acres) • Almost entirely covered by a combination of pavement and buildings • Shoreline segments 1, 2, 3, 4, 17, 18, 19, 40, and 41B are composed of armor rock, and segment 41A is a combination of armor rock and concrete slabs
Primary Threat	• Potential for contaminants to be transported to Sinclair Inlet and possibility of human contact with contaminated soil • Contaminant pathways to Sinclair Inlet include groundwater and intruding seawater entering storm drain lines, drydock discharges, direct groundwater discharge, and slumping or erosion along the shoreline
Land and Resource Use	• Industrial shipyard activities • Roadways, railways, buildings, crane tracks • Complex network of utility systems • Groundwater is not a potential source of drinking water • Suquamish Tribe's Usual and Accustomed Fishing Area[1]
Remedial Actions Performed pre-ROD	• 1998-2000—Paving of several previously unpaved areas (approximately 11,000 square yards)
OU C	
History of Contamination	• Aboveground Storage Tank 315, removed in the 1990s • UST 316, closed in place in 1986, filled with soil and industrial debris • UST 317, closed in place—filled with soil • 80,000 gallons of primarily bunker C fuel oil estimated to be present in subsurface from release from UST 317
Physical Characteristics	• Located in the north-central upland portion of BNC • Topographically higher than most of industrialized waterfront of BNC • 60 to 100 feet above mean sea level • Centered on a steep ravine • Approximately 500 feet from Sinclair Inlet shoreline • Depth to groundwater 85 to 130 feet
Primary Threat	• Potential for migration of free and dissolved-phase petroleum hydrocarbon contamination toward Dry Dock 6 and Sinclair Inlet
Land and Resource Use	• Parking • Undeveloped land • Groundwater is not a source of drinking water • Suquamish Tribe's Usual and Accustomed Fishing Area[1]
Remedial Actions Performed pre-ROD	• Steam sparging 1996-1999 recovered approximately 30,000 gallons of total petroleum hydrocarbons (TPH)
OU D	
History of Contamination	• Miscellaneous wastes included in fill materials used in developing the shoreline area • Historical spills and releases from industrial operations

Table 1-2: Summary of Background Information (continued)

OU D (cont.)	
Physical Characteristics	• Located at the east end of BNC • Approximately 2.5 acres transferred to the City of Bremerton for use as a city park • Immediately adjacent to the Washington State Ferry dock • Approximately 50 percent covered with paving stones, asphalt, or buildings, with the remaining area landscaping or grass • Does not include the shoreline, which remains part of OU B Terrestrial • Approximately 25 feet above mean sea level and relatively flat, with a rise toward the north side
Primary Threat	• Pathways include leaching of contaminants by site groundwater moving toward Sinclair Inlet and direct discharge in dissolved or particulate form through the storm drain lines serving the site
Land and Resource Use	• City Park • History museum • Suquamish Tribe's Usual and Accustomed Fishing Area[1]
Remedial Actions Performed pre-ROD	• 2004—Upgrades to paving and storm drain system infrastructure
OU NSC	
History of Contamination	• Fill material used to expand working area into tidelands • Historical spills and releases from site operations—scrapping and recycling, petroleum storage, and oil reclamation
Physical Characteristics	• Located just west of the north-south centerline of BNC, between Farragut Avenue and the waterfront • Consists of a roughly square-shaped portion of the BNC uplands, approximately 28 acres • Almost entirely paved or covered by buildings • Concrete and steel seawall to an estimated 40 feet below ground surface along full length of waterfront • Approximately 15 storm drain outfalls with discharge to Sinclair Inlet • Limited groundwater exchange with Sinclair Inlet because of presence of seawall and dry dock pumping
Primary Threat	• Potential contact with site soils and risk of transport of contaminants to the adjacent marine environment
Land and Resource Use	• Warehouse and office space for fleet supply • Groundwater is not a potential source of drinking water • Suquamish Tribe's Usual and Accustomed Fishing Area[1]
Remedial Actions Performed pre-ROD	• 1994—Removal of 5,000 cubic yards of contaminated surface soils at the Defense Reutilization and Marketing Office scrap metal stockpile: excavation of soil to approximately 4 feet below ground surface, removing acid pit and drain slab, placing impermeable cap on floor of excavation, and upgrading drainage for the stockpile area

Notes:

1. Sinclair Inlet is an exclusive portion of the Suquamish Tribe's adjudicated usual and accustomed fishing area, which is reserved under the 1855 Treaty of Point Elliott. The Tribe's treaty-reserved fishing rights are firmly established as a matter of federal law and are collocated with the Navy's facilities in Sinclair Inlet. The Tribe harvests several species of finfish within Sinclair Inlet and intends to harvest shellfish that is safe to consume in the future. The Navy and Tribe work on a government-to-government basis to address each party's federal interests respectfully, fairly, and without interference.

Abbreviations:
BNC = Bremerton Naval Complex
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act
NSC = Naval Supply Center
PCB = polychlorinated biphenyl
OU = operable unit
ROD = record of decision
UST = underground storage tank

Data sources: Navy, 2007a and 2012a.

1.2 Five-Year Review Summary Form

SITE IDENTIFICATION		
Site Name: Puget Sound Naval Shipyard Complex		
EPA ID: WA2170023418		
Region: 10	**State:** WA	**City/County:** Kitsap
SITE STATUS		
NPL Status: Final		
Multiple OUs? Yes	**Has the site achieved construction completion?** Yes	
REVIEW STATUS		
Lead agency: Other Federal Agency ***[If "Other Federal Agency," enter Agency name]*:** U.S. Department of the Navy		
Author name (Federal or State Project Manager): Joy Gryzenia and Phil Nenninger		
Author affiliation: Naval Facilities Engineering Systems Command Northwest		
Review period: 4/14/2021 – 8/11/2022 (*Start and end dates associated with the preparation of this FYR report*).		
Date of site inspection: 8/3/2021		
Type of review: Statutory		
Review number: 5		
Triggering action date: 10/12/2017		
Due date *(five years after triggering action date)*: 10/12/2022		

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Legend

BNC Property Line

Notes:
BNC = Bremerton Naval Complex (also known as PSNS Complex)
PSNS = Puget Sound Naval Shipyard

Basemap Source: ESRI Online Streaming Service 2022

0 1 2 3 4
Miles
1 Inch = 2 Miles

Fifth Five-Year Review Report
PSNS Complex Superfund Site
Naval Base Kitsap Bremerton
Bremerton, Washington

Site Location Map

PROJECT NO.:	20D5006.21F4073
DATE:	September 2022
DRAWN BY:	JP
CHECKED BY:	SF

NAVFAC

FIGURE 1-1

Date: 5/31/2022 File: Figure 1-1 Site Location Map.mxd

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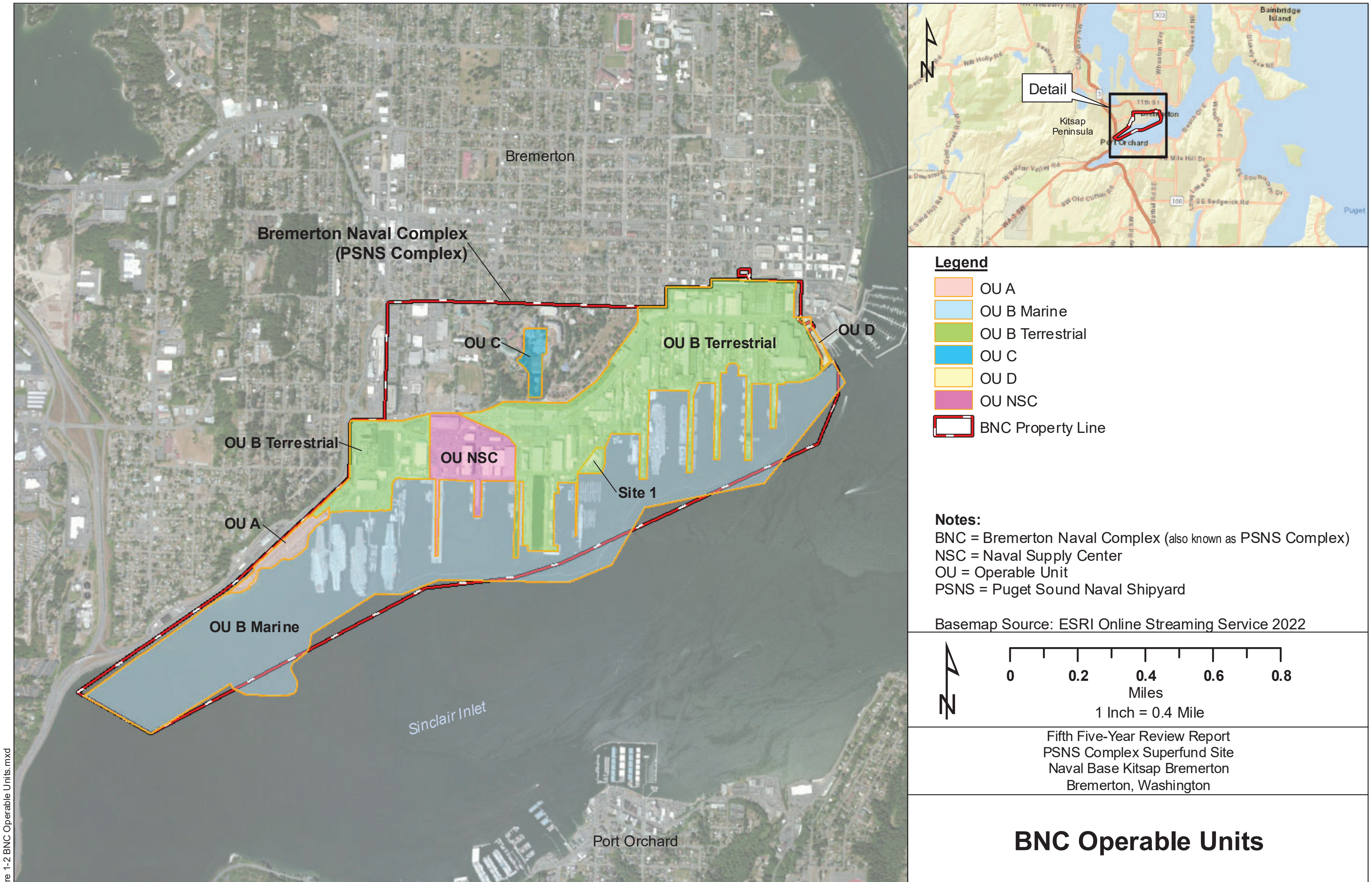

Fifth Five-Year Review Report
PSNS Complex Superfund Site
Naval Base Kitsap Bremerton
Bremerton, Washington

BNC Operable Units

PROJECT NO.:	20D5006.21F4073
DATE:	September 2022
DRAWN BY:	JP
CHECKED BY:	SF

FIGURE 1-2

Date: 5/31/2022 File: Figure 1-2 BNC Operable Units.mxd

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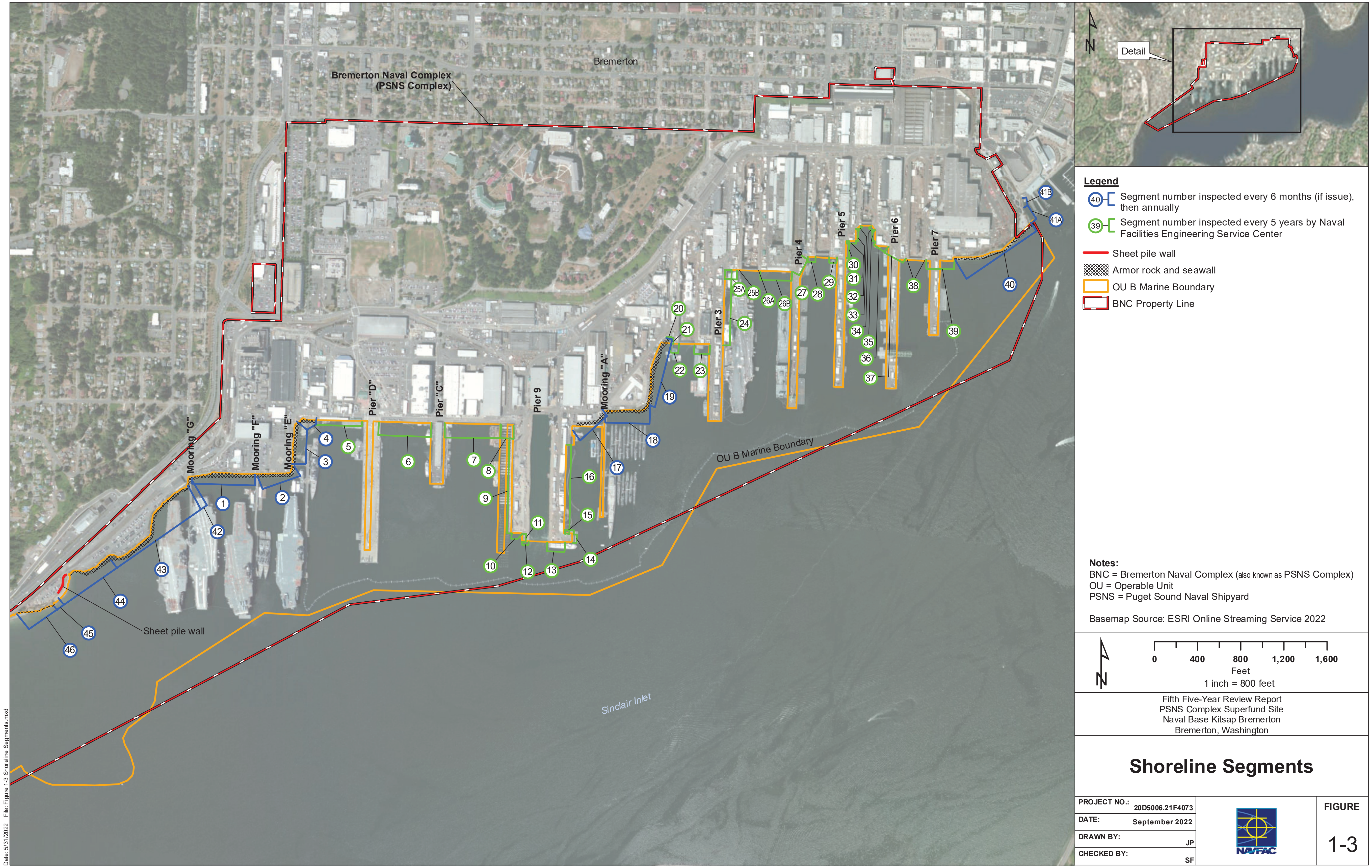
Bremerton
Bremerton Naval Complex
(PSNS Complex)
Mooring "G"
Mooring "F"
Mooring "E"
Pier "D"
Pier "C"
Pier 9
Mooring "A"
Pier 3
Pier 4
Pier 5
Pier 6
Pier 7
OU B Marine Boundary
Sheet pile wall
Sinclair Inlet
Detail
Legend
Segment number inspected every 6 months (if issue), then annually
Segment number inspected every 5 years by Naval Facilities Engineering Service Center
Sheet pile wall
Armor rock and seawall
OU B Marine Boundary
BNC Property Line
Notes:
BNC = Bremerton Naval Complex (also known as PSNS Complex)
OU = Operable Unit
PSNS = Puget Sound Naval Shipyard
Basemap Source: ESRI Online Streaming Service 2022
0 400 800 1,200 1,600
Feet
1 inch = 800 feet
Fifth Five-Year Review Report
PSNS Complex Superfund Site
Naval Base Kitsap Bremerton
Bremerton, Washington
Shoreline Segments
PROJECT NO.: 20D5006.21F4073
DATE: September 2022
DRAWN BY: JP
CHECKED BY: SF
NAVFAC
FIGURE
1-3
Date: 5/31/2022 File: Figure 1-3 Shoreline Segments.mxd

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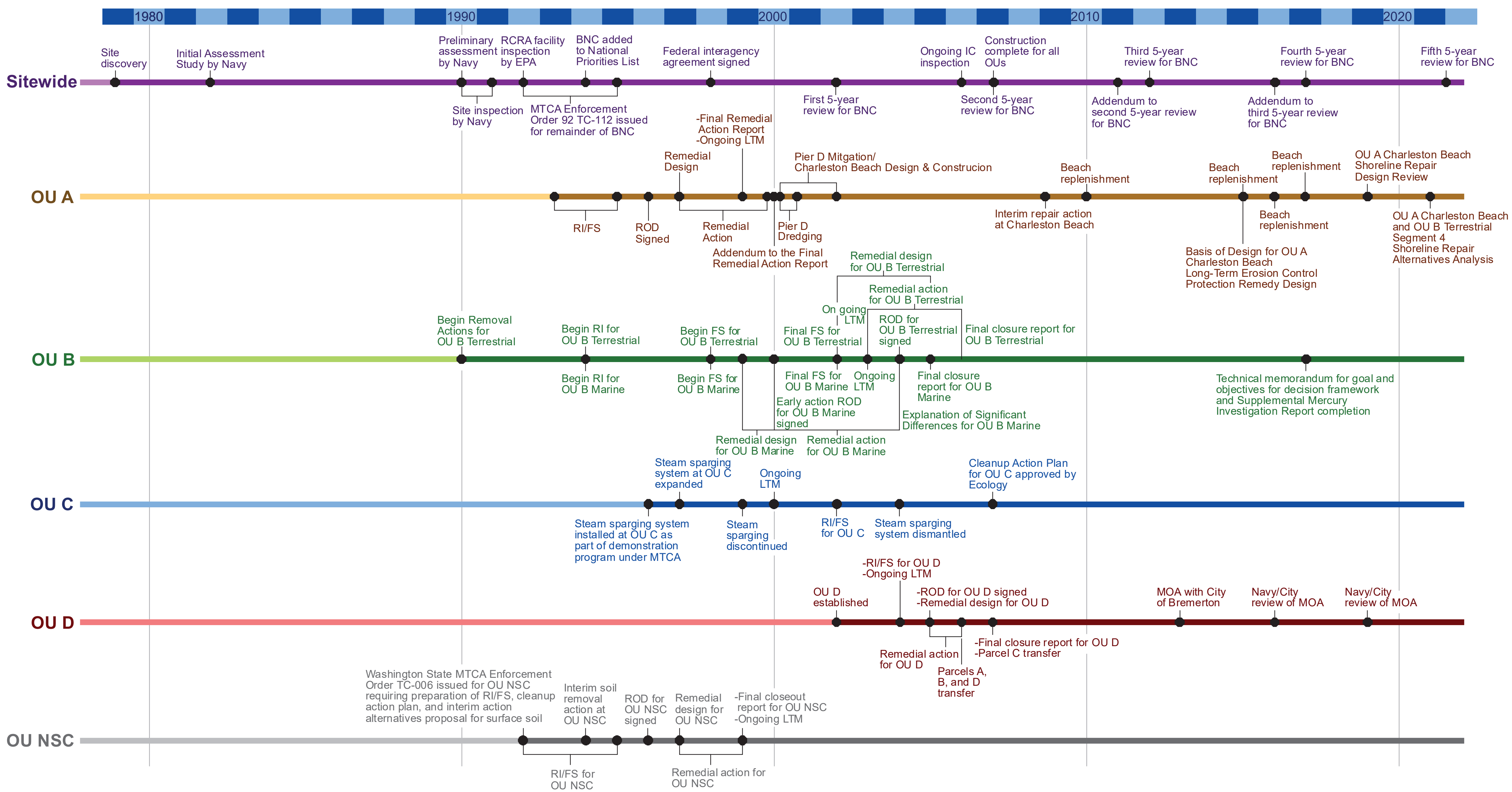

Notes:
BNC = Bremerton Naval Complex (also known as PSNS Complex)
EPA = US Environmental Protection Agency
IC = Institutional Controls
LTM =Long-term Monitoring
MOA = Memorandum of Agreement
MTCA = Model Toxics Control Act
NSC = Naval Supply Center
OU = Operable Unit
PSNS = Puget Sound Naval Shipyard
RCRA = Resource Conservation and Recovery Act
RI/FS = Remedial Investigation and Feasibility Study
ROD = Record of Decision

Date: 5/31/2022 File: Figure 1-4 Chronology of Events.mxd

Fifth Five-Year Review Report
PSNS Complex Superfund Site
Naval Base Kitsap Bremerton
Bremerton, Washington

Chronology of Events

PROJECT NO.:	20D5006.21F4073	FIGURE
DATE:	September 2022	1-4
DRAWN BY:	JP	
CHECKED BY:	SF	

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2.0 Response Action Summary

The CERCLA RODs for BNC required remedial actions for OU A, OU B Marine, OU B Terrestrial, OU D, and OU NSC. This section summarizes pre-ROD activities, the remedial action objectives (RAOs) and selected remedy components, and operation, maintenance, and monitoring requirements for each of the CERCLA OUs.

OU C is a petroleum-contaminated site. Petroleum products are not included in the definition of hazardous substances under CERCLA. Although excluded from CERCLA, cleanup of petroleum contamination is addressed, in Washington State, under Subchapter IX of RCRA and under MTCA. The Navy, as a matter of policy, follows the CERCLA process to the maximum extent practical at non-CERCLA sites. Additionally, because the remedy for OU C includes ICs through land-use restrictions, a FYR is required pursuant to Navy policy and a periodic review by Ecology is required pursuant to MTCA. For OU C, the cleanup objectives from the CAP are presented in this section, along with the cleanup action implementation and monitoring requirements.

The RODs for OU A, OU B Terrestrial, and OU NSC contain requirements that the Navy address petroleum contamination through a BNC-wide Petroleum Management Plan (PMP) (Navy, 2017a). The initial PMP was developed in 2002, amended in 2003, and revised in 2017. The PMP was established to address petroleum hydrocarbon contamination at OU A, OU B Terrestrial, and OU NSC. A primary goal of the PMP monitoring program is to evaluate the potential migration of petroleum hydrocarbon contamination into Sinclair Inlet by assessing concentration trends (Navy, 2019c). The PMP sampling requirements are now included in the Long-Term Monitoring, Inspection, and Improvement Plan for OU A, OU B Terrestrial, OU C, OU NSC, OU D, and PMP (Long-Term Monitoring [LTM] plan; Navy, 2020a, 2021e). The sampling conducted under the updated PMP (Navy, 2017a) is discussed below.

The Navy performs ongoing monitoring of groundwater, as described in the LTM plan (Navy, 2020a, 2021e). However, decisions regarding the scope of long-term monitoring beyond the 2021 LTM event will be suspended until additional information regarding groundwater fate and transport modeling and the groundwater-to-porewater pathway has been evaluated, which is anticipated to be awarded in FY 2023 and complete in FY 2024. At that time, the project team will revise the scope of the LTM program and the decision criteria (Navy, 2021c). ICs have been implemented, including access restriction, land use controls (LUCs), and excavation management, at OU A, OU B Marine, OU B Terrestrial, OU C, OU D, and OU NSC. The Navy has committed to operation and maintenance (O&M) activities for OU A, OU B Terrestrial, and OU NSC. These activities include inspection and maintenance of BNC storm drains, pavement caps or vegetated covers, and shoreline erosion protection as described in the O&M

and IC plan (Navy, 2020b). The remedy inspections are conducted to evaluate and document the implementation of the remedial actions and confirm the RAOs are being met. New in 2017 was the subjective ranking of the top, or most notable, deficient pavement and vegetated cover locations (Navy, 2018b). The sections below include a summary of the inspections, maintenance, and monitoring which have occurred at the OUs and background well 346, which is located on the northern boundary of BNC, since the 2017 FYR.

Non-LTM, which is included in the sections below where applicable, is not directly required under CERCLA but is included in this FYR to provide information and data that can supplement CERCLA efforts. Data were sometimes generated from activities not related to CERCLA that provided an opportunity to readily sample and analyze environmental media or involved handling of waste when contamination was unexpectedly encountered.

Additionally, the Navy conducted a protectiveness evaluation to determine if changes to the State's water quality criteria have an effect on the protectiveness of the remedies at BNC. Results of the evaluation showed revisions to the water quality criteria do not specifically impact the protectiveness of the remedies, except for trichloroethene (TCE) at OU B Terrestrial, owing to a significant change in the groundwater criterion for TCE (Navy, 2019d). The evaluation detailed additional recommendations, which have been implemented through the terrestrial LTM sampling.

2.1 Basis for Taking Action

For each OU, Table 2-1 provides a summary of reasonably anticipated land use, potential receptors (pathways), and chemicals of concern (COCs) by medium at the time of the decision documents for each OU. This information represents the basis for remedial action at each OU.

Table 2-1: Summary of Land Use, Potential Receptors, and Chemicals of Concern by Medium as Basis for Remedial Action

Operable Unit	Reasonably Anticipated Land Use	Potential Receptors[1] (Pathway)	Media	Chemicals of Concern
OU A	Industrial	• Current Transit Walker (Inhalation) • Current Utility Worker (Ingestion, Inhalation, Dermal) • Future Industrial Worker (Ingestion, Inhalation, Dermal) • Hypothetical Future Resident (Ingestion, Inhalation, Dermal) • Future Shellfish Harvester/Fisher (Ingestion, Dermal)[2]	Soil	• Metals—arsenic, lead • cPAHs • PCBs

Table 2-1: Summary of Land Use, Potential Receptors, and Chemicals of Concern by Medium (continued)

Operable Unit	Reasonably Anticipated Land Use	Potential Receptors[1] (Pathway)	Media	Chemicals of Concern
OU A (cont.)	Industrial (cont.)	• Ecological	Groundwater	• Metals—arsenic, copper, lead, nickel, silver, thallium, zinc • PAHs • Pesticides —DDT • TPH • PCBs
OU B Marine	Industrial Suquamish Tribe's Usual and Accustomed Fishing Area[3]	• Finfisher, Subsistence (Ingestion, Dermal) • Sea Cucumber Harvester, Subsistence (Ingestion, Dermal) • Shellfish Harvester, Subsistence (Ingestion, Dermal)	Marine Sediment	• PCBs • Mercury • Pesticides
		• Finfisher, Subsistence (Ingestion) • Finfisher, Recreational (Ingestion) • Sea Cucumber Harvester, Subsistence (Ingestion) • Sea Cucumber Harvester, Recreational (Ingestion) • Shellfish Harvester, Subsistence (Ingestion)	Marine Tissue	
OU B Terrestrial	Industrial	• Industrial Worker (Ingestion, Inhalation, Dermal) • Construction Worker (Ingestion, Inhalation, Dermal) • Future Resident (Ingestion, Inhalation, Dermal)	Soil	• Metals—arsenic • TCE • PAHs • PCBs • Pesticides
		• Construction Worker (Dermal) • Drydock Worker (Dermal)	Groundwater	• Metals—arsenic • Total PCBs
OU C	Industrial	• No receptors identified in CAP because the "No Action alternative" was deemed protective of human health and the environment	Groundwater	• Bunker C Fuel Oil
OU D	Recreational	• Construction Worker (Ingestion, Dermal, Inhalation) • Recreational Visitors (Ingestion, Dermal, Inhalation)	Soil	• Tetrachloroethene • cPAHs (total) • Pesticides—4,4'-DDT, dieldrin, endrin • Metals—Arsenic, cadmium, copper, mercury, zinc

Table 2-1: Summary of Land Use, Potential Receptors, and Chemicals of Concern by Medium (continued)

Operable Unit	Reasonably Anticipated Land Use	Potential Receptors[1] (Pathway)	Media	Chemicals of Concern
OU NSC	Industrial	• Current Utility Worker (Ingestion, Inhalation, Dermal) • Future Construction Worker (Ingestion, Inhalation, Dermal) • Future Industrial Worker (Ingestion, Inhalation, Dermal) • Future Resident (Ingestion, Inhalation, Dermal)	Soil	• Metals—lead • Total TPH • Individual cPAHs • Total PCBs

Notes:
1 Potential receptors presented in the table are from the RODs for the respective OUs and the CAP for OU C.
2 "Future Shellfish Harvester/Fisher (Ingestion, Dermal)" is included as potential receptor for OU A, because reducing the transport of chemicals to groundwater or the marine environment is listed as an RAO in the OU A ROD. However, sediment sampling and monitoring are not included in the OU A ROD and are instead covered in the ROD for OU B Marine.
3 Sinclair Inlet is an exclusive portion of the Suquamish Tribe's adjudicated Usual and Accustomed fishing area, which is reserved under the 1855 Treaty of Point Elliott. The Tribe's treaty-reserved fishing rights are firmly established as a matter of federal law and are collocated with the Navy's facilities in Sinclair Inlet. The Tribe harvests several species of finfish within Sinclair Inlet and intends to harvest shellfish that is safe to consume in the future. The Navy and Tribe work on a government-to-government basis to address each party's federal interests respectfully, fairly, and without interference.

Abbreviations:
cPAH = carcinogenic polycyclic aromatic hydrocarbon
DDT = dichlorodiphenyltrichloroethane
OU = operable unit
PAH = polycyclic aromatic hydrocarbon
PCB = polychlorinated biphenyl
ROD = Record of Decision
TCE = trichloroethene
TPH = total petroleum hydrocarbons
VOC = volatile organic compound

Data Sources: Navy et al., 1996; 1997; 2000; 2004a; 2005; Navy, 2007c.

Groundwater at BNC is not a source of drinking water. The overall groundwater flow at BNC is toward the dry docks and Sinclair Inlet. Groundwater modeling (Jones et al., 2016) indicates tidal influence does not affect groundwater flow directions farther than approximately 700 feet inland of the shoreline. No perennial streams or freshwater bodies are located within the BNC site boundaries. Groundwater beneath each OU is sampled for analysis of applicable COCs. The COCs are discussed in the following sections.

BNC shares a 3-mile border with Sinclair Inlet. Sinclair Inlet is designated as Excellent for Aquatic Life Use, which meets or exceeds the requirements for all uses including, but not limited to, salmonid migration and rearing; other fish migration, rearing, and spawning; clam, oyster, and mussel rearing and spawning; crustaceans and other shellfish (crabs, shrimp, crayfish, scallops, etc.) rearing and spawning. The recreational use is primary contact recreation, and the miscellaneous marine water uses are wildlife habitat, harvesting, commerce and navigation, boating, and aesthetics (Ecology, 2022). Sinclair Inlet is part of Puget Sound, which is designated as an estuary of national significance under the Clean Water Act (Navy, 2017a).

2.2 OU A

2.2.1 Response Action

In August and October 1995, the final Remedial Investigation (RI) and Feasibility Study (FS) reports for OU A were completed (Navy, 1995a, 1995b). The purpose of the RI/FS was to characterize the site, determine the nature and extent of contamination, assess human and ecological risks, and evaluate remedial alternatives (Navy et al., 1997). No removal action was conducted prior to the completion of the ROD.

The RAOs for OU A include the following (Navy et al., 1997):

- Prevent people from coming into contact with soil containing lead, arsenic, PCBs, and polycyclic aromatic hydrocarbons (PAHs) (and potentially associated petroleum contamination) above acceptable levels.
- Reduce the physical hazards associated with the existing riprap, such as exposed scrap metal, construction debris, and fill materials.
- Limit erosion of heavy metal and organic constituents in fill materials to Sinclair Inlet marine waters through the existing riprap.
- Reduce the transport of chemicals to groundwater or the marine environment.
- Enhance terrestrial and marine habitat.

The components of the selected remedy for OU A include the following (Navy et al., 1997):

- Upgrading the pavement cap
- Placing erosion protection
- Implementing ICs
- Implementing a groundwater monitoring sampling and analysis program
- Conducting a periodic review of the data no less frequently than every 5 years through a FYR
- Conducting regular inspection and maintenance of the pavement cap and erosion protection, particularly after storms
- Implementing marine and terrestrial habitat enhancements

The remedy for OU A did not involve any remedial actions along Charleston Beach, the southwestern end of OU A. The toe of the riprap embankment along Charleston Beach and the remainder of the OU A shoreline is the waterward extent of OU A.

2.2.2 Status of Remedy Implementation

Completion of pavement upgrading, erosion protection, and habitat enhancements was documented in the final remedial action report for OU A (Navy, 1999b) and the addendum to the final remedial action report for OU A (Navy, 2000a). Shoreline erosion protection and beach habitat enhancement consisting of placing additional armor rock and gravel, reducing slopes, and creating a vegetated corridor were carried out from 26 January to 4 March 1998. From 9 March through 28 April1998, terrestrial habitat enhancement included constructing a vegetated soil pocket and bird nest boxes. Asphalt repair and sealing were performed from 11 July through 1 August 1998. Additional shoreline erosion protection was constructed from 10 July through 28 November 2000 and involved replacement of a failing seawall.

A monitoring program for OU A that summarizes all elements of the remediation is documented in the Final Monitoring Plan for OU A (Navy, 2000b) and includes annual monitoring events, which began in 1998. Monitoring at OU A is now conducted under the LTM plan (Navy, 2018a, 2020a, 2021e). Groundwater monitoring activities at specific monitoring wells associated with OU A are conducted every 1, 2, or 5 years. The frequency of analysis for each COC is based on the trends observed in previous sample results (Navy 2020a, 2021e).

Inspection and maintenance of pavement and shoreline erosion protection had been implemented at the time of the first FYR for OUA in 2002 and was originally implemented as part of the LTM process (Navy, 2000b). However, the 2006 O&M plan consolidated the requirements and procedures for pavement cap and shoreline inspection for all applicable OUs (Navy, 2006a). Currently, inspections and maintenance are conducted under the LTM plan (Navy, 2018a, 2020a, 2021e). Annual inspections of the pavement, vegetative cap, fencing, and signage; shoreline inspections by foot and boat; and LUC implementation are documented to provide consistent quantification of site conditions. Annual inspections at OU A are conducted during both dry conditions (impervious areas, the shoreline, and signage during the summer or early fall) and wet conditions (stormwater/catch basin system during fall or early winter) (Navy, 2020a, 2021e).

IC requirements for BNC were addressed by completion of the final IC work plan (Navy, 2006b). ICs implemented at OU A include access control, harvest restriction, groundwater restriction, excavation management, and land use restrictions. The ICs are currently conducted under the O&M and IC Plan (Navy, 2020b). Excavation management controls have been included as part of the O&M and IC plan (Navy, 2020b), and an Excavation Management Plan has been prepared to provide guidance on the measures necessary to conduct excavation work at BNC (Navy, 2020d).

After completion of the OU A remedy, the Charleston Beach area was designated as a mitigation site for the Pier D military construction project (Ecology, 2000). The mitigation involved expanding the intertidal habitat along approximately 120 linear feet of Charleston Beach between December 2001 and February 2002. This action included excavating a portion of the riprap embankment and replacing it with a combination of soft bank and sheet pile, as well as placing fish-mix gravel on the excavated surface to provide a more gently sloped beach. The mitigation activities were conducted at a CERLCA site but were not part of a CERCLA action (Navy, 2017b).

The analytical results for the fill material to be exposed after excavation for the mitigation revealed exceedances of Washington State Sediment Quality Standards (SQS). Although modeling of the cover material was never conducted, placement of 3 feet of beach mix on top of the exposed surface (as performed during the mitigation action) was deemed protective of human health and the environment by Ecology as long as scouring was not excessive. A feeder berm of fish mix and erosion gauges were installed as part of this mitigation action (Navy, 2002i).

After the 2002 mitigation action, the fish mix and bank eroded, and fill debris/material was observed on the beach during the 2007 storm season. No maintenance had been conducted on the beach between the 2002 mitigation action and the 2007 observance of debris. An interim action in August 2008 included placement of armor rock and additional fish mix as a temporary erosion control measure while a more lasting alternative approach was sought (Navy, 2007d). Additional fish mix was placed in this area during interim erosion control actions in 2010, 2015, 2016, and 2017 in response to further loss of beach material as required by the IC work plans (Navy, 2009b, 2014a, 2015c, 2017e). Navy studies triggered by the observation of beach erosion have included sediment and soil sampling and analysis to approximate the physical extent of fill material in the intertidal and adjacent upland areas at Charleston Beach (Navy, 2010b; CH2M HILL, Inc. [CH2M], 2021) and an investigation of beach dynamics (Navy, 2010c). These studies culminated in a remedy repair evaluation report (Navy, 2012b). The remedies and the actions after OU A remedy implementation are depicted in Figures 2-1 and 2-2.

Based on the remedy repair evaluation report, a Basis of Design (BOD) for a permanent remedy repair at Charleston Beach was completed in 2015 (Navy, 2015a). The 2015 BOD was finalized by the Navy without final concurrence from the Stakeholder team. Following completion of the 2015 BOD, the Navy awarded the construction task order for the remedy repair. However, during discussions with upper Navy management, it was determined that implementation of the permanent remedy as presented in the 2015 BOD would result in a loss of productive fish and shellfish habitat when compared to the post-Pier D mitigation state of the beach. Therefore, the construction task order was cancelled, and the Navy made the decision to start the BOD process over, with full Stakeholder involvement.

In 2017, a Habitat Benefit Analysis was completed to compare various conditions with the post-Pier D mitigation condition in order to develop a mitigation strategy for losses of habitat benefit in the Charleston Beach area. An engineering review of the previous Charleston Beach shoreline repair design was completed in January 2019 (CH2M, 2019). The objectives of this engineering review were to serve as a baseline analysis of previous modeling and designs for OU A Charleston Beach prior to evaluating new alternatives and to evaluate whether the 2015 BOD for OU A Charleston Beach would meet the RAOs, specifically:

- The design was protective of human health and the environment without impacting the effectiveness of the implemented OU B Marine remedy, and
- The design would result in no net loss of productive fish and shellfish habitat, based on the habitat value of the site at the time the Pier D mitigation project was implemented.

The 2019 review concluded the 2015 BOD would ultimately result in a reduction of productive fish and shellfish habitat. As a result, the permanent remedy repair was postponed due to Navy concerns over the potential net loss of habitat, requiring additional mitigation.

In December 2017, the Navy completed a habitat benefit analysis (CH2M, 2017), which focused on the area where a potential future remedy repair may change the nature of the beach. The analysis was conducted to compare various conditions with the post-Pier D mitigation condition to develop a mitigation strategy for losses of habitat benefit in the Charleston Beach area. Three shoreline habitat conditions were compared as part of the analysis:

- Pre-Pier D Mitigation Project Condition, which represents the shoreline as it existed following completion of the OU A remedy and prior to implementation of a mitigation project (Navy, 2002a);
- Post-Pier D Mitigation Project Condition, which represents the shoreline as it existed following the mitigation project (Navy, 2002a); and
- Current condition, which represents the shoreline as of 14 November 2016.

In March 2021, a shoreline repair design alternatives assessment was completed to evaluate potential shoreline repair alternatives which would meet the ROD and post-Pier D mitigation objectives without the net loss of productive fish and shellfish habitat. Four alternatives were considered. The selected alternative involves removal of the armor rock revetment along the central and western portion of Charleston Beach, reconstructing the armor rock revetment landward of the existing revetment, expansion of a fish mix beach through the central and western portion of the beach, and maintaining a 15-foot vegetated buffer between the revetment and parking lot (Navy, 2021a). The selected alternative was agreed upon by the Navy and Stakeholder team.

The Navy has prepared the 30 percent (%) BOD for shoreline repairs for OU A Charleston Beach and OU B Terrestrial Segment 4 (Navy, 2021b). The design of long-term erosion protection and habitat mitigation for Charleston Beach to replace the existing interim repair must meet the objectives for the Pier D habitat mitigation project, as well as maintenance of the level of contaminant containment from the original OU A ROD. The BOD was updated in the 60%, 90%, and 100% design phases and will be completed in 2023.

2.2.3 O&M and Monitoring

2.2.3.1 Inspection and Maintenance

Annual inspection of the pavement cap and shoreline protection has been conducted since 1998. During this FYR period, semiannual and annual inspections were conducted. The inspections included annual inspections of the pavement cap and vegetated covers along the upper edge of the shoreline, semiannual inspection of Charleston Beach, and wet and dry season inspections of storm drain catch basins.

The results of the inspection verification site visit conducted as part of the current FYR process are discussed in Section 4.4.

Pavement Cap

During this FYR period, the pavement was in good condition overall, with minor cracks measuring ⅛ inch to ¼ inch wide. In 2017, deficiency codes were assigned to 12 new pavement features, two existing features had expanded, and one feature was changed from an incipient condition to alligator cracking. In 2018, five new features were documented, which accounted for an additional 44 linear feet and 361 square feet of deficient pavement. Four new features were documented in 2019, accounting for an additional 35 linear feet and 4 square feet of deficient pavement. Two new features were documented in 2020, accounting for an additional 112 square feet of deficient pavement. Deficiencies observed during this FYR period were sealant deterioration, gapping/cracking, alligator cracking, and vegetation growth through deteriorated seals. Most of the deficiencies ranked as poor were not in significantly worse condition than noted during previous inspections. The OU A poor rating decreased from 4.5% in 2017 to 0.5% in 2020 (Navy, 2018b, 2019e, 2020c, 2021d).

During the 2018 inspection, an approximately 20,000-square-foot area of the parking lot ranked as poor. A paving project conducted in the summer of 2019 resulted in the repair of 16 features, and the total area of the repair was approximately 25,000 square feet. Pavement repairs included removing the old asphalt, adding new subgrade gravel material, repaving with two layers of new asphalt, and painting new parking spot lines (Navy, 2019e, 2020c).

Vegetated Cover

During this FYR period, the vegetated cover had adequate topsoil to sustain vegetation. Topsoil was adequate, and areas of sparse and dead vegetation were present; however, no erosion was observed. The vegetated cover above Charleston Beach had adequate plant cover; some dead trees were observed, and much of the ground cover had dried out due to a lack of water, which was likely seasonal and changes during the rainy season. No evidence of landfill or non-native material (debris used for fill material) was observed within the vegetated cover (Navy, 2018b, 2019e, 2020c, 2021d).

Shoreline

The OU A shoreline is divided into five segments (Figure 2-1) and includes a sheet pile wall (Segment 42), armor rock shoreline (Segments 43, 44, and 46), and Charleston Beach (Segment 45). During this FYR period, the sheet pile wall at Segment 42 was observed to be in generally good condition, with some rusting along joints. One pile, at the northeast end of the southeast-facing portion of the wall, was deflected slightly outward from the top. Segments 43, 44, and 46 also appeared in good condition with no deficiencies. Adjacent to Segment 46 and above the westernmost outfall, the armoring in a portion of the shoreline appears to consist mostly of large concrete pieces with a relatively haphazard placement. Small gaps in the armor rock were noted in this area (Navy, 2018b, 2019e, 2020c, 2021d), however, there was no evidence of erosion or exposed fill material.

Erosion gauges are installed at Charleston Beach (Segment 45). In 2017, approximately 114 tons (78 cubic yards) of fish mix was added to the shoreline. During this FYR period, the gauges that could be measured (Gauge B was completely covered) indicated greater than 3 feet of fish mix cover at Charleston Beach. If exposure of over 2 feet is noted at any of the gauges (which results in less than 3 feet of overall fish mix coverage), the NAVFAC NW Remedial Project Manager (RPM) is notified, and the Navy will evaluate repair options and initiate repairs. Exposed soil has not been observed along the Charleston Beach shoreline segment since the 2008 repair action. The feeder berm and beachfront have fish mix remaining, but the amount of material in the berm in January 2021 was visibly less than observed in September 2019, and armor rock was beginning to be exposed near Gauge A. A permanent repair for the Charleston Beach shoreline is in development and anticipated to be implemented in summer 2023 (Navy, 2018b, 2019e, 2020c, 2021d).

Catch Basins

During the dry and wet weather inspections, no backups or ponding were observed, indicating the conveyances were functioning as intended (Navy, 2018b, 2019e, 2020c, 2021d). Per the O&M and IC Plan (Navy, 2020b), when sediment thickness exceeds 60% of the total sump depth, the Navy will notify the appropriate Environmental Office and Public Works regarding conditions and the need for any repairs. No inspection locations in OU A had sediment build-up exceeding the 60% threshold during this FYR period. A task order was awarded in 2021 to determine additional backup locations for catch basin and outfall inspections. Updates to the stormwater maps and to the stormwater inspection checklists were completed as part of this task order and will be included in the next iteration of the Terrestrial LTM and O&M Plan.

Of the 99 inspection locations planned for inspection in 2021, 15 were unavailable for inspection due to obstructions or construction activities occurring in the area. Of the 84 inspection locations completed, 7 inspections were performed at alternate locations as the primary locations could not be inspected due to various reasons.

The only catch basins for which inspections could not be completed were not due to parked vehicles but because they were underneath items in laydown areas (such as large steel plates), closed to personnel, or in an active construction zone with restricted access. PSNS is a very active shipyard and there will always be difficulty inspecting all planned locations due to the nature of site operations.

2.2.3.2 Long Term Monitoring

Long term monitoring during this FYR period consisted of groundwater sampling conducted in 2018, 2020, and 2021 (Table 2-2). Groundwater sampling was not planned for wells in OU A in 2017 or 2019. In 2018, OU A monitoring wells were analyzed in various combinations for arsenic, copper, nickel, and zinc (Navy, 2019c). Based on recommendations from the protectiveness evaluation (Navy, 2019d) to resume periodic groundwater monitoring of organic COCs, which was implemented in the LTM (Navy, 2020a, 2021e), OU A wells were analyzed in various combinations for total metals, chrysene, pesticides, and PCBs in 2020. Petroleum hydrocarbons, heavy metals, semivolatile organic compounds (SVOCs), and PCBs have been identified in soil and sediments at varying concentrations throughout BNC. Petroleum hydrocarbons, metals, and volatile organic compounds (VOCs) have been detected in groundwater monitoring wells.

Groundwater cleanup levels at OU A are based on the protection of adjacent surface waters of Sinclair Inlet. LTM activities performed at OU A during this FYR period are summarized in Table 2-2.

Total arsenic concentrations at all four OU A wells and background well 346 exceeded the cleanup level of 0.5 microgram per liter (µg/L) outlined in the ROD. However, the Navy and stakeholders have agreed to compare groundwater monitoring results for arsenic to the Washington State background value of 5 µg/L to be consistent with the arsenic remedial goals at other OUs (Navy, 2019d).

Results from monitoring during this FYR period (2017 through 2021) at OU A are available in the respective data summary and trend analysis reports. The results are summarized in Section 4.3 for 2017 through 2020; the 2021 data were not available at the completion of this FYR and will be evaluated during the next FYR period. If conditions exist such that there is no trend for total metals, yet cleanup levels are exceeded, it was recommended that monitoring occur every two years per the optimization approach set forth in 2014 among the Navy and stakeholders. There were no detections of PAHs, pesticides, or PCBs at wells sampled at OU A in 2020, and it was recommended that sampling of these analytes be discontinued on the basis of OU A RGs being met. Additionally, the Navy is currently reexamining the fate and transport models used to determine protectiveness at each OU, which will determine the future of the LTM program and decision criteria (Navy, 2021c).

Table 2-2: LTM Groundwater Monitoring at OU A

Well ID (Alternate Well ID)	Arsenic (Total)	Copper (Total)	Nickel (Total)	Zinc (Total)	Chrysene	Pesticides[2]	PCBs[3]
2018							
203 (PS03-MW03)	X	X	—	—	—	—	—
204 (MW204)	X	X	X	X	—	—	—
206 (MW206)	X	—	—	—	—	—	—
241 (MW241)	X	X	X	X	—	—	—
Background Well 346 (PS11-MW01L)	X	X	X	X	—	—	—
2020							
203 (PS03-MW03)	X	X	—	—	X	X	X
204 (MW204)	X	X	X	X	X	X	X
206 (MW206)	—	—	—	—	X	X	X
241 (MW241)	X	X	X	X	X	X	X
Background Well 346 (PS11-MW01L)	X	X	X	X	X	X	X
2021							
203 (PS03-MW03)	X	X	—	—	X	X	X
204 (MW204)	X	X	X	X	X	X	X

Table 2-2: LTM Groundwater Monitoring at OU A (continued)

Well ID (Alternate Well ID)	Arsenic (Total)	Copper (Total)	Nickel (Total)	Zinc (Total)	Chrysene	Pesticides[2]	PCBs[3]
206 (MW206)	—	—	—	—	X	X	X
241 (MW241)	X	X	X	X	X	X	X
Background Well 346 (PS11-MW01L)	X	X	X	X	X	X	X

Notes:
"X" indicates the well was sampled for the analyte.
"—" indicates the well was not sampled for the analyte.
Pesticides comprised aldrin, dieldrin, endrin, cis (alpha)-chlordane, trans (gamma)-chlordane, 4,4'-DDD, 4,4'-DDE, 4,4'-DDT.
PCB analysis comprised Aroclor 1260.
Abbreviations:
DDD = dichlorodiphenyldichloroethane
DDE = dichlorodiphenyldichloroethene
DDT = dichlorodiphenyltrichloroethane
PCBs = polychlorinated biphenyls

2.2.3.3 PMP Monitoring

As discussed in Section 2.0, the Navy is addressing petroleum impacts through a separate BNC-wide PMP, as required by the ROD (Navy et al., 2004a). Groundwater monitoring for petroleum-related contaminants was initiated in 2002. The PMP was amended in 2003 to establish ongoing petroleum monitoring requirements for OU A, OU B Terrestrial, and OU NSC (see Sections 2.4.3.3 and 2.7.3.3 for OU B Terrestrial and OU NSC PMP monitoring information). Based on the previous groundwater monitoring results and the absence of on-site sources of petroleum constituents, the 2003 Amended PMP recommended discontinuing petroleum hydrocarbon monitoring and free product measurements of all OU A wells (Navy, 2003a).

BNC records from 1997 to 2016 were researched for the 2017 PMP to determine if additional petroleum contamination has occurred within OU A. No new petroleum hydrocarbon sources were discovered. In addition, monitoring of petroleum hydrocarbons in OU A has been discontinued since 2003. Therefore, OU A will not be addressed further in the PMP (Navy, 2017a).

2.2.3.4 Non-LTM

<u>Intertidal Sediment Sampling (2018)</u>

As recommended in the BNC fourth FYR (Navy, 2017b), in 2018 intertidal sediment sampling at OU A was conducted to obtain information on the presence or absence of PCBs and total metals (including mercury), in an effort to help inform the Charleston Beach remedy repair design, and to assess whether fill debris/materials are impacting the adjacent marine sediment. In total, 10 sediment samples (samples BR-OUA-INT-01, -02, -03, -04, -05, -06, -07, -08, -09, and -10) were collected, with four of these samples (samples BR-OUA-INT-07, -08, -09, and -10) collected outside of the landfill boundaries on the waterward side (Navy, 2020g).

Samples were collected at low tide in locations accessible by foot. Sampling was accomplished by hand digging through fish-mix gravel to native surface sediment. Samples were collected from the upper 10 centimeters (cm) of the native surface sediment and analyzed for total PCBs, total metals (including mercury), total organic carbon, grain size, and percent moisture. Washington State Sediment Management Standard (SMS) sediment cleanup objective (SCO) and cleanup screening levels (CSLs), and natural background as defined by Ecology, were used as points of comparison. See Section 4.3.2 for a summary of sample results.

Subsurface Soil and Marine Sediment Sampling (2020 – 2021)

Soil and sediment samples were collected from December 2020 through February 2021 to support the design and implementation of the selected preferred shoreline repair alternative at Charleston Beach (Navy, 2021b). The primary objectives of this investigation were to:

- Determine COC concentrations within the soil proposed for removal and disposal to evaluate whether it would be classified as hazardous.
- Determine COC concentrations within the soil at the proposed future ground surface to evaluate potential transport of contaminants associated with the preferred alternative for OU A Charleston Beach remedy repair.
- Determine COC concentrations within sediment in the western beach upper intertidal area to evaluate potential transport of contaminants associated with the preferred alternative for OU A Charleston Beach remedy repair.

From 14 December through 18 December 2020, a total of 46 subsurface soil samples were collected from 12 soil borings spaced within 20- by 30-foot grids on top of the western revetment. Within each boring, four distinct depth intervals were sampled:

- Upper large interval (ranging from 0 to 5 feet below ground surface (bgs) to 0 to 6 feet bgs)
- Upper small interval (ranging from 5 to 5.5 feet bgs to 6 to 6.5 feet bgs)
- Lower large interval (ranging from 5.5 to 8.5 feet bgs to 6.5 to 9.5 feet bgs)
- Lower small interval (ranging from 8.5 to 9 feet bgs to 9.5 to 10 feet bgs)

The purpose of the two large-interval samples was to determine if the soil to be removed, or the soil below the future ground surface, would be characterized as hazardous or non-hazardous waste. Large-interval composite soil samples were analyzed for selected metals, SVOCs, PCBs, total petroleum hydrocarbons (TPH), grain size, and metals using the toxicity characteristic leaching procedure (TCLP). The purpose of the two small-interval samples was to determine the presence of potential contamination at and below the proposed future ground surface which would likely be transported by erosion or leaching. Small-interval composite soil samples were analyzed for selected metals, SVOCs, and PCBs. Soil samples were compared to the following published criteria:

- USEPA Regional Screening Levels (RSLs) (based on a hazard quotient [HQ] = 0.1);
- Washington State Cleanup Levels and Risk Calculation (CLARC) Method B screening levels for total PCBs, total SVOCs, and selected metals;
- Criteria for TCLP metals specified under 40 CFR; and
- Washington State CLARC Method A screening levels for TPH.

See Section 4.3.2 for a summary of sample results.

On 3 February 2021, seven sediment samples were collected from seven sediment sampling locations spaced within 20- by 30-foot grids within the western beach intertidal zone at Charleston Beach. Sediment samples were collected within the top 10 cm of sediment below overlying cobble. All sediment samples were analyzed for select metals, SVOCs, and PCBs. The sediment samples were compared to USEPA RSLs and Washington State SMS Criteria normalized for organic carbon content and/or Apparent Effects Threshold. In addition, metals were compared to the natural background concentrations. See Section 4.3.2 for a summary of sample results.

2.3 OU B Marine

2.3.1 Response Action

The final RI and FS reports for OU B were completed in March and May 2002, respectively (Navy, 2002c and 2002d). The purpose of the RI/FS was to determine the nature and extent of contamination from COCs, evaluate the probable environmental fate of chemicals, delineate subsections of OU B with comparatively consistent characteristics, and evaluate the potential risk to human health and the environment associated with chemicals found at OU B (Navy, 2002c). No removal action was conducted prior to the completion of the ROD.

The basis for taking action is specified in the ROD for OU B Marine, signed on 13 June 2000 (Navy et al., 2000). The RAOs for OUB Marine include the following:

- Reduce the concentration of PCBs in sediments to below the minimum cleanup level (MCUL) in the biologically active zone (0 to 10 cm depth) within OU B Marine, as a measure expected to reduce PCB concentrations in fish tissue;
- Control shoreline erosion of contaminated fill material at Site 1; and
- Selectively remove sediment with high concentrations of mercury collocated with PCBs.

The components of the selected remedy for OU B Marine include the following (Navy et al., 2000):

- Dredging of sediment
- Confined aquatic disposal (CAD)
- Enhanced natural recovery (placement of a thin layer of clean sediment to accelerate natural recovery processes)
- In situ capping
- Habitat restoration
- Shoreline stabilization at Site 1
- Monitoring
- Maintenance
- Marine sediment sampling
- Hydrographic survey
- Sub bottom profiling survey
- Tissue sampling
- CAD pit monitoring
- ICs
- Evaluation of IC effectiveness
- Natural recovery

An explanation of significant differences (ESD) signed on 19 February 2004, identified changes in the boundary of OU B Marine and action levels for the response action on the state-owned aquatic land next to the Navy's CAD pit (Navy et al., 2004b). The ESD did not change any of the RAOs stated in the ROD.

MCULs are compliance standards intended to protect human health and the environment. The sediment cleanup at OU B Marine was developed on the basis of an

MCUL for total PCBs normalized to 3 milligrams per kilogram (mg/kg) of organic carbon (mg/kg OC), measured on an area-weighted average (AWA) basis for PCBs in marine sediments (0 to 10 cm depths) throughout the OU B Marine area. The MCUL for PCBs was developed based on interagency agreement after consideration of natural recovery modeling, which predicted this MCUL could be achieved within 10 years of remedy completion assuming a post-remedy AWA of 4.1 mg/kg OC. Although actions were taken to address mercury in sediments, the ROD did not specify a MCUL for mercury (Navy et al., 2000).

Several action levels were identified as guidelines for use during the configuration and comparison of remedial alternatives, which led to the development of the remedy for OU B Marine. Primary considerations in choosing action levels were: whether a cleanup based on these levels is likely to achieve the desired sediment quality goals, whether the levels are consistent with other regional cleanups, and whether the levels are cost-effective, appropriately balancing risk reduction against cost. A PCB action level of 12 mg/kg OC was identified for sediment dredging. An additional PCB action level of 6 mg/kg OC was identified for selecting sediment areas appropriate for enhanced natural recovery. For mercury, it was decided the RAO to selectively remove sediment containing elevated mercury collocated with elevated PCBs could be accomplished with combined action levels of 3 mg/kg for mercury and 6 mg/kg OC for PCBs.

The ROD established cleanup goals for total PCBs in sediment and English sole tissue based on reference area conditions. The cleanup goal for total PCBs in sediment is 1.2 mg/kg OC, measured as an AWA throughout Sinclair Inlet. The cleanup actions taken at the site were predicated on natural recovery modeling, which predicted although a sediment PCB concentration of 3 mg/kg OC could be achieved within 10 years, several decades could be required for sediments to recover to 1.2 mg/kg OC in Sinclair Inlet. As documented in the ROD, the cleanup goal established for English sole tissue is based on the 90th percentile of PCB concentrations measured in fish from nonurban Puget Sound embayments. The total PCBs cleanup goal for English sole tissue is 0.023 mg/kg wet weight, based on the assumption that reductions in sediment PCB concentrations would gradually lead to reductions in PCB concentrations in fish tissue.

2.3.2 Status of Remedy Implementation

The primary components of the remedy for OU B Marine were implemented between summer 2000 and fall 2001, as shown in Figure 2-3 (Navy, 2002f). New sheet pile was installed at Site 1 in the central part of the BNC shoreline, riprap was placed to improve armoring and limit erosion, and gravel mix was placed to enhance nearshore habitat quality.

A total of approximately 225,000 cubic yards of contaminated sediment was dredged and placed in the CAD pit. The CAD pit was capped with approximately 17,000 cubic yards of sand and 69,000 cubic yards of clean sediment. Approximately 57,000 cubic yards of clean sediment was used to form the cap and surrounding enhanced natural recovery area offshore of OU A. A total of approximately 5,000 tons of engineered rock and gravel mixes was used to enhance nearshore habitat in the OU A vicinity.

In the latter stages of the remedial action, evidence was found suggesting contaminated sediment had been released during the process of filling the CAD pit. Approximately 2 feet of clean sediment was placed in an arc around the three Navy property sides of the CAD pit to cover sediment found to have elevated levels of PCBs. The Navy then undertook a more extensive evaluation of the extent of contaminant release onto the state-owned aquatic lands adjacent to the fourth side of the CAD pit. Based on this investigation, clean sediment was used to cover the contaminated sediment found on the adjacent state-owned aquatic lands. The results of the investigation and the actions to be taken in response were documented in an ESD (Navy et al., 2004b), and the work was completed in February and March 2004.

As part of the ROD, LTM has been conducted to confirm predicted natural recovery of sediments in OU B Marine. Specifics of LTM of OU B Marine are further discussed in Section 2.3.3.

Institutional Controls

Based on recommendations from the fourth FYR, an IC Plan for OU B Marine was prepared and implemented (Navy, 2020e). The IC Plan was prepared to document the responsibilities and requirements for complying with the ICs and maintaining the long-term physical integrity of the remedy required by the OU B Marine ROD (Navy et al., 2000). The IC Plan identifies LUC measures to protect human health and the environment at OU B Marine as the site is suitable for limited use only.

The OU B Marine ROD IC requirement was: “Land-use restrictions will be implemented by the Navy to maintain the integrity of the CAD cells and the shoreline stabilization measures” (Navy et al., 2000). The ESD for the OU B Marine ROD stated: “No land use restrictions will be required on the state-owned aquatic lands portion of OU B Marine. This ESD does not change the ROD specified land use restrictions” (Navy et al., 2004b).

According to Section 12.2.9 of the OU B Marine ROD, the selected remedy requires: “Any remedy that results in hazardous substances remaining on site above levels that allow for unlimited use and unrestricted exposure requires some form of ICs to ensure that human health and the environment are protected” (Navy et al. 2000).

The LUC objectives defined in the ROD are as follows:

- Ensure the integrity of the cap is maintained
- Prevent any digging or construction on top of the cap
- Prevent dredging on top of the cap

LUCs at OU B Marine are designed to protect the integrity of the engineered remedy by restricting activity in the capped and CAD areas, including dredging, anchoring, or unauthorized construction. LUCs are also needed to protect the remaining areas of OU B Marine from impacts to the remedy from construction projects conducted within OU B Marine. NBK Bremerton has site access restrictions already in place, and OU B is monitored and partly fenced to prevent offshore access to the area; signage and fencing are also in place to control unauthorized access.

The Navy conducts regular monitoring and inspection to ensure LUCs are being maintained and remain effective, unless and until LUCs are terminated. Specific Navy responsibilities are specified in Naval Base Kitsap Instruction 5090.14 (Navy, 2019b) and in the O&M and IC Plan (Navy, 2018c).

As required by the O&M and IC Plan (Navy, 2018c), the Navy provides the results of LUC inspections and monitoring in a remedy inspection report to the USEPA and Ecology on an annual basis. The annual remedy inspection reports are also provided to the DNR and Suquamish Tribe.

2.3.3 O&M and Monitoring

2.3.3.1 Inspections and Maintenance

At the time this FYR was prepared, an inspection of OU B Marine had not been documented because physical underwater inspections are not part of the O&M activities for OU B Marine.

2.3.3.2 Long Term Monitoring

A monitoring plan for OU B Marine was prepared in 2003 (Navy, 2003c) based on the monitoring requirements identified in the ROD (Navy et al., 2000). The 2003 plan was updated for each subsequent LTM event. Since completion of the dredging and capping activities, the Navy conducted monitoring events in 2003, 2005, 2007, 2010, 2012, 2014, 2015, and 2018 to assess progress toward achievement of remediation goals and to evaluate the integrity of the remedy. The monitoring events have included marine surveys, English sole tissue sampling, and sediment sampling.

Monitoring at OU B Marine during this FYR period included both measures to verify the remedy integrity and measures to assess progress toward meeting cleanup goals.

Measures to assess progress toward meeting cleanup goals included:

- Sampling of marine surface sediment (2018)
- Sampling of fish tissues (English sole, 2018)

Measures to assess remedy integrity included:

- Hydrographic surveys in the CAD pit area, thick cap, and enhanced natural recovery areas offshore of OU A (2018) to assess potential changes in the sea floor profile in these two areas from consolidation or erosion since 2001; and
- Sub-bottom profiling (SBP) of the CAD pit (2018) to assess potential changes in cap material thickness since placement of the cap.

Sampling conducted during this FYR period occurred in 2018 and is documented in the long-term monitoring report for OU B Marine and the intertidal area of OU A (Navy, 2020g); results are summarized in Section 4.3.2.

<u>Marine Sediment Sampling</u>

The primary component of the OU B Marine monitoring program is the collection and analysis of surface (0 to 10 cm) marine sediment samples based on two regular square grids, which together cover the entirety of Sinclair Inlet. These data are used to characterize surface sediment quality on an AWA basis. This sediment sampling is guided by two grids laid out across the area of Sinclair Inlet. By combining the results from sampling of the two grids on an area-weighted basis, AWA measures of the sediment quality of the entire inlet can be computed. This approach was developed for the 2003 LTM event and has been carried forward for subsequent events.

Marine surface sediment was sampled in 2018 in 500-foot and 1,500-foot grids. The same randomly identified individual grab sample locations used during previous LTM rounds were used to create composites of each grid cell during the 2018 LTM event. Each sample was analyzed for PCB Aroclors, mercury, total organic carbon, percent moisture, and grain size.

PCB Monitoring

The 2014 sediment monitoring results demonstrated PCB levels in sediment in OU B Marine met the sediment MCUL, and PCB levels throughout Sinclair Inlet had achieved the long-term cleanup goal established in the OU B Marine ROD (Navy, 2016d). However, the Navy and stakeholders (USEPA, Ecology, DNR, and the Suquamish Tribe) agreed a confirmatory round of monitoring would be conducted in 2018 to validate the 2014 LTM results (Navy, 2016b, 2016d). The sampling program developed in 2003 and used for the 2018 event was intended to serve as a check on the continued protectiveness of the remedy for OU B Marine and track anticipated improvements in sediment and tissue quality. The OU B Marine ROD specifies surface sediments in Sinclair Inlet would be monitored to verify long-term protection of the environment and to assess natural recovery processes (Navy et. al., 2000). The 2018 sediment and tissue data are considered usable for confirming OU B Marine ROD cleanup objectives have been met for OU B Marine and Sinclair Inlet. Declining total PCB Aroclor concentrations in sediment are corroborated by similar trends in PCB Aroclor concentrations in English sole fish tissue. The PCB results from 2018 are discussed in Section 4.3.2.

Mercury Monitoring

Based on the findings of the baseline risk assessment performed as part of the RI for OU B Marine (Navy 2002c), the Navy, USEPA, and Ecology agreed long-term human health risks from consumption of marine tissue, mostly associated with PCBs, would be the primary basis for remedial action at the site. Although mercury had been found in sediment throughout Sinclair Inlet at concentrations above the Washington State marine benthic sediment cleanup objective level of 0.41 mg/kg in marine sediment, a wide variety of marine studies completed during the RI indicated little or no ecological or human health risk from mercury. PCBs were selected as the primary focus in developing cleanup criteria for the site and planning the remediation. However, an RAO and a sediment action level for mercury collocated with elevated PCB concentrations were also included in the OU B Marine ROD when, subsequent to the risk assessment, mercury in rockfish (sampled in 1995 and 1998), especially older fish, was observed at considerably higher levels than had been measured in biota used in the risk assessment.

After the OU B Marine ROD was published, new information regarding Suquamish Tribal subsistence seafood consumption rates became available. These new consumption rates were higher than the rates used in the earlier risk assessment (Suquamish Tribe, 2000). Subsequently, the second FYR for BNC (Navy, 2007a) identified potential risks from mercury via the seafood consumption pathway and recommended additional analysis of these risks. In 2010, the Navy completed a supplemental human health risk evaluation for two future populations potentially exposed to mercury in Sinclair Inlet sediment and seafood: a general sport fishing population and the Suquamish Tribe population (Navy, 2010d). This evaluation was performed using existing marine tissue data collected from 1991 to 2007 from Sinclair Inlet and non-urban reference areas.

The supplemental human health risk evaluation reported incremental mercury HQs of 3.9 for an adult and 3.4 for a child, above target levels for subsistence-level consumption by the Suquamish tribal members. Hazards for a general sport fishing population met target health goals. The greatest concerns were the consumption of rockfish and the potential increased hazards to children consuming seafood containing both mercury and PCBs. However, significant risks were also associated with consumption of shellfish and salmon. The shellfish species contributing most to the shellfish HQ were clams and crabs.

The findings of the supplemental risk evaluation (Navy, 2010d) re-emphasized the role of mercury as a chemical of concern for BNC based on subsistence-level consumption of seafood collected in Sinclair Inlet. A preliminary conceptual site and exposure model indicates a portion of the total mercury from BNC and other sources is methylated under anoxic conditions in sediment where appropriate bacteria are present and other conditions are met. Methylmercury is more toxic than mercury and bioaccumulates (Bloom, 1992).

The supplemental risk evaluation recommended additional tissue mercury data collection to evaluate current baseline conditions and support a planned focused feasibility study. This recommendation was reiterated in the third and fourth FYRs for BNC (Navy, 2012a and 2017b). In response to the supplemental human health risk evaluation findings and the third FYR recommendations, the 2013 marine monitoring event was conducted, including collection of sediment and biota samples from Sinclair Inlet and several reference areas (Navy, 2015b). The monitoring was intended to address data concerns regarding the concentration and speciation of mercury in sediment and serve as a baseline for comparison to data collected in the future, to allow monitoring of trends of tissue mercury levels. The scope of the 2013 biota sampling included collection of tissue from multiple species representing different trophic levels, namely clams, crab, and two species of demersal fish (shiner perch and staghorn sculpin) from OU B Marine, Sinclair Inlet outside OU B Marine, and reference areas. Clam and crab samples were analyzed for both total and methylmercury; shiner perch and staghorn sculpin were analyzed for total mercury only. These species were selected based on (1) high site fidelity, (2) differing food chain connections to water and sediment, (3) likelihood mercury levels in site organisms can be distinguished from background, and (4) responsiveness of tissue mercury levels to changes in the environment. English sole sampling was not included in the 2013 biota sampling because the Supplemental Risk Evaluation (Navy, 2010d) concluded mercury concentrations in English sole from Sinclair Inlet were similar to reference area mercury concentrations (i.e., not distinguished from background).

Marine sediment samples (some collocated with clam and crab samples) were also collected and analyzed for both total mercury and methylmercury. Mercury and methylmercury data were gathered to:

- Improve understanding of how mercury moves through Sinclair Inlet into biota;
- Help evaluate whether there is a link between releases of mercury from terrestrial BNC and methylmercury in biota; and
- Improve decision-making on remedial actions to reduce risks for people eating fish and shellfish.

Statistical analyses were used to identify the numbers of samples needed to support project decision-making.

In addition to the 2013 marine monitoring work described above and the extensive sediment total mercury data collected during seven rounds of OU B Marine long-term monitoring, the Navy has also been engaged in other mercury investigative work in Sinclair Inlet. Other mercury investigation work includes investigations by the U.S. Geological Survey (USGS) of mercury distribution and fate and transport processes within Sinclair Inlet and adjacent areas and the Navy's Environmental Investment project, which is a cooperative effort involving the Navy, Ecology, USEPA, and other stakeholders to collect mercury and other environmental data from the Sinclair-Dyes Inlet watershed. The results of the 2018 OU B Marine and Sinclair Inlet sediment sampling and analysis conducted as part of the LTM program indicated the highest concentrations of mercury in sediment was toward the eastern end of OU B Marine. Trends in mercury concentrations in sediment appear to be declining or show no trend. The mercury analysis is summarized in Section 4.3.2.

Tissue Sampling

A second component of the OU B Marine monitoring program is the collection and analysis of marine tissue samples. Tissue sampling during this FYR period consisted of English sole sampling in 2018. English sole are collected using a trawl net, with samples made up from skin-off fillets. English sole samples were analyzed for PCB Aroclors and lipids. The average total PCB Aroclor concentration in English sole tissue was below the cleanup goal for Sinclair Inlet for the first time since monitoring began. The results of the 2018 OU B Marine fish tissue sampling and analysis are summarized in Section 4.3.2.

Hydrographic Survey

A precision hydrographic (bathymetric) survey was conducted at the CAD pit area and the capped area adjacent to OU A in 2018 (Navy, 2020g). The capped area adjacent to

OU A consists of a thick-layer cap and a thin-layer cap functioning as an enhanced natural recovery area. The survey information is intended to be used to identify evidence of sediment movement, erosion, and/or deposition which may have occurred since the last hydrographic survey was conducted in 2012. The survey of the cap areas followed track lines similar to those used in previous surveys so as to facilitate direct comparison to results from previous surveys. The bathymetry was measured using a multibeam-echosounder in parallel with an inertial navigation system to measure high-resolution bathymetric soundings of the seafloor referenced to mean lower low water (National Tidal Datum Epoch 1983-2001). An additional offset to lower the data set by 0.17 foot was applied to present the survey in the project historical vertical datum of mean lower low water (National Tidal Datum Epoch 1960-1978) (Navy, 2020g).

Sub-bottom Profiling Survey

In addition to the hydrographic survey, an SBP survey was conducted in the CAD pit area and the capped area adjacent to OU A in the same areas as the hydrographic survey. The SBP survey was conducted to identify changes in seabed density which characterize the nature and thickness of surficial and subsurface sediments. The purpose of the SBP survey was to determine whether there is evidence of significant change in the thickness of the protective caps and/or significant mixing of cap materials with underlying materials. The continuity and extent of the sand cap and overlying sediment were also observed and recorded. The SBP survey was conducted using a series of northeast-to-southwest and northwest-to-southeast transects with approximately 50-foot spacing across the CAD pit. Similar to the hydrographic survey, the sub-bottom survey of the capped area adjacent to OU A also followed the same track lines as those used in previous surveys to facilitate direct comparison of results. An SBP echosounder was used to penetrate the seafloor and measure the thickness of corresponding layers beneath the mudline surface. In contrast to the large swath of the multibeam-echosounder, SBP is a single-beam echosounder operating at a low frequency of 10 kilohertz. The low frequency allows the acoustic beam to penetrate deeper into the sediment for observing and measuring different layers of subsurface sediments. As a result, more lines were run for SBP than for the multibeam-echosounder in order to increase overlap for comparison and estimating accuracy of data processing. SBP technology creates cross-sectional acoustic images that are interpreted at discrete points to assess the thickness of the cap material (Navy, 2020g).

Survey Results

The results of the 2018 bathymetry survey and SBP of the CAD pit indicate that following construction of the CAD pit in 2001, there appears to be approximately 11.5 feet of consolidation of the CAD pit cover materials. The survey suggests cap materials continue to form a contiguous cover over the pit, with a combined sand and sediment thickness ranging from 2 to 11 feet and averaging 5.4 feet (Navy, 2020g).

The results of the 2018 bathymetry survey and SBP of the capped area adjacent to OU A indicate 1 to 2 feet of consolidation may have occurred in this area since 2012, and, prior to that, consolidation of up to 4 feet may have occurred. The results showed an approximate average thickness of 5 to 6 feet of cap material; however, a substantial percentage of the offshore cap area did not provide conclusive data. Sub-bottom survey data had not been collected in the capped area adjacent to OU A since 2003. In the absence of conclusive marine survey data for the capped area adjacent to OU A, a general assessment of beach processes was conducted. The general assessment observed loss of fish-mix along Charleston Beach, which is the result of longshore transport driven by waves approaching at an angle. The general assessment concluded that this same mechanism is not expected to influence the cap material offshore of Charleston Beach (Navy, 2020g).

2.3.3.3 Non-LTM

Repair Saltwater Distribution System Project

The Repair Saltwater Distribution System project involves replacement of the saltwater distribution main line piping that traverses the waterfront from east of Dry Dock 3 to west of Dry Dock 5. Project site work includes the following elements (Navy 2017g):

- dredging, decanting filtered water from dredge material, and treatment of decant water to remove trace metals;
- access for equipment, barges, and divers;
- in-water and upland trench excavation;
- processing environmental components;
- traffic control;
- demolition of paving and then repaving;
- disposal of debris generated from the removal of the deteriorated piping and associated components; and
- hydro-testing and commissioning to rectify the saltwater system per design standards.

In order to accomplish these activities and to implement best management techniques for sediment and pollution prevention control, a Detailed Dredging Plan (Ballard 2017) and a Water Quality Protection and Monitoring Plan (Navy 2017g) were developed. Sampling of effluent from the system treating decanted water from dredged material occurred on 21 and 27 August 2019. Samples were subsequently analyzed for PCBs, hexavalent chromium, metals, and mercury. Mercury was the only analyte detected, with concentrations of 0.55 ng/L on 21 August 2019 and 1.36 ng/L on 27 August 2019.

The Repair Saltwater Distribution System project was put on hold at Dry Dock 5 because petroleum-contaminated sediment patches were encountered during dredging activities in 2019. The project has not been completed pending funding allocation.

Petroleum Contaminated Sediment Action Plan

The Navy drafted a Petroleum Contaminated Sediment Action Plan (not finalized) to allow for continuation of the salt water main replacement project through petroleum-contaminated sediment. These actions are in addition to the actions in place per the Detailed Dredging Plan and the Water Quality Protection and Monitoring Plan documents. The Petroleum Contaminated Sediment Action Plan provides the approach for booming and spill response, best management practices, dredge effluent treatment, treated effluent testing, and reporting. This plan has not been finalized nor implemented due to delayed implementation of the saltwater main replacement project.

2.4 OU B Terrestrial

2.4.1 Response Action

The final RI and FS reports for OU B were completed in March and May 2002, respectively (Navy, 2002c, 2002d). The purpose of the RI/FS was to determine the nature and extent of contamination from chemicals of concern, evaluate the probable environmental fate of chemicals, delineate subsections of OU B with comparatively consistent characteristics, and evaluate the potential risk to human health and the environment associated with chemicals found at OU B (Navy, 2002c).

Various studies, investigations, and closure or removal actions were undertaken within OU B Terrestrial prior to the final RI and FS reports. Removal actions that included paving installation and soil, drum, and tank removal were documented in the final RI report (Navy, 2002c) and the ROD for OU B Terrestrial (Navy et al. 2004a).

Some elements of the OU B Terrestrial remedy were initiated during or after the RI/FS but prior to finalizing the ROD, including the following:

- Approximately 80,000 feet of storm drain piping were inspected, leading to cleaning of approximately 75,000 feet of piping. Details on remedial actions on storm drains are documented in closure and remedial action reports (Navy, 2002h, 2004c, 2006c).

- Approximately 2,000 feet of piping was replaced and another 2,000 feet was repaired. Eighteen catch basins and manholes were replaced or repaired. Approximately 112,000 square feet of new asphalt was placed throughout BNC. Details on the paving upgrades and capping are available in the closure and remedial action reports (Navy, 1998a, 2000d, 2004d, 2005, 2007b).
- A total of 11,200 feet of seawall was inspected, leading to actions to reduce over-steep slopes, augment armoring, control erosion, and enhance shoreline habitat in selected areas. Details on shoreline protection are described in the final remedial action report (Navy, 2006d).

The basis for taking action is specified within the ROD for OU B Terrestrial, signed on 8 March 2004 (Navy et al., 2004a). The RAOs specified in the ROD are the following:

- Continue to limit human exposure to site soils and groundwater; and
- Reduce the potential for chemical transport and control the threat of recontamination of the adjacent marine environment from:
  - Accumulation of sediment or debris in the stormwater system;
  - Infiltration of soil and groundwater into the stormwater system;
  - Infiltration of surface water into site soil; and
  - Erosion of shoreline soil.

The components of the selected remedy for OU B Terrestrial include the following (Navy et al., 2004a):

- Stormwater system restoration
- Paving
- Shoreline stabilization
- ICs
- Groundwater monitoring
- Remedy maintenance

No cleanup levels have been established for OU B Terrestrial. The RAOs are based on the need to contain contaminated terrestrial media (i.e., accumulated stormwater system sediment and debris, soil, and groundwater) and limit transport to the adjacent marine environment. The RAOs do not identify the need to remediate stormwater system sediment, soil, groundwater, or surface water based on risks due to direct exposure to those media.

2.4.2 Status of Remedy Implementation

As discussed above, some elements of the OU B Terrestrial remedy were initiated prior to finalizing the ROD in 2004. The last elements of the remedy were completed in 2006, with the exception of ongoing inspections, maintenance, and monitoring.

The ROD for OU B Terrestrial requires installation or upgrades and repairs to the existing pavement cap areas, shoreline inspections, and catch basin inspections. The Navy has performed annual inspections since 2008, in addition to needed maintenance to ensure remedies set forth in the ROD continue to seal the contaminated fill and route stormwater to the storm drain system. In general, vegetated cover within OU B Terrestrial appeared in good condition during annual inspections for this review period, with no major erosional problems observed (Navy, 2020c). Inspections since 2010 have continued to identify additional erosion at Segment 4 and have noted visible landfill material within the eroded area since the 2016 inspection (Navy, 2020c), as summarized in Section 2.4.3.1 of this report.

The protectiveness determination from the fourth FYR was Protectiveness Deferred because not enough information on OU B Terrestrial as a source of mercury to the marine environment was available to make a determination (Navy, 2017b). The protectiveness of the remedy at OU B Terrestrial was to be re-evaluated when a mercury source control evaluation was completed. In the interim, the pathways for human exposure are controlled through ICs which control access to the site, control excavation in contaminated areas, prevent groundwater consumption, and limit activities on site to industrial use, as summarized later within this section.

The USEPA agreed with the protectiveness determination for OU B Terrestrial (Navy, 2017b) and stakeholders supported the Navy's recommendation to stabilize Segment 4 of the shoreline. Stakeholders requested consideration of the USGS groundwater study (Jones et al., 2016), which indicated potential direct discharge of groundwater at Segment 4, and removal and proper disposal of all anthropogenic material during future site work (Navy, 2019f).

An alternative assessment was performed to evaluate potential shoreline repair alternatives which would meet the ROD objectives without the net loss of productive fish and shellfish habitat. Because of potential for elevated concentrations of contaminants of concern due to groundwater flow at OU B Terrestrial Segment 4, the decision was made to replace the sloped sand/gravel beach with a rock revetment, with the lost habitat area being replaced through the expansion of Charleston Beach at OU A (Navy, 2021a). The BOD process is ongoing and will be completed in fall 2022. Construction of the remedy repair will be awarded in early 2023, with implementation expected in summer 2023.

ICs

The ICs for OU B Terrestrial are intended to meet the RAO of "continue to limit human exposure to site soils and groundwater." The ICs are applicable throughout the OU B Terrestrial site and, because contaminated soil and groundwater are left on site, must be maintained until contaminant levels allow for unlimited use and unrestricted exposure.

The IC objectives for OU B Terrestrial are the following:

- Ensure access to the site is controlled
- Ensure the sole use of groundwater from the site is for monitoring purposes
- Ensure excavations carried out at the site are managed appropriately given the contaminants left in place
- Ensure the established industrial use of the site is maintained

In 2020 an excavation management plan (Navy, 2020d) was developed which details the processes and procedures that the Navy and its contractors must take while working within the CERCLA OUs. The excavation management plan provides guidance on the measures necessary to conduct excavation work, and contractors use this manual to comply with requirements for new development and redevelopment projects (Navy, 2020d).

2.4.3 O&M and Monitoring

2.4.3.1 Inspections and Maintenance

During this FYR period, the Navy conducted annual inspections and maintenance of the OU B Terrestrial remedy under the consolidated O&M and IC plan updated in 2018 and 2020 (Navy, 2018c and 2020b). The O&M and IC plans include inspection and maintenance requirements identified in the ROD for OU B Terrestrial. During this FYR period, annual inspections were conducted as required by the OU B Terrestrial ROD and included inspection of:

- Pavement caps and vegetated covers intended to minimize infiltration at BNC;
- Catch basins intended to prevent contaminant migration to Sinclair Inlet;
- Erosion control measures along the shoreline; and
- ICs to restrict access or exposure to affected media, manage new excavations, and restrict future land use.

The results of the inspection verification site visit conducted as part of the current FYR process are discussed in Section 4.4.

Pavement Cap

Overall, the condition of the OU B Terrestrial pavement cap in 2020 was similar to the condition observed during the previous five-year review. Although pavement repairs were completed periodically, weathering and other damage have resulted in a consistent portion of pavement with poor integrity over time. During the 2020 inspection, approximately 2.5% of OU B Terrestrial areas were determined to have poor pavement cap integrity, consistent with the previous annual inspections conducted during this FYR period. Vegetation growth through deteriorated seals, alligator cracking, gapping/cracking, and potholes accounted for most of the deficiency observations. Construction affecting the cap, subsidence, and uplifting with vegetation growth have also been observed (Navy, 2021d). Repairs to cap deficiencies of areal features (i.e., potholes) and linear features (i.e., cracks and deteriorated sealant) were carried out during the 2017, 2018, and 2019 inspections and maintenance of the OU B Terrestrial remedy. The OU B Terrestrial pavement rating was unchanged over the 5 years of the FYR period.

Vegetated Cover

OU B Terrestrial has several areas of vegetated cover requiring inspection. The areas included linear strips along the shoreline in the vicinity of Mooring E, Mooring F, Mooring G, and east of Pier 7; one large, sloped area along the northern boundary of OU B Terrestrial; and several smaller planted areas. Throughout this FYR period, vegetated cover within OU B Terrestrial appeared to have adequate coverage with minor evidence of erosion (Navy, 2018b, 2019e, 2020c, 2021d). This observation is consistent with the previous five-year review. Shoreline vegetation throughout OU B Terrestrial was sparse and dry and, in many areas, grass was the only cover, although kinnikinnick, non-native blackberry, Scotch broom, and English ivy plants were also observed. Soil rutting in the approximately 50-foot-long by 3-foot-wide area along the top of the shoreline at Segment 3 north of Mooring E, observed during 2017 and 2018 inspections, was less significant in 2019 and not observed during the 2020 inspection (Navy, 2020c, 2021d). It is likely that the rutting was minimized by natural processes (such as rainfall), as action was not taken to repair ruts. During the Segment 4 remedy repair, barriers, such as Jersey barriers or ecology blocks, will be placed at the edge of the pavement above shoreline Segment 3 to prevent rutting. In this area, the top of the shoreline slopes away from the water. This may prevent stormwater flow from eroding topsoil and washing it into Sinclair Inlet (Navy, 2020c).

Shoreline

Annual shoreline field inspections for OU B Terrestrial are conducted by boat and from land. The land inspection focuses on the upper shoreline portions, which are stable to walk on, while the boat inspection provides both an overview and a closer inspection of the lower shoreline. Segments 1 through 4, 17 through 19, 40, and 41B are composed of armor rock. Segment 41A is a combination of armor rock and concrete slabs.

The 2020 annual shoreline field inspections for OU B Terrestrial were conducted from land in October 2020 and by boat in March 2021. A summary of results by segment, compared to the previous FYR, is provided here (Navy, 2021d):

- Segment 1 appeared similar to previous inspections, with no overall change in condition or slope since the previous FYR. In the westernmost corner of the upper shoreline of Segment 1 under the edge of Mooring G, two areas of erosion, first documented in 2012, have been remedied by the placement of armor rock in 2020 on the upper west side of Mooring G. Additionally, a small amount of rock movement appeared to have occurred, with a few armor rocks having moved downslope from the outfall and a few rocks which appeared to have moved downslope from the east shoreline mooring.
- Segment 2 also had a small number of the larger armor rocks which have cracked, but the overall integrity of the armor rock remained unchanged since the previous FYR.
- Segment 3 appeared similar to 2017, 2018, and 2019, with no changes to its slope or general condition.
- Segment 4 continued to have areas of significant erosion exposing concrete, bricks, metal, landscaping fabric, and asphalt debris at the eastern end of the segment along the upper shoreline. During recent annual inspections, the eastern end of this erosion area appeared to extend under the pier area and to undercut the asphalt next to the edge of the shoreline. This erosion has been documented throughout this FYR period; however, with each inspection, the erosion appears to be worse than the prior inspection. The Navy has begun preparing the design (Navy, 2021b) for shoreline repairs at Segment 4.
- No deficiencies were observed in Segment 17 or Segment 19 during this FYR period. No changes in condition or slope were observed for these segments.
- During the 2020 inspection, Segment 18 had large concrete barriers along the upper shoreline that are not part of the remedy for Segment 18 and were placed sometime between the 2019 and 2020 inspections. The Segment 40 armoring appeared to be in generally good condition, with a few cracked rocks, throughout

the review period. This observation is consistent with the previous FYR. During the 2020 inspection, the area at the western end of the segment alongside the former pier footing appeared to be in better condition compared to the previous FYR. This improvement is likely due to a new fence restricting access to this area allowing vegetation to take hold. It was unknown if armor rock was required in this area. The 2020 inspection report (Navy, 2021d) recommended the Navy evaluate this area further to determine if engineering controls are required. Additionally, two incipient erosional areas in the eastern half of Segment 40 are located along the Harborside Fountain Park, both along the upper edge of the armor rock. A new fence line has been placed along the entire length of the upper shoreline.

- Segment 41A consists primarily of seven large concrete slabs, with armor rock located above, at the bottom (underwater) edge, and on top of the southernmost three slabs. An interim repair to shoreline Segment 41A was conducted in July 2011 by placing rock around the failing segments to stabilize the slabs, cover exposed soil, and enhance shoreline protection. The slabs have not appeared to move since this repair, and, according to the 2020 inspection report, the 2011 repair is considered a final action (Navy, 2021d). No changes were observed during this review period, and the concrete slabs appeared to remain in the same orientation. A previously noted erosional area along the upper edge of the armor rock at the southern end of the segment has since been remedied by placement of new armor rock in November 2020.
- The armor rock shoreline at Segment 41B appeared to be in good condition, an observation consistent with the previous FYR. No deficiencies were observed.

Catch Basins

The OU B Terrestrial dry and wet weather catch basin and manhole inspections were performed annually during this FYR period. During the dry weather inspections, catch basins and manholes were evaluated for evidence of damage, sediment buildup, and backups. Per the O&M and IC Plan (Navy, 2020b), when sediment thickness exceeds 60% of the total sump depth, the Navy will notify the appropriate Environmental Office Public Works regarding conditions and the need for any repairs. Catch basins and manholes which were inspected during this FYR period and were found to exceed the 60% threshold of sediment thickness were repaired ahead of the next inspection. Catch basins and manholes exceeding the 60% threshold between 2017 and 2020 are shown in Table D-3b in Appendix D of the 2020 inspection report (Navy, 2021d).

The wet weather inspection evaluated stormwater flow to and through catch basins and manholes. All catch basins and manholes inspected during the 2017 inspection were found to be free flowing. Backup or ponding was observed at two catch basin locations during the 2018 inspection. Backup or ponding was observed at four manholes and two catch basin locations during the 2019 inspection. During the 2020 inspection, backup or ponding was observed at two catch basin locations and one manhole location (Navy, 2018b, 2019e, 2020c, 2021d).

A task order was awarded in 2021 to determine additional backup locations for catch basin and outfall inspections. Updates to the stormwater maps and to the stormwater inspection checklists were completed as part of this task order and will be included in the next iteration of the Terrestrial LTM and O&M Plan.

2.4.3.2 Long Term Monitoring

The long-term groundwater monitoring requirement of the OU B Terrestrial ROD was satisfied by the initiation of monitoring in 2004. There is no current or expected future beneficial use of groundwater at OU B Terrestrial. It has been demonstrated it is not practicable to meet cleanup levels throughout the OU within a reasonable restoration time frame. On this basis, a conditional point of compliance was selected for groundwater at OU B Terrestrial in the OU B Terrestrial ROD. The point of compliance is along the shoreline, immediately upgradient of the dry docks, represented by four groundwater monitoring wells. Groundwater monitoring is intended to meet the RAO of “reduce potential for chemical transport and control the threat of recontamination of the adjacent marine environment” by providing information to verify predictions indicating site groundwater is protective of the marine environment. The Navy, USEPA, and Ecology selected constituents for groundwater monitoring based on a review of the nature and extent of the chemicals of interest throughout OU B Terrestrial. The chemicals monitored in OU B Terrestrial groundwater are listed in Table 2-3.

During preparation of the original LTM plan for OU B Terrestrial in July 2004 (Navy, 2004a), the Navy, USEPA, and Ecology agreed on an approach for estimating the extent of attenuation between the dry dock compliance monitoring wells and the groundwater discharge points to Sinclair Inlet. To determine whether compliance has been achieved, groundwater results from the wells were adjusted based on the estimated attenuation and compared to the conditional point of compliance groundwater criteria established in the ROD. This adjustment, or attenuation factor, estimates reduced contaminant concentrations based on the relative percent of groundwater to seawater. However, the methodology used to determine the attenuation factor may not portray an accurate representation of the chemical constituent concentrations being discharged into Sinclair Inlet. Therefore, the Navy, USEPA, Ecology, and Suquamish Tribe agreed to discontinue the attenuation factor calculations. This decision was based on the conclusion that the concentrations of contaminants that were calculated using the attenuation factor were possibly not representative of contaminants of concern in wells upgradient of the drydocks (Navy, 2018a).

LTM during this FYR period was conducted annually as presented in Table 2-3. Results from monitoring during this FYR period (2017 through 2021) at OU B Terrestrial are available in the respective data summary and trend analysis reports. The results are summarized in Section 4.3 for 2017 through 2020; the 2021 data were not available at the completion of this FYR and will be evaluated during the next FYR period.

Sampling was conducted in accordance with the comprehensive LTM plans covering all terrestrial OUs (Navy, 2011a, 2012c, 2013a, 2014b, 2016c, 2017f, 2018a, 2020a, 2021e). Under the current groundwater monitoring plan for OU B Terrestrial (Navy, 2020a, 2021e), monitoring activities were conducted at required well locations every 1, 2, or 5 years. Several of the wells in the OU B Terrestrial LTM program are sampled for mercury, cadmium, copper, nickel, and zinc; all of the program wells were sampled in 2020 for one VOC, specifically TCE, and pesticides. Table 2-3 indicates the sampling of each well during this FYR period.

Table 2-3: LTM Groundwater Monitoring at OU B Terrestrial

Well ID (Alternate Well ID)	Total Metals Analysis					VOC	Pesticides
	Mercury	Cadmium	Copper	Nickel	Zinc	TCE	
2017							
410R (MW-410R)	X	--	--	--	--	--	--
LTMP-1 (720)	X	--	--	--	--	--	--
LTMP-3 (722)	X	--	--	--	--	--	--
LTMP-5 (724)	X	--	--	--	--	--	--
Background Well 346 (PS11-MW1L)	X	--	--	--	--	--	--
2018							
410R (MW-410R)	X	--	--	--	--	--	--
LTMP-1 (720)	X	--	X	X	X	--	--
LTMP-3 (722)	X	--	X	X	X	--	--
LTMP-5 (724)	X	--	--	--	--	--	--
Background Well 346 (PS11-MW1L)	X	--	X	X	X	--	--
2019							
410R (MW-410R)	X	--	--	--	--	--	--
LTMP-1 (720)	X	--	--	--	--	--	--
LTMP-3 (722)	X	--	--	--	--	--	--
LTMP-5 (724)	X	--	--	--	--	--	--
Background Well 346 (PS11-MW1L)	X	--	--	--	--	--	--

Table 2-3: LTM Groundwater Monitoring at OU B Terrestrial (continued)

Well ID (Alternate Well ID)	Total Metals Analysis					VOC	Pesticides
	Mercury	Cadmium	Copper	Nickel	Zinc	TCE	
2020							
410R (MW-410R)	--	--	--	--	--	X	X
432 (PS07-MW03)	--	--	--	--	--	X	X
433 (PS07-MW04)	--	--	--	--	--	X	X
704 (OUB-MW15)	--	--	--	--	--	X	X
707 (OUB-MW18)	--	--	--	--	--	X	X
LTMP-1 (720)	X	--	X	X	X	X	X
LTMP-3 (722)	X	--	X	X	X	X	X
LTMP-5 (724)	X	--	--	--	--	X	--
Background Well 346 (PS11-MW1L)	X	--	X	X	X	X	X
2021							
410R (MW-410R)	--	--	--	--	--	X	X
432 (PS07-MW03)	--	--	--	--	--	X	X
433 (PS07-MW04)	--	--	--	--	--	X	X
704 (OUB-MW15)	--	--	--	--	--	X	X
707 (OUB-MW18)	--	--	--	--	--	X	X
LTMP-1 (720)	X	--	X	X	X	X	X
LTMP-3 (722)	X	--	X	X	X	X	X
LTMP-5 (724)	X	--	--	--	--	X	--
Background Well 346 (PS11-MW1L)	X	--	X	X	X	X	X

Notes:
"X" indicates the well was sampled for the analyte.
"—" indicates the well was not sampled for the analyte.
Well identifications in parentheses are alternate (secondary) names.
Pesticides comprised: aldrin, dieldrin, heptachlor epoxide, 4,4'-DDE, and 4,4'-DDT.
Abbreviations:
DDE = dichlorodiphenyldichloroethene
DDT = dichlorodiphenyltrichloroethane
ID = identification
TCE = trichloroethene
VOC = volatile organic compound

2.4.3.3 PMP Monitoring

As discussed in Section 2.0, the Navy is addressing petroleum impacts through a separate BNC-wide PMP, as required by the ROD (Navy et al., 2004a). Groundwater monitoring for petroleum-related contaminants was initiated in 2002. The original PMP (Navy, 2002b) documented petroleum management activities prior to execution of the OU B Terrestrial ROD (Navy et al., 2004a). The PMP was amended in 2003 to establish ongoing petroleum monitoring requirements for OU A, OU B Terrestrial, and OU NSC (see Sections 2.2.3.3 and 2.7.3.3 for OU A and OU NSC PMP monitoring information)

(Navy, 2003a). The PMP monitoring has been incorporated into the BNC-wide monitoring plan (Navy, 2016c). The current petroleum monitoring program satisfies the ROD requirement that petroleum contamination be managed through a separate BNC-wide PMP. Table 2-4 lists the wells sampled in 2018 under the PMP at OU B Terrestrial. The amended PMP requires free product monitoring of wells 428R and 406R in OU B Terrestrial and well 392 in OU NSC (see Section 2.7.3.3) (Navy, 2016c).

For the 2017 PMP, BNC records from 1997 to 2016 were researched to update petroleum hydrocarbon information for OU B Terrestrial. Eight petroleum sites were determined to have residual petroleum contamination left in place because further removal threatened the structural integrity of a nearby utility corridor, railroad, or building. The ninth petroleum site is a release from an upgradient site in 2013. Biennial sampling of well 811a was conducted in 2016 and confirmed groundwater remained free of petroleum. Sampling of well 811a was discontinued in 2017 (Navy, 2017a).

Table 2-4: PMP Groundwater Sampling at OU B Terrestrial

Well ID (Alternate Well ID)	Total Petroleum Hydrocarbons	
	Diesel Range	Oil Range
2018		
LTMP-1 (720)	X	X
LTMP-2 (721)	X	X
LTMP-3 (722)	X	X
LTMP-5 (724)	X	X
406R (MW-406R)	X	X
412 (PS10C-MW01)	X	X
709 (OUB-MW23)	X	X
713 (OUB-MW-20)	X	X
715R	X	X
Background Well 346 (PS11-MW01L)	X	X

Abbreviation:
ID = identification

2.5 OU C

2.5.1 Response Action

OU C is a petroleum-contaminated site. CERCLA does not address petroleum as a contaminant, but petroleum releases are addressed in Washington State under Subchapter IX of RCRA and MTCA. However, the Navy, as a matter of policy, follows the CERCLA process to the maximum extent practical at non-CERCLA sites. Additionally, because remedies for the sites include ICs through land use restrictions, a FYR for OU C is required pursuant to Navy policy, and a periodic review by Ecology is required pursuant to MTCA. A cleanup action plan under MTCA was executed for OU C in 2007, and this FYR includes an assessment of the OU C remedy protectiveness to address the periodic MTCA review requirements.

The Final CAP (Navy, 2007c), approved by Ecology, proposed No Action with semiannual product measurements, annual groundwater monitoring for sentinel wells, and implementation of ICs.

2.5.2 Status of Remedy Implementation

Steam sparging was conducted in OU C from 1996-1999 and recovered approximately 30,000 gallons of TPH (Navy, 2007c). As part of the focused RI/FS, additional wells were installed in July 1999 between OU C and Dry Dock 6 to monitor for potential migration of petroleum from the site. Baseline sampling was conducted in August 1999, and additional sampling was carried out in December 1999. Quarterly sampling of groundwater was initiated in January 2001. A final focused RI and a screening-level FS for OU C were published in April 2002 (Navy, 2002g). The overall conclusion was the petroleum is stable and not subject to off-site migration and therefore no further action other than ongoing groundwater monitoring is required to be protective of human health and the environment. The dewatering system associated with Dry Dock 6 was upgraded in the summer of 2006. This project has significantly reduced the saltwater intrusion induced by the dewatering system. The project has also reportedly had the effect of lowering the water table in the vicinity of the dry dock; several monitoring wells at OU NSC, OU B Terrestrial, and OU C can no longer be sampled for this reason (Navy, 2007a).

The Navy has conducted monitoring at OU C since the 1990s (prior to execution of the CAP). In January 2001, the Navy implemented a five-year groundwater monitoring program at OU C to monitor and further evaluate the dissolved- and free-phase petroleum hydrocarbon plumes, as well as to monitor potential migration of contaminants from OU C to Sinclair Inlet. The sentinel wells are used to detect whether petroleum hydrocarbon contamination is migrating from OU C toward Sinclair Inlet. The five-year groundwater monitoring program consisted of: (1) collecting quarterly product thickness measurements in accessible groundwater monitoring wells throughout OU C, and (2) conducting quarterly groundwater sampling and analysis at five sentinel wells located downgradient of the free- and dissolved-phase contaminant plume at OU C (Navy, 2007c). During the OU C LTM program, the Navy continued quarterly sampling for TPH parameters at the five sentinel wells and measured free-product thickness at accessible groundwater monitoring wells until 2006. The trigger level for diesel-range petroleum hydrocarbons is 0.5 milligrams per liter (mg/L), which is equivalent to

500 μg/L. Detection in a sentinel well above the trigger level is to be followed by four quarters of monitoring to confirm the result (Navy, 2007c).

The CAP for OU C was finalized in 2007 (Navy 2007c). The objective of the remedy outlined in the CAP was to prevent migration of free- and dissolved-phase petroleum hydrocarbon contamination from affecting Dry Dock 6 and Sinclair Inlet in order to protect human health and the environment. The CAP described a selected remedy of No Action with monitoring and ICs for OU C and outlined the criteria for reassessment and modification of the selected remedy based on the monitoring results. The CAP was approved by Ecology in December 2007. The CAP requires the following ICs:

- Prohibit activities at OU C which interfere with monitoring activities.
- Prohibit activities at OU C which may result in the release of petroleum hydrocarbon contamination, which is contained on site as part of the cleanup action.
- Notify Ecology of the Navy's intent to convey any interest in the site.
- Notify Ecology of any proposal to use the site in a manner inconsistent with the land use restrictions.

Annual inspection of these ICs (as is performed at other OUs) is not required by the OU C CAP. However, the O&M and IC Plan specifies inspection of ICs will now take place semiannually at OU C along with inspections of other OUs (Navy, 2018c, 2020b).

2.5.3 O&M and Monitoring

2.5.3.1 Inspection and Maintenance

In the 2018 O&M IC Plan Update (Navy, 2018c), ICs were defined for OU C to prohibit activities which interfere with monitoring activities and may result in the release of petroleum hydrocarbon contamination, which is contained on site as part of the cleanup action. No frequency of IC inspections was specified in the CAP (Navy, 2007c), but the 2020 O&M and IC Plan (Navy, 2020b) indicates visual inspections will be conducted semiannually by a Navy Technical Representative. In addition, visual site inspections at OU C have been performed as part of the FYRs.

The results of the inspection verification site visit conducted as part of the current FYR process are discussed in Section 4.4.

2.5.3.2 Long Term Monitoring

Monitoring for petroleum at OU C is now integrated into the site-wide LTM program. Monitoring is conducted at sentinel wells in accordance with the CAP, with reductions in the sampling regime as allowed by the CAP and approved through regulatory review of the monitoring plans. During this FYR period, monitoring consisted of the following activities:

- Collection of annual groundwater samples from sentinel monitoring wells (see Table 2-5), with analysis for TPH (diesel range and oil range).
- Gauging of free-product thickness in 11 to 12 monitoring wells on an annual basis for the entire FYR period.

Groundwater monitoring activities at OU C are conducted at selected well locations every 1, 2, or 5 years. The frequency for each COC is based on the trends seen in previous sample results (Navy 2020a, 2021e). Background well 346 was also sampled concurrent with the 2020 OU C sampling event. Samples from OU C wells are analyzed for TPH-diesel range and TPH-oil range (Navy, 2020a, 2021e). Results from monitoring during this FYR period (2017 through 2021) at OU C are available in the respective data summary and trend analysis reports. The results are summarized in Section 4.3 for 2017 through 2020; the 2021 data were not available at the completion of this FYR and will be evaluated during the next FYR period. Table 2-5 summarizes the monitoring wells sampled during this FYR period.

Free product in selected wells is measured annually at OU C. A subset of these selected wells is sampled for long-term groundwater monitoring if free product is not observed in the well. If free product is observed in a monitoring well scheduled for sampling, a substitute well is sampled for that event. Wells GMWT-18 and GMWT-19 were observed with product during each annual monitoring event in this review period. All other OU C wells measured did not have product during this period. Thickness of product in the two wells ranged from 0.04 to 5.0 feet over the course of the five years represented by this review. Due to the viscosity of the bunker C oil observed in 2020, the free product measurements may not be accurate.

No decision criteria are set forth in the CAP for free product measurements to be used as a basis to modify or discontinue measurement frequency. The Navy will continue to monitor wells for free product until no product is detected. At that time, free product measurement frequency will be re-evaluated. If the Navy chooses to lift ICs and deem OU C eligible for unlimited use and unlimited exposure, quarterly chemical monitoring for TPH compounds would be needed to verify levels of petroleum products in the monitoring wells are below MTCA Method A cleanup levels (Navy, 2019c).

Table 2-5: Long-Term Groundwater Monitoring at OU C

Well ID (Alternate Well ID)	Total Petroleum Hydrocarbons	
	Diesel Range	Oil Range
2017		
GMWT-9 (311)	X	X
GMWT-23 (736)	X	X
Background Well 346 (PS11-MW01L)	X	X
2018		
GMWT-9 (311)	X	X
GMWT-18 (718)	Not sampled due to free product in well	
Background Well 346 (PS11-MW01L)	X	X
2019		
GMWT-15 (224)	X	X
GMWT-18 (718)	Not sampled due to free product in well	
Background Well 346 (PS11-MW01L)	X	X
2020		
GMWT-15 (224)	X	X
GMWT-18 (718)	Not sampled due to free product in well	
GMWT-23 (736)	X	X
GMWT-26 (326)	X	X
Background Well 346 (PS11-MW1L)	X	X
2021		
GMWT-15 (224)	X	X
GMWT-18 (718)	Not sampled due to free product in well	
GMWT-23 (736)	X	X
GMWT-26 (326)	X	X
Background Well 346 (PS11-MW1L)	X	X

Notes:
“X” indicates the well was sampled for the analyte.
“—" indicates the well was not sampled for the analyte.
Well identifications in parentheses are alternate (secondary) names.

Abbreviation:
ID = identification

2.6 OU D

2.6.1 Response Action

The southern portion of OU D was evaluated as a portion of Site 10 East under the RIs for OU B in 1991, 1995, 1997, and 2000. In August 2002, the easternmost 5.3 acres of the BNC were separated from OU B Terrestrial and designated as OU D to support the transfer of that land to the City of Bremerton for development of a public park. The shoreline to the south of OU D remains part of OU B Terrestrial. In 2003, sampling was performed specifically for the OU D RI/FS. During remedial investigations of Site 10 East, soil borings were drilled and a groundwater monitoring well was installed in 1995. Analytical results from soil borings showed concentrations of TPH-diesel and TPH-heavy oils exceeding MTCA Method A values, and concentrations of carcinogenic polycyclic aromatic hydrocarbons (cPAHs) exceeding MTCA Method B unrestricted values. No detected concentrations in the groundwater exceeded the respective screening values (Navy et al., 2005).

In 2004, a removal action, which involved constructing an asphalt pavement cap over previously unpaved areas at the east end of the BNC, was conducted to minimize contact with human or ecological receptors and reduce infiltration of rain or irrigation waters into the underlying substrate. This project was performed as a Non-Time-Critical Removal Action following the requirements of the OU B Terrestrial ROD. The scope of the action included construction of an asphalt pavement cap over previously unpaved areas used for steel storage in the southerly half of OU D, west of the property proposed for transfer to the city. Prior to constructing the asphalt pavement cap, a new storm drain system was installed to collect stormwater runoff from the areas to be capped. The site-wide paving component of the OU B Terrestrial ROD was adopted into the ROD for OU D (Navy, 2005).

The RAOs identified for OU D are as follows (Navy et al., 2005):

- Reduce the potential for chemical transport to the adjacent marine environment from:
    - Accumulation of sediment or debris in the stormwater system;
    - Infiltration of soil and groundwater into the stormwater system; and
    - Infiltration of surface water into the soil.
- Continue to limit exposure to site soils and groundwater.

The remedy components selected in the ROD include the following (Navy et al., 2005):

- Site-wide capping
- Stormwater system maintenance
- ICs
- Groundwater monitoring

2.6.2 Status of Remedy Implementation

In 2002, the Navy began investigating the potential of transferring a portion of OU B Terrestrial to the City of Bremerton for the development of a public park (Navy, 2005; Navy, 2010a). This portion of OU B Terrestrial was redefined as OU D and, in 2003, underwent a subsequent investigation for the potential change in land use from industrial to recreational. Following the investigation, the Navy deemed the 2.5-acre area available for transfer. The property was transferred to the City of Bremerton through three separate quitclaim deeds in 2006 and 2007 (Navy et.al., 2005; Navy, 2017b). The shoreline to the south of OU D remains part of OU B Terrestrial.

Remedial actions at OU D are complete. Site-wide capping activities met the RAO of reducing the potential for chemical transport from infiltration of surface water into soil. Stormwater system components in the vicinity of OU D were cleaned, repaired, or removed as part of the stormwater system work at OU B Terrestrial (Navy, 2006c) and during the reconfiguration of the eastern property boundary during OU D cap installation (Navy, 2007b). No Navy storm drain component remained within the boundaries of OU D at the completion of the project.

The ICs meet the RAO of "continue to limit human exposure to site soils and groundwater." The ICs are applicable throughout the OU D site and, because contaminated soil and groundwater are being left on site, must be maintained until contaminant levels allow for unlimited use and unrestricted exposure.

2.6.3 O&M and Monitoring

As discussed above, OU D has been transferred to the City of Bremerton. As part of the OU D property transfer agreement between the Navy and the City, the City is to bear the responsibility for ICs and maintaining the remedy at the site. The deed restrictions were intended to ensure the ICs were transferred with the property. A Memorandum of Agreement (MOA) was established in May 2013, and renewed in June 2019, between the City of Bremerton and the Navy regarding the management and operations of OU D, including remedy inspections (Navy, 2013b and 2019a). This MOA established responsibility for remedy inspections to the City of Bremerton. OU D IC inspection reports completed by the City of Bremerton are included in the BNC annual remedy inspection reports. The annual inspection reports indicate no conveyance of interest has or is anticipated to occur, the usage of the site has not changed, and no adverse issues have been identified. OU D remains a CERCLA site, and the remedy must be maintained by the City of Bremerton in accordance with the deed and the MOA between the Navy and the City of Bremerton (Navy, 2019a) until it is no longer deemed a CERCLA site.

The results of the inspection verification site visit conducted as part of the current FYR process are discussed in Section 4.4.

No groundwater monitoring wells are located within OU D; however, OU B Terrestrial well LTMP-5 continues to serve as the conditional point of compliance well for groundwater in OU D. Therefore, the Navy monitors groundwater from OU D by sampling OU B Terrestrial well LTMP-5 and background well 346. Both wells were sampled in 2020 during the current FYR period and analyzed for organochlorine pesticides, cadmium, and mercury, as shown in Table 2-6 (Navy 2021c). However, beginning with the 2021 sampling event, well 903 (instead of LTMP-5) will serve as the conditional point of compliance for OU D per agreement with the team stakeholders (Navy, 2021e).

Table 2-6: LTM Groundwater Monitoring at OU D

Well ID (Alternate ID)	Total Metals		Organochlorine Pesticides			
	Cadmium	Mercury	4,4'-DDT	Aldrin	Dieldrin	Endrin
2020						
LTMP-5 (724)	X	X	X	X	X	--
Background Well 346 (PS11-MW01L)	X	X	X	X	X	--
2021						
903	X	X	X	--	X	X
Background Well 346 (PS11-MW01L)	X	X	X	--	X	X

Abbreviations:
DDT = dichlorodiphenyltrichloroethane
ID = identification

2.7 OU NSC

2.7.1 Response Action

Numerous studies of conditions at the BNC, including OU NSC, were performed before the formal RI process began in 1991. Laboratory analyses during the 1990/1991 site inspection for the BNC indicated contaminated surface soils at the Defense Reutilization and Marketing Office scrap metal stockpile constituted a risk to human health based on concentrations of lead and PCBs exceeding industrial screening levels. The Navy concluded it was appropriate to eliminate this risk by performing a removal action before completing the RI (Navy et al., 1996).

Primary components of the removal action were excavation of contaminated soils to a depth of approximately 4 feet, removal of the acid pit and drain slab, placement of an impermeable cap at the bottom of the excavated area, upgrades to drainage for the stockpile area, and placement of clean fill material to restore the area for use as a scrap metal stockpile. Approximately 5,000 cubic yards of soil was removed and disposed of at a landfill in Arlington, Oregon. The removal action satisfied RCRA requirements. The removal action was performed in 1994 (Navy et al., 1996).

The RAOs for OU NSC include the following:

- For soil: Reduce human exposure to COCs and reduce or control the contamination of groundwater.
- For groundwater: Reduce the potential for arsenic, copper, nickel, lead, pesticides, PCBs, and TPH to reach the groundwater, to the extent feasible, using implementable and effective technologies for the site.
- For surface water: Reduce the potential for COCs to be introduced into water flowing through the storm drains and thus discharged to Sinclair Inlet.
- For storm drain sediment: Reduce the potential for COCs in storm drain sediment to be discharged to Sinclair Inlet.

The selected remedy for OU NSC includes the following components (Navy et al., 1996):

- Enhance existing site paving
- Storm drain maintenance
- ICs
- Groundwater monitoring

2.7.2 Status of Remedy Implementation

Completion of paving, cleaning of stormwater piping and catch basins, and repair of stormwater piping and catch basins, as necessary, were documented in the remedial action closeout report for OU NSC (Navy, 1999a) for work performed between June 1997 and March 1999. Storm drains and catch basins were cleaned with a high-pressure water hose and vacuum truck, inspected via video camera, and repaired as necessary. Paving enhancement included paving previously unpaved areas and replacing pavement in the former Defense Reutilization and Marketing Office yard and Fleet and Industrial Supply Center (FISC) parking lot.

The ICs at OU NSC include access control, groundwater restrictions, excavation management, and land use restrictions. The ICs are currently conducted under the O&M and IC plan (Navy, 2020b). The O&M and IC plan includes requirements for annual inspection of selected storm drain system components within OU NSC in accordance with ROD requirements. Excavation management controls have been included as part of the O&M and IC plan (Navy, 2020b), and an Excavation Management Plan has been prepared to provide guidance on the measures necessary to conduct excavation work at BNC (Navy, 2020d).

Development and implementation of LTM was satisfied by the publication of the final monitoring plan for OU NSC in October 2000 (Navy, 2000c) and annual monitoring events beginning in 1998. Monitoring at OU NSC is now conducted under the LTM plan (Navy, 2018a, 2020a, 2021e). Groundwater monitoring activities at OU NSC are conducted every 1, 2, or 5 years. The monitoring frequency for each COC is based on the trends seen in previous sample results (Navy, 2020a, 2021e).

2.7.3 O&M and Monitoring

2.7.3.1 Inspection and Maintenance

Annual inspections of the storm drain system and pavement cap at OU NSC have been conducted since the ROD was executed, in accordance with ROD requirements. From the time the ROD was signed to the publication of the BNC-wide 2006 O&M plan (Navy, 2006a), these activities were guided by the OU NSC monitoring plan (Navy, 2000c). The annual and semiannual inspections and monitoring performed during this FYR period were performed in accordance with the 2016, 2018, and 2020 O&M and IC plans (Navy, 2016b, 2018c, 2020b). The inspections included the pavement cap, vegetated cover, and dry and wet weather catch basins. The annual wet weather inspections of the OU NSC catch basins were conducted to visually confirm surface water flows freely into and through storm drains during a rain event.

The results of the inspection verification site visit conducted as part of the current FYR process are discussed in Section 4.4.

Pavement Cap

In 2017, the deficient area from 2016 was repaired, but the condition of the OU NSC pavement cap showed deterioration, which was attributed to construction activities. There were 39 new features assigned a deficiency code during the 2017 inspection (linear features totaling 2,522 feet and areal features totaling 1,961 square feet). Eleven new features were documented during the 2018 inspection (linear features totaling 300 feet and areal features totaling 412 square feet). Seventeen new features were documented during the 2019 inspection (linear features totaling 410 feet and areal features totaling 3,295 square feet). One new feature was documented during the 2020 inspection, an aerial feature totaling 108 square feet. The OU NSC poor rated pavement decreased by 0.2% (from 2.6% poor rated in fall 2017 to 2.4% poor rated in fall 2020) over the period addressed in the FYR. The deficiencies noted during this FYR period included cracks/gapping, deteriorating seals, vegetation growth, alligator cracking, spalling potholes, exposed rebar, cut-off signposts, and unpaved areas (Navy, 2018b, 2019e, 2020c, 2021d).

The gravel rail bed along the northwest margin of the OU, north of Building 494, was paved, which resulted in a decrease in the designed unpaved area of 3,747 square feet (Navy, 2018b). In the summer of 2020, failing pavement was repaired in OU NSC around Buildings 494, 1146, 1147, and 467. Approximately, 4,400 square feet between Building 449 and the Controlled Industrial Area fence line was repaired, which resulted in the repair of 10 deficient features. During the April 2021 LUC inspections, a large area east of Building 494 and north of Building 943 was under initial pavement repair (Navy, 2021d).

Vegetated Cover

During this FYR period, no vegetated area appeared eroded or had inadequate topsoil. Adjustments to the size and shape of the strip of vegetated cover were made based on 2017 field measurements (Navy, 2018b, 2019e, 2020c, 2021d).

Catch Basins

Several issues were noted during both the dry weather and wet weather inspections conducted during this FYR period. During dry weather inspections, catch basins inspected showed evidence of failing plaster patches on some of the piping, vegetation growth, and crumbling around the basin collar. Several catch basins could not be opened due to heavy sediment socks. During the 2020 wet weather inspection, no backup or ponding was observed in the catch basins and manholes, indicating the conveyances were functioning as intended (Navy, 2018b, 2019e, 2020c, 2021d). A task order was awarded in 2021 to determine additional backup locations for catch basin and outfall inspections. Updates to the stormwater maps and to the stormwater inspection checklists were completed as part of this task order and will be included in the next iteration of the Terrestrial LTM and O&M Plan.

2.7.3.2 Long Term Monitoring

LTM during this FYR period consisted of groundwater sampling conducted in 2018, 2020, and 2021. Groundwater sampling was not planned for wells in OU NSC in 2017 or 2019. OU NSC monitoring wells were analyzed for selected total metals, which included arsenic, copper, and nickel, in fall 2018 (Navy, 2018a, 2019c). However, to ensure the remedy remains consistent with the RAOs, the protectiveness evaluation (Navy, 2019d) recommended resuming periodic groundwater monitoring of the organic COCs to evaluate current concentrations relative to improved limits of quantitation (LOQs). This recommendation was implemented in the LTM (Navy, 2020a, 2021e), and

OU NSC wells were analyzed selectively for arsenic, copper, mercury, nickel, pesticides, total PCBs in 2020 (see Section 2.7.3.3 for discussion of petroleum program sampling). Groundwater monitoring results for arsenic were compared to the Washington State background value of 5 µg/L to be consistent with the arsenic RGs at other OUs (Navy, 2019d).

Results from monitoring during this FYR period (2017 through 2021) at OU NSC are available in the respective data summary and trend analysis reports. The results are summarized in Section 4.3 for 2017 through 2020; the 2021 data were not available at the completion of this FYR and will be evaluated during the next FYR period. LTM performed at OU NSC during this FYR period is summarized in Table 2-7.

Table 2-7: LTM Groundwater Sampling at OU NSC

Well ID (Alternate ID)	Arsenic	Copper	Nickel	Mercury	Pesticides	Total PCB
2018						
310R	X	X	X	—	—	—
380 (MW380)	—	X	X	—	—	—
386 (MW386)	X	X	—	—	—	—
Background Well 346 (PS11-MW1L)	X	X	X	—	—	—
2020						
310R	X	X	X	X	X	X
380 (MW380)	—	X	X	X	X	X
386 (MW386)	X	X	—	X	X	X
Background Well 346 (PS11-MW1L)	X	X	X	X	X	X
2021						
310R	X	X	X	X	X	X
380 (MW380)	—	X	X	X	X	X
386 (MW386)	X	X	—	X	X	X
Background Well 346 (PS11-MW1L)	X	X	X	X	X	X

Notes:
"X" indicates the well was sampled for the analyte.
"—" indicates the well was not sampled for the analyte.
Pesticides included alpha-BHC, cis (alpha)-chlordane, trans (gamma)-chlordane, and 4,4'-DDT.
Abbreviations::
BHC = benzene hexachloride
DDT = dichlorodiphenyltrichloroethane
ID = identification
PCBs = polychlorinated biphenyl

2.7.3.3 PMP Monitoring

As discussed in Section 2.0, the Navy is addressing petroleum impacts through a separate BNC-wide PMP, as required by the ROD (Navy et al., 2004a). Groundwater monitoring for petroleum-related contaminants was initiated in 2002. The PMP was amended in 2003 to establish ongoing petroleum monitoring requirements for OU A, OU B Terrestrial, and OU NSC (see Sections 2.2.3.3 and 2.4.3.3 for OU A and OU B Terrestrial PMP monitoring information) (Navy, 2003a). The PMP monitoring has been incorporated into the BNC-wide monitoring plan (Navy, 2016c).

For the 2017 PMP, BNC records from 1997 to 2016 were researched to update petroleum hydrocarbon contamination information within OU NSC. Only two new petroleum sites were identified which have residual petroleum hydrocarbon contamination left in place. UST 817-1 and UST 817-2 were 79,800-gallon fuel oil tanks, which were closed in place in 2013. They were within close proximity to utility corridors and a seawall (Navy, 2017e).

The fall 2018 PMP sampling event included one well location from OU NSC (well 392R) (Table 2-8). Groundwater samples collected from PMP wells were analyzed for TPH (diesel range and oil range). Well 392R exceeded cleanup levels for TPH in 2018. Well 392R will continue to be sampled biennially, and the remainder of the PMP wells will be sampled every five years (Navy 2019c).

Table 2-8: PMP Groundwater Sampling at OU NSC

Well ID (Alternate Well ID)	Total Petroleum Hydrocarbons	
	Diesel Range	Oil Range
2018		
392R (MW-392R)	X	X
Background Well 346 (PS11-MW01L)	X	X
2020		
392R (MW-392R)	X	X
Background Well 346 (PS11-MW01L)	X	X
2021		
392R (MW-392R)	X	X
Background Well 346 (PS11-MW01L)	X	X

Abbreviation:
ID = identification

2.8 Institutional Controls

The Navy prepared an IC work plan (Navy, 2006b) to describe procedures for implementing the IC RAOs for OU A, OU B Terrestrial, OU D, and OU NSC at the BNC. The IC work plan was updated in 2008, 2009, 2014, and 2015 (Navy, 2008, 2009b, 2014a, 2015c). The IC plan was combined with the O&M plan into a single, updated plan in 2016, which was revised in 2018 and 2020 (Navy, 2016b, 2018c, 2020b). The ICs include access control, groundwater restrictions, excavation management, and land use restrictions. In 2020, the Navy completed the IC plan for OU B Marine to clearly document the OU B Marine IC requirements and associated inspection, inspection frequency, and reporting requirements.

As recommended in the fourth FYR, an IC plan for OU B Marine was prepared to document the responsibilities and requirements for complying with the ICs and maintaining the long-term physical integrity of the remedy required by the OU B Marine ROD (Navy, 2020e). The IC Plan supports implementation of LUCs which can consist of engineering controls and ICs.

The Navy is responsible for implementing, monitoring, reporting on, and enforcing the ICs at the terrestrial OUs, with the exception of OU D; the City of Bremerton is responsible for monitoring the ICs at OU D per the MOA. The IC plan and Navy real property procedures ensure, in the event of a future transfer of a portion of the property, land use restrictions would be documented, and appropriate deed restrictions would be developed.

Inspection and maintenance of the ICs as detailed in the O&M and IC plan (Navy, 2020b) ensure the RAO of limiting human exposure to site soils and groundwater is maintained. The ICs will be maintained until contaminant levels allow for unlimited use and unrestricted exposure. Observations are documented on checklists and via photographs, as necessary (Navy, 2020b).

The Navy maintains a central database of properties restricted by ICs. The database includes relevant information on the property, types of ICs established, land use monitoring and management responsibilities, and the location of real estate records. This database is queried when making land use and planning decisions.

The objective of the ICs is to protect human health, the environment, and the integrity of an engineering remedy by limiting the activities which may occur at a particular contaminated site. The ICs for BNC are summarized in Table 2-9.

The objectives of the ICs implemented at BNC are the following:

- Ensure access to BNC is controlled.
- Ensure the sole use of groundwater is for monitoring purposes.
- Ensure excavations are managed appropriately given the contaminants left in place.
- Ensure land use restrictions are maintained and controlled, including real estate transactions/property transfers, land use changes, and new construction.
- Ensure land use remains compatible with cleanup decisions.

The soil management plan requirement in the OU A ROD is equivalent to the excavation management plan requirement established under the OU NSC ROD. Excavation management controls have been included as part of the O&M and IC plan (Navy, 2020b). Additionally, an excavation management plan has been prepared to provide guidance on the measures necessary to conduct excavation work at BNC (Navy, 2020d).

ICs were required in the CAP for OU C, but no inspection frequency was specified. Inspections at OU C have been performed as part of five-year reviews until recently, when OU C ICs were included in the O&M and IC Plan (Navy, 2018c, 2020b). The OU C ICs prohibit activities which interfere with monitoring activities and may result in the release of petroleum hydrocarbon contamination, which is contained on site as part of the cleanup action. The O&M and IC plan indicates Navy personnel will conduct inspections and evaluations semiannually to determine LUCs are being followed and groundwater is not being used for any purpose other than monitoring. This FYR recommends the results of the annual and semiannual OU C IC inspections be included and summarized in the text of the Annual Remedy Inspection Report.

Table 2-9: Summary of Planned and/or Implemented ICs

Operable Unit(s)	Media, engineered controls, and areas that do not support UU/UE based on current conditions	ICs Needed	ICs Called for in the Decision Documents	IC Objective	Title of IC Instrument Implemented and Date (or planned)
OU A	Soil and Groundwater	Yes	Yes	Restrict use and access to control human exposure to chemicals of concern in the soils and shellfish by implementing institutional controls through restrictions on residential use, fish and shellfish harvesting, and public access.	Record of Decision, November 1996; O&M and IC Plan (Navy, 2008; 2016a; 2018c, 2020b).
OU B Marine	Sediment	Yes	Yes	Ensure access to the site is controlled.	O&M and IC Plan (Navy, 2020b)
OU B Terrestrial	Soil and Groundwater	Yes	Yes	Ensure access to the site is controlled; ensure the sole use of groundwater from the site is for monitoring purposes; ensure excavations carried out at the site are managed appropriately given the contaminants left in place; ensure the established industrial use of the site is maintained.	O&M and IC Plan (Navy, 2020b)
OU C	Groundwater	Yes	Yes	Prohibit activities which may interfere with monitoring or release contaminants out of contained area.	Final CAP, September 2007 (Navy, 2007c)
OU D	Soil and Groundwater	Yes	Yes	Ensure property use is restricted to recreation and prohibit the development and use of the property for residential housing, schools, or any land use other than recreational; ensure the integrity of the pavement and vegetative cover; ensure groundwater is not withdrawn except for monitoring purposes.	Record of Decision, April 2005; Memorandum of Agreement between Navy and City of Bremerton (Navy, 2019a)
OU NSC	Soil and Groundwater	Yes	Yes	Limit access to the site through existing site security procedures, restrict groundwater and land usage, and ensure residual site contamination is taken into consideration if site land use or ownership changes in the future.	Record of Decision, November 1996

Abbreviations:
CAP = cleanup action plan
IC = institutional control
O&M = operation and maintenance
UU/UE = unlimited use and unrestricted exposure

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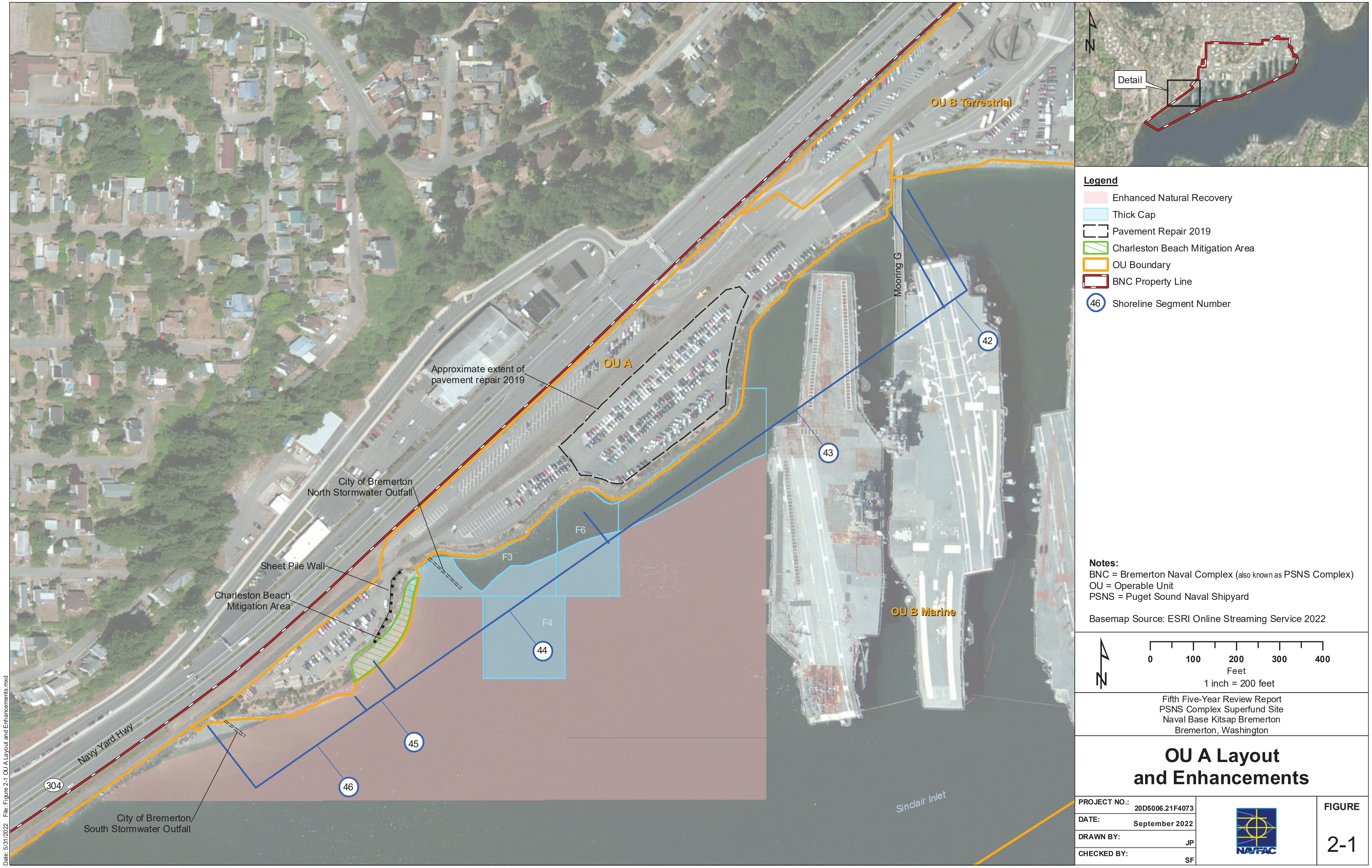
OU B Terrestrial
OU A
OU B Marine
Mooring G
Approximate extent of pavement repair 2019
City of Bremerton North Stormwater Outfall
Sheet Pile Wall
Charleston Beach Mitigation Area
City of Bremerton South Stormwater Outfall
Navy Yard Hwy
304
F3
F4
F6
42
43
44
45
46
Sinclair Inlet
Detail
Legend
Enhanced Natural Recovery
Thick Cap
Pavement Repair 2019
Charleston Beach Mitigation Area
OU Boundary
BNC Property Line
Shoreline Segment Number
Notes:
BNC = Bremerton Naval Complex (also known as PSNS Complex)
OU = Operable Unit
PSNS = Puget Sound Naval Shipyard
Basemap Source: ESRI Online Streaming Service 2022
0 100 200 300 400
Feet
1 inch = 200 feet
Fifth Five-Year Review Report
PSNS Complex Superfund Site
Naval Base Kitsap Bremerton
Bremerton, Washington
OU A Layout and Enhancements
PROJECT NO.: 20D5006.21F4073
DATE: September 2022
DRAWN BY: JP
CHECKED BY: SF
FIGURE
2-1
Date: 5/31/2022 File: Figure 2-1 OU A Layout and Enhancements.mxd

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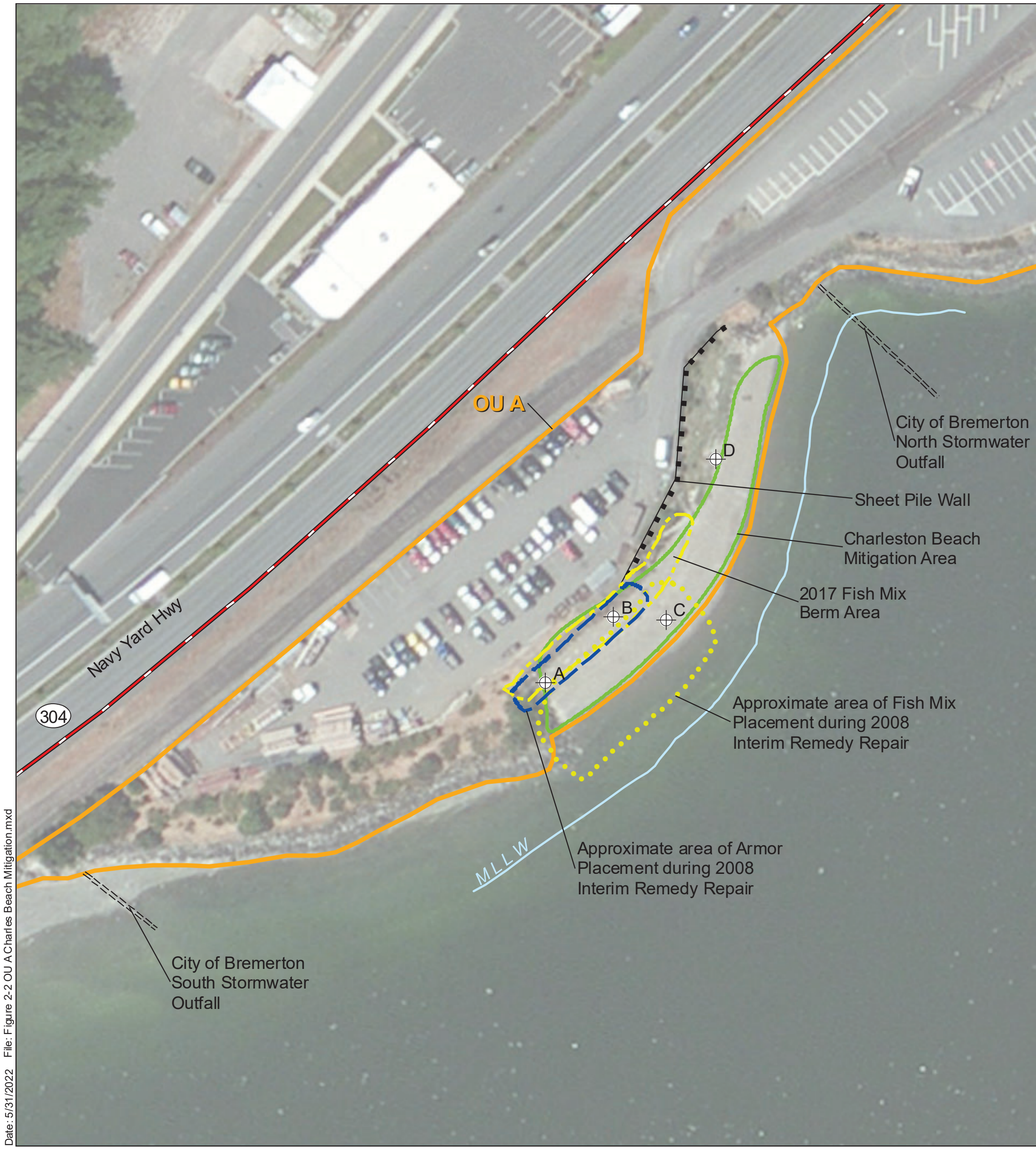

Legend

- Erosion Gauge
- Mean Lower Low Water
- Armor Placment 2008
- Fish Mix Placement 2008
- Fish Mix Berm Area 2017
- Sheet Pile Wall
- Charleston Beach Mitigation Area
- OU A Boundary
- BNC Property Line

Notes:
BNC = Bremerton Naval Complex (also known as PSNS Complex)
MLLW = Mean Lower Low Water
OU = Operable Unit
PSNS = Puget Sound Naval Shipyard

Basemap Source: ESRI Online Streaming Service 2022

N
0 50 100 150 200
Feet
1 Inch = 100 Feet

Fifth Five-Year Review Report
PSNS Complex Superfund Site
Naval Base Kitsap Bremerton
Bremerton, Washington

OU A Charleston Beach Mitigation

PROJECT NO.: 20D5006.21F4073	NAVFAC	FIGURE
DATE: September 2022		2-2
DRAWN BY: JP		
CHECKED BY: SF		

Date: 5/31/2022 File: Figure 2-2 OU A Charles Beach Mitigation.mxd

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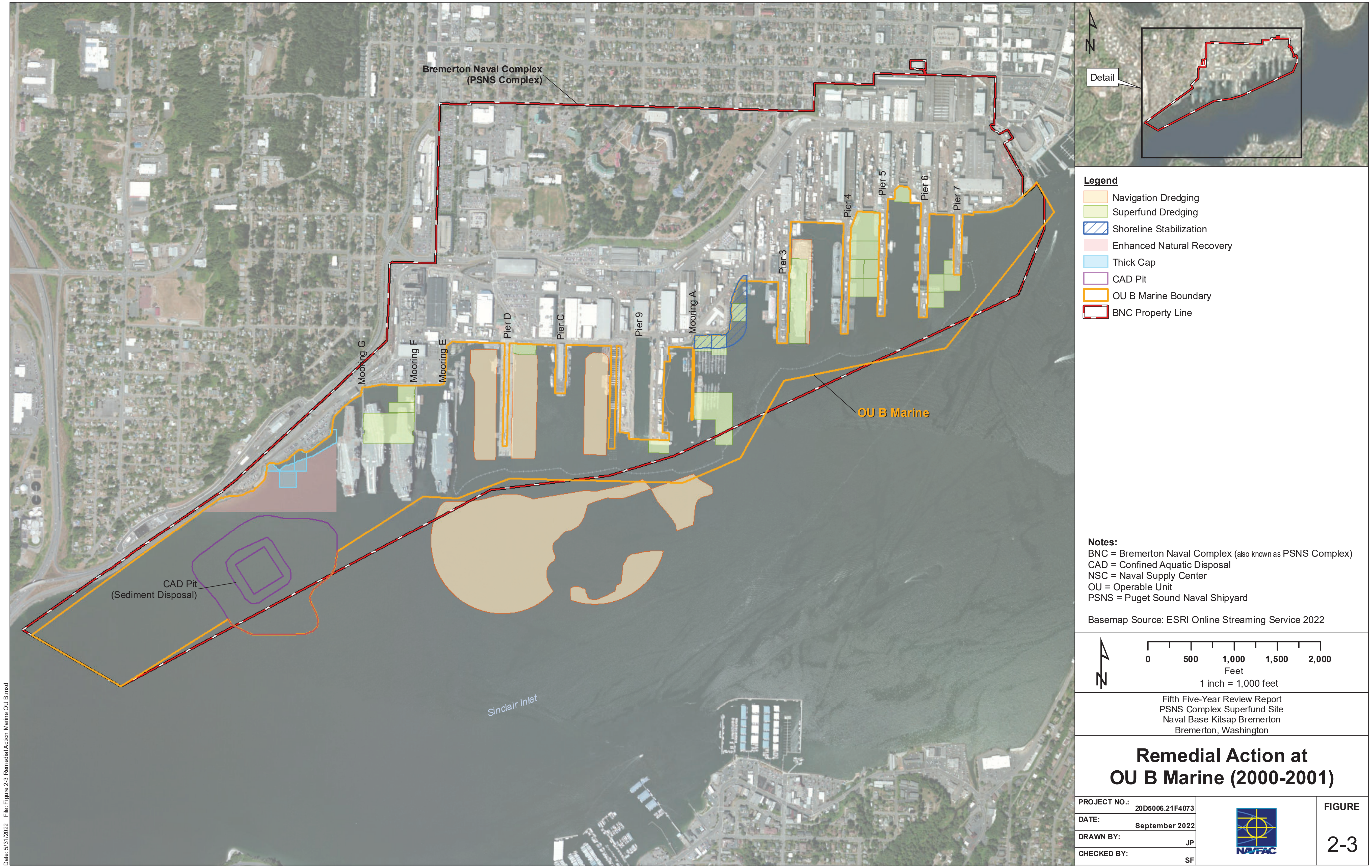
Bremerton Naval Complex (PSNS Complex)
Mooring G
Mooring F
Mooring E
Pier D
Pier C
Pier 9
Mooring A
Pier 3
Pier 4
Pier 5
Pier 6
Pier 7
OU B Marine
CAD Pit (Sediment Disposal)
Sinclair Inlet
Detail
Legend
Navigation Dredging
Superfund Dredging
Shoreline Stabilization
Enhanced Natural Recovery
Thick Cap
CAD Pit
OU B Marine Boundary
BNC Property Line
Notes:
BNC = Bremerton Naval Complex (also known as PSNS Complex)
CAD = Confined Aquatic Disposal
NSC = Naval Supply Center
OU = Operable Unit
PSNS = Puget Sound Naval Shipyard
Basemap Source: ESRI Online Streaming Service 2022
0 500 1,000 1,500 2,000
Feet
1 inch = 1,000 feet
Fifth Five-Year Review Report
PSNS Complex Superfund Site
Naval Base Kitsap Bremerton
Bremerton, Washington
Remedial Action at OU B Marine (2000-2001)
PROJECT NO.: 20D5006.21F4073
DATE: September 2022
DRAWN BY: JP
CHECKED BY: SF
FIGURE 2-3
Date: 5/31/2022 File: Figure 2-3 Remedial Action Marine OU B.mxd

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3.0 Progress Since the Last Review

This section includes the protectiveness statements and recommendations from the last FYR (Navy, 2017b) in Table 3-1, and the current status of those recommendations in Table 3-2.

Table 3-1: Protectiveness Determinations/Statements from the 2017 FYR

OU #	Protectiveness Determination	Protectiveness Statement
OU A	Short-term Protective	The remedy implemented at OU A is protective in the short term, based on the recent intertidal sediment sampling and interim erosion protection measures being implemented at Charleston Beach. However, to achieve long-term protectiveness, a permanent remedy repair must be selected and implemented in consultation with stakeholders. *Note: Stakeholders disagreed with the protectiveness determination for the remedy at OU A and found the remedy to be not protective.*
OU B Marine	Protectiveness Deferred	A protectiveness determination of the remedy for OU B Marine cannot be made until further information is obtained. The polychlorinated biphenyl (PCB) sediment cleanup level specified in the ROD for OU B Marine was achieved in 2014, and this conclusionwas confirmed during the 2018 LTM sampling event. However, the protectiveness of the OU B Marine remedy remains in question because of sources of mercury to OU B Marine. Mercury is a chemical of concern (COC) for OU B Marine. The magnitude and effects of the mercury source in the Outfall 15 drainage basin, and the potential mercury source located between Dry Docks 5 and 6 where groundwater discharges directly to Sinclair Inlet are not sufficiently understood. Source control evaluations are incomplete and a remedy has not been selected for mercury in the marine environment. The Navy is engaged with stakeholders to develop a focused feasibility study and identify a remedy for OU B Marine which addresses mercury source control and considers additional remedial actions for total mercury in sediment to reduce human health risk. At the completion of the mercury source control evaluation, the protectiveness of the remedy for OU B Marine will be reevaluated. ICs including Fish Advisories are in place for OUB Marine
OU B Terrestrial	Protectiveness Deferred	A protectiveness determination of the remedy for OU B Terrestrial cannot be made until further information is obtained. Evaluations of OU B Terrestrial as a source of mercury to the marine environment are incomplete. At the completion of source control evaluation, the protectiveness of the remedy for OU B Terrestrial will be reevaluated. In the interim, the pathways for human exposure are being controlled through ICs which control access to the site, control excavation in contaminated areas, prevent the consumption of groundwater, and limit activities on site to industrial use.
OU C	Protective	The remedy implemented at OU C currently protects human health and the environment. The cleanup action implemented under the state MTCA regulation continues to prevent migration of free and dissolved phase petroleum hydrocarbon from affecting Dry Dock 6 and Sinclair Inlet in order to protect human health and the environment. ICs remain in place to prohibit activities which interfere with monitoring activities and prevent release of petroleum hydrocarbons.
OU D	Protective	The remedy implemented at OU D is protective of human health and the environment. Exposure pathways and infiltration pathways which could increase contaminant migration and result in unacceptable risks are being controlled and monitored. The conditions and COC concentrations found today in groundwater are similar to those at the time the ROD was executed. Conditions at the time of ROD execution were found not to pose unacceptable risks to human health and the environment as long as exposures and contaminant migration were controlled.

Table 3-1: Protectiveness Determinations/Statements from the 2017 FYR (continued)

OU #	Protectiveness Determination	Protectiveness Statement
OU NSC	Protective	The remedy implemented at OU NSC is protective of human health and the environment. Exposure pathways and infiltration pathways which could increase contaminant migration and result in unacceptable risks are being controlled and monitored. The conditions and COC concentrations found today in groundwater are similar to those at the time the ROD was executed. Conditions at the time of ROD execution were found not to pose unacceptable risks to human health and the environment as long as exposures and contaminant migration were controlled.
Sitewide	Protectiveness Deferred	An overall protectiveness determination of the remedies for the BNC site cannot be made at this time and will be deferred until further information for OUs A, B Marine, and B Terrestrial. Following collection and evaluation of the necessary additional information, protectiveness determinations will be made for the site as a whole and the individual OUs no later than December 2020.

Abbreviations:
FYR = five-year review
IC = institutional control
MTCA = Model Toxics Control Act
OU = operable unit
ROD = record of decision

Source: Navy. 2017b.

Table 3-2: Status of Recommendations from the 2017 FYR

OU #	Issue	Recommendations	Current Status	Current Implementation Status Description	Completion Date (if applicable)
OU A, OU B Terrestrial, and OU NSC	Ongoing and completed maintenance and repairs to pavement and the stormwater system are not documented in the BNC Terrestrial Annual Remedy Inspection Report.	Develop and add a new section to the BNC Terrestrial Annual Remedy Inspection Report to describe ongoing and completed maintenance and repairs to pavement and the storm water system.	Completed	Section 7.5 “2018 Remedy Inspection Report Recommendations and Actions Summary” was added to the Annual Remedy Inspection Report.	6/24/2020
OU A, OU B Terrestrial, OU D, and OU NSC	The terrestrial remedies adjacent to Sinclair Inlet at BNC may be vulnerable to climate change effects, including sea level rise and increasing storm intensity.	Leverage ongoing Navy regional planning to begin an assessment of the vulnerability of the BNC remedies to climate change, in support of a future adaptation plan for BNC OUs. Yearly climate change planning updates will be provided to the stakeholder team.	Completed Ongoing	Remedy Protectiveness Evaluation Climate Change Analysis for NBK Bremerton WA was completed. A section will be added to the Annual Remedy Inspection Report that assesses the potential effect of climate change/sea level rise as observed over the last year.	2/1/2019 Yearly updates
	Recent changes to the water quality may impact protectiveness.	Evaluate how changes to Water Quality Criteria may impact protectiveness.	Completed	Remedy Protectiveness Evaluation Water Quality Criteria, for OU A, OU B Terrestrial, OU D, and OU NSC.	2/26/2019
OU A	The 100% design for the remedy repair at Charleston Beach is complete but needs to be revised to account for climate change considerations and to comply with ARARs. Consultation with the stakeholders regarding design changes and remedy repair implementation is still pending.	Revise the remedy repair design at Charleston Beach to account for climate change and compliance with ARARs, including performance of a habitat benefit analysis. Complete a consultation with the stakeholder group regarding plans for implementation of the remedy repair at Charleston Beach.	Ongoing	30% Design was provided for stakeholder review (May 2021); 60% Design expected late Summer 2022; 100% Design expected fall 2022.	11/2022
		Complete construction of the Charleston Beach remedy repair.	Ongoing	Construction planned to begin Summer 2023.	2023
OU B Marine	OU B Marine IC inspection and reporting requirements are not clearly documented in an IC plan.	Prepare an OU B Marine IC plan to clearly document the OU B Marine IC requirements, and associated inspection, inspection frequency, and reporting requirements.	Completed	Institutional Control Plan for OUB Marine.	9/30/2020

Table 3-2: Status of Recommendations from the 2017 FYR (continued)

OU #	Issue	Recommendations	Current Status	Current Implementation Status Description	Completion Date (if applicable)
OU B Marine (cont.)	The magnitude and effects of the mercury source in the Outfall 15 drainage basin and the potential mercury source located between Dry Docks 5 and 6 where groundwater discharges directly to Sinclair Inlet are not sufficiently understood.	Perform a source control evaluation, focused on transport of mercury through the storm drain system and direct discharge of groundwater to OU B Marine, and prepare an EE/CA and Action Memorandum to address mercury source control.	Ongoing	USGS studies: Tidal Flushing of Mercury from BNC through the PSNS015 Stormwater Drainage System to Sinclair Inlet, completed in 2018; Source Control Action Plan combined with FFS, expected Final in 2022.	TBD
		Implement source control actions selected in the Action Memorandum.	Addressed in Next FYR	Source control actions planned for FY 2024, to include Outfall 15 flapper valve replacement. Storm system repairs are scheduled for completion by the end of calendar year 2024.	12/2024
	A remedy for OU B Marine which addresses mercury source control and considers additional remedial actions for total mercury in sediment to reduce human health risk has not yet been developed.	Prepare a focused feasibility study for mercury.	Ongoing	Draft FFS submitted in May 2021; Final expected in 2022.	TBD
		Prepare a ROD amendment (or new ROD or ESD) for mercury after the focused feasibility study is completed.	Addressed in Next FYR	TBD	TBD
	Bathymetric survey data from the post-construction survey through the 2012 survey showed elevation changes, and the reasons for these changes are not clearly understood.	Complete a review and revalidation of the bathymetric survey data from the post-construction survey through the 2012 survey in the CAD pit, ENR, and thick cap areas to validate if the physical components are functioning as intended by the ROD.	Completed	Technical memorandum prepared.	8/22/2019
OU B Terrestrial	Recent shoreline inspections indicate erosion along Segment 4.	Develop a plan to stabilize the shoreline along Segment 4, while considering actions needed in light of the USGS finding groundwater discharges to surface water in this area. Involve both the OU B Marine and BNC Terrestrial teams in planning for action along Segment 4.	Ongoing	Combined with Charleston Beach work. 30% Design submitted to stakeholders May 2021; 60% Design expected winter 2021-2022; 100% Design expected fall 2022.	7/2022
		Implement the plan to stabilize the shoreline along Segment 4.	Ongoing	Construction planned to begin summer 2023.	6/2023

Table 3-2: Status of Recommendations from the 2017 FYR (continued)

OU #	Issue	Recommendations	Current Status	Current Implementation Status Description	Completion Date (if applicable)
OU B Terrestrial and OU C	In OU B Terrestrial, due to site sampling location limitations in the former Building 871 area, potential cyanide presence in soil and groundwater was not fully defined, and the current IC and O&M Plan does not contain future use restrictions for the potentially affected areas. For OU C, the IC inspection frequency is not specified in the Cleanup Action Plan, and therefore IC inspections for OU C have not been included in the BNC IC and O&M Plan. This issue only affects protectiveness for OU B Terrestrial, not for OU C.	Update the BNC Terrestrial IC and O&M Plan to include the OU C ICs required by the Cleanup Action Plan and to include restrictions for future use of the Building 871 area due to potential cyanide presence in soil and groundwater. This issue only affects protectiveness for OU B Terrestrial, not for OU C.	Completed	Operation and Maintenance and Institutional Control Plan for OU A, OU B Terrestrial, OU C, OU NSC, and OU D updated in 2018 to include recommendations from 4th FYR; Updated in 2020 to include recommendations from stakeholder meetings (final dated October 2020).	10/13/2020

Source: Navy. 2017b.
Abbreviations:
ARAR = applicable or relevant and appropriate requirement
BNC = Bremerton Naval Complex
CAD = confined aquatic disposal
EE/CA = engineering evaluation/cost analysis
ENR = enhanced natural recovery
ESD = Explanation of Significant Differences
FFS = focused feasibility study
FYR = Five-Year Review
IC = institutional control
NBK = Naval Base Kitsap
O&M = operations and maintenance
OU = operable unit
ROD = record of decision
USGS = U.S. Geological Survey

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4.0 Five-Year Review Process

The five-year review process at each of the OUs is described in the following sections and consists of the following:

- Community Notification
- Interviews
- Data Review
- Site Inspections

4.1 Community Notification

An initial public notice was made available by newspaper posting in the Kitsap Sun on 5/27/2021, 5/28/2021, and 5/29/2021 and the North Kitsap Herald on 6/4/2021, 6/11/2021, and 6/18/2021, stating a FYR was being prepared for the BNC. The Navy welcomed written comments from the community during the five-year review process. Comments were accepted until 31 August 2021. No comments were received. A Notice of Completion for the fifth five-year review for BNC is anticipated to be published in October 2022. The final FYR report will be made available at the site information repository located at NAVFAC Northwest, 1101 Tautog Circle, Silverdale, WA 98315-1101.

4.2 Interviews

As part of the five-year review, interviews were conducted with persons familiar with the CERCLA actions at BNC to document any perceived problems or successes with the remedies which have been implemented to date. Interview candidates were identified from a variety of organizations and groups, including the Navy, USEPA, Ecology, Suquamish Tribe, Washington State Department of Fish and Wildlife, DNR, and the City of Bremerton. A set of interview questions and instructions was transmitted to interview candidates by e-mail. Not all of those invited to participate in the interviews chose to do so.

Highlights from the interview responses are summarized below directly from the comments provided by organizations and groups. The opinions and observations provided here are not necessarily those of the Navy RPMs. Interview responses are included in Appendix A.

4.2.1 Navy Personnel

Interview questionnaires were sent to five individuals with the Navy and two Navy contractors; three Navy personnel and one Navy contractor responded.

The Navy interviewees indicated in regard to monitoring, inspections, and maintenance of the remedies, monitoring and inspections have been taking place regularly, though needed maintenance has been infrequent. Further, there has not been “regular” maintenance of pavement, aside from mainly to address the operational needs of the shipyard, nor has there been regular maintenance of vegetative caps beyond some invasive species control at OU A and OU C and mowing of OU D grassy areas. However, the Navy believes human contact with impacted soil is limited by the presence of pavement and vegetative covers (even if in poor condition), and implementation of the excavation management plan within the terrestrial OUs and the restrictions at OU D further limit human contact with impacted soils. The Navy thinks the recent increase in communication among NAVFAC NW and PSNS and Intermediate Maintenance Facility (IMF) will help to improve identifying and addressing any areas which need follow-up or additional maintenance.

The Navy interviewees noted storm sewer catch basins are routinely cleaned out, but are unclear as to how the cleaning frequency is assigned and how these efforts are tracked/quantified for reporting purposes. It was also noted some emergent storm sewer repairs have been made since terrestrial RODs were implemented to address operational needs, not to minimize transport of COCs to Sinclair Inlet, and deteriorating storm sewer infrastructure has resulted in impacted soil from within the terrestrial OUs being transported to Sinclair Inlet.

The Navy interviewees recognized the shoreline maintenance/repair process is an inherently slow/long process, though Sinclair Inlet is a relatively quiescent embayment and, except for Charleston Beach, only minor shoreline erosion occurs; periodic additions of fish mix have been effective in reducing erosion at Charleston Beach. The Navy interviewees believe shoreline protection has been adequate at preventing erosion of fill materials. One Navy interviewee believes that the remedy for OU B Terrestrial Segment 4 was not put in place to reduce erosion but rather to increase habitat, and mentioned that stakeholders now agree this area is not suitable for such habitat, and a riprap wall will be constructed in that location to meet the remedy goal.

The Navy interviewees stated remedy performance for OU B Terrestrial and OU B Marine is poor due to the ongoing mercury source control issues. Furthermore, because of ongoing mercury source control investigation work, the protectiveness determination for OU B Terrestrial is unlikely to change during this FYR cycle. It was the opinion of one Navy interviewee that the areas of elevated mercury have been studied extensively and enough data have been gathered to make OU-wide decisions on a mercury remedy. Additionally, at the time of the interview response, the draft focused feasibility study (FFS) was completed and in stakeholder review. The Navy interviewees indicated because a ROD for mercury as a COC has not yet been established, a protectiveness determination is not yet required.

One Navy interviewee mentioned a lot of data have been gathered since the remedy implementation, though these data have not fully been used to optimize monitoring and inspection activities. The same interviewee stated that changes such as baseline surveys for both pavement and shoreline inspections, along with inspections that are performed by qualified inspectors using definitive, defensible criteria, would help in identifying and planning necessary maintenance needs so that remedies continue to meet remedial goals. One Navy interviewee also commented that work upcoming in 2021, including further groundwater monitoring as well as the addition of catch basin/manhole sediment monitoring, will help to further refine the fate and transport model, hopefully helping to better identify stormwater drainage basins of concern.

The Navy interviewees recognized that stakeholders are concerned about erosion at Charleston Beach, ongoing sources of mercury from terrestrial areas to sediment and marine waters of Sinclair Inlet, shoreline erosion along unhardened portions of the shoreline, impacts of construction projects on terrestrial and marine remedies in place, extended timelines to implement remedy maintenance projects, and presence of exposed asbestos brick and slag at Charleston Beach.

4.2.2 Agency Personnel

4.2.2.1 Environmental Protection Agency

Interview questionnaires were sent to three individuals with the USEPA, all of whom responded.

The USEPA mentioned remedies for OU A and OU B Marine have been compromised and are no longer protective; however, they also noted the OUB Marine remedy for PCBs continues to be effective, although stakeholders have questioned the PCB sediment data collected in 2018. It was noted the OU B Marine ROD focused on PCBs and that mercury was added to it as a last minute COC. As such, the USEPA believes that the original OU B Marine remedy is not sufficient for mercury. USEPA does say, in general, the information being collecting is helpful in addressing the data gaps/needs to identify sources of mercury being transported from the terrestrial environment to the marine environment. However, indication that mercury levels were increasing (or at least not decreasing) during the most recent round of marine sediment sampling implies that sources of mercury may remain and continue to impact the marine sediment, suggesting that additional remedies may be needed, which they have not seen proposed.

It was noted long-term monitoring of upland groundwater has shown continued COC exceedances and, in some cases, concentrations have increased over the years. The USEPA feels the stakeholders have struggled to define what source control actions for mercury should occur under the Terrestrial OUs rather than as part of OU B Marine.

Concern was expressed that upcoming construction work at PSNS related to the Multi-Mission Dry Dock (M2D2)/Shipyard Infrastructure Optimization Plan (SIOP) could potentially undo the effectiveness of the OU B Marine remedy for both PCBs and mercury if not done correctly, and stakeholders want to be involved in reviewing the plans for the new construction projects to help minimize potential impacts to the CERCLA remedies. It was noted major communication will be needed between the stakeholders and the M2D2/SIOP teams as work progresses at the base and overlaps with each other.

Additionally, it was noted that the Navy and stakeholders have had numerous reviews and discussions of repair design proposals (Charleston Beach and Segment 4), and the Navy has been receptive to the feedback received by stakeholders. The USEPA is hopeful the proposed design will be acceptable to stakeholders and findings from the USGS groundwater investigation will be incorporated into the 60% Basis of Design.

The USEPA noted the stakeholders have made improvements to the inspection plans for the Terrestrial OUs (tracking pavement status/repairs, catch basin sediment sampling, replacement of sediment socks for catch basins, etc.). However, the USEPA feels the stakeholders have struggled with updating COCs and determining frequency for groundwater LTM due to the time frame in which data are received, noting data from the previous year are received after it is too late to update the monitoring plan for the following year. It was also suggested that the decision-making process for determining the frequency and COCs for groundwater LTM needs to be re-evaluated as the current program lacks data quality objectives necessary to provide data needed to update the conceptual site model (CSM). However, it was stated that the stakeholders are working to resolve the timing issue, as updated groundwater LTM, in conjunction with the USGS findings from the groundwater study, will help in updating the groundwater CSM.

The USEPA recognizes per- and polyfluoroalkyl substances (PFAS) are a potential new set of COCs at the site, that work to investigate PFAS is underway, and that there has been better coordination between stakeholders to address catch basin sediment cleaning, sediment sock replacement, and pavement repair.

4.2.2.2 Washington State Department of Ecology

Three individuals from the Washington State Department of Ecology responded to the interview questionnaire. One individual’s responses focused on the Terrestrial OUs

(OU A, OU B Terrestrial, OU C, OU D, and OU NSC), and the two other individuals' responses focused on OU B Marine.

Terrestrial OUs

Regarding the terrestrial OUs, Ecology mentioned the remedies for OU A and OU B Terrestrial are not functioning as intended by the ROD. Ecology believes the remedy is not protective at OU A due to the erosion of fish mix, though noted the Navy is working on a remedy repair and that substantial progress has been made on a basis of design, with stakeholder consensus. At OU B Terrestrial, the respondent stated the groundwater chemical concentration has not decreased, and rather is increasing in some instances. The respondent believes the effectiveness of remedy activities such as storm system inspection and sealing cracks in pavement is an unanswered question. The respondent further stated concentrations of mercury in sediment are documented to have increased and believes other upland COCs may have also increased in the marine environment. They suggest that more data collection is necessary to determine if upland COCs are impacting the marine environment, citing the recent USGS study on metals near direct groundwater discharge zones.

The respondent stated some progress has been made to slip line a stormwater line, which they believe is the largest carrier of mercury to Sinclair Inlet. However, concern was expressed about the dry dock drainage system (indirect groundwater), direct groundwater, and stormwater discharge (unknown amount), which continue to be a threat of recontamination from OU B Terrestrial to OU B Marine. Ecology believes groundwater loading has not been accurately estimated in the draft source control evaluation for the OU B Marine FFS and source control as proposed in the FFS is inadequate.

Ecology indicated O&M activities are consistent with ROD/CAP documents, though the RODs are vague and incorrect in a couple of instances. They stated it is undetermined whether ROD O&M activities are effective in protecting human health and the environment.

Ecology stated some decision criteria and the monitoring program are obsolete and do not have objectives to meet future remediation goals. The respondent voiced concern that monitoring has continued for some COCs that have been detected below background levels, and that monitoring for some COCs was stopped based on non-detect results, even though these results did not meet regulatory levels. It was suggested better analytical methods with lower detection levels should be used when available (USEPA method 1668 for PCBs and USEPA method 8270 by select ion monitoring for low-level PAHs and pesticides), and samples should be reanalyzed if needed. Also noted was the completion of a preliminary assessment, which identified

22 potential areas for further investigation related to PFAS compounds. It was suggested the USEPA federal facilities site investigation and conceptual site model guidance be followed to investigate the potential PFAS release areas.

With regard to inspections and maintenance, Ecology indicated the Navy has made some progress on taking action when deficiencies are reported; however, these actions should be institutionalized following stakeholder recommendations. Ecology also believes the Navy needs to rethink the waste in place remedy, as Ecology believes the Navy has not demonstrated the waste in place remedy is protective of the marine environment.

Lastly, the respondent indicated they appreciate that leadership, management, and coordination have improved in the recent past.

OU B Marine

Ecology believes the remedy to lower PCB concentrations in sediment and marine tissue has met the intent of the corrective action agreed to at the time the ROD was signed. However, as was recommended by the Terrestrial OU respondent, to ensure protectiveness and to avoid previous issues with reporting limits, Ecology recommends LTM should include analysis of PCB congeners by USEPA Method 1668 (to provide a more accurate determination of potential risks and also comply with SMS requirements), as well as the most current analytical method with sufficiently low detection limits.

Ecology believes the completion of stormwater outfall repairs in OU B Terrestrial, especially those regarding Outfall 15, are important to ensure OU B Marine is not subjected to additional contamination, and furthermore is not recontaminated once a remedy for mercury is implemented. Moreover, Ecology believes any ongoing releases from stormwater outfalls have the potential to re-contaminate areas that were cleaned up as part of the PCB remedy.

As noted by the Terrestrial OU respondent, this respondent stated the Navy has made progress on the shoreline repair at OU A and engaged with stakeholders regarding the alternatives; however, currently, Ecology does not agree with the Navy’s determination that the remedy at OU A was short-term protective and believes that the remedy for OU A should be considered non-protective, due to the erosion of the fish mix, until a permanent remedy is constructed.

Based on stakeholder meetings and discussions regarding the FFS for OU B Marine, to Ecology it appears that the Navy may be using the same site boundary for mercury as was used for PCBs. Ecology believes site boundaries for a contaminant need to be established based on where the contamination is present, whether it is within the Navy facility boundary or not, and that the boundary applicable to the mercury FFS is required to be established based on where the mercury contamination is located. The respondent also indicated that Ecology recommends proceeding with any PFAS investigations, whether during the site investigation or RI, in a manner (1) to ensure that no data gaps in the CSM are created and (2) that will provide the information necessary to determine if PFAS presents a potential risk to ecological receptors or human health from seafood consumption. To ensure protectiveness for ecological and human health, Ecology believes surface water and sediments need to be sampled and analyzed for PFAS and the stormwater to surface water and sediment pathway needs to be considered.

Lastly, Ecology suggests that M2D2 and SIOP teams continue to coordinate as appropriate with stakeholders, as they feel that coordination will be beneficial to the CERCLA site if sampling conducted as part of M2D2 and/or SIOP can be used to provide supplemental information regarding contaminant concentrations. It was also suggested dredging that may occur as part of the M2D2 and/or SIOP projects may also clean up some of the contamination that would otherwise be required to be dredged as part of the CERCLA remedy.

4.2.3 Natural Resource Trustee Personnel

4.2.3.1 Suquamish Tribe

Interview questions were submitted to an individual representing the Suquamish Tribe, who is familiar with BNC, as well as the specific RODs, remedies, and monitoring and maintenance programs for OU NSC, OU A, OU B Marine, OU B Terrestrial, and OU D.

The Tribe’s representative indicated the remedies were generally implemented as intended by the RODs; however, as they noted in the fourth FYR, the remedies for OU A, OU B Terrestrial, and OU B Marine are not functioning as intended and have not achieved long-term goals for protectiveness. Of particular concern are:

- Implementation of the remedy repair for the OU A shoreline at Charleston Beach;
- Control of ongoing sources of mercury and other contaminants from the upland areas to the marine environment;
- Accumulation of mercury in marine sediments and aquatic organisms, which continues to present an unacceptable health risk via consumption of seafood;
- Potential impacts of PSNS construction projects and operations on in-place or future remedies.

As the Tribe’s representative commented in the fourth FYR, actions taken to date have been important steps in reducing the contaminant load in Sinclair Inlet. It was noted, however, the remedial actions have had limited direct benefit to tribal members as harvest restrictions remain in effect. It was noted that armoring of the BNC shoreline, while generally effective in preventing erosion, is detrimental to the habitat of treaty-protected resources. The Tribe also indicated they do not generally regard the use of ICs, specifically fish advisories and harvest restrictions, as viable long-term remedies. In their perspective, ICs are used to avoid and/or minimize exposure until the remedial objectives and goals for the sites are met, and that ICs alone do not reduce contaminant concentrations or control sources.

The Tribe noted long-term monitoring programs were originally designed to meet the goals of the RODs; however, after two decades of data collection, they generally need to be updated to reflect current understanding of site dynamics, changes to regulatory criteria and approaches, and improvements to analytical methods. An agreement on how to verify natural recovery (as a remedy component) is continuing and/or stable, and how to integrate data from sampling related to military construction into a decision framework for OU B Marine, also needs to be reached by the stakeholders. The Tribe feels, eventually, LTM for OU B Marine should evaluate source control efforts, as well as long-term protectiveness for both mercury and PCBs.

It was also expressed that planning for future Navy military construction activities, including the siting of a new dry dock, be coordinated with the stakeholders to effectively evaluate any impacts to in-place or planned remedies.

Lastly, the Tribe indicated since the last FYR, the stakeholders have made considerable progress in coordinating efforts and improving communication.

4.2.3.2 Washington State Department of Natural Resources

Interview questions were submitted to an individual with the DNR who is familiar with the BNC, RODs, remedies, and monitoring and maintenance programs for OU NSC, OU A, OU B Marine, OU B Terrestrial, and OU D.

The DNR site manager indicated that, overall, the remedies were implemented as intended, but are not currently functioning as well as intended and are not meeting protectiveness for both human health and the environment. Specific issues noted include the need for a remedy repair at Charleston Beach, the still ongoing FFS for mercury contamination, and the ongoing need for source control efforts, particularly for mercury and PCBs, as well as emerging chemicals such as PFAS. Moreover, it was noted by the DNR that for the remedies to remain successful, effective source control must be implemented, not only in current facilities, but incorporated into any future projects and that monitoring should be continued as necessary to ensure that source control is effective even after compliance goals are met.

It was expressed that the ongoing program of environmental monitoring at the BNC would benefit from improved incorporation of other data sources and should be re-examined/updated to reflect current knowledge of site dynamics and analytical methods. The DNR also mentioned that they prefer to avoid the use of ICs that may impact current and future land use.

4.2.3.3 Washington State Department of Fish and Wildlife

An interview response was not received from the Washington State Department of Fish and Wildlife.

4.2.3.4 City of Bremerton

An interview response was not received from the City of Bremerton.

4.3 Data Review

This section summarizes results and trends in chemical data collected through the various monitoring programs at BNC during this FYR period. The implications of the data with respect to the functionality and protectiveness of the remedies are discussed in Section 5. The monitoring wells sampled as part of the LTM program are shown on Figure 4-1.

4.3.1 Groundwater Data Review

Table 4-1 shows the analytes sampled by OU during each year of this FYR period. As shown in the table, sampling is more extensive in the even years of monitoring (2018 and 2020) compared to the odd years (2017 and 2019). Sampling for 2021 is summarized in Table 4-1 and included the same analytes as 2020; however, results were not received in time for inclusion in this FYR. This is due to the frequency requirements of monitoring for each OU or analyte.

Table 4-1: LTM during the FYR Period

OU	2017	2018	2019	2020	2021
OU A	*No sampling conducted*	Arsenic, Copper, Nickel, Zinc	*No sampling conducted*	Chrysene, Pesticides, PCBs, Arsenic, Copper, Nickel, Zinc	Chrysene, Pesticides, PCBs, Arsenic, Copper, Nickel, Zinc
OU B Terrestrial	Mercury	Mercury, Copper, Nickel, Zinc, PMP (TPH-D & TPH-O)	Mercury	Mercury, Copper, Nickel, Zinc, TCE, Pesticides	Mercury, Copper, Nickel, Zinc, TCE, Pesticides
OU C	TPH-D and TPH-O	TPH-D and TPH-O	TPH-D and TPH-O	TPH-D and TPH-O	TPH-D and TPH-O
OU D	*No sampling conducted*	*No sampling conducted*	*No sampling conducted*	Pesticides, Cadmium, Mercury	Pesticides, Cadmium, Mercury

Table 4-1: LTM during the FYR Period (continued)

OU	2017	2018	2019	2020	2021
OU NSC	*No sampling conducted*	Arsenic, Copper, Nickel, PMP (TPH-D & TPH-O)	*No sampling conducted*	Pesticides, PCBs, Arsenic, Copper, Nickel, PMP (TPH-D & TPH-O)	Pesticides, PCBs, Arsenic, Copper, Nickel, PMP (TPH-D & TPH-O)

Abbreviations:
FYR = five-year review
LTM = long-term monitoring
PCB = polychlorinated biphenyl
PMP = Petroleum Management Plan
TCE = trichloroethene
TPH-D = total petroleum hydrocarbons-diesel range
TPH-O = total petroleum hydrocarbons-oil range

The sections below provide a summary of the analyte exceedances per OU that occurred during this FYR period. Also, a summary of the trends analyzed for each site monitoring well in the 2020 Data Summary and Trend Analysis Report for each OU is provided. With the exception of TCE, cleanup levels used for comparison in this section are consistent with the cleanup levels used for comparison in the fourth FYR report (Navy, 2017b), which were typically RGs as established in the ROD/CAP documents. The current regulatory level for TCE is 0.7 µg/L, which is the USEPA federally promulgated human health criterion for Washington, organism only (Navy, 2019d). Cleanup levels are further discussed in Section 5.2 of this report.

4.3.1.1 OU A

The trends and data for metals collected in 2018 and 2020 at OU A are presented on Figure 4-2.

Arsenic

Exceedances of cleanup level (5.0 µg/L):

- 2018 – Well 203 at 161 µg/L, Well 241 at 11.2 µg/L.
- 2020 – Well 203 at 36.3 µg/L, Well 241 at 10.7 µg/L.

Arsenic trends in monitoring wells in OU A (Navy, 2021c):

- Well 203 – decreasing
- Well 204 – increasing
- Well 241 – increasing

Copper

Exceedances of cleanup level (2.5 µg/L):

- 2018 – Well 203 at 5.89 µg/L, Well 204 at 17.5 µg/L, Well 241 at 20.1 µg/L.
- 2020 – Well 203 at 4.52 µg/L, Well 204 at 23.5 µg/L, Well 241 at 3.43 µg/L.

Copper trends in monitoring wells in OU A (Navy, 2021c):

- Well 203 – increasing
- Well 204 – increasing
- Well 241 – no trend

Nickel

Exceedances of cleanup level (7.9 µg/L):

- 2018 – Well 204 at 9.67 µg/L, Well 241 at 32.6 µg/L.
- 2020 – Well 204 at 9.7 µg/L, Well 241 at 13.3 µg/L.

Nickel trend in monitoring wells in OU A (Navy, 2021c):

- Well 204 – no trend
- Well 241 – no trend

Zinc

Exceedances of cleanup level (76.6 µg/L):

- 2018 – Well 204 at 98.5 µg/L, Well 241 at 549 µg/L.
- 2020 – Well 204 at 97.4 µg/L, Well 241 at 144 µg/L.

Zinc trends in monitoring wells in OU A (Navy, 2021c):

- Well 204 – decreasing
- Well 241 – increasing

Organics

Groundwater was analyzed for chrysene, pesticides, and PCBs in OU A wells in 2020. These analytes were not reported above the detection limit or were below the established cleanup level (Navy, 2021c). The data for PAHs, pesticides, and PCBs collected in 2020 at OU A are presented on Figure 4-3.

4.3.1.2 OU B Terrestrial

Mercury

Exceedances of compliance criteria/current regulatory level (0.025 µg/L):

- 2017 – Well LTMP-1 at 0.174 µg/L, Well LTMP-3 at 3.57 µg/L, Well LTMP-5 at 0.0686 µg/L.

- 2018 – Well LTMP-1 at 0.0984 µg/L, Well LTMP-3 at 2.18 µg/L, Well LTMP-5 at 0.0374 µg/L.
- 2019 – Well LTMP-1 at 0.0774 µg/L, Well LTMP-3 at 2.74 µg/L.
- 2020 – Well LTMP-1 at 0.246 µg/L, Well LTMP-3 at 0.633 µg/L.

Mercury trends in monitoring wells in OU B Terrestrial (Navy, 2021c):

- Well LTMP-1 – no trend
- Well LTMP-3 – no trend
- Well LTMP-5 – increasing

Concentrations of mercury at Well LTMP-5 are well below the compliance criterion at 0.0086 µg/L in the 2020 monitoring event. The trends and data for metals collected from 2017 through 2020 at OU B Terrestrial are presented on Figure 4-4.

Organics

Groundwater was analyzed for TCE and pesticides in OU B Terrestrial wells in 2020. Pesticides were not reported above the detection limit. TCE exceedances of the compliance criterion (0.7 µg/L) and the project action limit (1.0 µg/L) occurred in the following wells during the 2020 monitoring (Navy, 2021c):

- Well 410R at 37 µg/L; well 432 at 41 µg/L; well 707 at 2.1 µg/L; LTMP-3 at 3.3 µg/L.

The trends and data for TCE collected in 2020 at OU B Terrestrial are presented on Figure 4-4. The data for pesticides collected in 2020 at OU B Terrestrial are presented on Figure 4-5.

PMP

PMP wells at OU B Terrestrial were sampled in 2018 for TPH-D and TPH-O. These analytes were not reported above the detection limit or were below the established cleanup level (Navy, 2019c). The data for PMP wells collected in 2018 at OU B Terrestrial are presented on Figure 4-6.

4.3.1.3 OU C

Monitoring for petroleum at OU C is now integrated into the site-wide LTM program.

Total Petroleum Hydrocarbons as Diesel and Motor Oil

Monitoring for petroleum at OU C is now integrated into the site-wide LTM program. The data for TPH-D and TPH-O collected from 2017 through 2020 at OU C are presented on Figure 4-7.

Exceedances of the Trigger Level (500 µg/L) (Navy, 2007c):

- 2017 – No exceedances of the trigger level were observed in the 2017 LTM event. The maximum concentration observed was 203 µg/L in Well GMWT-9.
- 2018 – No exceedances observed.
- 2019 – Well GMWT-15 at 3,610 µg/L for TPH-D and 2,000 µg/L for TPH-O.
    - This exceedance of the trigger level was from a monitoring well but not a sentinel well, which would have triggered quarterly monitoring. This event was the first time that well GMWT-15 was sampled for an annual event.
- 2020 – Well GMWT-15 at 1,800 µg/L for TPH-D and 2,400 µg/L for TPH-O.

As a result of the elevated results in GMWT-15, sentinel wells were sampled in 2020 and were below trigger levels. The trends for diesel-range organics and oil-range organics are not available for OU C due to limited historical data. In 2018, product thickness in GMWT-18 was trending downward (Navy, 2019c).

4.3.1.4 OU D

Cadmium

Groundwater was analyzed for cadmium and mercury in Well LTMP-5 (compliance well for OU D). These analytes were reported below their respectively established compliance criteria (Navy, 2021c). The data for OU D wells collected in 2020 are presented on Figure 4-8.

Pesticides

Groundwater was analyzed for pesticides (4,4’-DDT, aldrin, and dieldrin) in OU D well LTMP-5 in 2020. None of the tested pesticides were detected above the detection limit (Navy, 2021c). The data collected in 2020 at OU D are presented on Figure 4-8.

4.3.1.5 OU NSC

The trends and data for metals collected in 2018 and 2020 at OU NSC are presented on Figure 4-9.

Arsenic

Groundwater was analyzed for arsenic at OU NSC in the 2018 and 2020 LTM events, but no exceedances of the cleanup level (5.0 µg/L) were observed. The highest detections observed in 2018 and 2020 were in well 310R at 1.6 µg/L and 0.56 µg/L, respectively.

Arsenic trends in monitoring wells in OU NSC (Navy, 2021c):

- Well 310R – decreasing
- Well 386 – decreasing
- Well 380 – increasing

Copper

Exceedances of the cleanup level (2.5 µg/L) or current regulatory level (3.1 µg/L):

- 2018 – Well 380 at 3.23 µg/L, Well 386 at 3.18 µg/L.
- 2020 – Well 380 at 5.70 µg/L.

Copper trends in monitoring wells in OU NSC (Navy, 2021c):

- Well 310R – no trend
- Well 380 – increasing
- Well 386 – no trend

Nickel

Exceedances of cleanup level (7.9 µg/L) or current regulatory level (8.2 µg/L):

- 2018 – Well 380 at 19.5 µg/L.
- 2020 – Well 380 at 103.0 µg/L.

Nickel trends in OU NSC (Navy, 2021c):

- Well 310R – decreasing
- Well 380 – no trend

Mercury

Mercury was analyzed in 2020 at OU NSC wells (310R, 380, and 386), but it was not detected above the detection limit (0.00015 µg/L) or was below the established cleanup level (Navy, 2021c).

Organics

Groundwater was also analyzed for total PCBs and pesticides at OU NSC in 2020. There was one detection of a pesticide and one detection of total PCBs, but both concentrations were near the reporting limit and well below the cleanup levels (Navy, 2021c). The data for PCBs and pesticides collected in 2020 at OU NSC are presented on Figure 4-10.

PMP

PMP well 392R at OU NSC was sampled in 2018 and 2020 for TPH-D and TPH-O. In 2018, results for TPH-D and TPH-O were detected at concentrations above the 500 μg/L cleanup level at well 392R; however, it should be noted that the result for TPH-O was qualified as “U” (not detected at indicated quantitation limit) and the result for TPH-D was qualified as “Y” (chromatogram did not match the standard). In 2020, TPH-D and TPH-O were not reported above the laboratory detection limit. The data for PMP samples collected in 2018 and 2020 at OU NSC are presented on Figure 4-6.

4.3.1.6 Other Analytes

Multiple new analytes have been added to the LTM sampling suite for the 2020 event. Groundwater samples were analyzed for these additional parameters from OU A, OU B Terrestrial, OU D, and OU NSC. These samples collected in 2020 were analyzed for a suite of organochlorine pesticides, chrysene, and TCE; however, none were reported above the laboratory detection limits (Navy, 2021c).

4.3.2 Other Data Summary

4.3.2.1 OU A Soil and Sediment Data Review

This section provides a summary of the intertidal sediment sampling conducted at OU A in 2018 and subsurface soil and marine sediment sampling conducted at OU A in 2020/2021. The sample locations from these events are presented on Figure 4-11, and the results are provided in Appendix B.

In 2018, intertidal sediment sampling was performed to evaluate presence or absence of contaminants in OU A sediment (Navy, 2020g). The samples were analyzed for mercury, arsenic, cadmium, copper, lead, silver, chromium, and PCBs. The results were compared to Washington State SMS SCOs, CSLs, and natural background as defined by Ecology. The following is a summary of results:

- PCBs were detected in 5 out of 10 samples collected. One sample, located within the historical landfill boundary, exceeded the apparent effects threshold SCO value of 130 micrograms per kilogram (μg/kg).

- Copper and mercury were present at levels exceeding SCO and CSLs.
  - Copper exceeded SCO and CSL in 2 of 10 samples.
  - Mercury exceeded SCO and CSL in 5 of 10 samples.
- Natural background levels were exceeded for all metals, except chromium.
  - Arsenic exceeded natural background in 2 of 10 samples.
  - Cadmium exceeded the natural background in 1 of 10 samples.
  - Cooper exceeded the natural background in 6 of 10 samples.
  - Lead exceeded the natural background in 9 of 10 samples.
  - Mercury exceeded the natural background in 3 of 10 samples.
  - Silver exceeded the natural background in 1 detected sample and 1 non-detected sample.
  - Zinc exceeded the natural background in 8 of 10 samples.

Further sediment investigation was recommended for OU A. Additional investigation was conducted in December 2020 through February 2021 at Charleston Beach.

From 14 December through 18 December 2020, a total of 46 composite subsurface soil samples were collected from 12 soil borings spaced within 20- by 30-foot grids on top of the western revetment. The samples were compared to USEPA RSLs (HQ = 0.1), criteria specified under 40 CFR, and Washington State CLARC Method B screening levels for total PCBs, total SVOCs, and selected metals; 40 CFR criteria for TCLP metals; and Washington State CLARC Method A screening levels for TPH (CH2M, 2021). The following is a summary of the results:

- SVOCs were detected in all 46 samples, seven unique SVOCs were detected above the Project Action Limits (PALs), and at least one SVOC exceeded the PAL in 22 soil samples.
- One PCB (Aroclor 1260) was detected in six of the 46 soil samples and exceeded the PAL in three of the samples.
- Metals (arsenic, barium, cadmium, chromium, copper, lead, mercury, nickel, and zinc) were detected above the PALs in all 46 soil samples. Silver was detected but did not exceed the PAL, and selenium was not detected in any samples.
- TPH as gasoline, diesel, and residual range were detected in all 23 soil samples analyzed for this suite, but none of the detections exceeded the PALs.

- TCLP analysis of metals was performed on eight samples. Six metals (arsenic, barium, cadmium, chromium, lead, and mercury) were detected across these sample results; lead was the only analyte exceeding the PAL (CH2M, 2021).

On 3 February 2021, seven composite sediment samples were collected from seven sediment sampling locations spaced within 20- by 30-foot grids within the western beach intertidal zone at Charleston Beach. The samples were compared to USEPA RSLs (HQ = 0.1), Washington State OC-normalized SMS criteria and/or apparent effects thresholds for total PCBs and SVOCs; and USEPA RSLs (HQ = 0.1), Washington State OC-normalized SMS criteria and/or apparent effects thresholds, and natural background concentrations for metals (CH2M, 2021). The following is a summary of the results:

- SVOCs were detected in five of the seven sediment samples; 17 unique SVOCs were detected, but none was above the respective PAL.
- PCBs were not detected in any of the sediment samples.
- Metals (arsenic, barium, chromium, copper, lead, mercury, nickel, and zinc) were detected in all sediment samples. Chromium was the only analyte that exceeded the screening level; however, chromium concentrations were all below the natural background concentration. Cadmium, selenium, and silver were not detected in any of the sediment samples (CH2M, 2021).

Based on these results, soil from the central portion of the revetment was determined to be hazardous waste as identified by the sampling grid in the technical memorandum. This soil is planned to be disposed of as appropriate by state regulation. Other soil and sediment exceeding the PALs is planned to be removed and disposed of based on the results from this sampling event (CH2M, 2021). Some soil exceeding PALs will remain in place, but will be buried below clean fill and/or the newly constructed revetment.

4.3.2.2 OU B Marine Sediment and Tissue Data Review

This section summarizes the data collected during the supplemental mercury investigation and the intertidal sediment sampling in OU B Marine. The sediment sampling grids used during these events are presented on Figures 4-12 and 4-13. The tissue collection area is presented on Figure 4-14.

<u>Mercury</u>

A supplemental mercury investigation was prepared in 2017 to evaluate the levels of mercury at BNC, with attention toward OU B Marine. Mercury concentrations in multiple media were evaluated and ratios were determined to compare mercury in OU B Marine to Sinclair Inlet and in Sinclair Inlet to the surrounding or adjacent bays. Per the

Supplemental Mercury Investigation Report (Navy, 2017c), mercury concentrations were higher in OU B Marine and the Sinclair Inlet compared to reference areas, but the concentrations were also declining. The rate of decline is measured with LTM data as far back as 2000 and is compared to rates of decline in the outer Sinclair Inlet. More recent LTM data largely show no trend in mercury concentrations, as summarized below. A primary contributing source of the mercury from BNC can be traced to the southern portion of the Outfall 15 drainage basin. Dry dock and groundwater discharge are also considered potential sources. Based on the 2017 mercury investigation results, the Navy determined further investigation was needed to determine an effective approach for Outfall 15 drainage basin source control (Navy, 2017c).

Long-term monitoring and intertidal sediment sampling were conducted in 2018 and included mercury analysis in sediment (Navy, 2020g). Mercury detected in sediment in a 500-foot grid around OU B Marine in 2018 showed an average of 1.5 mg/kg in sediment with highest concentrations toward the eastern end of OU B Marine. The maximum concentration was 27.8 mg/kg. The mercury trends in the 500-foot grids indicate a declining trend in approximately 8% of the grids, an increasing trend in approximately 3% of the grids, and no trend in the remaining 89% of the grids. In the 1,500-foot grids, 3% had a declining concentration and the remaining 97% of the grids showed no trend.

The results of the 2018 OU B Marine and Sinclair Inlet sediment sampling and analysis for mercury indicate the following (Navy, 2020g):

- Mercury concentrations in the 500-foot grids near OU B Marine ranged from below the detection limit of 0.00019 mg/kg to 27.8 mg/kg, with an average of 1.5 mg/kg and a median of 0.8 mg/kg. Mercury was detected in 70 of 71 samples, with a detection limit of 0.00019 mg/kg; the detection limit value of 0.00019 mg/kg was used for the non-detected result to calculate the average across the sampling area. The highest concentrations of mercury were located toward the eastern end of OU B Marine. For example, grids 67 and 62 had mercury concentrations of 27.8 and 9.5 mg/kg, respectively.
- Mercury concentrations in the 1,500-foot grids throughout Sinclair Inlet ranged from 0.061 to 1.3 mg/kg, with an average of 0.66 mg/kg and a median of 0.75 mg/kg. Mercury was detected in all 32 sediment samples. The lower concentrations were located toward the western end and southern shore of Sinclair Inlet.

- Trend testing of mercury data indicates 6 of the 71 500-foot grid polygons have declining mercury concentrations, 2 have increasing mercury concentrations, and the 63 remaining show no trend. One of the 32 1,500-foot grids has a declining concentration, with the remaining 31 grids showing no trend.

As stated in the 2018 OU B Marine Long-term Monitoring and OU A Intertidal Sediment Sampling Report (Navy, 2020g), 2018 trend testing for mercury data is not corroborated by the time-series plots of individual grid cells or the AWA mercury concentrations from 2003 to 2018, which show an increase in 2018. In the 500-foot grids, 63 of 71 mercury results were higher in 2018 than they were in 2014. In the 1,500-foot grids, the mercury results in all 32 grids were higher in 2018 than they were in 2014.

PCBs

PCB concentrations in sediment and fish tissue were obtained during an LTM and intertidal sampling event. The 2018 sediment data are considered usable for confirming OU B Marine ROD cleanup objectives for PCBs have been met for OU B Marine and Sinclair Inlet. The 2018 tissue data are considered usable for determining the OU B Marine ROD fish tissue cleanup objective for PCBs has been met for Sinclair Inlet. The stakeholders expressed concern related to the non-detect PCB results from the 2018 LTM sampling and analysis, based on historical results and a laboratory change in analytical procedures; however, 10 percent of the samples from locations considered "worst case" for PCB concentrations were reanalyzed using a micro-extraction in order to lower analytical detection limits, which also resulted in non-detects.

However, waste was left in place as part of the OU B Marine remedy, and the Navy is committed to ongoing evaluation of the remedy in some form to confirm the remedy remains protective for the purposes of the FYR process (Navy, 2020g).

The PCB results of the 2018 OU B Marine and Sinclair Inlet LTM sediment sampling indicate the following (Navy, 2020g):

- Total PCB Aroclors in OU B Marine sediment (measured in 500-foot grids) were not detected, with detection limits ranging from 6.5 to 24 µg/kg. Total PCBs in Sinclair Inlet sediment (outside of OU B Marine and measured in 1,500-foot grids) were not detected, with detection limits ranging from 7.3 to 26 µg/kg. This is the first time that PCB Aroclors were not detected since monitoring began.
- Total OC-normalized PCB Aroclors in the 500-foot grids were not detected with detection limits ranging from 0.45 to 1.8 mg/kg OC. Using detection limits for each sample, the geometric mean (geomean) is calculated to be 0.90 mg/kg OC, which is below the OU B Marine ROD minimum cleanup level of 3 mg/kg OC (Navy et al., 2000).

- Total OC-normalized PCB Aroclors in the 1,500-foot grids were not detected with detection limits ranging from 0.69 to 8.3 mg/kg OC. Using the detection limit value for each sample, the geomean is calculated to be 1.1 mg/kg OC.
- The geomean of the combined 500-foot and 1,500-foot grid results for total OC-normalized PCB Aroclors was 1.06 mg/kg OC, which is below the OU B Marine ROD long-term cleanup goal of 1.2 mg/kg OC for Sinclair Inlet (Navy et al., 2000).
- Trend testing of both total PCB Aroclor and total OC-normalized PCB Aroclor concentrations from 2003 through 2018 indicates declining trends in PCB Aroclor concentrations that are also evident in 52 of the 71 500-foot grid cells (73%) in OU B Marine and 18 of the 32 1,500-foot grid cells (56%) in Sinclair Inlet. The remaining grid cells show no trend.
- Regional Mann–Kendall trend tests for both the 500-foot and combined grids also indicate declining PCB Aroclor concentrations. The results of the formal trend tests are corroborated by declining PCB Aroclor concentrations that are observed in time-series plots of both individual grid cells and geomean concentrations by event.
- Declining total PCB Aroclor concentrations in sediment are corroborated by similar trends in PCB Aroclor concentrations in English sole fish tissue.

The results of the 2018 OU B Marine fish tissue sampling indicate the following (Navy, 2020g):

- Of the 10 English sole tissue samples analyzed for total PCB Aroclors, PCBs were not detected in 8 samples with detection limits ranging from 0.0087 to 0.0088 mg/kg wet weight.
- Total PCB Aroclors were detected in 2 of 10 samples at concentrations of 0.016 and 0.017 mg/kg wet weight.
- The arithmetic mean of the 2018 English sole tissue samples for total PCB Aroclors was 0.010 mg/kg wet weight (calculated using the detections and eight non-detections at the full detection limits), which is below the OU B Marine ROD long-term cleanup goal of 0.023 mg/kg wet weight (Navy et al., 2000). Neither of the two detected total PCB Aroclor results (0.016 and 0.017 mg/kg wet weight) exceeded the cleanup goal.
- The average total PCB Aroclor concentration in English sole tissue was below the cleanup goal of 0.023 mg/kg wet weight for Sinclair Inlet for the first time since monitoring began.

- The 2018 tissue data are considered usable for determining that the OU B Marine ROD fish tissue cleanup objective has been met for Sinclair Inlet.

4.3.3 Tidal-Related Sampling Campaigns

From December 2011 through June 2012, the USGS conducted three tidal-related sampling events to characterize mercury dynamics in the largest stormwater drain system (PSNS015), which passes through the soils of an area known as Site 2 and functions as a conduit for landward seawater movement during high tides. The sampling events documented the extent of seawater intrusion and quantified mercury concentrations and other ancillary parameters during a range of tidal conditions. No sources of precipitation-derived mercury were identified. In May 2012, spring-tide conditions drained the water in PSNS015 to Sinclair Inlet, and the highest filtered (dissolved) total mercury concentrations (60 nanograms per liter [ng/L]) were measured during the lower-low tide in the freshwater flowing into the seaward-most stormwater drain vault. Similar conditions were not observed during the companion neap-tide sampling event (June 2012); the water in the seaward-most stormwater vault was brackish rather than fresh, and the filtered total mercury concentration did not exceed 24 ng/L. Particulate total mercury concentrations and dynamics during the spring- and neap-tide sampling events were variable, with higher concentrations (133 ng/L) measured throughout the neap-tide study compared to those measured during the spring-tide study (4.34 ng/L). The highest filtered total mercury concentration of all sampling campaigns (1,140 ng/L) was measured during ebb tide in a nearshore monitoring well that represents groundwater discharging from the contaminated soils directly to Sinclair Inlet along an unwalled part of the shoreline. The results suggest that mercury extracted from Site 2 soils can be carried to Sinclair Inlet during ebb tides through groundwater directly to Sinclair Inlet along an unwalled part of the shoreline or through the stormwater drain system when the water level in Sinclair Inlet drops below the water level in the stormwater drain system (Conn et.al., 2018).

4.3.4 Terrestrial Mercury Assessment Report

Subsurface soil samples were collected in March 2020 and June 2020 associated with OU B Terrestrial and analyzed for mercury (Navy, 2020i). The soil samples were collected from around the drain lines in OU B Terrestrial to characterize soil for mercury impacts from the boundary of OU B Terrestrial to the BNC property boundary and from the area north of OU B Terrestrial, along the PSNS015 main storm drain line and next to vault locations on Barclay Street. Sample results showed concentrations of mercury in soil above the 0.2 mg/Kg PSL as follows:

- Four of the 14 vault locations had reported mercury concentrations above the PSL, with a maximum concentration of 2.0 mg/Kg at location V14

- None of the Barclay Street locations had mercury concentrations above the PSL.
- Four of the nine Class 4 and 5 sampling locations had reported mercury concentrations above the PSL, with a maximum concentration of 28 mg/Kg at location D8. This was the maximum concentration reported for all samples collected during the field program.
- Six of the nine random industrial locations (including manhole R/30-5) had reported mercury concentrations above the PSL, with a maximum concentration of 18 mg/Kg at location R7.

4.4 Site Inspection

The five-year review site-wide inspection was conducted from 2 August through 4 August 2021 by Liberty JV. This section summarizes the findings and observations made during site-wide inspection. As discussed in Section 2.0, annual remedy inspections and quarterly LUC inspections are conducted at each of the OUs; see Section 2 for a summary of these inspections and their findings.

The goal of the site-wide inspection was to walk each of the OUs, noting any observations with regard to:

- **Access:** Fencing, security measures, signage
- **Institutional controls:** Groundwater restrictions, excavation management, land use restrictions, fishing and shellfish harvesting restrictions, vandalism/trespassing, off-site adjacent land use changes
- **Pavement and vegetative cap:** Overall condition, maintenance, damage, areas of recent repair
- **Catch basins and storm drains:** Overall condition, maintenance, areas of recent repair or expansion
- **Shoreline (OU A and OU B Terrestrial):** Overall condition of armor rock seawall and sheet pile walls, evidence of erosion or sluffing, evidence of exposed fill or debris, groundwater or petroleum seepage, Charleston Beach erosion gauges (OU A only)

The salient findings from the site wide inspection are summarized in Table 4-2. Field inspection sheets are provided in Appendix C.

Additionally, the Navy was onsite at OU B Terrestrial in October 2021 and observed significant erosion of the shoreline at Segment 4 along with stained soil and bricks and construction debris that were breaching the upper shoreline.

Table 4-2: Fifth FYR Site-Wide Inspection Summary

OU A

Overall, the cap at OU A appears to be in generally good condition and is being maintained. However, some general observations were made and are outlined below.

Pavement Cap and Vegetative Cover

- .An area of disturbed vegetation was observed in the southwestern portion of Zone 1 and was related to recent (December 2020) soil characterization activities.
- Vegetation cap at the top of the shoreline rock wall is stressed.

Shoreline

- A small number of bricks, glass, and clay pipe were scattered across the beach, predominantly southwest of Charleston Beach. Few scattered bricks were observed on the lower portion of Charleston Beach. None of the material appeared to be recently placed and is not thought to be landfill material because it is covered with barnacles and has been there for a long time. It is possible, though it cannot be confirmed, that the bricks were used as shoreline armoring prior to the ROD being implemented. The glass is likely washed-up surficial garbage/beach glass, which is commonly observed on Puget Sound beaches. The clay pipe is an abandoned City of Bremerton outfall that will be removed as part of the Charleston Beach remedy repair.
- Erosion gauges A and C are visible across Charleston Beach. Approximately 18 inches of erosion gauge A and approximately 3 inches of erosion gauge C were visible. Erosion gauges B and D were not located and assumed to be buried.
- “Fish mix” rock material is visible at the top portion of the beach. Large armor rock is visible in the southwest portion of the fish mix berm.

Monitoring Wells

- Well 204 can be opened by hand, and the inner casing plug was not inserted into the pipe correctly, allowing for easy access.

Access

- Some signs are visible, but are minimal and hard to find. Several signs are faded and in disrepair.
- No damaged fencing visible, and although not legally, most of the OU can be accessed by the general public from the shoreline or nearby highway.

On the first day of the of the inspections, a small inflatable boat with an attached outboard motor was noticed at Charleston Beach. When OU A was inspected, on the third day of the inspections, the small inflatable boat was observed locked to a log on Charleston Beach with its outboard motor placed on the inside of the boat, suggesting the small boat had been recently used. The RPM was notified and contacted security.

OU B Terrestrial

Overall, the cap at OU B Terrestrial appears to be in generally good condition and is being maintained. However, some general observations were made and are outlined below.

Pavement Cap

- South of electrical substation 1035 is a pothole in the pavement where the cap is compromised.
- Pavement southwest of building 1108 has exposed soil/gravel.
- An area of soil measuring approximately 6 feet by 6 feet is exposed, and pavement has been removed at an area northeast of building 368.
- South of building 1160 is an area of very poor concrete, where soil and gravel are filling open areas.
- Several locations were found with cracks or deficiencies in the pavement.
- An area south of building 850 has new concrete, where excavation likely occurred. This area is approximately 20 feet by 10 feet in size.
- New asphalt is visible along a recently trenched area near building 857.

Table 4-2: Fifth FYR Site Wide Inspection Summary (continued)

• The area southeast of building 851 (recycling area) has a new concrete surface, installed within the "last 4 months" according to onsite personnel. **Excavations** • Southwest of building 431 is an area of active excavation where soil is being removed. • Along the northwest corner, west of building 431, is an area being excavated and a newly opened trench. • West of building 1157 is an exposed area, approximately 30 feet by 4 feet, that looks like it was recently excavated. • West of building 431 is a 3-foot by 3-foot area of cut asphalt with apparent exposed soil. • Along the southeast corner of building 431 is an active excavation. • West of building 78 is an area of active trenching, approximately 3 feet by 20 feet. • South of building 850A are two areas of active excavations. • The area north of the powerplant is marked for future excavation. **Localized Settlement** • An area of subsidence at the northwest corner of building 427 was observed. • An area of subsidence southwest of building 550 that appears to have been previously patched was observed. **Monitoring Wells** • Wells 432, 713, 715 R, 736, and 809 are missing one or more bolts on their covers. • The cover bolts for Well LTMP-2 are rusted and cannot be tightened.
OU C
Pavement Cap • The pavement caps located in the parking lots of OU C were in good condition with no significant defects observed. **Institutional Control** • No evidence of activities that could interfere with monitoring was observed. • No evidence of activities that could result in the release of petroleum hydrocarbons was observed. **Other** • The cover of a flush-mount well monument (likely an old component of the steam sparge system) located at the southwest corner of a former building foundation was not bolted down and there was no casing plug present.
OU D
Overall, the cap at OU D appears to be in generally good condition and is being maintained. However, some general observations were made and are outlined below. **Pavement Cap and Vegetative Cover** • Pavement and vegetative caps are being maintained. **Localized Settlement** • Paving stones at the south end of the OU have noticeable settlement up to 6 inches in depth.

Table 4-2: Fifth FYR Site Wide Inspection Summary (continued)

OU NSC

Overall, the cap at OU NSC appears to be in generally good condition and is being maintained. However, some general observations were made and are outlined below.

Pavement Cap

- Pavement and concrete are cracked in some areas, especially near steam utility trenches.
- Asphalt is cracked between building 1245 and building 449.
- Some asphalt defects are visible north of building 816.
- Recent trenching and repaving were observed north of building 556 and building 467.
- Newly installed concrete is present south and east of building 449.
- New asphalt visible south of and between building 556 and building 802.
- New concrete visible east and south of building.

Excavations

- Active excavation near building 494.
- West of building 971 is a small area (approximately 8 feet by 16 feet) where soil is exposed. This area is fenced off and is likely part of the larger excavation occurring at nearby building 494.
- There appear to be construction activities and exposed soil west of building 556.

Localized Settlement

- Locations of settling >6 inches northwest of building 816 and north of building 70 are visible.

Monitoring Wells

- Monument for MW-392 is below grade.

Abbreviations:
OU = operable unit
RPM = Remedial Project Manager

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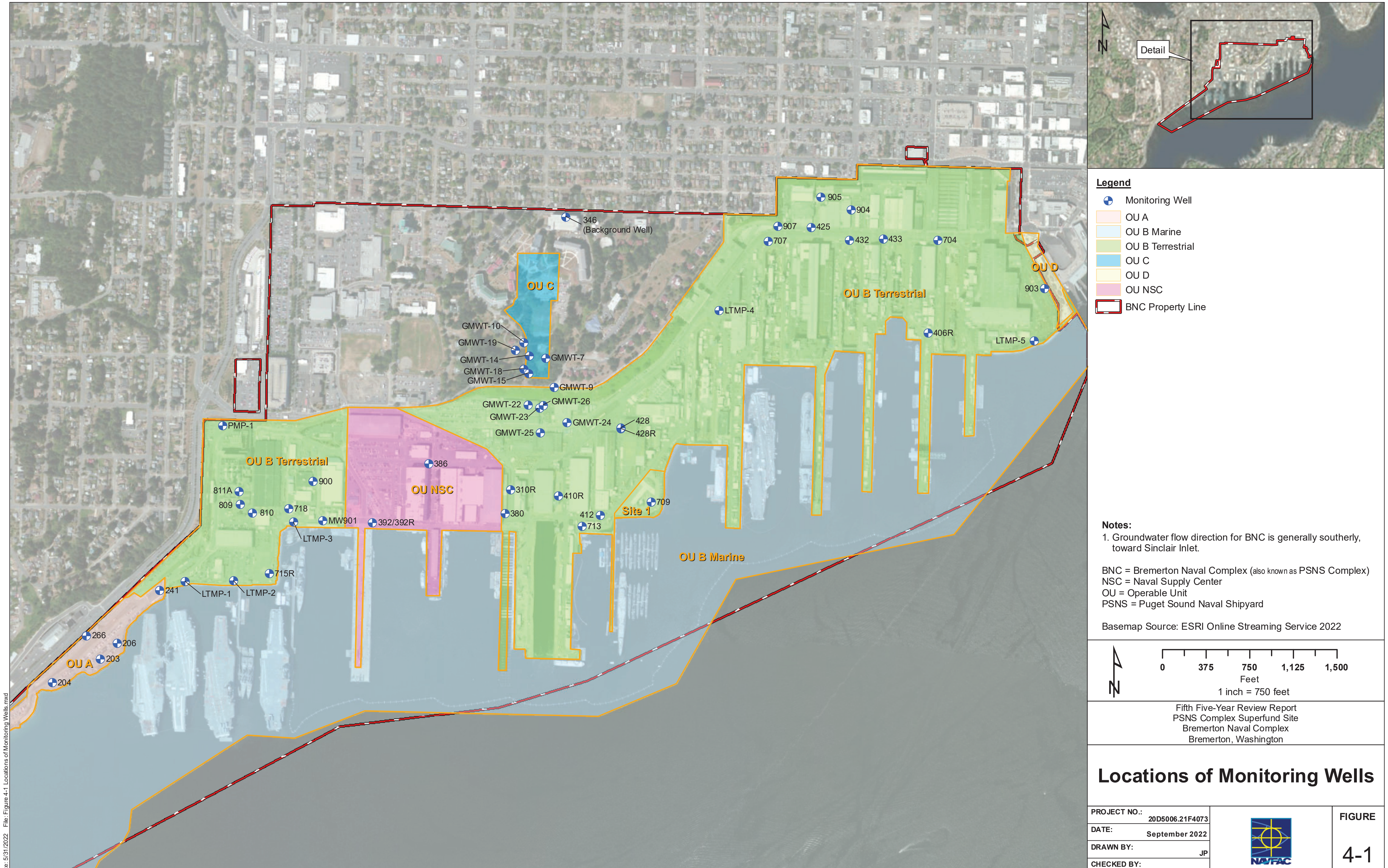

Locations of Monitoring Wells

FIGURE 4-1

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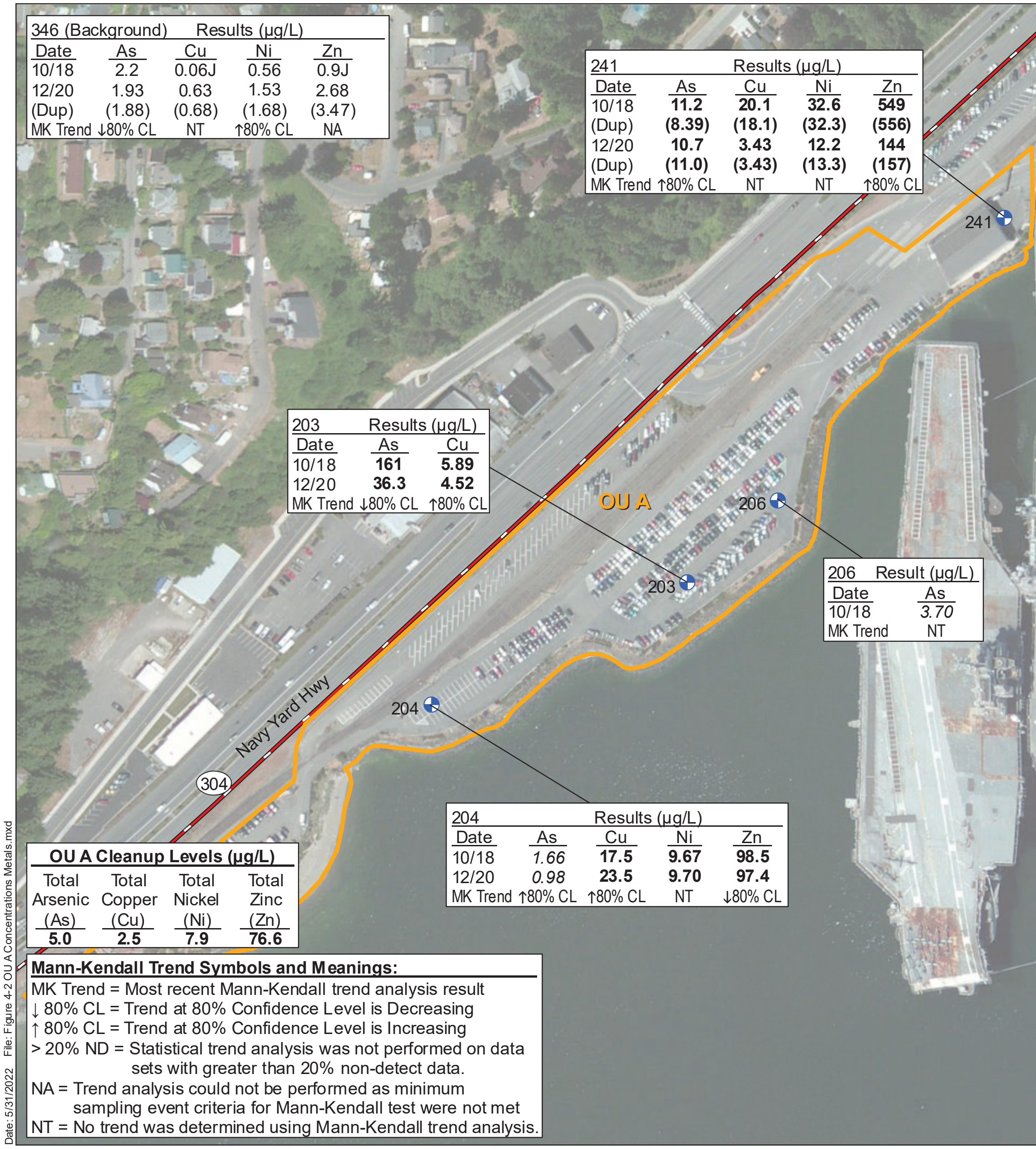


346 (Background)	Results (µg/L)			
Date	As	Cu	Ni	Zn
10/18	2.2	0.06J	0.56	0.9J
12/20	1.93	0.63	1.53	2.68
(Dup)	(1.88)	(0.68)	(1.68)	(3.47)
MK Trend	↓80% CL	NT	↑80% CL	NA

241	Results (µg/L)			
Date	As	Cu	Ni	Zn
10/18	**11.2**	**20.1**	**32.6**	**549**
(Dup)	**(8.39)**	**(18.1)**	**(32.3)**	**(556)**
12/20	**10.7**	**3.43**	**12.2**	**144**
(Dup)	**(11.0)**	**(3.43)**	**(13.3)**	**(157)**
MK Trend	↑80% CL	NT	NT	↑80% CL

203	Results (µg/L)	
Date	As	Cu
10/18	**161**	**5.89**
12/20	**36.3**	**4.52**
MK Trend	↓80% CL	↑80% CL

206	Result (µg/L)
Date	As
10/18	*3.70*
MK Trend	NT

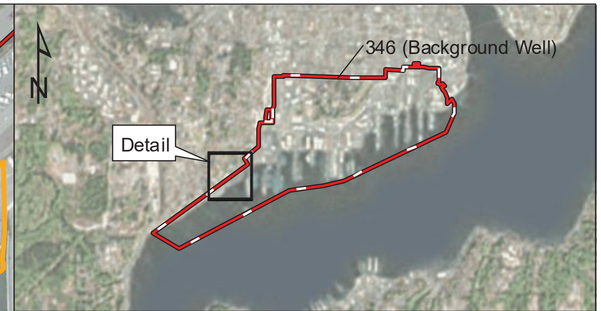
204	Results (µg/L)			
Date	As	Cu	Ni	Zn
10/18	*1.66*	**17.5**	**9.67**	**98.5**
12/20	*0.98*	**23.5**	**9.70**	**97.4**
MK Trend	↑80% CL	↑80% CL	NT	↓80% CL

OU A Cleanup Levels (µg/L)

Total Arsenic (As)	Total Copper (Cu)	Total Nickel (Ni)	Total Zinc (Zn)
5.0	**2.5**	**7.9**	**76.6**

Mann-Kendall Trend Symbols and Meanings:

MK Trend = Most recent Mann-Kendall trend analysis result
↓ 80% CL = Trend at 80% Confidence Level is Decreasing
↑ 80% CL = Trend at 80% Confidence Level is Increasing
> 20% ND = Statistical trend analysis was not performed on data sets with greater than 20% non-detect data.
NA = Trend analysis could not be performed as minimum sampling event criteria for Mann-Kendall test were not met
NT = No trend was determined using Mann-Kendall trend analysis.



Legend

- OU A Long Term Monitoring Well
- OU A Boundary
- BNC Property Line

Notes:

1. All results are in µg/L.
2. The results and trends for background well 346 are provided for comparison.
3. **Bold** text indicates detection is above the cleanup level.
4. *Italic* text indicates recommendation to discontinue analysis.
5. Values in parentheses are field duplicate results.

µg/L = micrograms per liter
BNC = Bremerton Naval Complex (also known as PSNS Complex)
J = The result is an estimated value
OU = Operable Unit
PSNS = Puget Sound Naval Shipyard

Basemap Source: ESRI Online Streaming Service 2022

N
0 125 250 375 500
Feet
1 Inch = 250 Feet

Fifth Five-Year Review Report
PSNS Complex Superfund Site
Naval Base Kitsap Bremerton
Bremerton, Washington

OU A Concentrations and Trends, Metals

PROJECT NO.: 20D5006.21F4073
DATE: September 2022
DRAWN BY: JP
CHECKED BY: SF

NAVFAC

FIGURE 4-2

Date: 5/31/2022 File: Figure 4-2 OU A Concentrations Metals.mxd

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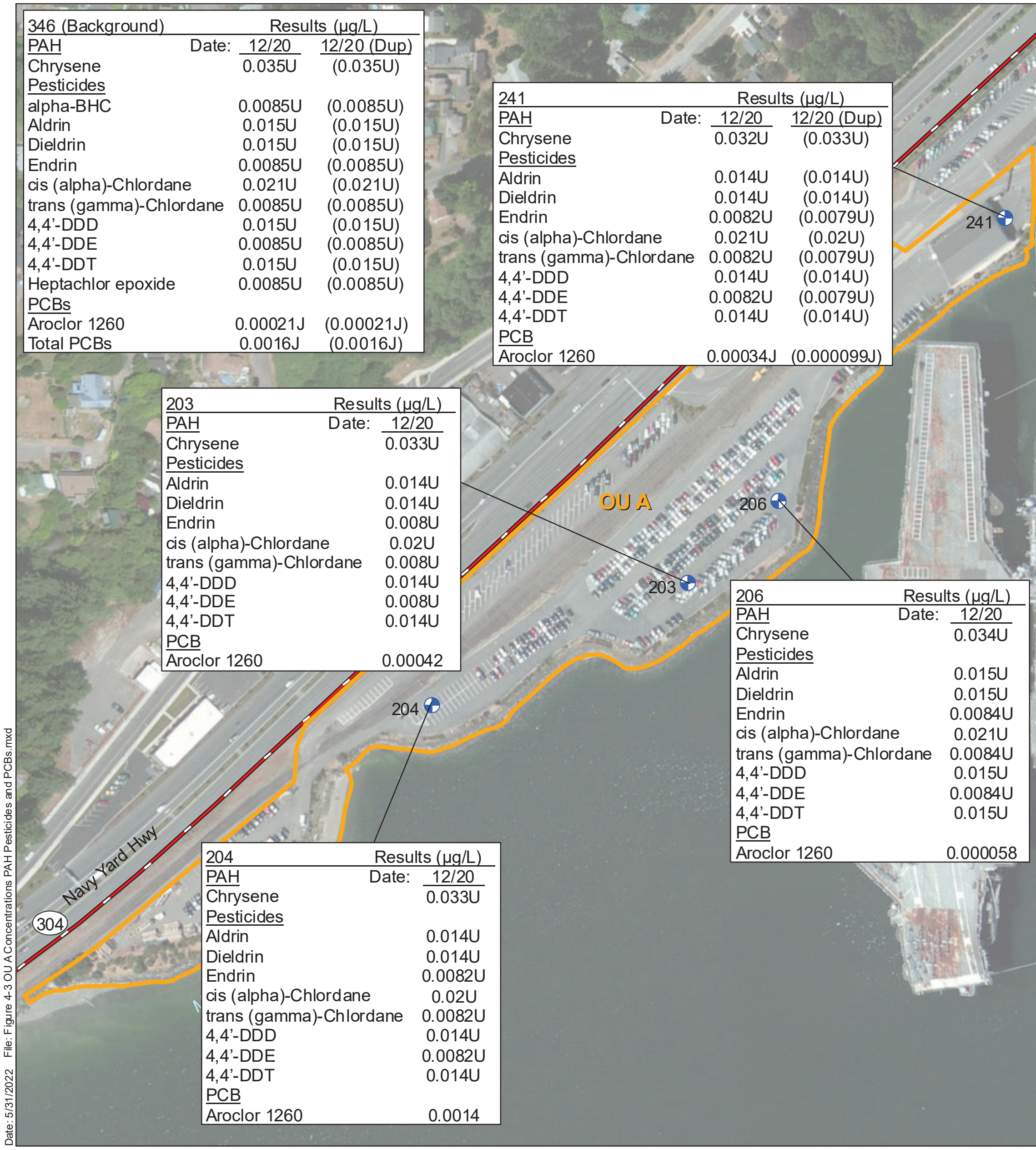


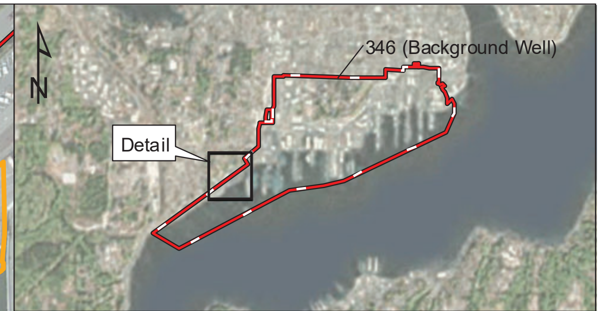
346 (Background)	Results (µg/L)	
PAH	Date: 12/20	12/20 (Dup)
Chrysene	0.035U	(0.035U)
Pesticides		
alpha-BHC	0.0085U	(0.0085U)
Aldrin	0.015U	(0.015U)
Dieldrin	0.015U	(0.015U)
Endrin	0.0085U	(0.0085U)
cis (alpha)-Chlordane	0.021U	(0.021U)
trans (gamma)-Chlordane	0.0085U	(0.0085U)
4,4'-DDD	0.015U	(0.015U)
4,4'-DDE	0.0085U	(0.0085U)
4,4'-DDT	0.015U	(0.015U)
Heptachlor epoxide	0.0085U	(0.0085U)
PCBs		
Aroclor 1260	0.00021J	(0.00021J)
Total PCBs	0.0016J	(0.0016J)

241	Results (µg/L)	
PAH	Date: 12/20	12/20 (Dup)
Chrysene	0.032U	(0.033U)
Pesticides		
Aldrin	0.014U	(0.014U)
Dieldrin	0.014U	(0.014U)
Endrin	0.0082U	(0.0079U)
cis (alpha)-Chlordane	0.021U	(0.02U)
trans (gamma)-Chlordane	0.0082U	(0.0079U)
4,4'-DDD	0.014U	(0.014U)
4,4'-DDE	0.0082U	(0.0079U)
4,4'-DDT	0.014U	(0.014U)
PCB		
Aroclor 1260	0.00034J	(0.000099J)

203	Results (µg/L)
PAH	Date: 12/20
Chrysene	0.033U
Pesticides	
Aldrin	0.014U
Dieldrin	0.014U
Endrin	0.008U
cis (alpha)-Chlordane	0.02U
trans (gamma)-Chlordane	0.008U
4,4'-DDD	0.014U
4,4'-DDE	0.008U
4,4'-DDT	0.014U
PCB	
Aroclor 1260	0.00042

206	Results (µg/L)
PAH	Date: 12/20
Chrysene	0.034U
Pesticides	
Aldrin	0.015U
Dieldrin	0.015U
Endrin	0.0084U
cis (alpha)-Chlordane	0.021U
trans (gamma)-Chlordane	0.0084U
4,4'-DDD	0.015U
4,4'-DDE	0.0084U
4,4'-DDT	0.015U
PCB	
Aroclor 1260	0.000058

204	Results (µg/L)
PAH	Date: 12/20
Chrysene	0.033U
Pesticides	
Aldrin	0.014U
Dieldrin	0.014U
Endrin	0.0082U
cis (alpha)-Chlordane	0.02U
trans (gamma)-Chlordane	0.0082U
4,4'-DDD	0.014U
4,4'-DDE	0.0082U
4,4'-DDT	0.014U
PCB	
Aroclor 1260	0.0014



Legend

- OU A Long Term Monitoring Well
- OU A Boundary
- BNC Property Line

Notes:

1. All results are in µg/L.
2. The results for background well 346 are provided for comparison.
3. Values in parentheses are field duplicate results.

µg/L = micrograms per liter
BNC = Bremerton Naval Complex (also known as PSNS Complex)
J = the result is an estimated value
OU = Operable Unit
PAH = polycyclic aromatic hydrocarbon
PCB = polychlorinated biphenyl
PSNS = Puget Sound Naval Shipyard
U = analyte not detected at indicated reporting limit

Basemap Source: ESRI Online Streaming Service 2022

N
0 125 250 375 500
Feet
1 Inch = 250 Feet

Fifth Five-Year Review Report
PSNS Complex Superfund Site
Naval Base Kitsap Bremerton
Bremerton, Washington

OU A Concentrations, PAH, Pesticides and PCBs

PROJECT NO.: 20D5006.21F4073
DATE: September 2022
DRAWN BY: JP
CHECKED BY: SF

FIGURE 4-3

Date: 5/31/2022 File: Figure 4-3 OU A Concentrations PAH Pesticides and PCBs.mxd

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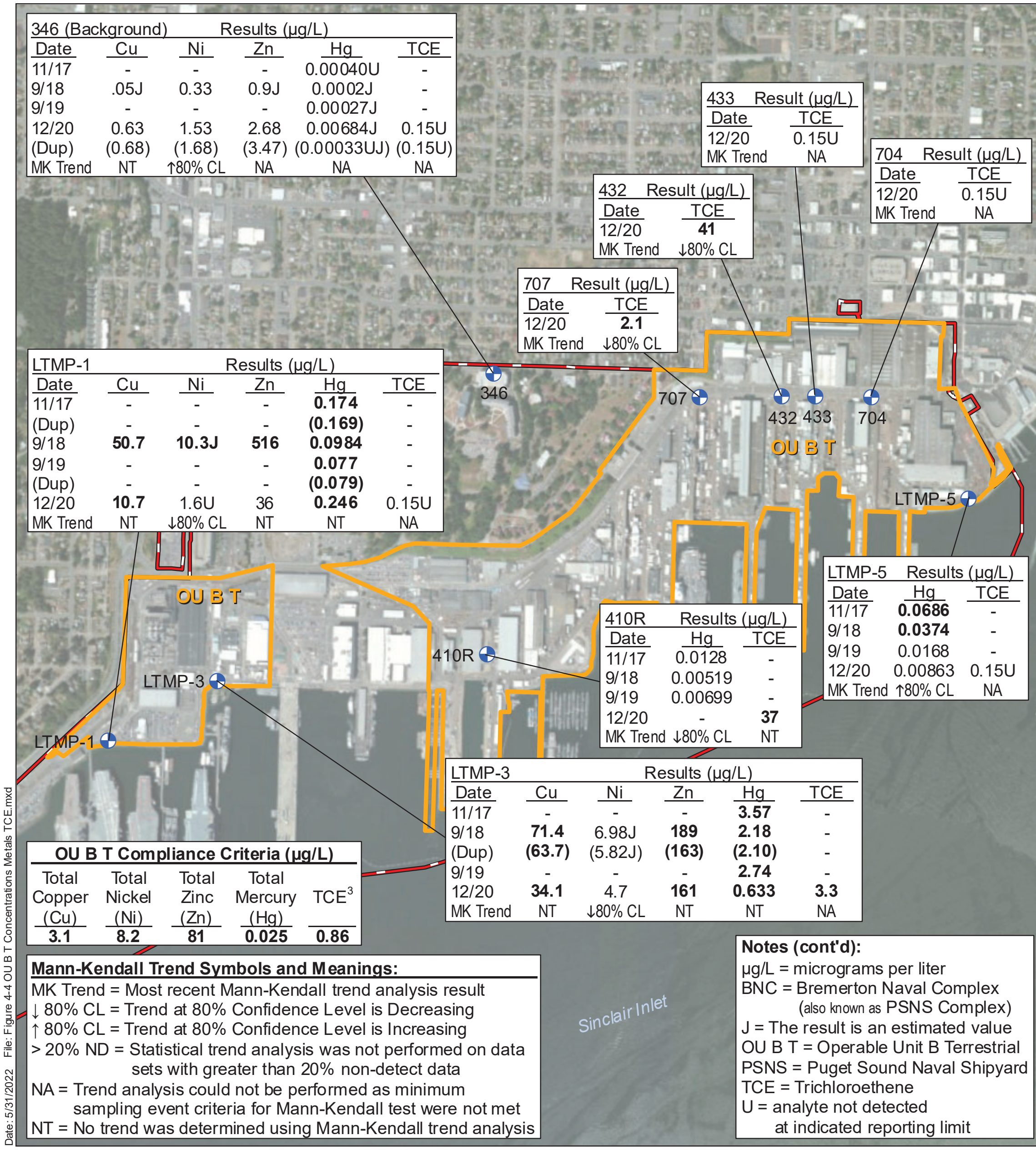


346 (Background)	Results (µg/L)				
Date	Cu	Ni	Zn	Hg	TCE
11/17	-	-	-	0.00040U	-
9/18	.05J	0.33	0.9J	0.0002J	-
9/19	-	-	-	0.00027J	-
12/20	0.63	1.53	2.68	0.00684J	0.15U
(Dup)	(0.68)	(1.68)	(3.47)	(0.00033UJ)	(0.15U)
MK Trend	NT	↑80% CL	NA	NA	NA

433	Result (µg/L)
Date	TCE
12/20	0.15U
MK Trend	NA

704	Result (µg/L)
Date	TCE
12/20	0.15U
MK Trend	NA

432	Result (µg/L)
Date	TCE
12/20	**41**
MK Trend	↓80% CL

707	Result (µg/L)
Date	TCE
12/20	**2.1**
MK Trend	↓80% CL

LTMP-1	Results (µg/L)				
Date	Cu	Ni	Zn	Hg	TCE
11/17	-	-	-	**0.174**	-
(Dup)	-	-	-	**(0.169)**	-
9/18	**50.7**	**10.3J**	**516**	**0.0984**	-
9/19	-	-	-	**0.077**	-
(Dup)	-	-	-	**(0.079)**	-
12/20	**10.7**	1.6U	36	**0.246**	0.15U
MK Trend	NT	↓80% CL	NT	NT	NA

LTMP-5	Results (µg/L)	
Date	Hg	TCE
11/17	**0.0686**	-
9/18	**0.0374**	-
9/19	0.0168	-
12/20	0.00863	0.15U
MK Trend	↑80% CL	NA

410R	Results (µg/L)	
Date	Hg	TCE
11/17	0.0128	-
9/18	0.00519	-
9/19	0.00699	-
12/20	-	**37**
MK Trend	↓80% CL	NT

LTMP-3	Results (µg/L)				
Date	Cu	Ni	Zn	Hg	TCE
11/17	-	-	-	**3.57**	-
9/18	**71.4**	6.98J	**189**	**2.18**	-
(Dup)	**(63.7)**	(5.82J)	**(163)**	**(2.10)**	-
9/19	-	-	-	**2.74**	-
12/20	**34.1**	4.7	**161**	**0.633**	**3.3**
MK Trend	NT	↓80% CL	NT	NT	NA

OU B T Compliance Criteria (µg/L)

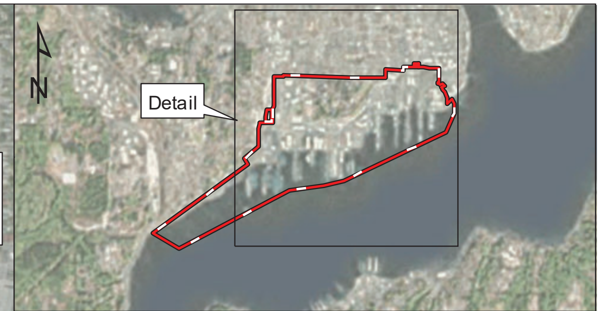
Total Copper (Cu)	Total Nickel (Ni)	Total Zinc (Zn)	Total Mercury (Hg)	TCE[3]
3.1	8.2	81	0.025	0.86

Mann-Kendall Trend Symbols and Meanings:

MK Trend = Most recent Mann-Kendall trend analysis result
↓ 80% CL = Trend at 80% Confidence Level is Decreasing
↑ 80% CL = Trend at 80% Confidence Level is Increasing
> 20% ND = Statistical trend analysis was not performed on data sets with greater than 20% non-detect data
NA = Trend analysis could not be performed as minimum sampling event criteria for Mann-Kendall test were not met
NT = No trend was determined using Mann-Kendall trend analysis

Notes (cont'd):

µg/L = micrograms per liter
BNC = Bremerton Naval Complex (also known as PSNS Complex)
J = The result is an estimated value
OU B T = Operable Unit B Terrestrial
PSNS = Puget Sound Naval Shipyard
TCE = Trichloroethene
U = analyte not detected at indicated reporting limit



Legend

- OU B T Long Term Monitoring Well
- OU B T Boundary
- BNC Property Line

Notes:

1. All results are in µg/L.
2. The results and trends for background well 346 are provided for comparison.
3. TCE is compared to the State of Washington Water Quality Criteria instead of the ROD compliance criteria as outlined in the Remedy Protectiveness Evaluation Water Quality Criteria (Navy 2019).
4. **Bold** text indicates detection is above the compliance criteria.
5. Values in parentheses are field duplicate results.

Basemap Source: ESRI Online Streaming Service 2022

N
0 0.125 0.25 0.375 0.5
Miles
1 Inch = 0.25 Miles

Fifth Five-Year Review Report
PSNS Complex Superfund Site
Naval Base Kitsap Bremerton
Bremerton, Washington

OU B Terrestrial Concentrations and Trends, Metals and TCE

PROJECT NO.: 20D5006.21F4073
DATE: September 2022
DRAWN BY: JP
CHECKED BY: SF

NAVFAC

FIGURE 4-4

Date: 5/31/2022 File: Figure 4-4 OU B T Concentrations Metals TCE.mxd

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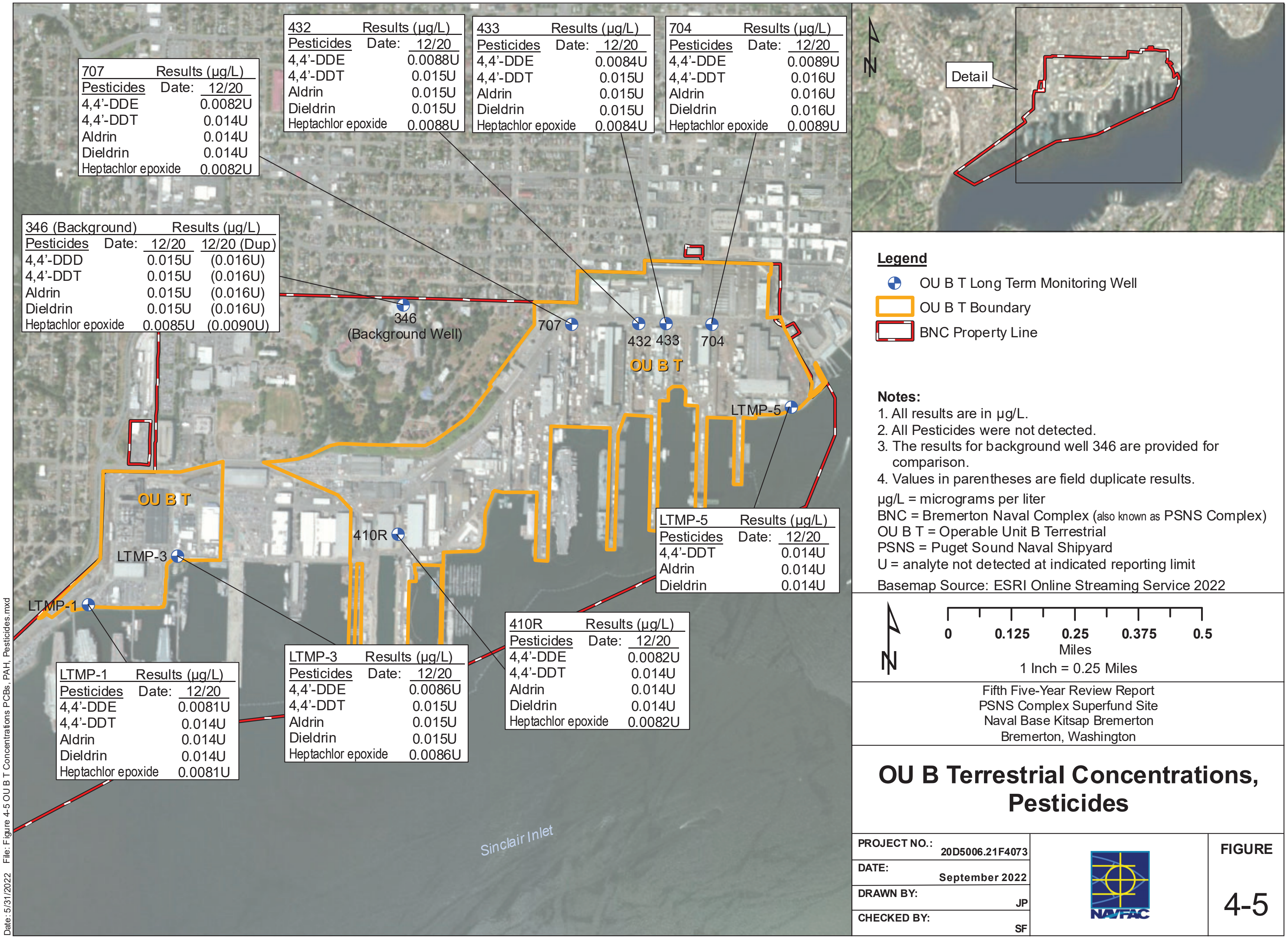
707 Results (µg/L)
Pesticides Date: 12/20
4,4'-DDE 0.0082U
4,4'-DDT 0.014U
Aldrin 0.014U
Dieldrin 0.014U
Heptachlor epoxide 0.0082U
432 Results (µg/L)
Pesticides Date: 12/20
4,4'-DDE 0.0088U
4,4'-DDT 0.015U
Aldrin 0.015U
Dieldrin 0.015U
Heptachlor epoxide 0.0088U
433 Results (µg/L)
Pesticides Date: 12/20
4,4'-DDE 0.0084U
4,4'-DDT 0.015U
Aldrin 0.015U
Dieldrin 0.015U
Heptachlor epoxide 0.0084U
704 Results (µg/L)
Pesticides Date: 12/20
4,4'-DDE 0.0089U
4,4'-DDT 0.016U
Aldrin 0.016U
Dieldrin 0.016U
Heptachlor epoxide 0.0089U
346 (Background) Results (µg/L)
Pesticides Date: 12/20 12/20 (Dup)
4,4'-DDD 0.015U (0.016U)
4,4'-DDT 0.015U (0.016U)
Aldrin 0.015U (0.016U)
Dieldrin 0.015U (0.016U)
Heptachlor epoxide 0.0085U (0.0090U)
346
(Background Well)
707
432
433
704
OU B T
LTMP-5
OU B T
410R
LTMP-3
LTMP-1
LTMP-5 Results (µg/L)
Pesticides Date: 12/20
4,4'-DDT 0.014U
Aldrin 0.014U
Dieldrin 0.014U
410R Results (µg/L)
Pesticides Date: 12/20
4,4'-DDE 0.0082U
4,4'-DDT 0.014U
Aldrin 0.014U
Dieldrin 0.014U
Heptachlor epoxide 0.0082U
LTMP-3 Results (µg/L)
Pesticides Date: 12/20
4,4'-DDE 0.0086U
4,4'-DDT 0.015U
Aldrin 0.015U
Dieldrin 0.015U
Heptachlor epoxide 0.0086U
LTMP-1 Results (µg/L)
Pesticides Date: 12/20
4,4'-DDE 0.0081U
4,4'-DDT 0.014U
Aldrin 0.014U
Dieldrin 0.014U
Heptachlor epoxide 0.0081U
Sinclair Inlet
Date: 5/31/2022 File: Figure 4-5 OU B T Concentrations PCBs, PAH, Pesticides.mxd
N
Detail
Legend
OU B T Long Term Monitoring Well
OU B T Boundary
BNC Property Line
Notes:
1. All results are in µg/L.
2. All Pesticides were not detected.
3. The results for background well 346 are provided for comparison.
4. Values in parentheses are field duplicate results.
µg/L = micrograms per liter
BNC = Bremerton Naval Complex (also known as PSNS Complex)
OU B T = Operable Unit B Terrestrial
PSNS = Puget Sound Naval Shipyard
U = analyte not detected at indicated reporting limit
Basemap Source: ESRI Online Streaming Service 2022
N
0 0.125 0.25 0.375 0.5
Miles
1 Inch = 0.25 Miles
Fifth Five-Year Review Report
PSNS Complex Superfund Site
Naval Base Kitsap Bremerton
Bremerton, Washington
OU B Terrestrial Concentrations, Pesticides
PROJECT NO.: 20D5006.21F4073
DATE: September 2022
DRAWN BY: JP
CHECKED BY: SF
NAVFAC
FIGURE
4-5

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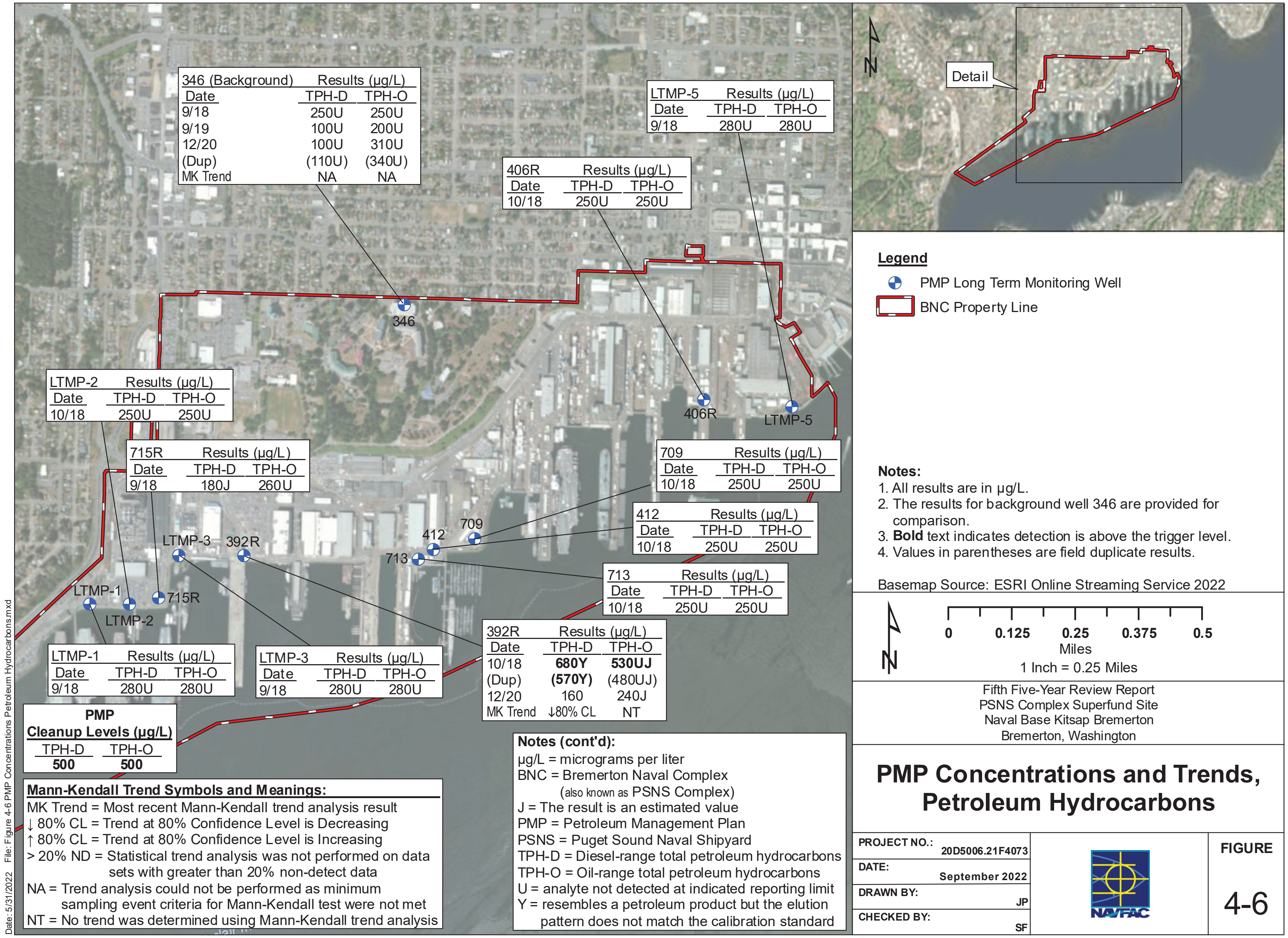
346 (Background) Results (µg/L)
Date TPH-D TPH-O
9/18 250U 250U
9/19 100U 200U
12/20 100U 310U
(Dup) (110U) (340U)
MK Trend NA NA
LTMP-5 Results (µg/L)
Date TPH-D TPH-O
9/18 280U 280U
406R Results (µg/L)
Date TPH-D TPH-O
10/18 250U 250U
LTMP-2 Results (µg/L)
Date TPH-D TPH-O
10/18 250U 250U
715R Results (µg/L)
Date TPH-D TPH-O
9/18 180J 260U
709 Results (µg/L)
Date TPH-D TPH-O
10/18 250U 250U
412 Results (µg/L)
Date TPH-D TPH-O
10/18 250U 250U
713 Results (µg/L)
Date TPH-D TPH-O
10/18 250U 250U
392R Results (µg/L)
Date TPH-D TPH-O
10/18 **680Y** **530UJ**
(Dup) **(570Y)** (480UJ)
12/20 160 240J
MK Trend ↓80% CL NT
LTMP-1 Results (µg/L)
Date TPH-D TPH-O
9/18 280U 280U
LTMP-3 Results (µg/L)
Date TPH-D TPH-O
9/18 280U 280U
346
406R
LTMP-5
LTMP-1
LTMP-2
LTMP-3
392R
715R
412
709
713
PMP
Cleanup Levels (µg/L)
TPH-D TPH-O
500 500
Mann-Kendall Trend Symbols and Meanings:
MK Trend = Most recent Mann-Kendall trend analysis result
↓ 80% CL = Trend at 80% Confidence Level is Decreasing
↑ 80% CL = Trend at 80% Confidence Level is Increasing
> 20% ND = Statistical trend analysis was not performed on data sets with greater than 20% non-detect data
NA = Trend analysis could not be performed as minimum sampling event criteria for Mann-Kendall test were not met
NT = No trend was determined using Mann-Kendall trend analysis
Notes (cont'd):
µg/L = micrograms per liter
BNC = Bremerton Naval Complex (also known as PSNS Complex)
J = The result is an estimated value
PMP = Petroleum Management Plan
PSNS = Puget Sound Naval Shipyard
TPH-D = Diesel-range total petroleum hydrocarbons
TPH-O = Oil-range total petroleum hydrocarbons
U = analyte not detected at indicated reporting limit
Y = resembles a petroleum product but the elution pattern does not match the calibration standard
N
Detail
Legend
PMP Long Term Monitoring Well
BNC Property Line
Notes:
1. All results are in µg/L.
2. The results for background well 346 are provided for comparison.
3. **Bold** text indicates detection is above the trigger level.
4. Values in parentheses are field duplicate results.
Basemap Source: ESRI Online Streaming Service 2022
0 0.125 0.25 0.375 0.5
Miles
1 Inch = 0.25 Miles
Fifth Five-Year Review Report
PSNS Complex Superfund Site
Naval Base Kitsap Bremerton
Bremerton, Washington
PMP Concentrations and Trends, Petroleum Hydrocarbons
PROJECT NO.: 20D5006.21F4073
DATE: September 2022
DRAWN BY: JP
CHECKED BY: SF
NAVFAC
FIGURE
4-6
Date: 5/31/2022 File: Figure 4-6 PMP Concentrations Petroleum Hydrocarbons.mxd

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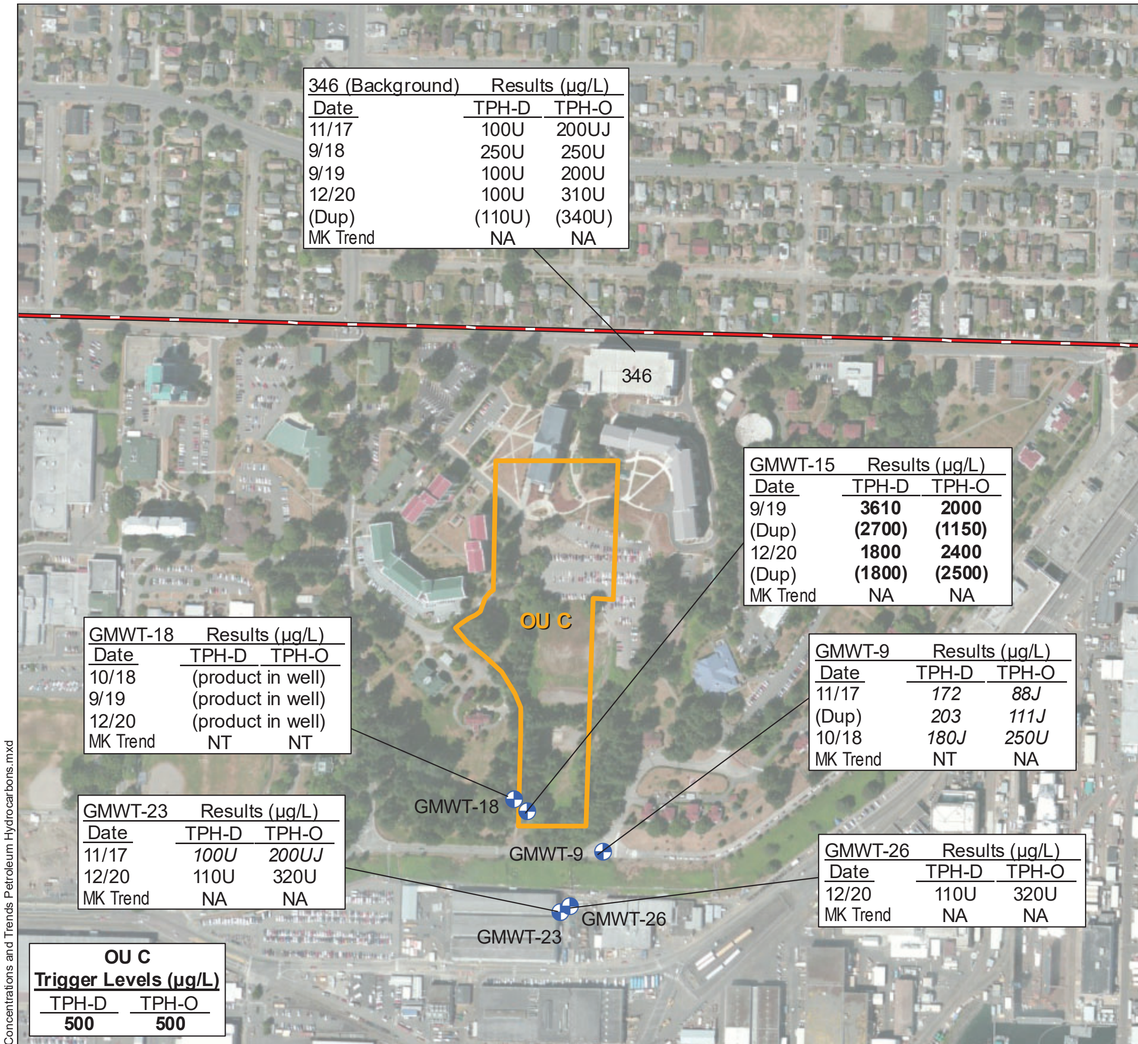


346 (Background)	Results (µg/L)	
Date	TPH-D	TPH-O
11/17	100U	200UJ
9/18	250U	250U
9/19	100U	200U
12/20	100U	310U
(Dup)	(110U)	(340U)
MK Trend	NA	NA

GMWT-15	Results (µg/L)	
Date	TPH-D	TPH-O
9/19	**3610**	**2000**
(Dup)	**(2700)**	**(1150)**
12/20	**1800**	**2400**
(Dup)	**(1800)**	**(2500)**
MK Trend	NA	NA

GMWT-18	Results (µg/L)	
Date	TPH-D	TPH-O
10/18	(product in well)	
9/19	(product in well)	
12/20	(product in well)	
MK Trend	NT	NT

GMWT-9	Results (µg/L)	
Date	TPH-D	TPH-O
11/17	*172*	*88J*
(Dup)	*203*	*111J*
10/18	*180J*	*250U*
MK Trend	NT	NA

GMWT-23	Results (µg/L)	
Date	TPH-D	TPH-O
11/17	*100U*	*200UJ*
12/20	110U	320U
MK Trend	NA	NA

GMWT-26	Results (µg/L)	
Date	TPH-D	TPH-O
12/20	110U	320U
MK Trend	NA	NA

OU C Trigger Levels (µg/L)

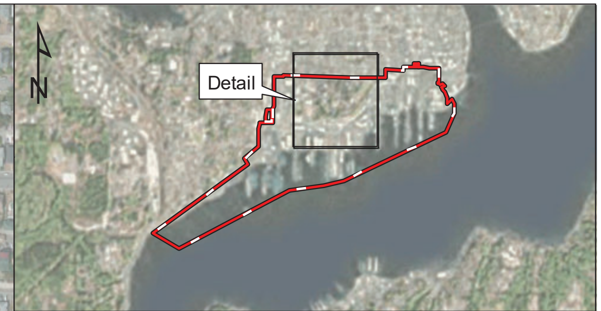
TPH-D	TPH-O
500	**500**

Mann-Kendall Trend Symbols and Meanings:

MK Trend = Most recent Mann-Kendall trend analysis result
↓ 80% CL = Trend at 80% Confidence Level is Decreasing
↑ 80% CL = Trend at 80% Confidence Level is Increasing
> 20% ND = Statistical trend analysis was not performed on data sets with greater than 20% non-detect data
NA = Trend analysis could not be performed as minimum sampling event criteria for Mann-Kendall test were not met
NT = No trend was determined using Mann-Kendall trend analysis

Notes (cont'd):

µg/L = micrograms per liter
BNC = Bremerton Naval Complex (also known as PSNS Complex)
OU = Operable Unit
PSNS = Puget Sound Naval Shipyard
TPH-D = Diesel-range total petroleum hydrocarbons
TPH-O = Oil-range total petroleum hydrocarbons
U = analyte not detected at indicated reporting limit



Legend

- OU C Long Term Monitoring Well
- OU C Boundary
- BNC Property Line

Notes:

1. All results are in µg/L.
2. The results and trends for background well 346 are provided for comparison.
3. **Bold** text indicates detection is above the trigger level.
4. *Italic* text indicates recommendation to discontinue analysis.
5. Values in parentheses are field duplicate results.

Basemap Source: ESRI Online Streaming Service 2022

N

0 250 500 750 1,000
Feet
1 Inch = 500 Feet

Fifth Five-Year Review Report
PSNS Complex Superfund Site
Naval Base Kitsap Bremerton
Bremerton, Washington

OU C Concentrations and Trends, Petroleum Hydrocarbons

PROJECT NO.: 20D5006.21F4073
DATE: September 2022
DRAWN BY: JP
CHECKED BY: SF

NAVFAC

FIGURE 4-7

Date: 5/31/2022 File: Figure 4-7 OU C Concentrations and Trends Petroleum Hydrocarbons.mxd

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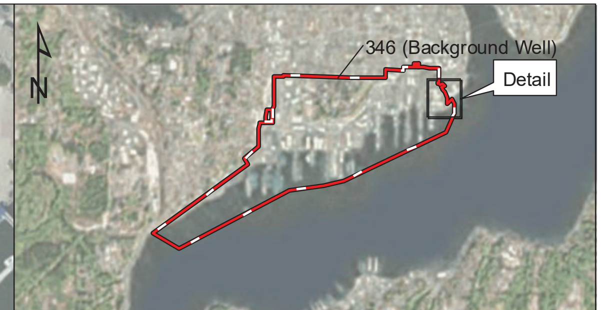

Legend

- OU D Long Term Monitoring Well
- OU Boundary
- BNC Property Line

Notes:

1. All results are in µg/L.
2. The results for background well 346 are provided for comparison.

µg/L = micrograms per liter
BNC = Bremerton Naval Complex (also known as PSNS Complex)
J = The result is an estimated value
OU = Operable Unit
PSNS = Puget Sound Naval Shipyard
U = analyte not detected at indicated reporting limit

Basemap Source: ESRI Online Streaming Service 2022

N
0 100 200 300 400
Feet
1 Inch = 200 Feet

Fifth Five-Year Review Report
PSNS Complex Superfund Site
Naval Base Kitsap Bremerton
Bremerton, Washington

OU D Concentrations, Pesticides and Metals

PROJECT NO.: 20D5006.21F4073
DATE: September 2022
DRAWN BY: JP
CHECKED BY: SF

NAVFAC

FIGURE 4-8

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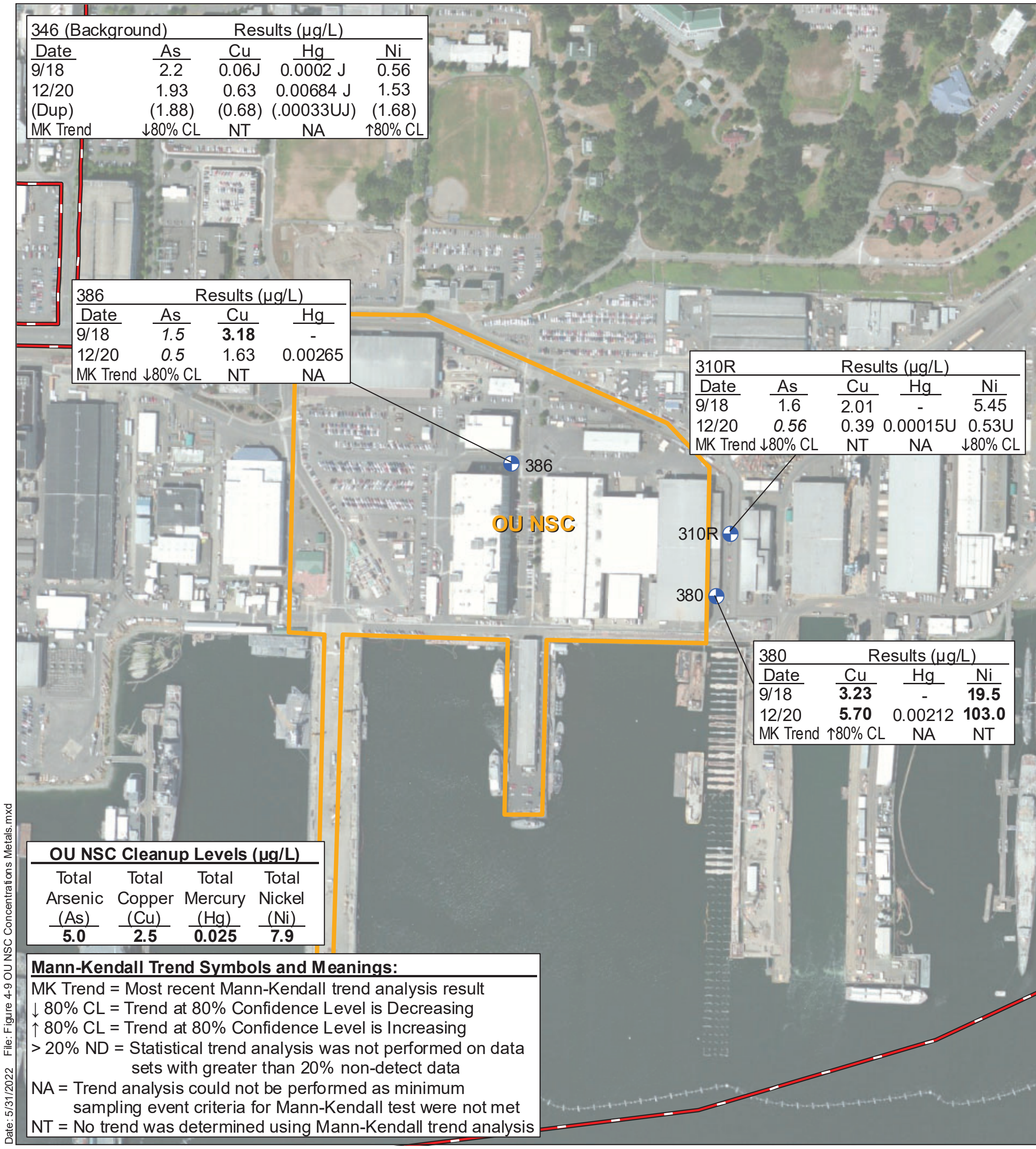

346 (Background)	Results (µg/L)			
Date	As	Cu	Hg	Ni
9/18	2.2	0.06J	0.0002 J	0.56
12/20	1.93	0.63	0.00684 J	1.53
(Dup)	(1.88)	(0.68)	(.00033UJ)	(1.68)
MK Trend	↓80% CL	NT	NA	↑80% CL

386	Results (µg/L)		
Date	As	Cu	Hg
9/18	*1.5*	**3.18**	-
12/20	*0.5*	1.63	0.00265
MK Trend	↓80% CL	NT	NA

310R	Results (µg/L)			
Date	As	Cu	Hg	Ni
9/18	1.6	2.01	-	5.45
12/20	*0.56*	0.39	0.00015U	0.53U
MK Trend	↓80% CL	NT	NA	↓80% CL

380	Results (µg/L)		
Date	Cu	Hg	Ni
9/18	**3.23**	-	**19.5**
12/20	**5.70**	0.00212	**103.0**
MK Trend	↑80% CL	NA	NT

OU NSC Cleanup Levels (µg/L)

Total Arsenic (As)	Total Copper (Cu)	Total Mercury (Hg)	Total Nickel (Ni)
5.0	**2.5**	**0.025**	**7.9**

Mann-Kendall Trend Symbols and Meanings:

MK Trend = Most recent Mann-Kendall trend analysis result
↓ 80% CL = Trend at 80% Confidence Level is Decreasing
↑ 80% CL = Trend at 80% Confidence Level is Increasing
> 20% ND = Statistical trend analysis was not performed on data sets with greater than 20% non-detect data
NA = Trend analysis could not be performed as minimum sampling event criteria for Mann-Kendall test were not met
NT = No trend was determined using Mann-Kendall trend analysis

Legend

- OU NSC Long Term Monitoring Well
- OU NSC Boundary
- BNC Property Line

Notes:

1. All results are in µg/L.
2. The results and trends for background well 346 are provided for comparison.
3. **Bold** text indicates detection is above the cleanup level.
4. *Italic* text indicates recommendation to discontinue analysis.
5. Values in parentheses are field duplicate results.

µg/L = micrograms per liter
BNC = Bremerton Naval Complex (also known as PSNS Complex)
J = The result is an estimated value
OU NSC= Operable Unit Naval Supply Center
PSNS = Puget Sound Naval Shipyard
U = analyte not detected at indicated reporting limit

Basemap Source: ESRI Online Streaming Service 2022

0 250 500 750 1,000
Feet
1 Inch = 500 Feet

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PSNS Complex Superfund Site
Naval Base Kitsap Bremerton
Bremerton, Washington

OU NSC Concentrations and Trends, Metals

PROJECT NO.:	20D5006.21F4073
DATE:	September 2022
DRAWN BY:	JP
CHECKED BY:	SF

NAVFAC

FIGURE 4-9

Date: 5/31/2022 File: Figure 4-9 OU NSC Concentrations Metals.mxd

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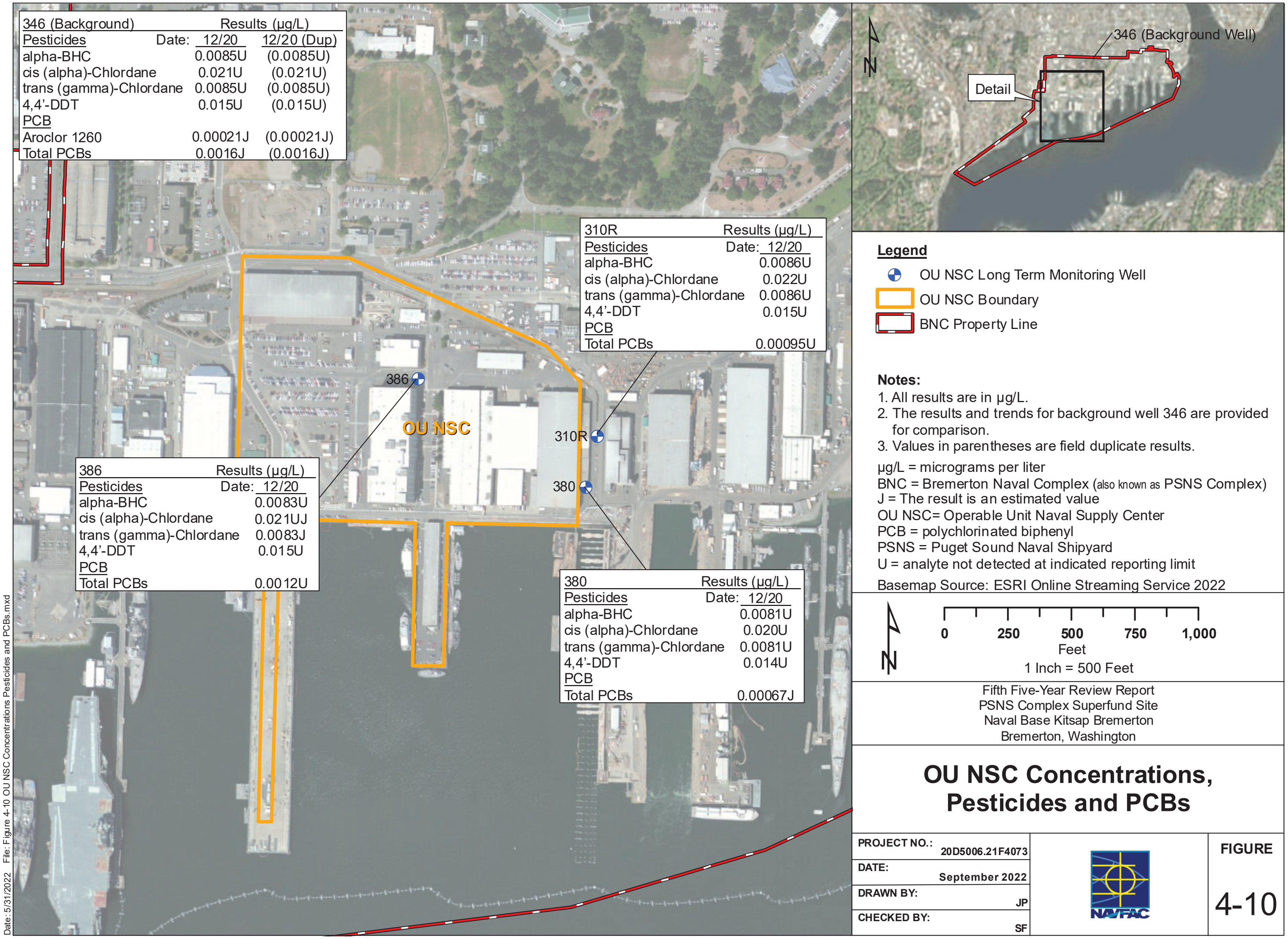
346 (Background) Results (µg/L)
Pesticides Date: 12/20 12/20 (Dup)
alpha-BHC 0.0085U (0.0085U)
cis (alpha)-Chlordane 0.021U (0.021U)
trans (gamma)-Chlordane 0.0085U (0.0085U)
4,4'-DDT 0.015U (0.015U)
PCB
Aroclor 1260 0.00021J (0.00021J)
Total PCBs 0.0016J (0.0016J)
310R Results (µg/L)
Pesticides Date: 12/20
alpha-BHC 0.0086U
cis (alpha)-Chlordane 0.022U
trans (gamma)-Chlordane 0.0086U
4,4'-DDT 0.015U
PCB
Total PCBs 0.00095U
386
OU NSC
310R
380
386 Results (µg/L)
Pesticides Date: 12/20
alpha-BHC 0.0083U
cis (alpha)-Chlordane 0.021UJ
trans (gamma)-Chlordane 0.0083J
4,4'-DDT 0.015U
PCB
Total PCBs 0.0012U
380 Results (µg/L)
Pesticides Date: 12/20
alpha-BHC 0.0081U
cis (alpha)-Chlordane 0.020U
trans (gamma)-Chlordane 0.0081U
4,4'-DDT 0.014U
PCB
Total PCBs 0.00067J
N
346 (Background Well)
Detail
Legend
OU NSC Long Term Monitoring Well
OU NSC Boundary
BNC Property Line
Notes:
1. All results are in µg/L.
2. The results and trends for background well 346 are provided for comparison.
3. Values in parentheses are field duplicate results.
µg/L = micrograms per liter
BNC = Bremerton Naval Complex (also known as PSNS Complex)
J = The result is an estimated value
OU NSC= Operable Unit Naval Supply Center
PCB = polychlorinated biphenyl
PSNS = Puget Sound Naval Shipyard
U = analyte not detected at indicated reporting limit
Basemap Source: ESRI Online Streaming Service 2022
N
0 250 500 750 1,000
Feet
1 Inch = 500 Feet
Fifth Five-Year Review Report
PSNS Complex Superfund Site
Naval Base Kitsap Bremerton
Bremerton, Washington
OU NSC Concentrations, Pesticides and PCBs
PROJECT NO.: 20D5006.21F4073
DATE: September 2022
DRAWN BY: JP
CHECKED BY: SF
FIGURE
4-10
Date: 5/31/2022 File: Figure 4-10 OU NSC Concentrations Pesticides and PCBs.mxd

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Detail
Legend
Surface Sediment Sample Location (2015)
Intertidal Sediment Sample Location (2018)
F2 Soil Sample Grid (2020)
C6 Sediment Sample Grid (2021)
A4 Grid Not Sampled
Anticipated to be Designated as Hazardous Waste 2
Charleston Beach Mitigation Area
OU A Boundary
BNC Property Line
OU A
Navy Yard Hwy
304
Sinclair Inlet
BR-OUA-INT-01-SD-0918
BR-OUA-INT-02-SD-0918
BR-OUA-INT-03-SD-0918
BR-OUA-INT-04-SD-0918
BR-OUA-INT-05-SD-0918
BR-OUA-INT-06-SD-0918
BR-OUA-INT-07-SD-0918
BR-OUA-INT-08-SD-0918
BR-OUA-INT-09-SD-0918
BR-OUA-INT-10-SD-0918
CB-1
CB-2
CB-3
A4 A5 B4 B5 C3 C4 C5 D1 D2 D3 D4 D5 E1 E2 E3 E4 E5 F1 F2 F3 F4 F5 G1 G2 G3 G4 G5 H1 H2 H3 I1 I2 I3 J1 J2 K1 K2 K3 L1 L2 M1 M2 M3 N1 N2 N3 O1 O2 O3 P1 P2 P3
Notes:
1. Collection of the 2020 Soil and 2021 Sediment Samples was performed in accordance with the 2020 Sampling and Analysis Plan. The exact sample location within each grid is not shown.
2. Characterization was performed in support of the Charleston Beach preferred shoreline repair alternative. The results indicate the material within the grids is presumed to be designated as hazardous waste. All other grids are presumed to be designated as non-hazardous material.
BNC = Bremerton Naval Complex (also known as PSNS Complex)
OU = Operable Unit
PSNS = Puget Sound Naval Shipyard
Basemap Source: ESRI Online Streaming Service 2022
0 30 60 90 120
Feet
1 Inch = 60 Feet
Fifth Five-Year Review Report
PSNS Complex Superfund Site
Bremerton Naval Complex
Bremerton, Washington
OU A Intertidal Sediment and Soil Sampling Locations
PROJECT NO.: 20D5006.21F4073
DATE: September 2022
DRAWN BY: JP
CHECKED BY: SF
NAVFAC
FIGURE
4-11
Date: 5/31/2022 File: Figure 4-11 OU A Intertidal Sediment and Soil Sampling Locations.mxd

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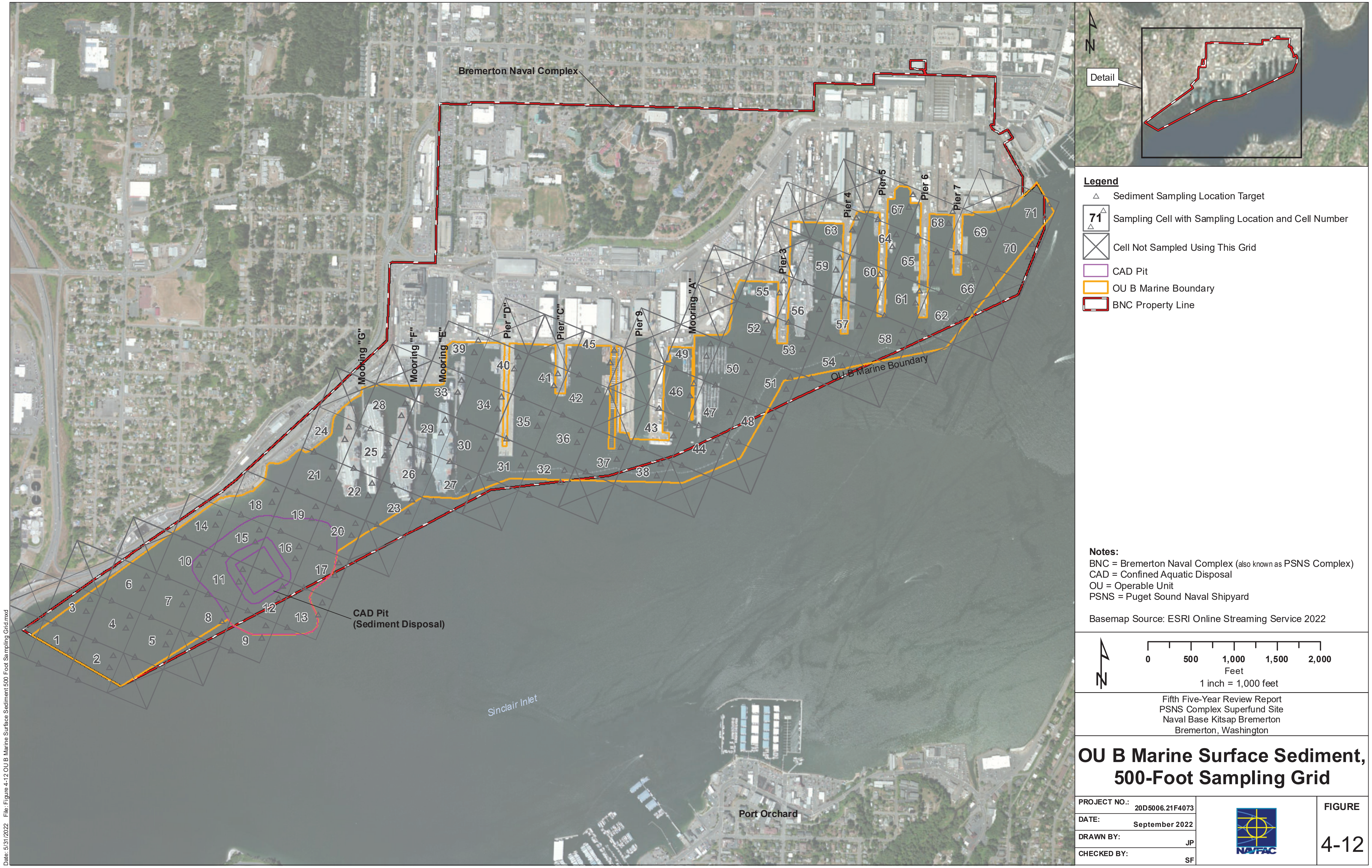
Bremerton Naval Complex
Mooring "G"
Mooring "F"
Mooring "E"
Pier "D"
Pier "C"
Pier 9
Mooring "A"
Pier 3
Pier 4
Pier 5
Pier 6
Pier 7
OU B Marine Boundary
CAD Pit
(Sediment Disposal)
Sinclair Inlet
Port Orchard
Detail
N
Legend
Sediment Sampling Location Target
Sampling Cell with Sampling Location and Cell Number
Cell Not Sampled Using This Grid
CAD Pit
OU B Marine Boundary
BNC Property Line
Notes:
BNC = Bremerton Naval Complex (also known as PSNS Complex)
CAD = Confined Aquatic Disposal
OU = Operable Unit
PSNS = Puget Sound Naval Shipyard
Basemap Source: ESRI Online Streaming Service 2022
0 500 1,000 1,500 2,000
Feet
1 inch = 1,000 feet
Fifth Five-Year Review Report
PSNS Complex Superfund Site
Naval Base Kitsap Bremerton
Bremerton, Washington
OU B Marine Surface Sediment, 500-Foot Sampling Grid
PROJECT NO.: 20D5006.21F4073
DATE: September 2022
DRAWN BY: JP
CHECKED BY: SF
FIGURE
4-12
Date: 5/31/2022 File: Figure 4-12 OU B Marine Surface Sediment 500 Foot Sampling Grid.mxd

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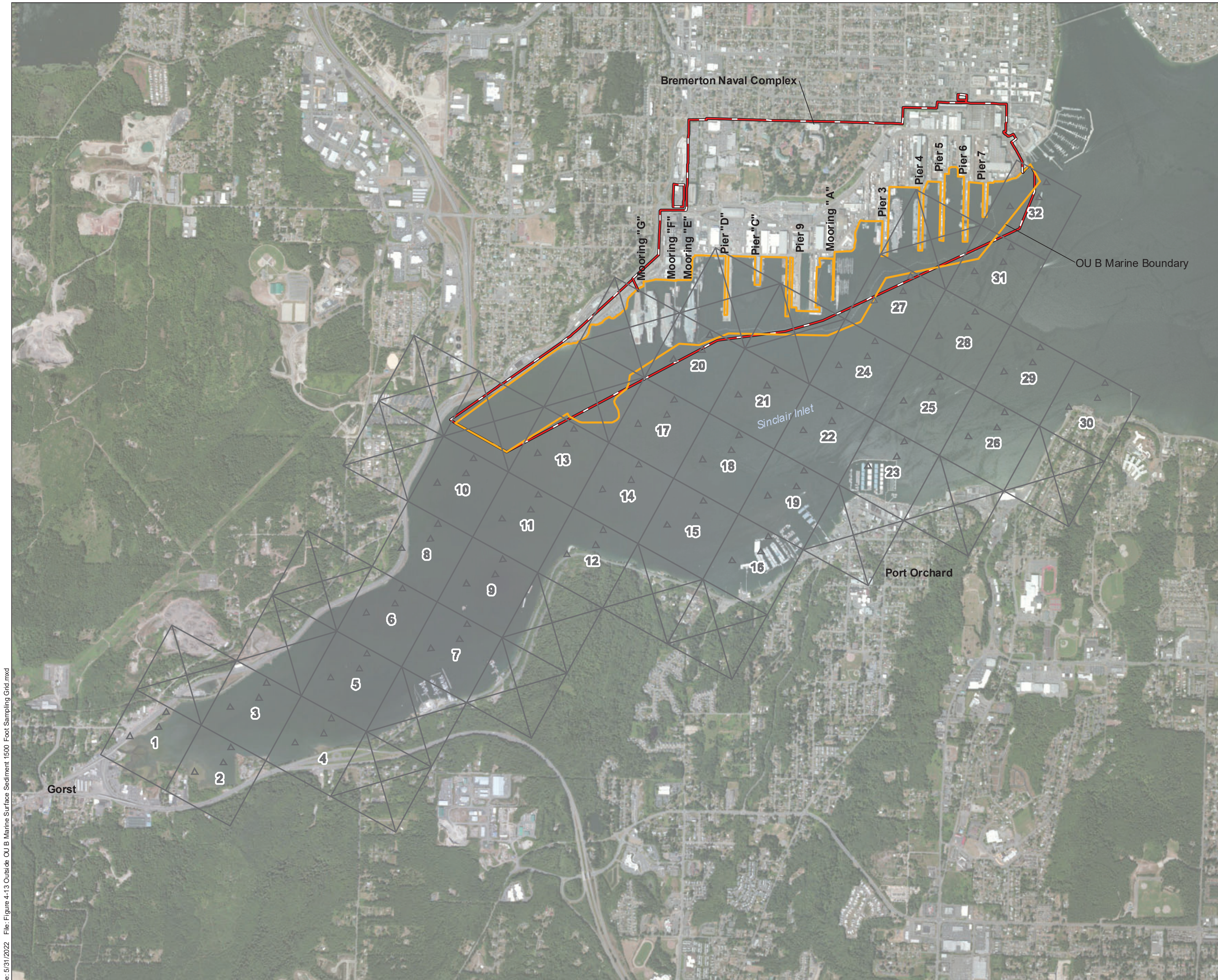

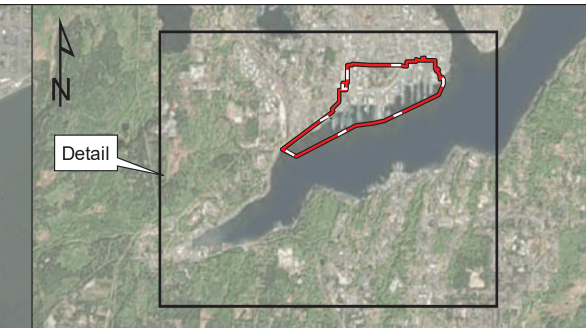

Legend

- Sediment Sampling Location Target
- Sampling Cell with Sampling Location and Cell Number
- Cell Not Sampled Using This Grid
- OU B Marine Boundary
- BNC Property Line

Notes:
BNC = Bremerton Naval Complex (also known as PSNS Complex)
OU = Operable Unit
PSNS = Puget Sound Naval Shipyard

Basemap Source: ESRI Online Streaming Service 2022

0 1,000 2,000 3,000 4,000
Feet
1 inch = 2,000 feet

Fifth Five-Year Review Report
PSNS Complex Superfund Site
Naval Base Kitsap Bremerton
Bremerton, Washington

OU B Outside Marine Surface Sediment, 1,500-Foot Sampling Grid

PROJECT NO.:	20D5006.21F4073
DATE:	September 2022
DRAWN BY:	JP
CHECKED BY:	SF

NAVFAC

FIGURE 4-13

Date: 5/31/2022 File: Figure 4-13 Outside OU B Marine Surface Sediment 1500 Foot Sampling Grid.mxd

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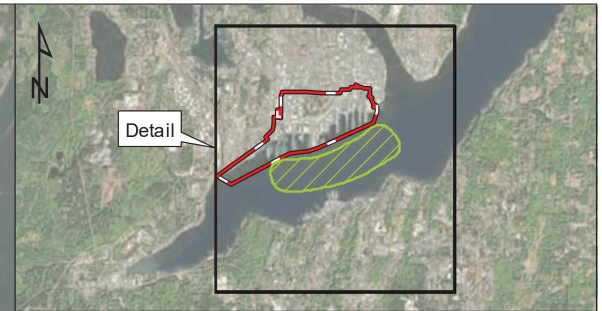

Legend

- CAD Pit
- English Sole Collection Area
- OU B Marine Boundary
- BNC Property Line

Notes:
BNC = Bremerton Naval Complex (also known as PSNS Complex)
CAD = Confined Aquatic Disposal
OU = Operable Unit
PSNS = Puget Sound Naval Shipyard

Basemap Source: ESRI Online Streaming Service 2022

N
0 0.25 0.5 0.75 1
Miles
1 Inch = 0.5 Miles

Fifth Five-Year Review Report
PSNS Complex Superfund Site
Naval Base Kitsap Bremerton
Bremerton, Washington

OU B Marine English Sole Collection Area

PROJECT NO.:	20D5006.21F4073
DATE:	September 2022
DRAWN BY:	JP
CHECKED BY:	SF

NAVFAC

FIGURE 4-14

Date: 5/31/2022 File: Figure 4-14 OU B English Sole Collection Area.mxd

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5.0 Technical Assessment

The answers to the technical assessment questions and protectiveness evaluations performed on each of the individual OUs are discussed in Sections 5.1 through 5.3, and summarized in Table 5-1.

Table 5-1: Technical Assessment and Protectiveness Summary

Operable Unit	Question A: Is the remedy functioning as intended by the decision document?	Question B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of the decision document still valid?	Question C: Has any other information come to light that could call into question the protectiveness of the remedy?	Protectiveness Determination
OU A	No	Yes	Yes	Deferred
OU B Marine	No	Yes	Yes	Deferred
OU B Terrestrial	No	No	Yes	Not Protective
OU C	Yes	Yes	No	Protective
OU D	Yes	Yes	No	Protective
OU NSC	Yes	Yes	No	Protective

Abbreviations:
OU = operable unit
RAO = remedial action objective

5.1 Question A

Is the remedy functioning as intended by the decision documents?

5.1.1 Functionality of Remedy for OU A

Is the remedy functioning as intended by the ROD? No, the OU A remedy is not currently functioning as intended by the ROD.

The main issues driving this response are lead concentrations in soil along the shoreline that exceed the RCRA hazardous waste criteria and that a permanent repair is needed to ensure long-term protection to human health and the environment at OU A Charleston Beach and to satisfy the intent of the habitat mitigation for Pier D. At the time this FYR was prepared, the Basis of Design that details the permanent repair was in preparation (Navy, 2021b).

5.1.1.1 Remedial Action Performance for OU A

The shoreline along Charleston Beach is not sufficiently resistant to erosion and occasionally requires beach replenishment to limit erosion of constituents in fill material to Sinclair Inlet. The design of long-term erosion protection and habitat mitigation for Charleston Beach to replace the existing interim repair must (1) meet the objectives for the Pier D habitat mitigation project, and (2) maintain the level of contaminant containment from the original OU A ROD.

The Suquamish Tribe has asked the Navy to refrain from adding more fish mix to the artificial beach until the remedy repair is implemented. Additionally, regular inspections are conducted at Charleston Beach to measure the depth of fish mix. There has been at least 3 feet of fish mix on the beach at every inspection since November 2017, and additional fish mix has not been required.

The 30% BOD for shoreline repairs for Charleston Beach and OU B Terrestrial Segment 4 has been prepared. The selected alternative in the BOD included the following elements:

- Cutback and reconstruction of the existing armor rock revetment at Charleston Beach
- Expansion of the fish mix beach to span the length of the Charleston Beach parking lot to promote natural beach processes
- Establishment of a 15-foot vegetated riparian buffer between the face of the revetment and the curb of the Charleston Beach parking lot
- Establishment of a monitoring program to monitor performance of the beach

The schedule, placement, and mixture of fish mix in the feeder berm may be modified with time depending on performance of the beach. Cutback of the revetment will result in removal and disposal of landfill material presently landward of the existing revetment (Navy, 2021b).

5.1.1.2 System Operations and Monitoring for OU A

Groundwater monitoring has been conducted under plans approved by the regulatory agencies, as intended by the ROD. The groundwater data (Section 4.3) indicate conditions present at the time of the ROD largely remain constant, with the exception of some decreasing and increasing trends of specific COCs; some COCs remain below cleanup levels. Monitoring is ongoing as contaminants are being managed in place. However, a re-evaluation of fate and transport modeling is scheduled to be awarded in fiscal year 2023. In addition, the USGS is currently investigating the groundwater-to-porewater pathway for the nearshore environment, including the shoreline of OU A and areas of direct groundwater discharge within OU B Terrestrial. The Navy and the project team agree that fate and transport modeling, the USGS study, and the results of long-term monitoring will be used to review monitoring objectives, strategies, and decision criteria for the terrestrial OUs (Navy, 2021c).

The inspections of the pavement and erosion protection remedy components conducted during this FYR period have identified and documented needed repairs, and this inspection process is generally functioning as intended by the ROD.

Upgrades to site paving continue as required. A paving project conducted in the summer of 2019 resulted in the repair of 16 features, and the total area of the repair was approximately 25,000 square feet. The site paving continues to interrupt the exposure pathways.

5.1.1.3 Implementation of ICs for OU A

ICs for OU A include limiting access, extended prohibition on fish and shellfish harvesting at Charleston Beach, and land use restrictions on residential use. The ICs at OU A consist of land use restrictions, groundwater use restrictions, and fencing and warning signs. The site paving remains intact, interrupting the exposure pathways. Therefore, the ICs are generally functioning as intended by the ROD.

5.1.2 Functionality of Remedy for OU B Marine

Is the remedy functioning as intended by the ROD? No, the OU B Marine remedy is not functioning as intended by the ROD.

The main issue driving this response is mercury in sediment, which will undergo additional investigation and a source control evaluation. Remediation goals related to PCBs at OU B Marine have been met.

5.1.2.1 Remedial Action Performance for OU B Marine

The physical construction components of the OU B Marine remedy were completed by March 2004 (see Sections 2.3.1 and 2.3.2).

In addition to the Charleston Beach erosion issue, anthropogenic debris is present within the intertidal zone of OU A. The anthropogenic materials along the intertidal area at Charleston Beach have not been released to the environment during the last 5 years due to the shoreline erosion protection system (combination of riprap, sheet pile and fish mix berm). These materials were present in/on the beach at the time the OU A and OU B Marine RODs were signed and do not constitute a new condition or concern.

5.1.2.2 System Operations and Monitoring for OU B Marine

Post-remedy monitoring of OU B Marine during this FYR period was conducted in 2018, when marine sediment and English sole were sampled. Monitoring in 2018 also included bathymetric surveys and sub-bottom profiling.

The 2018 sub-bottom profiling results indicated that the CAD pit cover is intact and functioning as planned. However, a substantial percentage of the offshore cap area did not provide conclusive data. In place of conclusive profiling data, a general assessment of beach processes was conducted, and recommendations included that future marine surveys must adhere to marine survey standard operating procedures (Navy, 2020g).

The 2014 sediment monitoring results demonstrated that PCB levels in sediment in OU B Marine had met the sediment MCUL, and PCB levels throughout Sinclair Inlet had achieved the long-term cleanup goal established in the OU B Marine ROD (Navy, 2016d). The Navy and stakeholders agreed that a confirmatory round of monitoring would be conducted in 2018 to validate the 2014 LTM results (Navy, 2016b, 2016d). The 2018 sediment and tissue data are considered usable for confirming that OU B Marine ROD cleanup objectives have been met for OU B Marine and Sinclair Inlet (Navy, 2020g).

The generally decreasing trends in PCB levels and achievement of the OU B Marine MCUL for PCBs in 2014 and 2018 indicate natural recovery of sediments in OU B Marine is generally occurring. However, potential ongoing sources for mercury discharge include stormwater, dry dock discharge, and direct groundwater discharge at various locations throughout BNC. These potential ongoing sources will be identified and addressed through conducting mercury source control actions and the FFS to identify potential remedial action alternatives (Navy, 2020g).

5.1.2.3 Implementation of ICs for OU B Marine

Implementation of ICs at OU B Marine was addressed through the development of a sitewide IC program, and the ICs are documented in the original IC work plan (Navy, 2006b). In 2020, an IC plan specific to OU B Marine was published (Navy, 2020e).

5.1.3 Functionality of Remedy for OU B Terrestrial

Is the remedy functioning as intended by the ROD? No, the OU B Terrestrial remedy is not functioning as intended by the ROD.

5.1.3.1 Remedial Action Performance for OU B Terrestrial

The physical construction components of the OU B Terrestrial remedy have been completed (see Sections 2.4.1 and 2.4.2). However, the remedy for OU B Terrestrial is not functioning as intended by the ROD. Significant erosion of the shoreline at Segment 4 has continued to worsen during this FYR period, and stained soil and bricks and construction debris were observed breaching the upper shoreline. Additionally, in the protectiveness evaluation conducted in 2019 (Navy, 2019d), it was recommended that the groundwater monitoring results for TCE be compared to the current regulatory level

(0.7 μg/L) to ensure protection of human health, which affects the protectiveness of the remedy.

Mercury is a COC for OU B Marine. The largest known ongoing source of filtered mercury from BNC to Sinclair Inlet, including OU B Marine, is from the western portion of OU B Terrestrial, located in the southern portion of the Outfall 15 drainage basin. Whole water mercury concentrations in discharges associated with Outfall 15 are unknown and could potentially represent an important source of particulate-bound mercury to sediment.

Progress has been made in the FYR period toward addressing mercury contamination at OU B Terrestrial that may be impacting OU B Marine media. This progress includes the following:

- The USGS completed a tidal flushing evaluation of mercury in the Outfall 15 storm drain system in 2018.
- A Source Control Action Plan, combined with a Focused Feasibility Study (FFS), is expected to be finalized in April 2023.
- Repairs of the Outfall 15 storm drain system have been awarded and will be completed by summer 2022.
- Repairs to the Outfall 15 flapper valve are planned to be awarded in FY 2024.
- The Navy is considering a ROD amendment or other administrative mechanism to address mercury after completion of the FFS and pending resolution of the M2D2/SIOP plans.

These actions have not yet improved function of the OU B Terrestrial remedy components related to mercury, but they are part of the process toward development of an effective approach for Outfall 15 drainage basin source control and other potential upland sources of mercury.

Source control investigations and remedial actions undertaken within the boundaries of OU B Terrestrial may be administratively part of OU B Marine, not OU B Terrestrial, because they address exposures in the marine environment. Related cost calculations and remedy selection will be discussed in the FFS.

5.1.3.2 System Operations and Monitoring for OU B Terrestrial

Periodic groundwater monitoring has been conducted under plans approved by the regulatory agencies, as intended by the ROD. The monitoring data (Section 4.3) indicate that, overall, the conditions present at the time the ROD was executed have persisted. Monitoring is ongoing as contaminants are being managed in-place.

However, a re-evaluation of fate and transport modeling is scheduled to be awarded in fiscal year 2023. In addition, the USGS is currently investigating the groundwater-to-porewater pathway for the nearshore environment, including the shoreline of OU A and areas of direct groundwater discharge within OU B Terrestrial. The Navy and the project team agree that fate and transport modeling, the USGS study, and the results of long-term monitoring will be used to review monitoring objectives, strategies, and decision criteria for the terrestrial OUs (Navy, 2021c).

5.1.3.3 Implementation of ICs for OU B Terrestrial

Inspections of the physical remedy components and ICs continued to be implemented during this FYR period. An Excavation Management Plan finalized in 2020 (Navy, 2020d) supports improved communication among Navy departments to help maintain the integrity of remedies already in place. However, additional improvements are needed for identifying and addressing new excavations, pavement, and storm drain system maintenance, both to ensure the ongoing correction in a timely manner of deficiencies identified during inspections and in documenting whether corrective actions have been implemented and are effective.

5.1.4 Functionality of Cleanup Action for OU C

Is the cleanup action functioning as intended by the CAP? Yes, the cleanup action is functioning as intended by the CAP.

ICs are in place, and both groundwater and free-product monitoring are being conducted as required under the CAP (see Section 2.5). The inspection frequency was not specified in the CAP or otherwise. Previously, inspections in OU C were only taking place as a part of the FYR process. In 2018, the O&M and IC Plan was updated to include OU C with the IC inspections to prohibit activities that interfere with monitoring activities (Navy, 2018c).

Information necessary for Ecology to perform the periodic review for OU C pursuant to WAC 173-340-420 is provided in Appendix D.

5.1.4.1 Remedial Action Performance for OU C

The remedial action continues to operate as intended for OU C. LTM and inspection take place at OU C, and TPH is often not detected, except for well GMWT-15, which was sampled for the first time in 2019 during the annual LTM. Sentinel wells sampled in 2020 did not have detections of TPH greater than trigger levels.

ICs are being maintained in OU C. Based on the available data and observations, containment of petroleum within OU C is effective.

5.1.4.2 System Operations and Monitoring for OU C

Monitoring for OU C takes place on a rotational schedule and is combined with inspections and monitoring at other OUs. This method of scheduling creates the most efficient system to continue necessary monitoring, inspection, and observation while conserving cost and time.

LTM and inspection of compliance to ICs represent the current cleanup action for OU C and are working in a manner that will continue to maintain effectiveness. Exceedance of trigger levels is infrequent and shows the remedy is working as implemented.

5.1.4.3 Implementation of ICs for OU C

ICs for OU C include land use controls and prohibition of activities that interfere with monitoring. These ICs are effective for OU C because they limit disturbance of the ground surface and therefore disturbance of the petroleum contamination, which is present approximately 80-120 feet bgs. Because of the location and geology of OU C, the contamination will not otherwise be disturbed, supporting effectiveness of the ICs in preventing exposure.

5.1.5 Functionality of Remedy for OU D

Is the remedy functioning as intended by the ROD? Yes, the OU D remedy is functioning as intended by the ROD.

5.1.5.1 Remedial Action Performance for OU D

The USEPA and Navy have established that the surface features installed by the City of Bremerton meet the remedy capping requirements. The storm drain cleaning and repair components of the OU D remedy were implemented together with the similar remedy component for OU B Terrestrial (see Sections 2.6.1 and 2.6.2).

5.1.5.2 System Operations and Monitoring for OU D

Groundwater monitoring, which is combined with the monitoring program for OU B Terrestrial and provides data from well LTMP-5, is functioning in accordance with the ROD requirements.

5.1.5.3 Implementation of ICs for OU D

ICs at OU D continue to limit exposure to site soils and groundwater. The IC inspection component of the remedy for OU D has been memorialized in a Memorandum of Agreement between the City of Bremerton and the Navy, and the City conducts annual

IC inspections (Navy, 2013b, 2019a). The inspection reports generated by the City are included in the BNC terrestrial annual remedy inspection reports.

5.1.6 Functionality of Remedy for OU NSC

Is the remedy functioning as intended by the ROD? Yes, the OU NSC remedy continues to function as intended by the ROD.

5.1.6.1 Remedial Action Performance for OU NSC

The physical construction components of the OU NSC remedy were implemented prior to the first FYR (see Sections 2.7.1 and 2.7.2).

5.1.6.2 System Operations and Monitoring for OU NSC

Periodic groundwater monitoring has been conducted under plans approved by the regulatory agencies, as intended by the ROD. The monitoring data (Section 4.3.1) indicate that the low-risk conditions present at the time of the ROD remain present. Monitoring is ongoing as contaminants are being managed in-place.

The inspections of the pavement cap, vegetated cover, and catch basins conducted during this FYR period have identified and documented needed repairs. Additionally, the gravel rail bed along the northwest margin of the OU was paved. The inspection process is generally functioning as intended by the ROD.

5.1.6.3 Implementation of ICs for OU NSC

ICs at OU NSC include limiting access, restricting groundwater and land usage, and ensuring that residual site contamination is taken into consideration if site land use or ownership changes in the future. Inspections of the physical remedy components and ICs continued to be implemented during this FYR period and are proving be effective.

5.2 Question B

Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy selection still valid?

5.2.1 Question B Summary

No. In most cases, assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection are still valid; TCE is the exception within OU B Terrestrial. In those cases where toxicity data or cleanup levels have changed since the RODs were signed, the changes did not negatively impact the protectiveness to human health and the environment as long as the ICs preventing exposure remain in place and ongoing monitoring is continued until COC concentrations in groundwater and surface water are below the RGs.

This section describes the changes, if any, to ARARs (i.e., the standards and the “to be considered” [TBC] policies and guidance) and basic risk assessment assumptions (methods, exposure, and toxicity) that have occurred since the RODs were signed in order to assess the protectiveness of the remedies at OU A, OU B Marine, OU B Terrestrial, OU D, and OU NSC.

Concentrations of chemicals in groundwater remain above the RGs at many locations in OU A, OU B Terrestrial, and OU NSC, resulting in the need for continued ICs to prevent exposure and the need for ongoing monitoring. Although some of the RGs might be lower if calculated today, the remedy components in general continue to protect against exposures, just as they did at the time the ROD was signed.

The Navy and the OU B Marine stakeholder team are working to address mercury-related human health risks associated with subsistence-level consumption of Sinclair Inlet marine species. A Source Control Action Plan and Focused Feasibility Study to evaluate mercury sources to Sinclair Inlet are in progress.

5.2.2 Changes in Standards and TBCs

In the preamble to the National Oil and Hazardous Substances Pollution Contingency Plan, USEPA states that ARARs are generally “frozen” at the time of ROD signature, unless new or modified requirements call into question the protectiveness of the selected remedy. Five-year review guidance (USEPA, 2001) indicates that the question of interest in developing the five-year review is not whether a standard identified as an ARAR in the ROD has changed in the intervening period, but whether such a change to a regulation calls into question the protectiveness of the remedy. If the change in the standard would be more stringent, the next stage is to evaluate and compare the old and the new standards and their associated risk. This comparison is done to assess whether the currently calculated risk associated with the standard identified in the ROD is still within the USEPA acceptable excess cancer risk range of 10^{-6} to 10^{-4} and below a hazard index of 1 for noncancer effects and does not exceed the State of Washington MTCA ARAR for excess cancer risk of 10^{-6} for individual contaminants and 10^{-5} for cumulative risks or a hazard quotient of 1 for individual contaminant risks and a hazard index of 1 for cumulative risks. If the old standard is not considered protective,a new cleanup standard may need to be adopted after the five-year review through CERCLA’s processes for modifying a remedy.

ARARs have been reviewed during each of the previous four five-year reviews. For this fifth five-year review, all ARARs identified in the RODs for OU A, OU B Marine, OU B

Terrestrial, OU D, and OU NSC were again reviewed for changes that could affect the assessment of whetherthe remedy is protective. Levels identified for OU C were also reviewed although these are considered “trigger levels” and were not identified as part of a ROD.

ARARs that were used in the determination of cleanup levels that have been amended since publication of one or more of the RODs include the following:

- Washington State MTCA Regulations
- Washington State Marine Surface Water Quality Standards for Protection of Aquatic Life and Human Health
- Washington State SMS
- USEPA Clean Water Act National Ambient Water Quality Criteria

In accordance with Ecology Interim Policy 730: Taking into Account Federal Human Health Surface Water Quality Criteria under MTCA issued by Ecology in January 2021 (Ecology, 2021b), the ARARs used in determination of current cleanup levels for the purposes of this FYR include values from 40 CFR 130.45. The 40 CFR 130.45 cleanup levels are often the lowest values considered in this evaluation and drive cleanup levels lower than those presented in the Navy’s Final Remedy Protectiveness Evaluation (Navy, 2019d). However, as stated in Section 5.2.1, these cleanup levels do not negatively impact the protectiveness of remedies to human health and the environment. For many of the COCs in groundwater, the RG was based on the laboratory practical quantitation limit (PQL). For the other COCs, the RG was based on MTCA regulatory levels. MTCA allows for use of the PQL when the MTCA cleanup level is below the PQL. However, as analytical techniques improve over time, laboratories may be able to achieve lower PQLs for some of these COCs. As part of the ARAR evaluation, current analytical limits of quantitation (LOQs) are compared to PQLs listed in the ROD. In present day terminology for U.S. Department of Defense (DoD) sites, the PQL is referred to as the LOQ in accordance with the DoD Quality Systems Manual for Environmental Laboratories (QSM) [DoD, 2019] and the Navy’s Tier II Sampling and Analysis Plan format guidelines. The LOQ is synonymous with the PQL, as defined in WAC 173-340.

The result of the amendments to the regulations is sometimes the lowering of a numeric ARAR. In these instances, the revised ARAR must be evaluated to determine whether there is a negative effect on the protectiveness of the remedy. In other instances, the ARAR remains unchanged or has been raised. In these instances, no further discussion is provided, because the protectiveness of the remedy is not affected.

5.2.2.1 Operable Unit A

For OU A, soil cleanup levels were based on industrial site usage, and groundwater cleanup levels were based on the protection of adjacent surface waters of Sinclair Inlet. For the COCs in soil and groundwater listed in the OU A ROD, no revision to the ARARs was found that would affect the protectiveness of the remedy.

Soil. Table 5-2 compares current ARAR values for soil with those provided in the OU A ROD (Table 8-1 of Navy et al., 1997). Since the time of the fourth five-year review, there has been no ARAR revision for soil that would affect the protectiveness of the remedy.

As discussed in previous FYRs, the MTCA Method C industrial soil cleanup level for total PCBs increased from 17 to 66 mg/kg for “high risk and persistent PCBs” (as defined by USEPA guidance). The lower cleanup level selected in the ROD (17 mg/kg) remains protective of human health and the environment.

As discussed in the preceding FYR, the MTCA Method C industrial soil cleanup level of 88 mg/kg for arsenic is lower than the ROD RG of 219 mg/kg. However, no change to the ROD RG for arsenic is considered necessary. As stated in previous FYRs, the effect of a lower cleanup level is minimal because the areas with the greatest arsenic concentrations have been paved, thereby effectively preventing the direct contact exposure route.

At the time of the OU A ROD, individual carcinogenic PAHs (cPAHs) were assessed based on the MTCA Method C industrial soil cleanup level for benzo(a)pyrene. The RG for cPAHs in soil required adjusting the concentrations of individual cPAHs based on their relative toxicity to benzo(a)pyrene, then summing up the individual adjusted concentrations and comparing the result to the RG for benzo(a)pyrene. This resulted in a total “toxicity equivalent” concentration (TTEC) based on the toxicity of benzo(a)pyrene (Ecology, 2001).

The current MTCA Method C industrial value is 130 mg/kg for benzo(a)pyrene, which was updated in 2020 based on updates to USEPA toxicity values, as summarized in an Ecology memorandum (Ecology, 2020). Because this revised value represents an increase in the cleanup level, the ROD RG remains protective. MTCA Method C industrial values for individual cPAHs are presented in Table 5-2 using the toxicity equivalent factors (TEFs) for cPAHs provided by Ecology (Ecology, 2015a). As noted in Table 5-2, current MTCA Method C industrial values have been calculated for the individual cPAHs, such that the summing step may no longer be required if only one cPAH is present. However, this does not constitute a change in the assessment of the toxicity of these compounds, and the TTEC approach is still required by MTCA.

Groundwater. Table 5-3 compares the RGs presented in the OU A ROD (Table 8-1 of Navy et al, 1997) to current groundwater ARAR values for the protection of surface water and current LOQs.

At OU A, groundwater monitoring is currently required for arsenic, copper, nickel, and zinc. Groundwater monitoring had been discontinued for the other COCs shown in Table 5-3, in accordance with the recommendations of the first five-year review (Navy, 2002e). However, based on recommendations from the protectiveness evaluation (Navy, 2019d) to resume periodic groundwater monitoring of organic COCs [Aroclor 1260, chrysene, aldrin, dieldrin, endrin, cis (alpha)-chlordane, trans (gamma)-chlordane, 4,4'-DDD, 4,4'-DDE, and 4,4'-DDT], monitoring for these chemicals was resumed in 2020.

Arsenic is the only remaining COC for which the RG was based on the PQL recorded in the ROD. As the current LOQ is the same as the ROD PQL, there is no ARAR revision for arsenic in groundwater that would affect the protectiveness of the remedy. In a protectiveness evaluation conducted in 2019 (Navy, 2019d), it was recommended that the arsenic RG be updated to 5 µg/L (the local background concentration of arsenic in groundwater) consistent with the RGs identified for OU B T and OU D.

ROD RGs for copper, lead, nickel, and zinc were based on the marine ambient water quality criteria (WQC) at the time of the ROD, which, as shown in Table 5-3, are lower than current regulatory levels. Thus, there are no ARAR revisions for these four COCs in groundwater that would affect the protectiveness of the remedy.

Even though monitoring is no longer performed for some of the organic COCs, changes to regulatory levels and quantitation limits are listed in Table 5-3 for completeness. Note that the RGs for all organic COCs were based on the PQL at the time the ROD was completed. When RGs are established as PQLs and the PQLs decrease with improved technology, the FYR process does not typically recommend revising the RGs during every FYR. Instead, the FYR includes an assessment of whether the use of current laboratory analytical techniques might alter the conclusion that the remedy remains protective.

As stated above, quantitation limits (i.e., ROD PQL and current LOQ) for the organic COCs are provided in Table 5-3. When groundwater monitoring at OU A began in 1998, analyses for the COCs were based on ROD PQLs. However, as analytical techniques improved over time, updates were made to the groundwater monitoring program at OU A, and the lowest quantitation limits available at the time of individual monitoring events were used for that groundwater monitoring event. By spring 2002, groundwater samples were analyzed for all organic COCs using quantitation limits less than ROD PQLs, and during the spring 2003 groundwater monitoring event, analyses for the organic COCs were based on quantitation limits similar to the current LOQs listed in Table 5-3. Except for bis(2-ethylhexyl) phthalate, none of the organic COCs were detected above quantitation limits throughout the groundwater monitoring program. Although bis(2-ethylhexyl) phthalate continued to be sporadically detected after remedial actions occurred, concentrations were much lower than those detected before the ROD. Because organic COCs were not detected (at the lower quantitation limits) or were detected at much lower concentrations than those observed before the ROD over multiple consecutive sampling events, the organic COCs were dropped from the analyte list after spring 2003; this was done in accordance with the first FYR and the 2002/2003 annual monitoring report recommendation to not sample with the approval of USEPA and Ecology. However, based on recommendations from the protectiveness evaluation (Navy, 2019d) to resume periodic groundwater monitoring of organic COCs [Aroclor 1260, chrysene, aldrin, dieldrin, endrin, cis (alpha)-chlordane, trans (gamma)-chlordane, 4,4’-DDD, 4,4’-DDE, and 4,4’-DDT], monitoring for these chemicals was resumed in 2020.

As current laboratory techniques have not significantly changed since the organic COCs were dropped from the groundwater monitoring program, and because the COCs were not detected above the lower quantitation limits while sampling was still being performed during the groundwater monitoring program, the RGs remain protective of human health and the environment.

The current regulatory levels for pesticides and PCBs have decreased; however, the RGs in the ROD were based on an LOQ. Because the current regulatory levels are still lower than the LOQ, the RGs selected would still be the LOQ if a ROD were being signed today. Therefore, the LOQ is an appropriate RG, and the changes in the regulatory levels do not affect the protectiveness of the remedy.

Sediment. Actions at Charleston Beach taken after the OU A remedy implementation (described in Section 2.2.2) resulted in the presence of a small area of intertidal sediment within the boundaries of OU A (Figure 2-1). OU A originally included marine sediments; however, these sediments were later included with OU B so that the marine environment at PSNS would be addressed as a whole (Navy et al., 1997). Regulatory levels for OU B Marine are discussed in Section 5.2.2.2.

Table 5-2: Soil Cleanup Levels for OU A

Chemical	ROD Remediation Goal[a] (mg/kg)	ROD Basis	Current Regulatory Level[b] (mg/kg)
Arsenic	219	MTCA C Industrial	88
Lead	1,000	MTCA A Industrial	1,000
cPAHs	18[c]	MTCA C Industrial	130
Benzo(a)anthracene	-	NA	1,300
Benzo(a)pyrene	-	NA	130
Benzo(b)fluoranthene	-	NA	1,300
Benzo(k)fluoranthene	-	NA	1,300
Chrysene	-	NA	13,000
Dibenz(a,h)anthracene	-	NA	1,300
Indeno(1,2,3-cd)pyrene	-	NA	1,300
Total PCBs	17	MTCA C Industrial	66

Data sources:
[a] ROD Table 8-1 (Navy et al., 1997).
[b] Department of Ecology, State of Washington, CLARC Data Tables (February 2021); complies with MTCA Cleanup Regulation, WAC 173-340. Values that have significantly changed since the ROD have been highlighted.
[c] The remediation goal (RG) in the ROD for cPAHs (total) is based on the MTCA Method C industrial soil cleanup level for benzo(a)pyrene (Department of Ecology, State of Washington, CLARC Data Tables [February 2021]; complies with MTCA Cleanup Regulation, chapter 173-340 WAC). The RG for cPAHs in soil requires comparing the TTEC for the seven cPAHs relative to benzo(a)pyrene to the cleanup level derived for benzo(a)pyrene. The 2021 MTCA Method C industrial soil cleanup level for benzo(a)pyrene has been updated based on changes to toxicity values to 130 mg/kg; MTCA Method C industrial values have been calculated for individual cPAHs based on the toxicity equivalency factors (Ecology, 2015a). The individual values may be used if only one cPAH is detected. If multiple cPAHs are present, the TTEC approach must be used.
Yellow highlighted cell indicates the current regulatory value is different from the value at the time of the ROD. Orange highlighted cell indicates the current regulatory value is greater than the value at the time of the ROD. Green highlighted cell indicates the current regulatory value is less than the value at the time of the ROD.
- An individual cleanup goal was not provided in the ROD. Rather, concentrations of these individual cPAHs were normalized to benzo(a)pyrene values using the TTEC approach.

Abbreviations:
CLARC = Cleanup Levels and Risk Calculation
cPAH = carcinogenic polycyclic aromatic hydrocarbon
mg/kg = milligram per kilogram
MTCA = Model Toxics Control Act
PCB = polychlorinated biphenyl
ROD = record of decision
TTEC = total "toxicity equivalent" concentration
WAC = Washington Administrative Code

Table 5-3: Groundwater Cleanup Levels for Protection of Surface Water for OU A

Chemical	ROD Regulatory Level[a] (µg/L)	Current Regulatory Level[b] (µg/L)	ROD Basis	ROD PQL[c] (µg/L)	Current LOQ[d,e] (µg/L)	ROD Remediation Goal[f] (µg/L)
Arsenic	0.0982	5[g]	MTCA B SW	0.5	0.50	0.5[h]
Copper	2.5	3.1	State WQC	2.5	0.10	2.5
Lead	5.8	5.6	State WQC	5	0.4	5.8
Nickel	7.9	8.2	State WQC	5	2	7.9
Zinc	76.6	81	State WQC	5	0.50	76.6
Benzo(a)anthracene	0.0296	0.0013	MTCA B SW	5	0.05	5[k]
Benzo(a)pyrene	0.0296	0.00013	MTCA B SW	5	0.1	5[k]
Benzo(b)fluoranthene	0.0296	0.0013	MTCA B SW	5	0.05	5[k]
Benzo(k)fluoranthene	0.0296	0.013	MTCA B SW	5	0.05	5[k]
Chrysene	0.0296	0.13	MTCA B SW	5	0.1	5[i]

Table 5-3: Groundwater Cleanup Levels for Protection of Surface Water for OU A (continued)

Chemical	ROD Regulatory Level [a] (µg/L)	Current Regulatory Level [b] (µg/L)	ROD Basis	ROD PQL [c] (µg/L)	Current LOQ [d,e] (µg/L)	ROD Remediation Goal [f] (µg/L)
Indeno(1,2,3-cd)pyrene	0.0296	0.0013	MTCA B SW	5	0.05	5[k]
Bis(2-ethylhexyl) phthalate	3.56	0.25	MTCA B SW	5	0.2	5[k]
Aldrin	0.0000816	0.000000041	MTCA B SW	0.01	0.024	0.01
Dieldrin	0.0000867	0.00000007	MTCA B SW	0.02	0.018	0.02[j]
Endrin	0.0023	0.002	State WQC	0.02	0.012	0.02[j]
Alpha-chlordane	0.000354	0.000022	MTCA B SW	0.01	0.027	0.01
Gamma-chlordane	0.000354	0.000022	MTCA B SW	0.01	0.02	0.01
4,4'-DDD	0.000504	0.0000079	MTCA B SW	0.02	0.015	0.02[j]
4,4'-DDE	0.000356	0.00000088	MTCA B SW	0.02	0.01	0.02[j]
4,4'-DDT	0.000356	0.0000012	MTCA B SW	0.02	0.02	0.02
Aroclor 1260	0.000027	0.000007	MTCA B SW	0.02	0.45	0.02

Data sources:
[a] ROD Table 8-1 (Navy et al., 1997).
[b] Department of Ecology, State of Washington, CLARC Data Tables (February 2021); complies with MTCA Cleanup Regulation, WAC 173-340. Values that have changed significantly since the ROD have been highlighted. Note that values in the CLARC tables are presented with two significant figures. Changes in regulatory values that are due to rounding to two significant figures are not highlighted.
[c] PQLs at the time of the ROD.
[d] In present day terminology, the practical quantitation limit (PQL) is referred to as a "limit of quantitation" (LOQ) in accordance withthe DoD Quality Systems Manual for Environmental Laboratories (QSM) [DoD 2013] and the Navy's Tier II SAP format guidelines.The LOQ is synonymous with the practical quantitation limit (PQL), as defined in WAC 173-340.
[e] Source of LOQs is Eurofins Environment Testing or ALS Laboratory, Inc., using the following methods: SVOCs by USEPA Method 8270E (SIM), PAHs by USEPA Method 8270E (SIM), PCB Aroclors by USEPA Method 8082A (for groundwater), pesticides by USEPA Method 8081B (for groundwater), and total RCRA metals by USEPA Method 6020B.
[f] The ROD states that the remedial goal is the higher of the regulatory level or the PQL, which is allowed by WAC 173-340-700(6).
[g] Background level, as recommended in the Navy's Final Remedy Protectiveness Evaluation (Navy, 2019d).
[h] Neither the regulatory level nor the LOQ has changed since the ROD; therefore, the remediation goal would still be based on the LOQ if an ROD were being signed today.
[I] The regulatory level has stayed the same or increased but a lower LOQ is achievable; therefore, the RG selected wouldbe the regulatory level if a ROD were being signed today.
[j] Although a lower LOQ is achievable, the regulatory level is still lower than the LOQ; thus, the RG selected still would be the LOQ if a ROD were being signed today.
[k] The LOQs have changed since the ROD was published. However, in accordance with the recommendations of the first five-year review, these chemicals of concern are no longer part of the monitoring program.

Notes:
Orange highlighted cell indicates the current regulatory value is greater than the value at the time of the ROD.Blue highlighted cell indicates that the chemical is no longer included in the long-term monitoring program. Green highlighted cell indicates the current regulatory value is less than the value at the time of the ROD.

Abbreviations:
µg/kg = microgram per kilogram
CLARC = Cleanup Levels and Risk Calculation
DDD = dichlorodiphenyldichloroethane
DDE = dichlorodiphenyldichloroethene
DDT = dichlorodiphenyltrichloroethane
DoD = U.S. Department of Defense
LOQ = limit of quantitation
MTCA = Model Toxics Control Act
PAHs = polycyclic aromatic hydrocarbon
PCB = polychlorinated biphenyl
PQL = practical quantitation limit
QSM = Quality Systems Manual
RCRA = Resource Conservation and Recovery Act
RG = remediation goal
ROD = record of decision
SAP = Sampling and Analysis Plan
SVOC = semivolatile organic compound
SW = surface water
TTEC = total "toxicity equivalent" concentration
USEPA = U.S. Environmental Protection Agency
WAC = Washington Administrative Code
WQC =water quality criteria

5.2.2.2 Operable Unit B Marine

For OU B Marine, Washington State SMS are applicable to the sediment cleanup levels and cleanup actions. The SMS rule was last revised in 2013, after the third FYR was completed. The amendments adopted in 2013 include the following:

1. Integrate the SMS and MTCA, Chapter 173-340 WAC, cleanup requirements where appropriate
2. Clarify requirements for protection of human health from sediment contamination
3. Clarify requirements for protection of higher trophic level species from sediment contamination
4. Promulgate numeric chemical and biological criteria for freshwater sediment to protect the benthic community
5. Clarify requirements for coordinating source control and cleanup actions at cleanup sites

The original SMS rule did not clearly address how to assess human health and ecological risk from chemicals that bioaccumulate in the food chain. The amendments to Part V of the rule add to the SMS decision framework a mechanism for setting standards to protect human health and the environment in sediment. The mechanism is based on a two-tiered framework establishing sediment cleanup standards using risk-based, background-based, and PQL-based values to select the lower tier SCO and the upper tier CSL. Subsequently, the sediment cleanup level is determined by adjusting upwards from the SCO to a maximum of the CSL based on technical possibility and net adverse environmental impacts (Ecology, 2021c).

In addition, in the original rule, source control requirements to prevent sediment recontamination following cleanup were difficult to implement. The 2013 amendments clarify requirements for coordinating cleanup actions and source control requirements that will help prevent recontamination and make the requirements for cleanup actions attainable.

The OU B Marine ROD (Navy et al., 2000) identified RAOs for sediment and associated MCULs, action levels, and long-term cleanup goals for PCBs and a combined action level for collocated PCBs and mercury. The way in which the cleanup levels and cleanup goals for PCBs and mercury may be interpreted in light of the revised SMS is the focus of the following discussion.

PCBs. The RAO for addressing PCBs in sediment was based on the human health risk assessment finding that unacceptable risks were posed to subsistence seafood consumers, primarily from the presence of PCBs in tissues of bottom-dwelling fish.

However, no risk-based cleanup goals were calculated for PCBs in sediment or tissue in the ROD. Instead, the long-term cleanup goals in the ROD for sediment (1.2 mg/kg OC) and tissue (0.023 mg/kg wet weight) were established based on the 90th percentile of sediment and tissue reference area concentrations, inferred at the time to represent natural background[1].

This was done as it was expected that risk-based sediment concentrations would be below natural background, which is the case for most bioaccumulative carcinogenic chemicals such as PCBs. Whether to change the sediment PCB cleanup goal of 1.2 mg/kg OC was one of three issues resolved and documented in the May 2009 Joint Resolution Statement (JRS) by the Dispute Resolution Committee (DRC), consisting of representatives from the Navy, USEPA, and Ecology (Navy, 2009a). The DRC concluded that no change in the Sinclair Inlet cleanup goal was warranted and that the goal represents ideal clean conditions and may be at or below background levels for Sinclair Inlet. The rationale in the JRS was based on "a preliminary review of an August 2008 set of PCB Aroclor concentrations in sediment at 70 nonurban locations throughout Puget Sound." These data are identified in the DRC Navy support documentation as the "DMMP Bold data." The JRS infers that the Bold data evaluation results are consistent with the cleanup goal of 1.2 mg/kg OC, stating "If the [2008] sampling was representative of background, these detections indicate an approximate 96% confidence that the true background is below 2.95 mg/kg OC and an approximately 94% confidence that it is below 1.12 mg/kg OC."

It is recognized that per Ecology's Sediment Cleanup User's Manual (SCUM) II, Ecology has determined a collective data set (referred to as Bold Plus) is appropriate to establish natural background in Puget Sound, and that the Bold Plus data include not only the 2008 Bold data, but data from approved samples. However, based on review of the new SMS rule and the DRC's conclusion that the 1.2 mg/kg OC cleanup goal represents ideal clean conditions and may be at or below background, there has been no change in the approach used to establish the OU B Marine cleanup goals for PCBs in sediment that would affect the protectiveness of the selected remedy.

The ROD also defined an MCUL of 3 mg/kg OC for PCBs in OU B Marine sediments, defined as representing a site-specific concentration limit to protect human health and the environment, conditioned by site-specific circumstances (e.g., sensitive habitats, engineering feasibility, and cost). The MCUL of 3 mg/kg OC was based on modeling results for natural recovery following active remediation, using the action levels defined

[1] In OU B Marine ROD Section 9.3.3, both sediment and fish tissue reference-area concentrations included the parenthetical "i.e., natural background."

in the ROD. The action level for dredging (12 mg/kg OC) was selected because it (1) was lower than the calculated cost-effectiveness threshold of 14 mg/kg OC, (2) was consistent with the Washington State SQS (benthic) criterion, and (3) generally fell within the range of other regional marine sediment cleanup action levels. A PCB action level of 6 mg/kg OC was selected to identify areas of sediment in which enhanced natural recovery actions would be considered (as accomplished by thin-layer capping). Combined with incidental removal of PCBs accomplished by the planned navigational dredging and considering the effects of natural recovery, modeling results indicated that remediation of PCBs to these action levels would lead to attainment of the MCUL within 10 years.

The MCUL is defined in the ROD as the primary measurable objective for cleanup of PCBs in OU B Marine sediments. Achievement of the MCUL in shallow sediment (0- to 10-cm depth) indicates compliance with the RAO, and leads to reduction of the concentration of PCBs in sediments to below the minimum cleanup level in the biologically active zone within OU B Marine. Achievement of the MCUL is also expected to reduce PCB concentrations in fish tissue.

With regard to source control, shoreline areas have been stabilized to minimize the potential for erosion of contaminated fill material into the marine environment, and ICs have been implemented to maintain the integrity of the shoreline stabilization measures. Remedial actions have been implemented in the terrestrial areas of BNC to reduce the potential for PCB transport and control the threat of PCB recontamination of the adjacent marine environment from contaminant transport through the stormwater system; infiltration of soil and groundwater into the stormwater system; infiltration of surface water into site soil; and erosion of shoreline soil. However, the 2013 revisions to the SMS clarify Ecology’s expectations for demonstrating control of upland sources that have the potential to re-contaminate areas of sediment remediation (WAC 173-204-500[4]).

Mercury. The 2000 ROD did not select a cleanup goal specific to mercury in sediment. Rather, the ROD selected a combined action level of 6 mg/kg OC PCBs and 3 mg/kg mercury in sediment to achieve the RAO to selectively remove sediment concentrations of mercury collocated with PCBs. The Washington State SMS SQS for mercury at the time the ROD was signed was 0.41 mg/kg, and the MCUL was 0.59 mg/kg. Currently, the SCO is the SQS of 0.41 mg/kg, and the sediment cleanup level remains 0.59 mg/kg. There has been no change in ARARs for mercury in sediment since the signing of the ROD that would affect the selected remedy.

Mercury is now considered a COC for OU B Marine based on the findings of a supplemental risk evaluation (Navy, 2010d). The Navy and the OU B Marine stakeholder team are working to address mercury-related human health risks associated with subsistence-level consumption of Sinclair Inlet marine species. A Source Control Action Plan and Focused Feasibility Study to evaluate mercury sources to Sinclair Inlet are in progress.

Surface water quality standards (Ecology, 2019) were last revised in 2019. The current regulatory levels for mercury associated with this ARAR are discussed below in the relevant sections.

5.2.2.3 Operable Unit B Terrestrial

The ROD for OU B Terrestrial concluded that under current conditions, with contaminated soil effectively capped by pavement and buildings and groundwater not being used, no action other than ICs was required to ensure protectiveness (Navy et al., 2004a). Therefore, no cleanup levels were established for the site. However, the potential for movement of contaminants off site was identified as a concern. The RAOs were based on the need to prevent exposure to contaminated terrestrial media (i.e., accumulated stormwater system sediment and debris, soil, and groundwater) and to limit transport to the adjacent marine environment (OU B Marine).

To achieve the RAOs for OU B Terrestrial, in addition to ICs, a conditional point of compliance for groundwater was selected at OU B Terrestrial near the shoreline to monitor groundwater discharge from OU B Terrestrial to Sinclair Inlet. Twelve target analytes were selected to be monitored in groundwater and compared against the conditional points of compliance groundwater criteria. Table 5-4 compares current ARAR values for the protection of surface water with those presented in the OU B Terrestrial ROD.

TCE, which is one of the chemicals selected for groundwater monitoring at the conditional point of compliance, has had a significant change in the groundwater criterion since the ROD was completed. The groundwater criterion for TCE was based on the MTCA Method B surface water value in the ROD. Since the fourth FYR, the TCE MTCA Method B surface water value has changed, and additional USEPA and State of Washington water quality criteria have been developed based on toxicity updates for TCE. The current MTCA Method B value is 4.9 µg/L, which has decreased from 55.6 µg/L in the ROD and 12.8 µg/L in the fourth FYR. The current regulatory level is 0.7 µg/L, which is the USEPA federally promulgated human health criterion for Washington, organism only (Navy, 2019d). Additionally, in a protectiveness evaluation conducted in 2019 (Navy, 2019d), it was recommended that the groundwater monitoring results for TCE be compared to the current regulatory level (0.7 µg/L) to ensure protection of human health, which affects the protectiveness of the remedy. This lower value means that the ROD RG represents a cancer risk of 8×10^{-5} based on the exposure assumptions used to derive the current surface WQC (55.6/0.7 is 79.4, so with 0.7 µg/L set at a target risk of1 x 10^{-6}, the risk at 55.6 µg/L is 8 x 10^{-5}). This risk is below the upper end of USEPA's risk management range (10^{-6} to 10^{-4}) but above the Department of Ecology target cancer risk level of 1 x 10^{-5} for industrial sites.

As reported in the 2020 Trend Analysis Report (Navy, 2021c), TCE concentrations measured in wells 410R, 432, 707, and LTMP-3, were reported as 37 µg/L, 41 µg/L, 2.1 µg/L, and 3.3 µg/L, respectively, which are above the current regulatory value of 0.7 µg/L. Results from individual event sampling of groundwater from compliance wells have been adjusted based on a natural attenuation ratio calculated from salinity differences between groundwater samples and Sinclair Inlet water. This adjustment has not been made with the 2020 results, although the 2020 Trend Analysis Report provides salinity results for these wells and concludes that substantial mixing is occurring in shallow groundwater near the shoreline.

The current regulatory values for pesticides shown in Table 5-4 are based on the lowest of the State of Washington WQC for human health for marine waters (consumption of organisms only), the Clean Water Act National Ambient Water Quality Criteria (NAWQC) for marine waters for human health, the State of Washington WQC for marine waters for aquatic organisms, the Clean Water Act NAWQC for marine waters for aquatic organisms, and the USEPA federally promulgated human health criteria for Washington. These values are lower than the MTCA Method B values for surface water that were used as the basis for the regulatory levels in the ROD. (The MTCA Method B values are also unchanged since the ROD.) As shown in Table 5-4, the current regulatory levels are lower than the LOQs (as were the ROD regulatory levels). As the LOQs are higher than the regulatory levels, the changes in the regulatory levels do not affect the protectiveness of the remedy.

Table 5-4: Groundwater Cleanup Levels for Protection of Surface Water for OU B Terrestrial

Chemical	ROD Regulatory Level (µg/L)	Current Regulatory Level[a] (µg/L)	ROD Basis	ROD Remediation Goal (µg/L)[b]
Trichloroethene	55.6	0.7	MTCA B SW	55.6
4,4'-DDT	0.000356	0.0000012	MTCA B SW	0.000356
4,4'-DDE	0.000356	0.00000088	MTCA B SW	0.000356
Aldrin	0.0000816	0.000000041	MTCA B SW	0.0000816
Dieldrin	0.0000867	0.00000007	MTCA B SW	0.0000867
Heptachlor epoxide	0.0000636	0.0000024	MTCA B SW	0.0000636
Arsenic	5	0.14	Background	5.0
Copper	3.1	3.1	State WQC	3.1
Lead	8.1	8.1	State WQC	8.1
Mercury	0.025	0.025	State WQC	0.025
Nickel	8.2	8.2	State WQC	8.2
Zinc	81	81	State WQC	81

Table 5-4: Groundwater Cleanup Levels for Protection of Surface Water for OU B Terrestrial (continued)

Data sources:
[a] The current regulatory levels were obtained from the Department of Ecology, State of Washington CLARC Data Tables (February 2021). Values that have changed significantly since the ROD have been highlighted. Note that values in the CLARC tables are presented with two significant figures. Changes in regulatory values that occur only due to rounding to two significant figures are not highlighted.
[b] The ROD identifies these levels as conditional point of compliance groundwater criteria, rather than ROD Remediation Goals.

Notes:
Green highlighted cell indicates the current regulatory value is lower than the value at the time of the ROD.
Abbreviations:
µg/kg = microgram per kilogram
CLARC = Cleanup Levels and Risk Calculation
DDE = dichlorodiphenyldichloroethene
DDT = dichlorodiphenyltrichloroethane
DoD = U.S. Department of Defense
LOQ = limit of quantitation
MTCA = Model Toxics Control Act
PAHs = polycyclic aromatic hydrocarbon
PCB = polychlorinated biphenyl
PQL = practical quantitation limit
QSM = Quality Systems Manual
RCRA = Resource Conservation and Recovery Act
ROD = record of decision
SAP = Sampling and Analysis Plan
SVOC = semivolatile organic compound
SW = surface water
USEPA = U.S. Environmental Protection Agency
WAC = Washington Administrative Code
WQC =water quality criteria

5.2.2.4 Operable Unit C

Compliance levels for OU C are referred to as trigger levels, which were based on MTCA Method A regulatory levels. No soil cleanup value was established for OU C because the contaminant depth was approximately 80 to 120 feet below ground surface.

Groundwater. Table 5-5 compares current ARAR values for the protection of surface water with those presented in the quarterly groundwater monitoring reports of OU C. There has been no ARAR revision for groundwater protective of surface water that would affect the protectiveness of the remedy. For OU C, based on discussions between the Navy and Ecology, and in accordance with MTCA (WAC 173-340), MTCA Method A values were used as trigger cleanup levels (Navy, 2007c). No change in MTCA Method A values has occurred since the trigger values were established.

Table 5-5: Groundwater Trigger Levels for Protection of Surface Water for OU C

Chemical	Trigger Level (µg/L)	Current Regulatory Level[a] (µg/L)	Basis[b]
Diesel	500	500	MTCA Method A
Heavy oil	500	500	
Gasoline (GRO without benzene)	1,000	1,000	

Data sources:
[a] The current regulatory levels were obtained from the Department of Ecology, State of Washington CLARC Data Tables (February 2021).
[b] Based on Ecology policy in similar waterfront situations (e.g., Harbor Island and the Seattle waterfront) in the RI/FS report (Navy, 2002g) and ongoing discussions between the Navy and Ecology (Navy, 2007c).

Abbreviations:
µg/L = microgram per liter
MTCA = Model Toxics Control Act
CLARC = Cleanup Levels and Risk Calculation

5.2.2.5 Operable Unit D

The ROD for OU D concluded as long as contaminated soil was contained in place, no action other than ICs and periodic groundwater monitoring was required to ensure protectiveness (Navy et al., 2005). The ROD-selected RGs for soil were based on the protection of adjacent surface waters of Sinclair Inlet. Ten chemicals were identified as COCs in soil at OU D. The cleanup levels for these 10 COCs are based on MTCA Method B soil values for the protection of surface water, except in cases where background concentrations were higher. Table 5-6 compares current ARAR values for soil based on the protection of surface water with those presented in the OU D ROD. Seven of the 10 COCs in soil have changes in toxicity criteria that have changed the MTCA Method B soil cleanup levels protective of surface water. For five of the seven COCs with changes (cPAHs, 4,4'-DDT, dieldrin, cadmium, and mercury), the changes are minor relative to other changes. For PCE and endrin, the changes are more significant. The new values, however, are higher than previous values (i.e., chemicals are less toxic than previously thought). The MTCA Method B soil cleanup level protective of surface water has increased from 0.0552 to 1.0 mg/kg for PCE and from 0.00076 mg/kg to 0.04 mg/kg for endrin. Note that the current soil cleanup levels protective of surface water for PCE and endrin are higher than the maximum concentrations of PCE and endrin reported in the RI (0.17 mg/kg and 0.0033 mg/kg, respectively).

Although the current regulatory levels may be slightly lower than the ROD RGs for some of the COCs, the original cap remedy prevents chemical transport to the adjacent marine environment.

No cleanup level was established for any other site media at OU D. However, periodic groundwater monitoring was selected as part of the remedy. One monitoring well was selected as the conditional point of compliance for groundwater monitoring of COCs in groundwater near the point of discharge to the marine environment. The groundwater criteria selected for monitoring of the COCs in groundwater were established as the higher of the regulatory level or the PQL and were based on protection of adjacent surface waters of Sinclair Inlet. Table 5-7 compares current values for the protection of surface water with the "preliminary remediation goals" presented in the OU D ROD. Since the first FYR, no change in ARARs has been identified that would affect the protectiveness of the selected remedy. However, several regulatory levels have changed since the ROD.

The marine ambient WQC for cadmium has increased from 8.8 to 9.3 µg/L, becoming slightly less conservative. The ROD monitoring level for cadmium remains protective.

The ROD monitoring criteria for DDT, dieldrin, endrin, and mercury were based on the PQL at the time of the ROD. As stated previously, MTCA allows for use of the PQL when the MTCA cleanup level is below the PQL. Current LOQs for DDT, dieldrin, and endrin are similar to the PQLs stated in the ROD, and each of the PQLs remains higher than current regulatory values. Thus, the changes to the regulatory levels have no effect on the protectiveness of the remedy. The fourth FYR noted that endrin had not been detected in compliance wells as reported in the Long-Term Monitoring Trend Analysis Report (Navy, 2015d) (and prior sampling was able to achieve an LOQ below the ROD RG). This finding supported the conclusion that the remedy was protective. However, in a protectiveness evaluation conducted in 2019 (Navy, 2019d), it was recommended that the groundwater monitoring results be compared to the current regulatory criteria for mercury (0.025 µg/L) and endrin (0.0023 µg/L) to be consistent with OU B Terrestrial compliance criteria. Groundwater samples from OU D have not been analyzed for endrin in the past five years.

The ROD-selected groundwater monitoring criterion for copper of 3.1 µg/L is based on the state and federal WQC. The current state and federal WQC for copper is 3.1 µg/L. Therefore, the ROD preliminary RG remains protective.

Table 5-6: Soil Cleanup Levels for Protection of Surface Water for OU D

Chemical	ROD Regulatory Level (mg/kg)	Current Regulatory Level[a] (mg/kg)	ROD Basis[a]	ROD Remediation Goal (mg/kg)
Tetrachloroethene (PCE)	0.0552	1.0	MTCA B	0.0552
cPAHs[b]	0.866	0.678	MTCA B	0.866
4,4'-DDT	0.00729	0.004883	MTCA B	0.00729
Dieldrin	0.0000672	0.0000448	MTCA B	0.0000672
Endrin	0.00076	0.04404	MTCA B	0.00076
Arsenic	2.64	2.64	Area Background	2.64[c]
Cadmium	2.3	2.3	Area Background	2.3[c]
Copper	21.7	21.7	Area Background	21.7[c]
Mercury	0.06	0.06	Area Background	0.06[c]
Zinc	101	101	MTCA B	101

Data sources:

[a]MTCA Method B soil levels protective of surface water were calculated using the "Workbook for Calculating Cleanup Levels for Individual Hazardous Substances" (MTCASGL11; Version NO 11; August 2006) from the Washington State Department of Ecology Toxics Cleanup and were provided by the Workbook tool. The target surface water level was set equal to the most stringent current MTCA B surface water standard or the state/federal water quality criterion. Values that have changed significantly since the ROD have been highlighted. Levels for inorganics are based on Area Background as identified in the OU D ROD.

[b]The preliminary RG in the ROD for cPAHs (total) is based on the MTCA Method B soil cleanup level for protection of surface water for benzo(a)pyrene. The RG for cPAHs in soil requires comparing the TTEC for the seven cPAHs relative to benzo(a)pyrene to the cleanup level derived for benzo(a)pyrene. Note that individual cancer values for cPAHs are now available because of different chemical property values that been established.

[c]The ROD remediation goal is based on area background concentrations.

Notes:

Orange highlighted cell indicates the current regulatory value is greater than the value at the time of the ROD.Green highlighted cell indicates the current regulatory value is less than the value at the time of the ROD.

Abbreviations:
cPAH = carcinogenic polycyclic aromatic hydrocarbon
DDT = dichlorodiphenyltrichloroethane
mg/kg = milligram per kilogram
MTCA = Model Toxics Control Act
RG = remediation goal
ROD = record of decision
TTEC = total "toxicity equivalent" concentration

Table 5-7: Groundwater Monitoring Levels for Protection of Surface Water for OU D

Chemical	ROD Regulatory Level (µg/L)	Current Regulatory Level[a] (µg/L)	ROD Basis	Previous PQL (µg/L)	Current LOQ[b,c] (µg/L)	ROD Preliminary Remediation Goal (µg/L)
4,4'-DDT	0.000356	0.0000012	MTCA B SW	0.01	0.02	0.01[d]
Dieldrin	0.0000867	0.00000007	MTCA B SW	0.01	0.018	0.01[d]
Endrin	0.0023	0.002	State WQC	0.01	0.012	0.01[d]
Arsenic	5	0.14	Background	0.5	0.5	5[e]
Cadmium	8.8	9.3	State/federal WQC	1	0.4	8.8
Copper	2.4	3.1	National Toxics Rule	0.5	0.1	3.1
Mercury	0.025	0.025	State WQC	0.2	0.000025	0.2[d]
Zinc	81	81	State WQC	1.8	0.5	81

Data sources:
[a]The current regulatory levels were obtained from the Department of Ecology, State of Washington CLARC Data Tables (February 2021). Values that have changed significantly since the ROD have been highlighted. Note that values in the CLARC tables are presented with two significant figures. Changes in regulatory values that occur only due to rounding to two significant figures are not highlighted.
[b]In present day terminology, the practical quantitation limit (PQL) is referred to as a "limit of quantitation" (LOQ) in accordance with the DoD Quality Systems Manual for Environmental Laboratories (QSM) [DoD 2013] and the Navy's Tier II SAP format guidelines. The LOQ is synonymous with the PQL, as defined in WAC 173-340.
[c]Source of LOQs is Eurofins Environment Testing or ALS Laboratory, Inc. using the following methods: pesticides by USEPA Method 8081B (for groundwater), total RCRA metals by USEPA Method 6020B, and mercury by USEPA Method 1631E.
[d]The ROD states that the goal is based on the PQL, which is allowed by WAC 173-340 if cleanup levels are below the PQL. Note, however, that the PQLs have changed since the ROD was published.
[e]The ROD remediation goal for arsenic is based on the area background concentration established in the OU B remedial investigation report.

Notes:
Orange highlighted cell indicates the current regulatory value is greater than the value at the time of the ROD. Green highlighted cell indicates the current regulatory value is less than the value at the time of the ROD.

Abbreviations:
µg/kg = microgram per kilogram
CLARC = Cleanup Levels and Risk Calculation
DDT = dichlorodiphenyltrichloroethane
DoD = U.S. Department of Defense
LOQ = limit of quantitation
MTCA = Model Toxics Control Act
PQL = practical quantitation limit
QSM = Quality Systems Manual
RCRA = Resource Conservation and Recovery Act
ROD = record of decision
SAP = Sampling and Analysis Plan
SW = surface water
USEPA = U.S. Environmental Protection Agency
WAC = Washington Administrative Code
WQC =water quality criteria

5.2.2.6 Operable Unit NSC

For OU NSC, soil cleanup levels were based on industrial site use, and groundwater cleanup levels were based on the protection of adjacent surface waters of Sinclair Inlet. For the COCs in soil and groundwater listed in the OU NSC ROD, no revision to the ARARs was found that would affect the protectiveness of the remedy.

Soil. Table 5-8 compares current ARAR values for the soil with those documented in the OU NSC ROD (Table 8-2 of Navy et al., 1996). The current MTCA Method C industrial soil cleanup level for total PCBs of 66 mg/kg is higher than the cleanup level selected in the ROD (17 mg/kg); therefore, the RG for total PCBs remains protective of human health and the environment.

As discussed above for OU A, the current MTCA Method C industrial value is 130 mg/kg for benzo(a)pyrene, which was updated in 2020 based on updates to USEPA toxicity values, as summarized in an Ecology memorandum (Ecology, 2020). Because this represents an increase in the cleanup level, the ROD RG remains protective. MTCA Method C industrial values are presented in Table 5-8 using the TEFs for cPAHs provided by Ecology (Ecology, 2015a). As noted in Table 5-8, current MTCA Method C industrial values have been calculated for the individual cPAHs. While MTCA Method C industrial values are now available for individual cPAHs using the same TTEC methodology, in most cases (i.e., more than one cPAH present), there is no real difference in the cPAH RG, and the remedies remain protective.

As described in the second FYR for TPH in soil, the ROD selected a RG of 200 mg/kg based on the MTCA Method A cleanup levels for TPH in soil. Current MTCA Method A values have been available since the second FYR for each of the specific fuel type fraction ranges of diesel, heavy oil, mineral oil, gasoline with benzene, and gasoline without benzene. As shown in Table 5-8, the ROD-selected RG of 200 mg/kg is protective for all the newer individual TPH compounds, except gasoline. However, the residual TPH in soil at OU NSC is more likely in the diesel range rather than the gasoline range, and the new lower TPH-G levels do not apply to the site. Benzene was not identified as a COC in the risk assessment, indicating that the TPH-G “with benzene” MTCA Method A value of 30 mg/kg is not relevant. According to the fourth FYR report (Navy, 2017b), TPH-G was detected at relatively low concentrations at depth (from 8 to 15 feet below ground surface), with a maximum detected concentration of 160 mg/kg and a frequency of detection of 8 out of 39 samples. In contrast, TPH-D was detected in 30 of 39 samples, with a maximum concentration of 1,800 mg/kg. While the maximum historical TPH-G concentration is above the current TPH-G MTCA Method A unrestricted level of 100 mg/kg (without benzene), the low frequency of detection in soil combined with the lack of detections of TPH-G in groundwater appear to confirm that the heavier petroleum products are the source of TPH at OU NSC. In addition, the MTCA Method A values are intended to be protective of unrestricted land use, and ICs are in place that will prevent residential use of the site. Therefore, the ROD-selected RG for TPH remains protective.

Groundwater. Table 5-9 compares current regulatory values for the protection of surface water with those presented in the OU NSC ROD (Table 8-1 of Navy et al., 1996). Since the previous FYR was performed, no ARAR revision that has been made for groundwater protection of surface water has affected the protectiveness of the remedy. As listed above for OU A, the RGs listed for many of the COCs in the OU NSC ROD are based on the laboratory PQL. For OU NSC, most of the COCs for which PQLs were used are currently being monitored. The PQL changes are described below.

Arsenic is the only remaining COC where the RG was based on the PQL. As the current LOQ is the same as the ROD PQL, there is no ARAR revision for arsenic in groundwater that would affect the protectiveness of the remedy. In a protectiveness evaluation conducted in 2019 (Navy, 2019d), it was recommended that the arsenic RG be updated to 5 µg/L (the local background concentration of arsenic in groundwater) consistent with the RGs identified for OU B Terrestrial and OU D.

ROD RGs for copper, lead, and nickel were based on the marine ambient WQC at the time of the ROD, which, as shown in Table 5-9, are lower than current regulatory levels. Thus, there are no ARAR revisions for these metals in groundwater that would affect the protectiveness of the remedy.

The RGs for alpha-BHC, alpha-chlordane, gamma-chlordane, DDT, and PCBs were based on the PQL at the time the ROD was completed. When groundwater monitoring at OU NSC began in 1998, analyses for the COCs were based on ROD PQLs. However, as analytical techniques improved over time, updates were made to the groundwater monitoring program and the lowest quantitation limits available at that time were used for that groundwater monitoring event. By spring 2002, groundwater samples were analyzed for these COCs using quantitation limits less than ROD PQLs and similar to the current LOQs listed in Table 5-9. None of these five COCs were detected at the lower quantitation limits. Because these COCs were not detected at lower quantitation limits over multiple consecutive sampling events, the COCs were dropped from the analyte list after spring 2003; this was done in accordance with the first FYR and 2002/2003 annual monitoring report recommendation to not sample with the approval of USEPA and Ecology. However, the four pesticides and total PCBs were analyzed in groundwater samples from OU NSC during the 2020 LTM event (Navy, 2021c) to ensure that the remedy remains consistent with the RAOs as recommended in the protectiveness evaluation (Navy, 2019d). As current laboratory LOQs (similar to ROD PQLs) have not significantly changed, there is no ARAR revision for these COCs in groundwater that would affect the protectiveness of the remedy.

For TPH in groundwater, the ROD selected a RG of 1,000 µg/L based on the MTCA Method A values for TPH. This value was intended to be compared to the total concentration of all TPH compounds, which was the common approach to reporting and assessing petroleum concentrations at the time the ROD was signed. However, petroleum is now commonly analyzed for the individual carbon-fraction ranges for specific fuel types. MTCA Method A values have been available since the second FYR for each of the specific fuel-type fraction ranges of diesel, heavy oil, mineral oil, gasoline with benzene, and gasoline without benzene. Because current MTCA Method A values are no longer available for total TPH, a straight comparison of present and past MTCA Method A levels cannot be made for TPH. The ROD-selected RG of 1,000 µg/L is equal to the current MTCA Method A level for gasoline without benzene, but is less protective than the current MTCA Method A values for the other individual fractions. Because benzene was not selected as a COC in groundwater, it is unlikely to be present. Therefore, use of the ROD RG value of 1,000 µg/L remains appropriate for gasoline monitoring based on current MTCA standards. For diesel monitoring, however, a value of 500 µg/L is more appropriate than the ROD RG of 1,000 µg/L. Similarly, a value of 500 µg/L is more appropriate than the ROD RG of 1,000 µg/L when evaluating monitoring results for heavy oil or mineral oil. The changes in the MTCA Method A groundwater cleanup values for TPH compounds since the ROD do not affect the protectiveness of the remedy because recent concentrations are less than those observed at the time of the ROD (Navy, 2017b, Table 7-17; Navy, 2021c), when risks were found to be acceptable. However, monitoring results should be compared to the current MTCA Method A values when making decisions regarding monitoring (such as changes to the monitoring frequency). The current Petroleum Management Plan includes the current MTCA Method A value for comparison.

Vapor Intrusion. The 2001 MTCA revisions included language for the evaluation of the vapor intrusion pathway at sites where the maximum diesel-range organic concentration in soil exceeds 10,000 mg/kg. As discussed in the second FYR, OU NSC fits this criterion. Therefore, in 2003 (at the request of Ecology), a vapor intrusion evaluation was conducted for OU NSC (Navy, 2004b). This evaluation used modeling to predict air concentrations from soil and groundwater and included an evaluation of the potential health risks to industrial workers associated with inhalation of indoor and outdoor air at OU NSC. Modeled air concentrations were compared to calculated MTCA Method C air cleanup levels. The vapor intrusion evaluation concluded that the vapor intrusion pathway is not a health concern to industrial workers at OU NSC.

For this fifth FYR, modeled air concentrations from the 2004 vapor intrusion evaluation were compared to current MTCA Method C air cleanup levels provided in the CLARC data tables (Ecology, 2021a). Both the modeled indoor and outdoor air concentrations are below current MTCA Method C air cleanup levels. Thus, revisions to MTCA Method C values since the vapor intrusion evaluation was conducted do not affect the protectiveness of the remedy selected for OU NSC.

Table 5-8: Soil Cleanup Levels for OU NSC

Chemical	ROD Remediation Goal[a] (mg/kg)	ROD Basis	Current Regulatory Level[b] (mg/kg)
Lead	1,000	MTCA A Industrial	1,000
cPAHs[c]	18	MTCA C Industrial	130
Benzo(a)anthracene	-	MTCA C Industrial	1,300
Benzo(a)pyrene	-	MTCA C Industrial	130
Benzo(b)fluoranthene	-	MTCA C Industrial	1,300
Benzo(k)fluoranthene	-	MTCA C Industrial	1,300
Chrysene	-	MTCA C Industrial	13,000
Dibenz(a,h)anthracene	-	MTCA C Industrial	1,300
Indeno(1,2,3-cd)pyrene	-	MTCA C Industrial	1,300
Total PCBs	17	MTCA C Industrial	66
Total petroleum hydrocarbons	200	MTCA A	NA
Diesel	-	-	2,000
Heavy oil	-	-	2,000
Mineral oil	-	-	4,000
Gasoline with benzene	-	-	30
Gasoline without benzene	-	-	100

Data sources:
[a] ROD Table 8-2 (Navy et al., 1996).
[b] Department of Ecology, State of Washington, CLARC Data Tables (February 2021); complies with MTCA Cleanup Regulation, WAC 173-340. Values that have significantly changed since the ROD have been highlighted.
[c] The remediation goal (RG) in the ROD for cPAHs (total) is based on the MTCA Method C industrial soil cleanup level for benzo(a)pyrene (Department of Ecology, State of Washington, CLARC Data Tables [February 2021]; complies with MTCA Cleanup Regulation, chapter 173-340 WAC). The RG for cPAHs in soil requires comparing the TTEC for the seven cPAHs relative to benzo(a)pyrene to the cleanup level derived for benzo(a)pyrene. The 2021 MTCA Method C industrial soil cleanup level for benzo(a)pyrene has been updated based on changes to toxicity values to 130 mg/kg; MTCA Method C industrial values have been calculated for individual cPAHs based on the toxicity equivalency factors (Ecology, 2015a). The individual values may be used if only one cPAH is detected. If multiple cPAHs are present, the TTEC approach must be used.

Notes:
Yellow highlighted cell indicates a regulatory value that has changed since the time of the ROD.
Orange highlighted cell indicates the current regulatory value is greater than the value at the time of the ROD.
- - An individual cleanup goal was not provided in the ROD. Rather, concentrations of these individual cPAHs were normalized to benzo(a)pyrene values using the TTEC approach.

Abbreviations:
cPAH = carcinogenic polycyclic aromatic hydrocarbon
CLARC = Cleanup Levels and Risk Calculation
mg/kg = milligram per kilogram
MTCA = Model Toxics Control Act
NA = not applicable
PCB = polychlorinated biphenyl
RG = remediation goal
ROD = record of decision
TTEC = total "toxicity equivalent" concentration
WAC = Washington Administrative Code

Table 5-9: Groundwater Cleanup Levels for Protection of Surface Water for OU NSC

Chemical	ROD Regulatory Level[a] (µg/L)	Current Regulatory Level[b] (µg/L)	ROD Basis	Previous PQL (µg/L)	Current LOQ[c,d] (µg/L)	ROD Remediation Goal (µg/L)
Arsenic	0.0982	5[e]	MTCA B SW	0.5	0.5	0.5
Copper	2.5	3.1	State WQC	2.5	0.1	2.5
Lead	5.8	8.1	State WQC	5	0.4	5.8
Nickel	7.9	8.2	State WQC	5	2	7.9
Alpha-BHC	0.0079	0.000048	MTCA B SW	0.01	0.018	0.01
Alpha-chlordane	0.000354	0.000022	MTCA B SW	0.01	0.027	0.01
Gamma-chlordane	0.000354	0.000022	MTCA B SW	0.01	0.02	0.01
4,4'-DDT	0.000356	0.0000012	MTCA B SW	0.02	0.02	0.02
Total PCBs	0.000027	0.000007	MTCA B SW	0.2	0.45	0.2
Total petroleum hydrocarbons	1,000	NA	MTCA A	250	250	1,000
Diesel	-	500	MTCA A	-	-	-
Heavy oil	-	500	MTCA A	-	-	-
Mineral oil	-	500	MTCA A	-	-	-
GRO with benzene	-	800	MTCA A	-	-	-
GRO without benzene	-	1,000	MTCA A	-	-	

Data sources:
[a] ROD Table 8-1 (Navy et al., 1996).
[b] Department of Ecology, State of Washington, CLARC Data Tables (February 2021); complies with MTCA Cleanup Regulation, WAC 173-340. Values that have changed significantly since the ROD have been highlighted.
[c] In present day terminology, the practical quantitation limit (PQL) is referred to as a "limit of quantitation" (LOQ) in accordance with the DoD Quality Systems Manual for Environmental Laboratories (QSM) [DoD 2013] and the Navy'sTier II SAP format guidelines. The LOQ is synonymous with the PQL, as defined in WAC173-340.
[d] Source of LOQs is Eurofins Environment Testing or ALS Laboratory, Inc., using the following methods: SVOCs by USEPA Method 8270E (SIM), PAHs by USEPA Method 8270DE (SIM), PCB Aroclors by USEPA Method 8082A (for groundwater), pesticides by USEPA Method 8081B (for groundwater), and total RCRA metals by USEPA Method 6020B.
[e] Background level, as recommended in the Navy's Final Remedy Protectiveness Evaluation (Navy, 2019d).

Yellow highlighted cell indicates a regulatory value that has changed since the time of the ROD. Orange highlighted cell indicates the current regulatory value is greater than the value at the time of the ROD. Blue highlighted cell indicates that the chemical is no longer included in the long-term monitoring program. Green highlighted cell indicates the current regulatory value is less than the value at the time of the ROD.
- - An individual cleanup goal was not provided in the ROD.
Abbreviations
µg/kg = microgram per kilogram
BHC = benzene hexachloride
CLARC = Cleanup Levels and Risk Calculation
DDT = dichlorodiphenyltrichloroethane
DoD = U.S. Department of Defense
GRO = gasoline-range organics
LOQ = limit of quantitation
MTCA = Model Toxics Control Act
PAH = polycyclic aromatic hydrocarbon
PCB = polychlorinated biphenyl
PQL = practical quantitation limit
QSM = Quality Systems Manual
RCRA = Resource Conservation and Recovery Act
ROD = record of decision
SAP = Sampling and Analysis Plan
SVOC = semivolatile organic compound
SW = surface water
USEPA = U.S. Environmental Protection Agency
WAC = Washington Administrative Code
WQC =water quality criteria

5.2.3 Changes in Toxicity and Other Contaminant Characteristics

Changes to toxicity criteria have occurred since the signing of the five RODs. These changes have been highlighted on Tables 5-1 through 5-8 as differences between the ROD regulatory values and current regulatory values. Current regulatory values were obtained from Ecology's CLARC tables, which were last updated in February 2021 with toxicity values used by USEPA to calculate the RSLs. The toxicity values used to calculate RSLs are selected using a hierarchy of toxicological sources, with the Integrated Risk Information System (IRIS) as its number one source. In addition, the toxicity values provided in the CLARC data tables were reviewed for each of the COCs and were found to be consistent with the latest IRIS toxicity criteria for all COCs.

In most instances, where differences between the ROD and current regulatory values have been highlighted, changes to toxicity values do not affect the protectiveness of the remedy. The protectiveness is not affected because either (1) the RG was selected as the PQL, which is lower over time as laboratory methods improve, or (2) the current regulatory level is higher than the value established in the ROD and is therefore less conservative than the enforceable ROD value. Thus, the protectiveness of the selected remedy is not affected. One exception to this is the toxicity values for TCE, which are discussed as part of OU B Terrestrial.

Toxicity values for the supplemental risk evaluations were also reviewed. Inhalation toxicity values used in the supplemental vapor intrusion evaluations at OU NSC and OU B Terrestrial are consistent with current inhalation toxicity values. Thus, the results of those evaluations have not changed. In addition, the toxicity values for mercury and PCBs used to evaluate consumption of seafood have not changed since those evaluations were completed.

Changes in toxicity values for three COCs, arsenic in soil at OU A, benzo(a)pyrene in soil at OU A and OU NSC, and TCE in groundwater at OU B Terrestrial, result in RGs that are different than the values established in the RODs. At OU A, the remedy remains protective for exposure to arsenic as the combination of ICs and pavement cap will minimize exposure to arsenic in soil. At OU B Terrestrial, while the groundwater RG for TCE is now lower than the value established in the ROD, the protectiveness of the selected remedy is not affected as addressed in Section 5.2.2.3. At OU A and OU NSC, the remedy remains protective as the revised values for benzo(a)pyrene and other cPAHs are higher than the RGs in the ROD.

5.2.4 Changes in Risk Assessment Methods

EPA has issued revisions to several chapters of the Exposure Factors Handbook.

The revised chapters are:

- Chapter 3: Ingestion of Water and Other Select Liquids
- Chapter 5: Soil and Dust Ingestion
- Chapter 9: Intake of Fruits and Vegetables
- Chapter 11: Intake of Meats, Dairy Products, and Fats
- Chapter 12: Intake of Grain Products
- Chapter 19: Building Characteristics

Risk-based cleanup levels selected for RGs are based on default exposure parameters set forth in MTCA and, therefore, USEPA changes to default exposure parameters do not affect risk-based RGs at any of the OUs.

5.2.5 Changes in Exposure Pathways

Exposure pathways that were identified after the RODs were signed were previously identified in the third FYR. The additional exposure pathways identified included potential exposure to contaminants previously capped at OU D, vapor intrusion in selected locations of OU B Terrestrial, and exposures to mercury in seafood consumed by subsistence fishers for OU B Marine.

No new exposure pathways have been identified for any of the OUs during this fifth FYR.

Amendments were made to the SMS rule for fish consumption that were identified as part of the fourth FYR. As stated on Ecology's Toxic Cleanup Program website, Ecology planned to include a default fish consumption rate for calculating sediment cleanup levels to protect human health but elected not to do so at that time. Instead, the rule amendments include a narrative that requires the fish consumption rate to be based on a tribal exposure scenario. As a Suquamish Tribe-specific total seafood consumption rate of 767 grams/day was used in the supplemental risk evaluation for exposures to mercury in seafood (Navy, 2010d), the SMS amendments do not affect the results of the supplemental risk evaluation and conclusions as reported in the 2010 risk evaluation remain the same: HQs exceed the target goal of 1 for seafood consumption due to mercury in both Sinclair Inlet and non-urban reference areas of Puget Sound at tribal consumption rates.

5.2.6 Expected Progress Toward Meeting RAOs

The remedies implemented at OU C, OU D, and OU NSC are meeting RAOs and are currently protecting human health and the environment. Potential exposure pathways and infiltration pathways that could increase contaminant migration and result in unacceptable risks are being controlled and monitored.

For OU B Terrestrial, the RAOs to limit human exposure to site soils and groundwater are not being met due to erosion issues at Segment 4; the RAO based on the need to contain contaminated terrestrial media (i.e., accumulated stormwater system sediment and debris, soil, and groundwater) and limit transport to the adjacent marine environment is not being met. The Navy is currently taking action to investigate presence of mercury in the environment at OU B Marine and identify transport pathways to OU B Marine.

5.3 Question C

Has any other information come to light that could call into question the protectiveness of the remedy?

Yes; a preliminary assessment for PFAS, an emerging class of chemicals, and an analysis of climate change effects were conducted during this FYR period.

5.3.1 Emerging Chemicals of Environmental Concern

Certain PFAS have been identified by the DoD as emerging chemicals of concern. In accordance with Navy policy (Deputy Assistant Secretary of the Navy [DASN], 2016), the Navy completed a Preliminary Assessment (Navy, 2020f) that documented potential sources of PFAS at BNC. Of the areas evaluated, 22 areas located at BNC were considered potential PFAS release areas and recommended for additional investigation as part of a Site Inspection. Currently, there is no documentation of PFAS contamination and there are LUCs in place preventing groundwater use. Once sampling has been conducted, a determination on the protectiveness of the remedy can be made with regard to PFAS.

Based on information obtained during the PFAS PA (Navy, 2020f), transferred properties within the OU D footprint were evaluated for potential PFAS release areas (CH2M, 2020). OU D was formerly used for administrative support functions, scrap metal storage, and small canister fire training. The documented fire training activities were conducted outside building 289 within OU D in the early to mid-1980s. It is unknown whether aqueous film-forming foam (AFFF) was used at this location; however, due to the time frame of the fire training activities and the use of diesel oil as a fuel source, it is possible that AFFF was used and released at this area. Therefore, OU D is considered a potential off-base PFAS release area and is recommended for additional investigation as part of the Site Inspection.

5.3.2 Climate Change

Based on a recommendation made in the fourth FYR, the Navy completed a Climate Change Analysis (Navy, 2019h) to provide a high-level screening assessment to evaluate plausible future climate conditions at BNC for the year 2050 based on current climate science and to assess the effects of these conditions on the protectiveness of the remedies for the terrestrial OUs (OU A, OU B T, OU NSC, OU C, and OU D) adjacent to Sinclair Inlet. The analysis identified areas, infrastructure, and systems related to the terrestrial OU remedies that could be impacted by climate change. Potential hazards associated with climate and weather phenomena include permanent inundation, nuisance and temporary flooding, and wind/wave damage to infrastructure and engineered systems that are part the protectiveness remedies. Based on the results of Climate Change Analysis, sea levels in the Pacific Northwest are projected to rise by 7 inches to 25 inches by 2050; the relative sea level change for BNC is estimated to be between 8 and 10 inches with a likely range of 6 to 12 inches and an upper range estimate of 24 inches.

Future sea level rise is typically evaluated as an increase above the mean higher high water (MHHW) elevation for a particular area. Aside from sea level, another typical metric used for climate change analysis is the 100-year return level or 100-year storm, which is defined as a storm that has a 1 percent chance of occurring in any particular year. To evaluate the nature and extent of the potential hazards and impacts to the terrestrial OU remedies under the plausible future conditions identified for BNC in 2050, the Climate Change Analysis utilized geographic information system capabilities, and LiDAR data were used to identify areas across the terrestrial OUs that would be affected by permanent inundation due to sea level rise and temporary inundation due to the 100-year storm. Five scenarios were evaluated as part of the Climate Change Analysis:

- Scenario 1: MHHW plus 1 foot of sea level rise
- Scenario 2: MHHW plus 2 feet of sea level rise
- Scenario 3: 100-year storm surge (approximately equivalent to MHHW plus 3 feet of sea level rise)
- Scenario 4: 100-year storm surge plus 1 foot of sea level rise
- Scenario 5: 100-year storm surge plus 2 feet of sea level rise

The results of the Climate Change Analysis are discussed below by OU.

OU A

The greatest effects as they relate to climate change at OU A were observed along the entire shoreline but have the greatest impact along Charleston Beach. With 1 foot of sea level rise, Charleston Beach would be permanently inundated up to or above the OU A boundary, and greater sea level rise would lead to deeper inundation into the OU. The projected inundation only depicts permanent inundation and does not account for the effects of waves/high waves.

Increased storm intensity will increase the rate and extent of erosion on portions of the beach and the adjacent areas. Shoreline segments that are not hardened with armor rock and/or sheet pile will likely have more erosion due to increased wave action and sea level rise. Beach erosion has exposed waste debris in the past, requiring interim beach repair actions. As discussed in Section 2.2.2, a permanent beach repair design is currently underway (Navy, 2019h).

OU B Terrestrial

In the western portion of OU B Terrestrial, a sea level rise of 1 foot or higher is projected to permanently inundate temporary structures and shoreline stabilization areas along Wycoff Way. No storm drains or monitoring wells are anticipated to be permanently or temporarily inundated in any of the five scenarios, as they are located inland of the immediate coastline.

In the central and eastern portions of OU B Terrestrial, all piers, dry docks, moorings, and temporary structures within the OU boundaries are projected to be impacted by 1 foot or more of sea level rise by permanent and/or temporary inundation. It should be noted that the piers and structures on the piers are not part of the OU B Terrestrial remedy, but the stormwater drains and outfalls are. In the central portion of OU B Terrestrial, seawalls on either side of Dry Dock 4 will also potentially be inundated by 1 foot or more of sea level rise. Shoreline stabilization areas are anticipated to be directly in contact with water at 2 feet of sea level rise and temporarily inundated during 100-year storm conditions.

In the easternmost portion of OU B Terrestrial, buildings along the shoreline and the storm drain system around the dry docks will potentially be inundated permanently with a 2-foot sea level rise. The shoreline adjacent to OU D is covered with riprap and is steep and protected to the east by the piers for the adjacent ferry terminal (Navy, 2019h).

OU NSC

At OU NSC, 1 foot of sea level rise is projected to encroach on Wycoff Way, between Barclay Street and W Street. Storm drains along Wycoff Way will potentially be temporarily and permanently inundated by 1 or more feet of sea level rise. Buildings that serve as a warehouse and contain offices could be impacted by 1 foot of sea level rise during a 100-year storm event (Navy, 2019h).

OU C and OU D

Climate change phenomena such as sea level rise and increasing storm intensity are not projected to impact either OU C or OU D by the year 2050.

Based on the results of this screening evaluation, the greatest potential impacts to the terrestrial OU remedies would occur in the shoreline industrial OUs: OU B Terrestrial and OU NSC. The hardscape covers and buildings that serve as barriers to surface water infiltration and subsequent contaminant migration could potentially be damaged by permanent inundation and wave action associated with gradual sea level rise and temporary flooding associated with extreme weather events like a 100-year storm. Approximately 160 storm drains and catch basins could be either permanently or temporarily inundated due to sea level rise or storm surge. Inundation and increased storm intensity and rainfall would alter the basis of design conditions for the surface water management system as well as potentially damage the infrastructure. Although no monitoring wells are in areas that could be potentially inundated, sea level rise may potentially alter overall groundwater conditions and increase the potential for contaminant migration from subsurface source areas to the marine environment. Point-of-compliance monitoring wells may also need to be re-evaluated with respect to screen elevations and locations (Navy, 2019h).

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6.0 Issues/Recommendations

Issues/Recommendations
OU(s) without Issues/Recommendations Identified in the Five-Year Review:
• *OU C*

Issues and Recommendations Identified in the Five-Year Review:

OU(s): A, B Marine, B Terrestrial, D, NSC	Issue Category: Changed Site Conditions			
	Issue: Conceptual Site Model			
	Recommendation: Reevaluate fate and transport modeling assumptions and results to update the CSM and determine if terrestrial groundwater remedies remain protective of human health and the marine environment. Findings will be documented in an independent report, which is expected to be completed by December 2025 and a summary will be included in the next FYR report.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	Navy	USEPA/State	Estimated 2025

OU(s): A, B Marine, B Terrestrial, D, NSC	Issue Category: Monitoring			
	Issue: LTM frequency			
	Recommendation: After the fate and transport model is updated, the LTM sampling frequency/schedule will be reevaluated and adjusted, if necessary, to ensure that data collected can be used to update the CSM and subsequently the LTM plan.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	Navy	USEPA/State	By the next FYR

OU(s):	**Issue Category: Monitoring**			
A, B Marine, B Terrestrial	**Issue:** LTM network			
	Recommendation: Review previous LTM data to optimize the monitoring network and list of COCs based on previous LTM analytical data and the updated Fate and Transport model.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	Navy	USEPA/State	By the next FYR

OU(s):	**Issue Category: Site Access/Security**			
A	**Issue:** Signage			
	Recommendation: Repair and/or replace faded and fallen over "No Trespassing" signs along shoreline.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
Yes	Yes	Navy	USEPA/State	Estimated 2023

OU(s):	**Issue Category: Remedy Performance**			
B Terrestrial	**Issue:** Shoreline			
	Recommendation: Develop a plan to stabilize the shoreline along Segment 4, while considering actions needed in light of the USGS finding that groundwater discharges to surface water in this area. Involve both the OU B Marine and BNC Terrestrial teams in planning for action along Segment 4. This action pertains to an emergency action repair. (Note: Plan is currently in progress.)			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
Yes	Yes	Navy	USEPA/State	October 2022

<table>
<tr><td rowspan="3">OU(s):
A
B Terrestrial</td><td colspan="4">Issue Category: Remedy Performance</td></tr>
<tr><td colspan="4">Issue: Shoreline</td></tr>
<tr><td colspan="4">Recommendation: Implement the plan to stabilize the shoreline along Charleston Beach and Segment 4. This action pertains to the longer term repair of the shoreline.</td></tr>
<tr><td>Affect Current Protectiveness</td><td>Affect Future Protectiveness</td><td>Party Responsible</td><td>Oversight Party</td><td>Milestone Date</td></tr>
<tr><td>Yes</td><td>Yes</td><td>Navy</td><td>USEPA/State</td><td>August 2024</td></tr>
</table>

<table>
<tr><td rowspan="3">OU(s):
A</td><td colspan="4">Issue Category: Changed Site Conditions</td></tr>
<tr><td colspan="4">Issue: Lead concentration in soil</td></tr>
<tr><td colspan="4">Recommendation: After the implementation of the Charleston Beach remedy repair, complete a follow-up study to analyze the remaining lead concentrations in soil that are greater than the RCRA hazardous waste criteria and the potential impacts to human health and the environment.</td></tr>
<tr><td>Affect Current Protectiveness</td><td>Affect Future Protectiveness</td><td>Party Responsible</td><td>Oversight Party</td><td>Milestone Date</td></tr>
<tr><td>Yes</td><td>Yes</td><td>Navy</td><td>USEPA/State</td><td>December 2025</td></tr>
</table>

<table>
<tr><td rowspan="3">OU(s):
B Terrestrial</td><td colspan="4">Issue Category: Operations and Maintenance</td></tr>
<tr><td colspan="4">Issue: Stormwater Outfalls</td></tr>
<tr><td colspan="4">Recommendation: Complete stormwater system and outfall repairs to ensure OU B Marine is not subjected to additional contamination and that it is not re-contaminated once a remedy for mercury is implemented. (Note: Contract for repairs in Outfall 15 drainage basin has been awarded; repairs to the Outfall 15 flapper valve are currently planned to be awarded in FY 2024.)</td></tr>
<tr><td>Affect Current Protectiveness</td><td>Affect Future Protectiveness</td><td>Party Responsible</td><td>Oversight Party</td><td>Milestone Date</td></tr>
<tr><td>Yes</td><td>Yes</td><td>Navy</td><td>USEPA/State</td><td>December 2025</td></tr>
</table>

OU(s): B Marine	**Issue Category: Remedy Performance**			
	Issue: Mercury contamination			
	Recommendation: Finalize the FFS, complete the Source Control Action Plan, which is included as Appendix A of the FFS, and prepare a new ROD or ROD amendment based on recent mercury data and implement a remedy for mercury at OU B Marine.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
Yes	Yes	Navy	USEPA/State	TBD (in consult with the Navy)

OU(s): A B Terrestrial, NSC, D	**Issue Category: Remedy Performance**			
	Issue: Groundwater regulatory level			
	Recommendation: After the fate and transport model is updated, the arsenic, mercury, and TCE remedial goals will be updated to 5, 0.025, and 0.7 µg/L, respectfully, and will be formalized in a decision document. These revisions do not affect protectiveness other than TCE at OU B Terrestrial.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	Navy	USEPA/State	By the Next FYR

OU(s): B Marine	**Issue Category: Institutional Controls**			
	Issue: Navy Internal Coordination on M2D2 and SIOP as these programs may affect current and future remedies			
	Recommendation: The Navy CERCLA program team and Project Management Office (PMO) will continue to coordinate on upcoming M2D2/SIOP plans and implementation to protect remedies in place.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	Navy	USEPA/State	By the Next FYR

Abbreviations:
BNC = Bremerton Naval Complex
COC = chemical of concern
CSM = conceptual site model
LTM = long-term monitoring
Navy = United States Department of the Navy
OU = operable unit
ROD = Record of Decision
TBD = to be determined
USEPA = U.S. Environmental Protection Agency
USGS = U.S. Geological Survey

6.1 Other Findings

In addition, the following sections include recommendations that were identified during the FYR and may improve performance of the remedy, reduce costs, and improve management of O&M, but do not affect current and/or future protectiveness.

It should be noted that a base-wide PFAS Site Inspection (SI) is being planned and conducted. However, no data have been reported within the review period, and results of the PFAS SI will be discussed in the next FYR, as appropriate.

6.1.1 OU B Marine

Future Monitoring to Verify Attainment of Cleanup Objectives and Confirm Natural Recovery of Sediment

According to Section 12.2.7 of the OU B Marine ROD (Navy et al., 2000), the LTM of PCBs in marine sediment and marine tissue may terminate when any of the following conditions are met:

- The sediment cleanup goal of 1.2 mg/kg OC PCB is attained, measured as an area-weighted average. The point of compliance for attaining this goal is the top 10 cm of sediment.
- Concentrations of PCBs in English sole from Sinclair Inlet decrease to levels consistent with the cleanup goal.
- The Navy, USEPA, and Ecology mutually agree that continued monitoring is no longer providing useful information.

According to Section 12.2.7 of the OU B Marine ROD, for both marine sediment and marine tissue monitoring, "the results of the sampling program will be documented for the periodic reviews and the specific numbers and types of samples, sampling frequency, and analytical methods could be adjusted in subsequent years after the five-year review based on the results of the monitoring" (Navy et al., 2000).

According to the 2018 OU B Marine LTM Report, "…sediment and fish tissue monitoring results indicate the OU B Marine ROD cleanup objectives have been attained for PCBs. However, because waste has been left in place as part of the OU B Marine remedy, the Navy is committed to ongoing evaluation of the remedy in some form to confirm the remedy remains protective for the five-year review process." Consistent with the OU B Marine ROD, the Navy recommends moving into a new phase, beginning with re-evaluation of future project objectives and adjusting strategies accordingly (Navy, 2020g).

It is anticipated that the Navy, USEPA, Ecology, the Suquamish Tribe, and the DNR will work together to address future project objectives and strategies. A critical part of the discussion will be how these decisions will be documented (e.g., interim remedial action completion report).

Future Monitoring to Confirm the Integrity of the CAD Pit and Capped Area Adjacent to OU A

No criteria in the OU B Marine ROD or design documents indicate specific measurements that may be used to assess the performance or integrity of the CAD pit or capped area adjacent to OU A. Therefore, the most important recommendation is to develop performance criteria and objectives for future monitoring in order to verify integrity of the caps. The mechanisms for working through and documenting these decisions will need to be identified going forward. Regarding the known marine survey data issues and lack of conclusive data for the capped area adjacent to OU A, the following actions are recommended (Navy, 2020g):

- Conduct a thorough review of processed raw data to identify and correct data problems, including the following:
    - Investigate shifts that appear to be consistent because they could reflect simple datum issues or more complex instrument sensor errors.
    - Investigate “along track” errors in the data. These errors present themselves in parallel with the survey track line. While easy to observe, the errors can be more challenging to identify because they can be a symptom of various sources (e.g., multibeam bathymetry sound velocity correction errors, multibeam or SBP sensor alignment or positioning issues, time synchronization errors).
- Conduct a thorough analysis of the survey data from the capped area adjacent to OU A to evaluate possible consolidation and settlement, cap material transport (if any), and other environmental factors that could have an impact on the functioning of the cap. Analysis may include preparation of time-series isopach maps of all monitoring events for supplementing SBP data and calculations of consolidation to verify cap changes over time.

With respect to future marine surveys, the following actions are recommended:

- Require future marine surveys to adhere to established marine survey standard operating procedures (Navy, 2019g) in order to ensure more accurate comparisons among surveys.

- In line with meeting new monitoring objectives, ensure clear direction on the exact areas to be surveyed. For example, the thick-layer cap south of the CAD pit has been inconsistently surveyed in the past.
- Provide a marine survey work plan specifying track line coordinates, survey systems and equipment specifications, datum, units, survey limits, a list of reference monuments to be used for quality assurance, and sound velocity profile frequency and location.
- Require detailed survey reports containing information specified in the marine survey work plan, raw data files, and quality assurance/quality control methods and results.
- Upon receipt of processed raw files, survey reports, and other required deliverables, conduct a thorough review of the native files and related deliverables to verify requirements are met and the survey methodology is accurately documented.
- Consider requirements for aiding future data interpretation, such as standardizing color palettes and adding SBP data to bathymetry cross sections.

6.1.2 OU B Terrestrial

COCs in groundwater at OU B Terrestrial include metals, pesticides, and TCE. The RAOs for OU B Terrestrial are to limit human exposure to site soils and groundwater, and to limit transport and control the threat of recontamination of the adjacent marine environment. The ROD for OU B Terrestrial (Navy et al. 2004a), however, also states that site groundwater conditions were considered sufficiently protective of the marine environment and that no active groundwater remediation was warranted. Therefore, no remedial goals were established for groundwater at OU B Terrestrial. Instead, point of compliance criteria were established to “verify predictions that site groundwater is protective of the marine environment.”

Metals have consistently been detected above criteria at OU B Terrestrial. Current regulatory criteria for metals are the same or higher now as they were at the time the ROD was published. However, because the ROD does not clearly describe the purpose of the groundwater monitoring at OU B Terrestrial as it relates to meeting the RAOs, it is not possible to determine whether site groundwater conditions remain sufficiently protective of Sinclair Inlet.

In the case of mercury, additional studies have shown that concentrations of mercury in OU B Terrestrial may be a significant source of methylmercury to the marine environment of Sinclair Inlet (Navy, 2017b). The Navy is currently engaged with stakeholders to develop a focused feasibility study and identify a remedy for OU B Marine that addresses mercury, including source control measures at OU B Terrestrial, and additional remedial actions for total mercury in sediment to reduce human health risk.

For pesticides, the basis of the compliance criteria was the MTCA Method B surface water cleanup level. The ROD did not consider PQLs. The USEPA's promulgated human health criteria for all pesticides are lower now than the MTCA Method B surface water cleanup levels used at the time of the ROD's publication. However, the current LOQs are still higher than the current USEPA promulgated human health criteria for these classes of chemicals. Monitoring for pesticides has been conducted to the lowest LOQ available at the time of sampling.

TCE is the only COC at OU B Terrestrial that has had a significant change in the groundwater criterion that potentially calls into question the protectiveness of the remedy. The ROD remediation goal for TCE was based on the MTCA Method B surface water value of 55.6 µg/L. The current regulatory level is 0.7 µg/L based on the USEPA federally promulgated human health criterion for Washington, organisms only. The change in the regulatory criteria since the ROD is significant enough that the ROD remediation goal represents a cancer risk of 8×10^{-5} based on the exposure assumptions used to derive the current surface WQC. This is below the USEPA upper limit of 1×10^{-4} for excess cancer risk but exceeds Ecology's target cancer risk level of 1×10^{-5} for industrial sites. TCE has been consistently detected in three wells (410R, 432, and 707), with recent concentrations ranging from 2.1 µg/l to 41 µg/L, which exceed the surface WQC of 0.7 µg/L.

While changes in the WQC do not specifically affect the protectiveness of the remedy for metals and pesticides, an overall assessment of the protectiveness of the remedy at OU B Terrestrial cannot be fully evaluated because the ROD is not clear regarding how to determine if site groundwater conditions remain protective of the marine environment. However, metals are consistently detected at concentrations greater than the compliance criteria (Navy, 2019d); recent studies indicate that concentrations of mercury in environmental media at OU B Terrestrial may be a significant source of methylmercury to the marine environment of Sinclair Inlet, and TCE concentrations are above the revised WQC.

The following actions are recommended to ensure that the remedy remains consistent with the RAOs (Navy, 2019d):

- Revisit the objectives of the groundwater monitoring as it relates to meeting the RAO.

- For pesticides, perform future groundwater analysis using the best available laboratory techniques at the time of sampling.
- Compare future groundwater monitoring results for TCE to the current regulatory criterion to ensure protection of human health.
- Sample the Drydock System 5 effluent discharge for TCE and TCE degradation products to determine if the groundwater meets the WQC at the point of discharge.
- Following the mercury source control evaluations planned for OU B Marine, reconsider the fate and transport model for chemical migration from groundwater to the marine environment and update the conceptual site model, as appropriate.
- Update the assumptions and decision criteria for the terrestrial LTM groundwater sampling and measure progress toward compliance and remedial goals. Evaluate the conveyance for outfalls at BNC and determine the proper inspection location and backup (the evaluation is complete and a final report is pending).

6.1.3 OU C

Inspections at OU C were recently included in the O&M and IC Plan (Navy, 2018c, 2020b). The O&M and IC plan indicates Navy personnel will conduct inspections and evaluations semiannually to determine LUCs are being followed and groundwater is not being used for any purpose other than monitoring. This FYR recommends including the discussion of OU C inspection results in the Annual Remedy Inspection Reports and providing documentation in an appendix.

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7.0 Protectiveness Statement

Protectiveness Statement(s)

Operable Unit:	*Protectiveness Determination:*	
OU A	**Protectiveness Deferred**	**End of FY 2024**

Protectiveness Statement:
The protectiveness determination of the remedy for OU A is deferred based on the interim erosion protection measures being implemented at Charleston Beach and lead concentrations in soil along the shoreline that exceed the RCRA hazardous waste criteria. A 30% BOD for shoreline repairs for OU A Charleston Beach and OU B Terrestrial Segment 4 was prepared. The BOD will be updated in the 60%, 90%, and 100% design phases. The Charleston Beach remedy repair will include the collection of additional soil samples, which will be used in the follow-on study. At the completion of the additional sampling, the protectiveness of the remedy for OU A will be reevaluated.

Operable Unit:	*Protectiveness Determination:*	*No Addendum (with concurrence from stakeholders)*
OU B Marine	**Protectiveness Deferred**	

Protectiveness Statement:
A protectiveness determination of the remedy for OU B Marine is deferred until further information is obtained. The protectiveness of the OU B Marine remedy remains in question because of ongoing sources of mercury to OU B Marine. Mercury is a chemical of concern (COC) for OU B Marine. The magnitude and effects of the mercury source in the Outfall 15 drainage basin, and the potential mercury source located between Dry Docks 5 and 6 where groundwater discharges directly to Sinclair Inlet, are not sufficiently understood. Source control evaluations are incomplete, and a remedy has not been selected for mercury in the marine environment. The Navy is engaged with stakeholders to develop a focused feasibility study and identify a remedy for OU B Marine that addresses mercury source control and considers additional remedial actions for total mercury in sediment to reduce human health risk. Additional sampling at OU B Marine will be delayed pending extensive waterfront construction under the SIOP/M2D2 program that is currently in planning stages; sampling will be conducted either in parallel with construction activities or after completion. At the completion of the additional sampling event and the mercury source control evaluation, the protectiveness of the remedy for OU B Marine will be reevaluated.

Operable Unit:	*Protectiveness Determination:*
OU B Terrestrial	**Not Protective**

Protectiveness Statement:
The remedy implemented at OU B Terrestrial is currently not protective, based on the recently observed shoreline erosion at Segment 4. Additionally, based on recommendations from the 2019 protectiveness evaluation, groundwater monitoring results for TCE will be compared to the current regulatory level (0.7 µg/L) to ensure protection of human health, which also affects the protectiveness of the remedy. Evaluations of OU B Terrestrial as a

Protectiveness Statement(s)	
source of mercury to the marine environment are incomplete. At the completion of the source control evaluation, the protectiveness of the remedy for OU B Terrestrial will be reevaluated. In the interim, the pathways for human exposure are being controlled through ICs that control access to the site, control excavation in contaminated areas, prevent the consumption of groundwater, and limit activities on site to industrial use.	
Operable Unit: **OU C**	*Protectiveness Determination:* **Protective**
Protectiveness Statement: The remedy implemented at OU C currently protects human health and the environment. The cleanup action implemented under the state MTCA regulations continues to prevent migration of free- and dissolved-phase petroleum hydrocarbons from affecting Dry Dock 6 and Sinclair Inlet in order to protect human health and the environment. ICs remain in place to prohibit activities that interfere with monitoring activities and prevent release of petroleum hydrocarbons.	
Operable Unit: **OU D**	*Protectiveness Determination:* **Protective**
Protectiveness Statement: The remedy implemented at OU D is protective of human health and the environment. Exposure pathways and infiltration pathways that could increase contaminant migration and result in unacceptable risks are being controlled and monitored. The conditions and COC concentrations found today in groundwater are similar to those at the time the ROD was executed. Conditions at the time of ROD execution were found not to pose unacceptable risks to human health and the environment as long as exposures and contaminant migration were controlled.	
Operable Unit: **OU NSC**	*Protectiveness Determination:* **Protective**
Protectiveness Statement: The remedy implemented at OU NSC is protective of human health and the environment. Exposure pathways and infiltration pathways that could increase contaminant migration and result in unacceptable risks are being controlled and monitored. The conditions and COC concentrations found today in groundwater are similar to those at the time the ROD was executed. Conditions at the time of ROD execution were found not to pose unacceptable risks to human health and the environment as long as exposures and contaminant migration were controlled.	

Sitewide Protectiveness Statement	
Protectiveness Determination: **Not Protective**	*Planned Addendum Completion Date:* **To Be Determined**
Protectiveness Statement: An overall protectiveness determination of the remedies for the BNC is not protective based on the OU B Terrestrial protectiveness statement. Following collection and evaluation of the necessary additional information, protectiveness determinations will be made for the site as a whole and the individual OUs. A determination for OU B Marine will be delayed due to upcoming M2D2/SIOP planning activities that will need to be completed prior to additional characterization of sediment at OU B Marine.	

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8.0 Next Review

The next five-year review report for the PSNS Superfund Site at the BNC is anticipated to be due on 12 October 2027 (five years from the completion date of this review).

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9.0 References

Ballard Marine Construction, Inc. (Ballard). 2017. Detailed Dredging Plan, Salt Water Project, 1016076, Rev. 7.2. September 6.

Bloom, N.S. 1992. On the Chemical Form of Mercury in Edible Fish and Marine Invertebrate Tissue. Can. J. Fish. Aquat. Sci. 49:1010-1017.

Kathleen E. Conn, Anthony J. Paulson, Richard S. Dinicola, and John F. DeWild. 2018. Tidal Flushing of Mercury through Stormwater Drain to Sinclair Inlet, Kitsap County, Washington, 2011–12—Scientific Investigations Report 2018–5087. ISSN 2328-0328. Access online: https://doi.org/10.3133/sir20185087

CH2M HILL, Inc. (CH2M). 2021. Draft Technical Memorandum, Charleston Beach Soil and Sediment Characterization, Operable Unit A, Bremerton Naval Complex, Bremerton, Washington. Prepare for Naval Facilities Engineering Systems Command Northwest. May.

_____ 2020. Technical Memorandum for Potential Off-Base Per- and Polyfluoroalkyl Substances Source Area Associated with Bremerton Naval Complex, Washington. Prepared for Department of the Navy, Naval Facilities Engineering Command Northwest. September.

_____ 2019. Technical Memorandum, Operable Unit A Charleston Beach, Shoreline Repair Design Review, Bremerton Naval Complex, Bremerton, Washington. Prepared for NAVFAC Northwest. January.

_____ 2017. Technical Memorandum, Habitat Benefits Analysis, Operable Unit A, Charleston Beach, Naval Base Kitsap-Bremerton, Bremerton, Washington. Revised Draft (Rev. 1). December 20.

Jones, J.L., K.H. Johnson, and L.M. Frans. 2016. Numerical Simulation of Groundwater Flow at Puget Sound Naval Shipyard, Naval Base Kitsap, Bremerton, Washington. U.S. Geological Survey Open-File Report 2016-1135, 35 p. http://dx.doi.org/10.3133/ofr20161135

Suquamish Tribe. 2000. Fish Consumption Survey of the Suquamish Indian Tribe of the Port Madison Indian Reservation, Puget Sound Region. Prepared by The Suquamish Tribe, Port Madison Indian Reservation, Fisheries Department. Suquamish, Washington. August 2000.

U.S. Department of Defense (DoD). 2019. DoD, Department of Energy Consolidated Quality Systems Manual (QSM) for Environmental Laboratories, Version 5.3. May.

U.S. Department of the Navy (Navy). 2021a. Shoreline Repair Alternatives Evaluation, Operable Unit A Charleston Beach and Operable Unit B Terrestrial Segment 4, Bremerton Naval Complex, Bremerton, Washington. January.

_____ 2021b. Draft 30% Basis of Design – Shoreline Repair Operable Unit A Charleston Beach and Operable Unit B Terrestrial Segment 4 Bremerton Naval Complex, Bremerton, Washington. May.

_____ 2021c. 2020 Data Summary and Trend Analysis Report, Operable Units A, B T, C, NSC, D, and Petroleum Management Plan, Naval Base Kitsap Bremerton, Bremerton, Washington. September 10.

_____ 2021d. Draft Final Annual Remedy Inspection Report 2020 Long-Term Monitoring, Operations, and Maintenance Naval Base Kitsap Bremerton Terrestrial. Prepared under contract N44255-20-D-6006, task order N4425520F4237. September.

_____ 2021e. Long-Term Monitoring, Inspection, and Improvement Plan Operable Units A, B T, C, NSC, D, and Petroleum Management Plan, Naval Base Kitsap Bremerton, Bremerton, Washington. Prepared by EA Engineering, Science, and Technology, Inc., PBC, under Contract N44255-20-D-6006, Task Order N4425521F4110. October 6.

_____ 2020a. Long-Term Monitoring, Inspection, and Improvement Plan for OU A, OU B T, OU C, OU NSC, OU D, and PMP, Naval Base Kitsap Bremerton, Washington. Prepared by EA Engineering, Science, and Technology, Inc., PBC, for the U.S. Navy, Contract N44255-20-D-6006. Task Order N4425520F4237. October 12.

_____ 2020b. Operation and Maintenance and Institutional Control Plan for OU A, OU B T, OU C, OU NSC, and OU D, Naval Base Kitsap Bremerton, Bremerton, Washington. October.

_____ 2020c. 2019 Annual Remedy Inspection Report, Puget Sound Naval Shipyard (PSNS) Complex Superfund Site, Bremerton, Washington. Contract No. N44255-14-D-9011 Task Order N4425519F4134. USEPA ID: WA2170023418. June 24.

_____ 2020d. Excavation Management Plan for OU A, OU NSC, OU B T, OU C, and OU D, Bremerton Naval Complex, Puget Sound Naval Shipyard Complex Superfund Site, Bremerton, Washington. USEPA ID: WA2170023418. Prepared for NAVFAC NW by Sealaska Environmental Services, LLC. April 10.

_____ 2020e. Institutional Control Plan Operable Unit B Marine, Naval Base Kitsap Bremerton, Bremerton, Washington. September.

_____ 2020f. Preliminary Assessment for Per- and Polyfluoroalkyl Substances (PFAS) Bremerton Naval Complex and Associated Special Areas Bremerton, Washington. Prepared for NAVFAC Northwest by CH2M HILL, Inc. under contract N62470-16-D-9000, task order N4425518F4117. July.

_____ 2020g. 2018 OU B Marine Long-term Monitoring and OU A Intertidal Sediment Sampling Report, Puget Sound Naval Shipyard Superfund Site, Naval Base Kitsap Bremerton, Bremerton, Washington. Prepared for NAVFAC Northwest by CH2M HILL, Inc. under contract N62470-16-D-9000, CTO N44255-18-F-4064. August.

_____ 2020h. 2019 Data Summary and Trend Analysis Report, Naval Base Kitsap Bremerton, Bremerton, Washington. Puget Sound Naval Shipyard Complex Superfund Site. USEPA ID: WA2170023418. May 26.

_____ 2020i. Terrestrial Mercury Assessment Report (Outfall 15 Storm Drain Line Investigation) at Operable Unit B Terrestrial, Bremerton Naval Complex, Bremerton, Washington. Prepared under Contract No. N62470-16-D-9008, CTO N4425519F4152. November.

_____ 2019a. Memorandum of Agreement Between the Department of the Navy and the City of Bremerton. Updated June 10, 2019.

_____ 2019b. Land Use Controls at Naval Base Kitsap Bremerton and Naval Base Kitsap, Instruction (NAVBASEKITSAPINST) 5090.14, PRB41. May 14.

_____ 2019c. 2018 Data Summary and Trend Analysis Report, Puget Sound Naval Shipyard (PSNS) Complex Superfund Site USEPA ID: WA2170023418, Naval Base Kitsap Bremerton, Bremerton, Washington. July 3.

_____ 2019d. Remedy Protectiveness Evaluation, Water Quality Criteria, Naval Base Kitsap Bremerton, Bremerton, Washington for Operable Units A, B Terrestrial, D, and NSC at PSNS Complex National Priorities List Site. Prepared for NAVFAC NW by AECOM Technical Services Inc. under Contract No. N62742-17-D-1800, CTO N4425518F4066. February.

_____ 2019e. 2018 Annual Remedy Inspection Report, Puget Sound Naval Shipyard (PSNS) Complex Superfund Site, Bremerton, Washington. USEPA ID: WA2170023418. Contract No. N44255-14-D-9011 Task Order N4425518F4137. July 3.

_____ 2019f. Operable Unit B Terrestrial Segment 4 Shoreline Design Review, Bremerton Naval Complex. Bremerton, Washington. January.

_____ 2019g. Hydrographic/SBP Survey Data Review, 18 NBK Bremerton OU B Hydrographic Survey/Sub-Bottom Profiling Data Review and SOP Development, Naval Base Kitsap Bremerton. Prepared by Tetra Tech for Department of the Navy, Naval Facilities Engineering Command Northwest. August 1.

_____ 2019h. Final Remedy Protectiveness Evaluation Climate Change Analysis Naval Base Kitsap, Bremerton WA. Prepared by AECOM Technical Services Inc. for Department of the Navy, Naval Facilities Engineering Command Northwest. Contract No. N62742-17-D-1800, Task Order N4425518F4066. February 1.

_____ 2018a. Final Long-Term Monitoring, Inspection, and Improvement Plan for OU A, OU NSC, OU B T, PMP, OU C, AND OU D, Naval Base Kitsap Bremerton, Puget Sound Naval Shipyard Complex Superfund Site USEPA ID: WA2170023418. Prepared under Contract No. N44255-14-D-9011, Task Order N4425518f4137. August 14.

_____ 2018b. 2017 Annual Remedy Inspection Report, Puget Sound Naval Shipyard (PSNS) Complex Superfund Site, Bremerton, Washington. USEPA ID: WA2170023418. Contract No. N44255-14-D-9011, Task Order 51. July 26.

_____ 2018c. Operation and Maintenance and Institutional Control Plan, Puget Sound Naval Shipyard (PSNS) Complex Superfund Site, Naval Base Kitsap Bremerton, Bremerton, Washington. USEPA ID: WA2170023418. Prepared by Battelle Memorial Institute. July 18.

_____ 2018d. 2017 Data Summary and Trend Analysis Report, Naval Base Kitsap Bremerton, Bremerton, Washington. Puget Sound Naval Shipyard Complex Superfund Site. USEPA ID: WA2170023418. May 25.

_____ 2017a. Final 2017 Petroleum Management Plan, Naval Base Kitsap Bremerton, Puget Sound Naval Shipyard Complex Superfund Site, USEPA ID: WA2170023418, Bremerton, Washington. Prepared for NAVFAC Northwest by Sealaska under Contract No. N44255-14-D-9011, LTM/OM, Task Order 37. April 26.

_____ 2017b. Fourth Five-Year Review, Puget Sound Naval Shipyard (PSNS) Complex Superfund Site, USEPA ID: WA2170023418, Bremerton Naval Complex, Bremerton, Washington. October.

_____ 2017c. Supplemental Mercury Investigation Report, PSNS Superfund Site, Bremerton Naval Complex, Bremerton, Washington. Prepared for NAVFAC NW by URS Group, Inc. under Contract No. N44255-09-D-4001, Task Order 51. February 28, 2017.

_____ 2017d. Goals and Objectives for Decision Framework Process for PCBs and Mercury in OU B Marine, Bremerton Naval Complex, Puget Sound Naval Shipyard. Technical memorandum prepared by NAVFAC NW for the OU B Project Managers Team. February 16, 2017.

_____ 2017e. OU A 2017 Interim Erosion Control Completion Report, Naval Base Kitsap Bremerton, Puget Sound Naval Shipyard (PSNS) Complex Superfund Site, Bremerton, Washington. USEPA ID: WA2170023418. Prepared for NAVFAC NW by Sealaska Environmental Services, LLC. December 28.

_____ 2017f. Long-Term Monitoring, Inspection, and Improvement Plan for OU A, OU NSC, OU B T, PMP, OU C, and OU D, Naval Base Kitsap Bremerton, Puget Sound Naval Shipyard (PSNS) Complex Superfund Site, Bremerton, Washington. USEPA ID: WA2170023418. Prepared for NAVFAC NW by Sealaska Environmental Services, LLC. November 3.

_____ 2017g. Water Quality Protection and Monitoring Plan, Repair Saltwater Distribution System, NAVFAC NW, Naval Base Kitsap, Bremerton, WA. Contract #N44255-16-C-7000. December 27.

_____ 2016a. Final Operation and Maintenance and Institutional Control Plan, Puget Sound Naval Shipyard (PSNS) Complex Superfund Site, Naval Base Kitsap Bremerton, Bremerton, Washington. Prepared for NAVFAC NW by Sealaska, under Contract No. N44255-09-D-4005, Task Order 85. March 30, 2016.

_____ 2016b. Final 2014 OU B Marine Phase 2 Long-term Monitoring Report, PSNS Superfund Site, Bremerton Naval Complex, Bremerton, Washington. Prepared for NAVFAC NW by URS Group, Inc., under Contract No. N44255-09-D-4001, Task Order 87. November 11, 2016.

_____ 2016c. Final Long-Term Monitoring, Inspection, and Improvement Plan for OU A, OU NSC, OU B T, PMP, OU C, and OU D, Naval Base Kitsap Bremerton LTM, Bremerton, Washington. Prepared for NAVFAC NW by Sealaska under Contract No. N44255-14-D- 9011, Task Order 19, and Amended under N44255-14-D-9011, Task Order 37, September 6, 2016.

_____ 2016d. Final 2014 Operable Unit B Marine Phase 1 Long-term Monitoring Report, PSNS Superfund Site, Bremerton Naval Complex, Bremerton, Washington. Prepared for NAVFAC NW by URS Group, Inc., under Contract No. N44255-09-D-4001, Task Order 87. March 10.

_____ 2015a. Basis of Design for Operable Unit A, Charleston Beach Long-Term Erosion Control Protection Remedy Design, Bremerton Naval Complex, Bremerton, Washington. 100 Percent, Revision 2. Prepared for NAVFAC NW by

URS Group, Inc. under Contract No. N44255-09-D-4001, Task Order 0067. October 30.

_____ 2015b. Final 2013 Sinclair Inlet Marine Monitoring Data Report, PSNS Superfund Site, Bremerton Naval Complex, Bremerton, Washington. Prepared for NAVFAC NW by URS Group, Inc. under Contract No. N44255-09-D-4001, Task Order 51. February 23, 2015.

_____ 2015c. Final Operation and Maintenance Plan, Puget Sound Naval Shipyard (PSNS) Complex Superfund Site, Naval Base Kitsap Bremerton, Washington. Prepared for NAVFAC NW by Sealaska under Contract No. N44255-09-D-4005, Task Order 72. July 29, 2015.

_____ 2015d. Long Term Monitoring Trend Analysis Report for OU A, OU NSC, OU BT, PMP OU C and OU D, Naval Base Kitsap Bremerton, Washington. Prepared for NAVFAC NW by Sealaska Environmental Services, LLC under Contract No. N44255- 09-D-4005, Task Order 72. March 27, 2015.

_____ 2014a. Final Operation and Maintenance Plan, Naval Base Kitsap Bremerton, Bremerton, Washington. Prepared for NAVFAC NW by Sealaska under Contract No. N44255-09-D-4005, Task Order 59. April 25, 2014.

_____ 2014b. Long-Term Monitoring, Inspection and Improvement Plan for OU A, OU NSC, OU BT, PMP, OU C and OU D, Naval Base Kitsap Bremerton, Washington. Prepared for NAVFAC NW by Sealaska Environmental Services, LLC., under Contract No. N44255-09-D-4005, Task Order 85. July 18, 2014.

_____ 2013a. Long-Term Monitoring, Inspection and Improvement Plan for OU A, OU NSC, OU BT, PMP, OU C and OU D, Naval Base Kitsap Bremerton, Washington. Prepared for NAVFAC NW by Sealaska Environmental Services, LLC., under Contract No. N44255-09-D-4005, Task Order 72. September 20, 2013.

_____ 2013b. Memorandum of Agreement Between the Department of the Navy and City of Bremerton. Executed May 6, 2013.

_____ 2012a. Final Third Five-Year Review, Bremerton Naval Complex, Bremerton, Washington. October 12, 2012.

_____ 2012b. CERCLA Remedy Repair Alternatives Evaluation for Long-Term Protection of Charleston Beach, Operable Unit A, Bremerton Naval Complex, Bremerton, Washington. Prepared for Naval Facilities Engineering Command Northwest by URS Group, Inc. under Contract No. N44255-05-D-5100, Delivery Order 0057. Silverdale, Washington. September 14, 2012.

_____ 2012c. Final Long-Term Monitoring, Inspection and Improvement Plan for OU A, OU NSC, OU B T, PMP, OU C and OU D, Naval Base Kitsap - Bremerton, Bremerton, Washington. Prepared for NAVFAC NW by Sealaska under Contract No. N44255-09-D- 4005, Task Order 59. September 19 2012.

_____ 2011a. Final Long-Term Monitoring Plan for OU A, OU NSC, OU B T, PMP, and OU C, Naval Base Kitsap - Bremerton, Bremerton, Washington. Prepared for NAVFAC NW by Sealaska under Contract No. N44255-09-D-4005, Task Order 42. October 2011.

_____ 2011b. Navy/Marine Corps Policy for Conducting Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Statutory Five-Year Reviews. June 7, 2011.

_____ 2010a. Draft Operable Unit D Remedy Evaluation Report, Bremerton Naval Complex, Bremerton, Washington. Prepared for NAVFAC NW by URS under Contract No. N44255-09-D-4001, Task Order 6. April 2010.

_____ 2010b. Final Charleston Beach Characterization Report, Bremerton Naval Complex, Bremerton, Washington. Prepared for NAVFAC NW by URS Group, Inc., under Contract No. N44255-05-D-5100, Task Order 44. April 2010.

_____ 2010c. Final Beach Dynamics Study for Charleston Beach, Operable Unit A Marine, Bremerton Naval Complex, Bremerton, Washington. Prepared for NAVFAC NW by URS under Contract No. N44255-05-D-5100, Task Order 57. January 2010.

_____ 2010d. Final Technical Memorandum: Human Health Risk Evaluation of Mercury in Sinclair Inlet Seafood, OU B Marine, Bremerton Naval Complex, Bremerton, Washington. Prepared by URS Group, Inc. for Naval Facilities Engineering Command Northwest under Contract No. N44255-05-D-5100, Delivery Order 0028. August 2010.

_____ 2009a. Joint Resolution Statement, OU B Marine, Bremerton Naval Complex. May 7, 2009.

_____ 2009b. Final Institutional Control Work Plan, Bremerton Naval Complex, Bremerton, Washington. Prepared for NAVFAC NW by SES-TECH under Contract No. N44255- 05-D-5101, Task Order 49. May 2009.

_____ 2008. Final Institutional Control Work Plan, Bremerton Naval Complex, Bremerton, Washington. Prepared for NAVFAC NW by SES-TECH under Contract No. N44255- 05-D-5101, Task Order 37. September 2008.

_____ 2007a. Second Five-Year Review, Bremerton Naval Complex, Bremerton, Washington. Prepared by URS Group for NAVFAC NW under Contract No. N44255-05-D-5100, Delivery Order 17. October 2007.

_____ 2007b. Final Remedial Action Report, Vegetated Cap Construction, Operable Unit D, Bremerton Naval Complex, Bremerton, Washington. Prepared for Naval Facilities Engineering Command Northwest by Tetra Tech EC, Inc. under Contract No. N44255- 01-D-2000, RAC 3/Task Order 36. Silverdale, Washington. March 2007.

_____ 2007c. Final Cleanup Action Plan, Operable Unit C, Bremerton Naval Complex, Bremerton, Washington. Prepared for NAVFAC NW under Contract Number N44255- 05-D-5101, Task Order 20. September 2007.

_____ 2007d. Action Memorandum, OU A Charleston Beach, Bremerton Naval Complex. September 5, 2007.

_____ 2006a. Final Operation and Maintenance Plan, Bremerton Naval Complex, Bremerton, Washington. Prepared for NAVFAC NW by Tetra Tech EC, Inc., under Contract No. N44255-01-D-2000, Task Order 18. February 2006.

_____ 2006b. Final Institutional Control Work Plan, Bremerton Naval Complex, Bremerton, Washington. Prepared for NAVFAC NW by Tetra Tech EC, Inc., under Contract No. N44255-01-D-2000, Task Order 18. February 2006.

_____ 2006c. Final Remedial Action Report, Storm Drain Cleaning, Inspection, and Repair, Operable Unit B Terrestrial, Bremerton Naval Complex, Bremerton, Washington. Prepared for Naval Facilities Engineering Command Northwest by Tetra Tech EC, Inc. under Contract No. N44255-01-D-2000, RAC 3/Task Order 9. Silverdale, Washington. September 2006.

_____ 2006d. Final Remedial Action Report, Erosion Control System, Operable Unit B Terrestrial. Phase II Remedial Action Shoreline Protection. Prepared by Tetra Tech Inc. for Naval Facilities Engineering Command Northwest under Contract No. N44255-01-D- 2000, Task Order 017. April 4, 2006

_____ 2005. Final Removal Action Closure Report, Asphalt Pavement Cap, East End Capping – Operable Unit D. Prepared by Tetra Tech FW Inc. for Naval Facilities Engineering Command Northwest under Contract No. N44255-01-D-2000, Task Order 021. January 10, 2005.

_____ 2004a. Final Long-Term Monitoring Plan, Operable Unit B Terrestrial, Bremerton Naval Complex, Bremerton, Washington. Prepared for Engineering Field Activity, Northwest, by URS Group, Inc., under Contract No. N44255-02-D-2008, Delivery Order 0033. July 2004.

_____ 2004b. Technical Memorandum, Screening Evaluation of Vapor Pathway at Operable Unit (OU) NSC, Fleet Industrial Supply Center, Bremerton Naval Station, Bremerton, Washington. Prepared by URS Group, Inc., for Engineering Field Activity, Northwest, under Contract No. N44255-020-D-2008. Poulsbo, Washington. January 2004.

_____ 2004c. Project Summary, R Street Sanitary Sewer and Storm Drain Repairs. Prepared by Tetra Tech FW Inc. for Naval Facilities Engineering Command Northwest under Contract No. N44255-01-D-2000, Task Order 031 and 40. November 17, 2004.

_____ 2004d. Final Closure Report, Bremerton Naval Complex, Operable Unit B Paving Upgrades (GeoEngineers, Inc) Prepared by GeoEngineers Inc. for Naval Facilities Engineering Command Northwest under Contract No. N68711-02-D-8306, Task Order 003. April 8, 2004.

_____ 2003a. 2003 Amended Petroleum Management Plan, Bremerton Naval Complex, Bremerton, Washington. Prepared by URS Group, Inc., Seattle, Washington for EFA NW under Contract No. N44255-02-D-2008, Delivery Order 0024. December 2003.

_____ 2003c. Final Operable Unit B Marine Monitoring Plan, Bremerton Naval Complex, Bremerton, Washington. Prepared for EFA NW by URS Group, Inc., under Contract No. N44255-98-D-4409, Delivery Order 21. September 2003.

_____ 2002a. 2001 Annual Monitoring Report, Operable Unit A, Bremerton Naval Complex, Bremerton, Washington. Prepared by The Environmental Company, Inc., for EFA NW under Contract No. N44255-98-D-4416, CTO 013. October 2002.

_____ 2002b. Final Petroleum Management Plan, Bremerton Naval Complex, Bremerton, Washington. Prepared for Engineering Field Activity, Northwest by The Environmental Company, Inc., under Contract No. N44255-98-D-4416, CTO 022. March 2002.

_____ 2002c. Final Remedial Investigation Report, Operable Unit B, Bremerton Naval Complex, Bremerton, Washington. Prepared for Engineering Field Activity, Northwest by URS Consultants under CLEAN Contract No. N62474-89-D-9295, CTO 0131. March 2002.

_____ 2002d. Final Feasibility Study, Operable Unit B, Bremerton Naval Complex, Bremerton, Washington. Prepared for Engineering Field Activity, Northwest by URS Consultants, Inc. under CLEAN Contract No. N62474-89-D-9295. May 2002.

_____ 2002e. Final Five-Year Review of Record of Decision, Bremerton Naval Complex, Bremerton, Washington. Prepared for Engineering Field Activity, Northwest by URS Group, Inc., under Contract No. N44255-00-D-2476, Delivery Order 0017. Executed October 31, 2002.

_____ 2002f. OU B Marine Post Construction Report and FY00 MCON Project P-338 Closure Report, Bremerton Naval Complex, Bremerton, Washington. Prepared for Engineering Field Activity, Northwest by Foster Wheeler Environmental Corporation, under Contract N44255-95-D-6030. November 2002.

_____ 2002g. Focused Remedial Investigation and Screening-Level Feasibility Study, Steam Sparging Area, Operating Unit C, Puget Sound Naval Shipyard, Bremerton, Washington. Prepared for Engineering Field Activity, Northwest, by Hart Crowser under Contract N44255-98-D-4408. Poulsbo, Washington. April 2002.

_____ 2002h. Final Closure Report, Treatability Study, Operable Unit B. Prepared by Foster Wheeler Environmental Corporation for Naval Facilities Engineering Command Northwest under Contract No. N44255-95-D-6030, Delivery Order 0104 017. November 5, 2002.

_____ 2002i. Final Closure Report, Charleston Beach Habitat Restoration Project, Bremerton Naval Complex, Bremerton, WA. Prepared for Engineering Field Activity, Northwest by Foster Wheeler Environmental Corporation, under Contract N44255-95-D-6030, Delivery Order No. 92. June 28, 2002.

_____ 2000a. Addendum to Final Remedial Action Report, Repairs at Operable Unit A, Naval Station Bremerton, Bremerton, Washington. Prepared for Engineering Field Activity, Northwest by Foster Wheeler Environmental Corporation, under RAC II Delivery Order 0075. December 2000.

_____ 2000b. Final Monitoring Plan for Operable Unit A, Revision 1, Operable Unit A, Bremerton Naval Complex, Bremerton, Washington. Prepared for Engineering Field Activity, Northwest by URS Greiner, Inc., under CLEAN Contract N62474-89-D-9295. Poulsbo, Washington. October 2000.

_____ 2000c. Final Monitoring Plan for Operable Unit NSC, Revision 1, Operable Unit NSC, Bremerton Naval Complex, Bremerton, Washington. Prepared for Engineering Field Activity, Northwest, by URS Greiner, Inc. under CLEAN Contract N62474-89-D-9295. Poulsbo, Washington. October 2000.

_____ 2000d. Remedial Action Report, Paving Sites, Operable Unit B (FWENC),

_____ 1999a. Remedial Action Closeout Report, Remedial Actions at Operable Unit Naval Supply Center, Fleet and Industrial Supply Center, Bremerton, Washington. Prepared for Engineering Field Activity, Northwest, by Foster Wheeler Environmental Corporation under RAC II Delivery Order 0027. April 1999.

_____ 1999b. Final Remedial Action Report, Remedial Design/Remedial Action, Operable Unit A, Puget Sound Naval Shipyard, Bremerton, Washington. Prepared for Engineering Field Activity, Northwest by Foster Wheeler Environmental Corporation under RAC II Delivery Order 0006. August 1999.

_____ 1998a. Closure Report, Site 1-C2, Operable Unit B (FWENC 1998)

_____ 1995a. Final Remedial Investigation Report, Operable Unit A, Bremerton Naval Complex, Bremerton, Washington. Prepared for EFA NW by URS Consultants, Inc. under CLEAN Contract No. N62474-89-D-9295. August 1995.

_____ 1995b. Final Feasibility Study, Operable Unit A, Bremerton Naval Complex, Bremerton, Washington. Prepared for EFA NW by URS Consultants, Inc. under CLEAN Contract No. N62474-89-D-9295. October 1995.

U.S. Department of the Navy, Washington State Department of Ecology, and U.S. Environmental Protection Agency (Navy et al.). 2005. Final Record of Decision, Bremerton Naval Complex, OU D, Bremerton, Washington. May 11, 2005.

_____ 2004a. Final Record of Decision, Operable Unit B Terrestrial, Bremerton Naval Complex, Bremerton, Washington. March 8, 2004.

_____ 2004b. Explanation of Significant Differences, Bremerton Naval Complex, OU B Marine. February 19, 2004.

_____ 2000. Final Record of Decision, BNC OU B Marine, Bremerton, Washington. June 13, 2000.

_____ 1997. Final Record of Decision, Operable Unit A, Missouri Beach Parking Lot and Charleston Beach, Bremerton Naval Complex, Bremerton, Washington. Executed January 29, 1997.

_____ 1996. Final Record of Decision, Operable Unit NSC, Fleet and Industrial Supply Center, Bremerton Naval Complex, Bremerton, Washington. Executed December 13, 1996.

U.S. Deputy Assistant Secretary of the Navy (DASN), 2016. Environmental Restoration Program Manual. Process to efficiently identify, validate, and prioritize the inventory of Sites and Areas of Concern (AOCs) with known, or potential, PFC/PFAS releases. June 20.

U.S. Environmental Protection Agency (USEPA). 2001. Comprehensive Five-Year Review Guidance. Office of Emergency and Remedial Response. USEPA 540-R-01-007. OSWER No. 9355.7-03B-P. June 2001.

Washington State Department of Ecology (Ecology). 2022. Surface water quality: designated uses. April. Accessed at https://ecology.wa.gov/Water-Shorelines/Water-quality/Water-quality-standards/Designated-uses

_____ 2021a. Cleanup Levels and Risk Calculation (CLARC) Data Tables. February. Accessed at https://fortress.wa.gov/ecy/clarc/CLARCDataTables.aspx.

_____ 2021b. Interim Policy 730: Taking into Account Federal Human Health Surface Water Quality Criteria under MTCA. Publication Number 20-09-059. January 11.

_____ 2021c. Sediment Cleanup Users Manual II, Guidance for Implementing the Cleanup Provisions of the Sediment Management Standards, Chapter 173-204 WAC. Publication No. 12-09-057. Third Revision. December.

_____ 2020. Polycyclic Aromatic Hydrocarbons and Benzo[a]pyrene: Changes to MTCA Default Cleanup Levels for 2017. January 2020.

_____ 2019. Water Quality Standards for Surface Waters of the State of Washington Chapter 173-201A WAC. Revised December 2019. Publication no. 06-10-091.

_____ 2015a. Evaluating the Human Health Toxicity of Carcinogenic PAHs (cPAHs) Using Toxicity Equivalency Factors (TEFs). Implementation Memorandum #10. Publication No. 15-09-049, April 20.

_____ 2001. Evaluating the Toxicity and Assessing the Carcinogenic Risk of Environmental Mixtures Using Toxicity Equivalency Factors. Updated per new rule amendments adopted by Department of Ecology on October 12, 2007.

_____ 2000. Water Quality Certification/Modification, Corps Public Notice 1998-2-01967, Navigation Dredging, PSDDA Disposal, and Reconstruction of Pier D. June 14, 2000.

Appendix A:
Interview Responses

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INTERVIEW RECORD FOR FIFTH FIVE-YEAR REVIEW
Bremerton Naval Complex
Bremerton, WA

Individual Contacted:	Bonnie Brooks
Title:	Natural Resource Scientist
Organization:	Washington State Department of Ecology

1. Please describe your specific knowledge of the Bremerton Naval Complex (BNC), the Records of Decision (RODs) for Operable Unit (OU) NSC, OU A, OU B Marine, OU B Terrestrial, and OU D, the implementation of the remedies at these operable units, the corrective action plan for OU C, and the monitoring and maintenance that has taken place.

   Response:

   I have been a sediment specialist for the OU B Marine project team since June of 2020 and the OU B Marine project manager since August 10, 2020. I am familiar with the OU B Marine ROD, remedy, monitoring and maintenance and ongoing work regarding mercury contamination. I am also familiar with the proposed remedy for the Charleston Beach in OUA. My responses will only cover OU B Marine and what I know regarding the proposed remedy for Charleston Beach at OUA. A lack of a response regarding any other areas of OUA or other OUs that I am not familiar with should not be misinterpreted as an Ecology response of approval regarding any activities in those areas.

2. What is your overall impression of remedy performance following signing of the RODs for OU A, OU B Marine, OU B Terrestrial, OU D, and OU NSC, completion of the corrective action plan for OU C, and implementation of the remedies at the BNC? Do you believe the remedies meet the intent of the RODs/corrective action plan for these sites? Do you feel the remedies continue to be effective? Please indicate the basis for your assessment as it relates to the implementation and effectiveness of remedies at the BNC.

   Response:

   I am only familiar with the remedy for OU B Marine and as such my answer only pertains to OU B Marine. A lack of comment regarding other OUs does not indicate Ecology's agreement with any activities in those areas.

   Ecology believes that the remedy to lower PCB concentrations in sediment and marine tissue has met the intent of the corrective action that was agreed to at the time the ROD was signed. However, to ensure protectiveness for both ecological and human health and avoid the issues with reporting limits that occurred during the 2018 long term monitoring where all data was nondetect, Ecology continues to recommend that long term monitoring should include analysis of PCB congeners and analytical methods with a sufficiently low detection limit. Use of EPA method 1668 would provide a more accurate determination of potential risks to human health and also comply with Sediment Management Standard requirements. In addition, when PCB Aroclors are analyzed, *similar methods to what were historically used should be used so that results are comparable.*

Completion of stormwater outfall repairs in OU B Terrestrial, especially those regarding outfall 15, are important to ensure OU B Marine is not subjected to additional contamination and that it is not recontaminated once a remedy for mercury is implemented. In addition, ongoing releases from stormwater outfalls have the potential to recontaminate areas that were cleaned up as part of the PCB remedy.

3. The fourth Five-Year Review (2017) indicates that the protectiveness determination for OU A is Short-Term Protective. Following the January 2019 *Operable Unit A Charleston Beach Shoreline Repair Design Review*, what is your specific knowledge regarding progress towards implementing a permanent repair of the OU A remedy. Please indicate the basis for your assessment regarding progress made towards a permanent repair of the OU A remedy.

   Response:

   Ecology did not concur with the Navy's determination that the remedy at Operable Unit A was short term protective as provided in the letter dated September 7, 2017 sent to the Navy regarding comments on the Draft Fourth Five Year Review. During initial construction, Ecology asserted that the placement of fish mix was intended to be a containment measure. To be protective, the fish mix was required to be maintained on the beach. The fish mix has been eroded and required several replenishments. Ecology asserted that OU A should be non protective due to the erosion of the fish mix from the beach and that a permanent remedy should be constructed.

   The project team is in the process of reviewing the "Charleston Beach Shoreline Repair 30% Basis of Design - shoreline Repair" Dated May 2021. Since this review has not been complete, my response does not include anything contained in that document. The Navy has made progress on the shoreline repair and engaged with stakeholders regarding the alternatives. Ecology has expressed to the Navy that analyzing for PCB Aroclors is not appropriate to determine potential human health risks and has recommended analyzing for PCB congeners using EPA method 1668.

4. The fourth Five-Year Review (2017) for the BNC indicates that the protectiveness determination for OU B Terrestrial is deferred and states that evaluations of OU B Terrestrial as a source of mercury to the marine environment are incomplete. What is your specific knowledge regarding the progress of a source control evaluation and a protectiveness determination for the remedy at OU B Terrestrial? Please indicate the basis for your assessment of progress made toward a source control evaluation and a protectiveness determination at OU B Terrestrial.

   Response:

I am not familiar enough with OU B Terrestrial to comment regarding the protectiveness and determination. From a OU B Marine perspective, controlling the sources from OU B Terrestrial to OU B Marine is important to achieve to ensure OU B Marine is not subjected to additional contamination and that it is not recontaminated once a remedy is implemented.

5. The fourth five-year review (2017) for the BNC deferred the protectiveness determination for OU B Marine and states that the sources of mercury to OU B Marine (e.g., Outfall 15 drainage basin and a potential source located between Dry Docks 5 and 6) are not sufficiently understood. The fourth five-year review also indicates that the Navy is engaged with stakeholders to develop a focused feasibility study and identify a remedy for OU B Marine. What is your specific knowledge regarding the progress of the focused feasibility study and a protectiveness determination for the remedy at OU B Marine? Please indicate the basis for your assessment regarding progress of the focused feasibility study and a protectiveness determination at OU B Marine.

Response:

The project team is in the process of reviewing the "Focused Feasibility Study Operable Unit B Marine" Dated May 2021. Since this review has not been complete, my response does not include anything contained in that document.

Multiple deadlines for the mercury FFS were missed resulting in 1 year and five month delay in the release of the FFS. Deadlines missed include: January 2020, December 2020 and January 2021. Ecology wants to ensure that the remedy for OU B Marine will be achieved in an appropriate timeframe which can be accomplished by releasing documents as close to the agreed timeline as possible.

When the mercury focused feasibility study (FFS) was discussed at team meetings, it appeared that the Navy was using the same site boundary for mercury as was used for PCBs. Site boundaries for a contaminant need to be established based on where the contamination is present whether it is within the Navy facility boundary or not. Per WAC 173-340-200, an ARAR for the site per the ROD, ""Facility" means any building, structure, installation, equipment, pipe or pipeline (including any pipe into a sewer or publicly owned treatment works), well, pit, pond, lagoon, impoundment, ditch, landfill, storage container, motor vehicle, rolling stock, vessel, or aircraft; ***or any site or area where a hazardous substance, other than a consumer product in consumer use, has been deposited, stored, disposed of, or placed, or otherwise come to be located****." The site boundary applicable to the mercury FFS is required to be established based on where the mercury contamination is located. In addition, per CERCLA CFR40 §302.3, also an ARAR for the site per the ROD and where the WAC definition was modeled after: "Facility means (1) any building, structure, installation, equipment, pipe or pipeline (including any pipe into a sewer or publicly owned treatment works), well, pit, pond, lagoon, impoundment, ditch, landfill, storage container, motor vehicle, rolling stock, or aircraft, or (2)* ***any site or area where a hazardous substance has been deposited, stored, disposed of, or placed, or otherwise come to be located****; but does not include any consumer product in consumer use or any vessel;…"*

§302.3

Knowledge gained from the completion of the USGS studies regarding mercury sources and metals in nearshore groundwater and porewater would provide valuable information that can be used to choose the most appropriate remedy for mercury contamination.

Completion of stormwater outfall repairs in OU B Terrestrial, especially those regarding outfall 15, are important to ensure OU B Marine is not subjected to additional contamination and that it is not recontaminated once a remedy for mercury is implemented. In addition, ongoing releases from stormwater outfalls have the potential to recontaminate areas that were cleaned up as part of the PCB remedy.

6. To your knowledge, since the completion of the fourth five-year review (2017), have there been any new scientific findings that relate to projecting potential site risks which might call into question the protectiveness of the remedies for OU A, OU B Marine, OU B Terrestrial, OU C, OU D, and OU NSC?

Response:

To ensure protectiveness for both ecological and human health, Ecology continues to recommend that long term monitoring should include analysis of PCB congeners and analytical methods with a sufficiently low detection limit. Use of EPA method 1668 would provide a more accurate determination of potential risks to human health and also comply with Sediment Management Standard requirements. In addition, when PCB Aroclors are analyzed, similar methods to what were historically used should be used so that results are comparable.

The PFAS Site Inspection (SI) is being discussed with the project team. During discussions, the Navy indicated it would include sampling and analyzing for PFAS for only soil and groundwater and the soil to groundwater to surface water and sediment pathway. It does not include what it likely to be the more significant pathway, stormwater to surface water and sediment. In discussions at project meetings, Navy project managers have indicated that PFAS sampling in surface water and sediment would not take place in the SI, but would take place in the remedial investigation (RI). Project team members were also told that other pathways would be included in the RI such as the stormwater and overboard discharge pathways and therefore, surface water and sediment would be sampled and analyzed for PFAS in the RI. Ecology management has also been under this same impression from meetings they have attended with EPA and Navy management. Recently, the Navy has expressed to Ecology that they do not intend to include surface water and sediment sampling in the RI unless the SI shows a complete pathway for the soil to groundwater to surface water and sediment pathway. It has also been communicated that Navy is not considering stormwater or overboard discharges as potential pathways. In addition, the Navy has proposed PFAS screening levels for only 3 PFAS based on protection of the drinking water pathway to decide whether PFAS needs to be investigated further in the RI. Handling PFAS in this manner will create data gaps in the CSM as this will not provide the information necessary to *determine if PFAS presents a potential risk to ecological receptors or human health from seafood consumption. To ensure protectiveness for ecological and human health, surface water and sediments need to be sampled and analyzed for PFAS and the stormwater to surface water and sediment pathway needs to be considered.*

7. To the best of your knowledge, are institutional controls and operations and maintenance procedures being utilized at the BNC consistent with the terms of the RODs/corrective action plan?

   Response:

   Yes, for OU B Marine.

8. Since the completion of the fourth five-year review (2017) have there been any complaints, violations, or other incidents related to the BNC installation restoration issues that required a response by your office? If so, please provide details of the events and results of the responses.

   Response:

   None that I am aware of since I started on the team in June 2020.

9. To the best of your knowledge, has the on-going program of groundwater monitoring, institutional controls inspection and maintenance, cap, shoreline, and storm drain inspection and maintenance, and sediment and marine biota monitoring at the BNC following implementation of the remedies been sufficiently thorough and frequent to meet the goals of the RODs/corrective action plan? Please indicate the basis for your assessment. Please indicate the basis for your assessment as it relates to monitoring, inspections, and/or maintenance activities.

   Response:

   To ensure protectiveness for both ecological and human health, Ecology continues to recommend that long term monitoring should include analysis of PCB congeners and analytical methods with a sufficiently low detection limit. Use of EPA method 1668 would provide a more accurate determination of potential risks to human health and also comply with Sediment Management Standard requirements. In addition, when PCB Aroclors are analyzed, similar methods to what were historically used should be used so that results are comparable.

   Completion of stormwater outfall repairs in OU B Terrestrial, especially those regarding outfall 15, are important to ensure OU B Marine is not recontaminated once a remedy for mercury is implemented. In addition, ongoing releases from stormwater outfalls have the potential to recontaminate areas that were cleaned up as part of the PCB remedy.

10. Are you aware of any community concerns regarding the remedies in place at the BNC? If so, please give details.

Response:

Ecology supports the moratorium on future in water hull cleanings at BNC, and encourages the Navy to continue researching alternative methods of hull cleaning that do not result in contaminant release.

11. Do you have any other comments, concerns, or suggestions regarding the effectiveness of the remedies in place to protect human health and the environment at the BNC?

Response:

The PFAS Site Inspection (SI) is being discussed with the project team. During discussions, the Navy indicated it would include sampling and analyzing for PFAS for only soil and groundwater and the soil to groundwater to surface water and sediment pathway. It does not include what it likely to be the more significant pathway, stormwater to surface water and sediment. In discussions at project meetings, Navy project managers have indicated that PFAS sampling in surface water and sediment would not take place in the SI, but would take place in the remedial investigation (RI). Project team members were also told that other pathways would be included in the RI such as the stormwater and overboard discharge pathways and therefore, surface water and sediment would be sampled and analyzed for PFAS in the RI. Ecology management has also been under this same impression from meetings they have attended with EPA and Navy management. Recently, the Navy has expressed to Ecology that they do not intend to include surface water and sediment sampling in the RI unless the SI shows a complete pathway for the soil to groundwater to surface water and sediment pathway. It has also been communicated that Navy is not considering stormwater or overboard discharges as potential pathways. In addition, the Navy has proposed PFAS screening levels for only 3 PFAS based on protection of the drinking water pathway to decide whether PFAS needs to be investigated further in the RI. Handling PFAS in this manner will create data gaps in the CSM as this will not provide the information necessary to determine if PFAS presents a potential risk to ecological receptors or human health from seafood consumption. To ensure protectiveness for ecological and human health, surface water and sediments need to be sampled and analyzed for PFAS and the stormwater to surface water and sediment pathway needs to be considered.

To ensure protectiveness for both ecological and human health, Ecology continues to recommend that long term monitoring should include analysis of PCB congeners and analytical methods with a sufficiently low detection limit. Use of EPA method 1668 would provide a more accurate determination of potential risks to human health and also comply with Sediment Management Standard requirements. In addition, when PCB Aroclors are analyzed, similar methods to what were historically used should be used so that results are comparable.

Ecology recommends the Navy Shipyard Infrastructure Optimization Plan (SIOP) and the Multi-Mission dry Dock (M2D2) teams continue to coordinate as appropriate with the project team. Coordination will be beneficial to the CERCLA site if sampling conducted as part of SIOP and/or M2D2 can be used to provide supplemental information regarding *contaminant concentrations. Dredging that will occur as part of the SIOP and/or M2D2 projects may also cleanup some of the contamination that would otherwise be required to be dredged as part of the CERCLA remedy.*

Ecology recommends the Navy and EPA NPDES teams continue to coordinate as appropriate with the project team.

INTERVIEW RECORD FOR FIFTH FIVE-YEAR REVIEW
Bremerton Naval Complex
Bremerton, WA

Individual Contacted: Anne Christopher	
Title: EPA RPM	
Organization: EPA R10	

1. Please describe your specific knowledge of the Bremerton Naval Complex (BNC), the Records of Decision (RODs) for Operable Unit (OU) NSC, OU A, OU B Marine, OU B Terrestrial, and OU D, the implementation of the remedies at these operable units, the corrective action plan for OU C, and the monitoring and maintenance that has taken place.

   Response: I have been the EPA RPM on this site since 2018, so I am very familiar with the RODs for all OUs at PSNS.

2. What is your overall impression of remedy performance following signing of the RODs for OU A, OU B Marine, OU B Terrestrial, OU D, and OU NSC, completion of the corrective action plan for OU C, and implementation of the remedies at the BNC? Do you believe the remedies meet the intent of the RODs/corrective action plan for these sites? Do you feel the remedies continue to be effective? Please indicate the basis for your assessment as it relates to the implementation and effectiveness of remedies at the BNC.

   Response: The OUB Marine ROD focused on PCBs and mercury was added at the last minute as a COC. Although the team has had questions about the PCB sediment data collected in 2018, I do believe the OUB M remedy for PCBs continues to be effective. The original OUB M remedy was not sufficient for mercury, so the Navy has drafted a source control action plan and FFS for mercury. I have not reviewed it yet.

The stakeholder team has also had questions about the groundwater remedies for the upland OUs (maintain pavement and monitor). Long term monitoring of upland gw has shown that there continue to be COC exceedances in gw and some concentrations have increased over the years. The Navy is currently having USGS do a gw/porewater study to confirm if the gw COCs are impacting porewater and sediment concentrations.

The stakeholder team has struggled to define what source control actions for mercury should occur under the terrestrial OUs vs. as part of the OUB Marine FFS. We have integrated the Terrestrial and Marine teams better now to get the work done as efficiently as possible. The Outfall 15 storm drain repairs will be completed by the Navy Terrestrial PM, but that work will count as a source control measure for OUBM as well.

There is the potential for a lot of construction work to occur at PSNS in the next 5-10 years (M2D2/SIOP). This work has the potential to undo the effectiveness of the OUB M remedy for both PCBs and mercury if not done correctly. The stakeholders want to be involved in reviewing the plans for the new construction projects to help minimize any potential impacts to the CERCLA remedies.

The Navy is also currently designing a repair for the Charleston Beach area of OUA. We hope the design will be able to incorporate findings from the USGS gw/porewater study.

3. The fourth Five-Year Review (2017) indicates that the protectiveness determination for OU A is Short-Term Protective. Following the January 2019 *Operable Unit A Charleston Beach Shoreline Repair Design Review*, what is your specific knowledge regarding progress towards implementing a permanent repair of the OU A remedy. Please indicate the basis for your assessment regarding progress made towards a permanent repair of the OU A remedy.

Response: Stakeholders are currently reviewing the 30% Basis of Design for the Charleston Beach Shoreline Repair. The Navy and stakeholders have had numerous reviews and discussions of repair design proposals and the Navy has been receptive to the feedback received by stakeholders. We are hopeful that the current design will be acceptable to stakeholders, especially if the USGS gw/porewater data can be incorporated into the 60% BOD this fall.

4. The fourth Five-Year Review (2017) for the BNC indicates that the protectiveness determination for OU B Terrestrial is deferred and states that evaluations of OU B Terrestrial as a source of mercury to the marine environment are incomplete. What is your specific knowledge regarding the progress of a source control evaluation and a protectiveness determination for the remedy at OU B Terrestrial? Please indicate the basis for your assessment of progress made toward a source control evaluation and a protectiveness determination at OU B Terrestrial.

Response: The Navy has submitted a Source Control Action memo as part of the OUB Marine Mercury FFS for stakeholder review. Source control alternatives will be evaluated and selected for a proposed plan and ROD Amendment. I would assume the protectiveness statement will be deferred until an alternative is selected and implemented. In the meantime, the Navy Terrestrial project manager has been completing some source control actions, including slip lining the storm drain lines for Outfall 15.

5. The fourth five-year review (2017) for the BNC deferred the protectiveness determination for OU B Marine and states that the sources of mercury to OU B

Marine (e.g., Outfall 15 drainage basin and a potential source located between Dry Docks 5 and 6) are not sufficiently understood. The fourth five-year review also indicates that the Navy is engaged with stakeholders to develop a focused feasibility study and identify a remedy for OU B Marine. What is your specific knowledge regarding the progress of the focused feasibility study and a protectiveness determination for the remedy at OU B Marine? Please indicate the basis for your assessment regarding progress of the focused feasibility study and a protectiveness determination at OU B Marine.

Response: The Navy has submitted a Source Control Action memo as part of the OUB Marine Mercury FFS for stakeholder review. A protectiveness determination can be made after an alternative from the FFS is chosen for a proposed plan, a ROD Amendment is issued and the new remedy is implemented.

6. To your knowledge, since the completion of the fourth five-year review (2017), have there been any new scientific findings that relate to projecting potential site risks which might call into question the protectiveness of the remedies for OU A, OU B Marine, OU B Terrestrial, OU C, OU D, and OU NSC?

Response: LTM of groundwater in the terrestrial OUs has shown exceedances of CULs and some increasing concentrations. USGS is currently studying the groundwater and porewater interactions to inform if we need to update the groundwater CSM for the terrestrial OUs and the impact of groundwater to the marine OU. PFAS is also a new COC being investigated at the site. A PA was completed and a SI is being scoped.

7. To the best of your knowledge, are institutional controls and operations and maintenance procedures being utilized at the BNC consistent with the terms of the RODs/corrective action plan?

Response: Yes, the IC Plans have been updated and implemented for the Terrestrial and Marine OUs and the O&M Plans have been followed. A new SOP for consistent bathymetric surveys was completed for the Marine OU. The inspections for the Terrestrial OUs have been improved to track pavement status and repair.

8. Since the completion of the fourth five-year review (2017) have there been any complaints, violations, or other incidents related to the BNC installation restoration issues that required a response by your office? If so, please provide details of the events and results of the responses.

Response: The Navy received an NOV from the NPDES program for violations of copper exceedances of the old NPDES permit. The CERCLA team has been coordinating with the NPDES program as the new NPDES permit is being completed. The copper exceedances also prompted the team to take a closer look at COCs in groundwater potentially discharging to OUB Marine.

The Navy was also sued for its in-water hull scraping activities on the Ex-Independence near Mooring G, which is within the OUB Marine. Implementation of the required response by the Navy in the settlement is being coordinated so that it does not disturb the OUB Marine remedy.

9. To the best of your knowledge, has the on-going program of groundwater monitoring, institutional controls inspection and maintenance, cap, shoreline, and storm drain inspection and maintenance, and sediment and marine biota monitoring at the BNC following implementation of the remedies been sufficiently thorough and frequent to meet the goals of the RODs/corrective action plan? Please indicate the basis for your assessment. Please indicate the basis for your assessment as it relates to monitoring, inspections, and/or maintenance activities.

Response: The team has made improvements to the inspection plans for the Terrestrial OUs (tracking pavement status/repairs, catch basin sediment sampling, replacement of sediment socks for catch basins, etc.). We have struggled with updating COCs and determining frequency for GW LTM because we get the data from the previous year after it is too late to update the monitoring plan for the following year. We are working to resolve that unfortunate timing issue. Updated GW LTM will help us update the GW CSM in conjunction with the USGS findings from the GW/porewater study.

There is better coordination between the CERCLA project manager and the Public Works team to address catch basin sediment cleaning, sediment sock replacement and pavement repair. It would also be beneficial to coordinate stormwater inspections with the NPDES program under the requirements of the new permit. Continued coordination will be needed between the teams for the SIOP and M2/D2 projects as well.

10. Are you aware of any community concerns regarding the remedies in place at the BNC? If so, please give details.

Response: No.

11. Do you have any other comments, concerns, or suggestions regarding the effectiveness of the remedies in place to protect human health and the environment at the BNC?

Response: Major coordination will be needed between the CERCLA team and the SIOP/M2D2 teams as all of the work progresses at the base and overlaps with each other. Efficiencies in LTM could be coordinated between the programs to ensure one project does not recontaminate or damage the other.

INTERVIEW RECORD FOR FIFTH FIVE-YEAR REVIEW
Bremerton Naval Complex
Bremerton, WA

Individual Contacted:	John Evered
Title:	Toxicologist
Organization:	Washington State Department of Ecology

1. Please describe your specific knowledge of the Bremerton Naval Complex (BNC), the Records of Decision (RODs) for Operable Unit (OU) NSC, OU A, OU B Marine, OU B Terrestrial, and OU D, the implementation of the remedies at these operable units, the corrective action plan for OU C, and the monitoring and maintenance that has taken place.

   Response: I was the OUB Marine project manager from April 2015 to August 2020, until being replaced by Bonnie Brooks. Since August 2020 I have not been involved in any major project decisions or discussions, and have acted only in an advisory capacity.

2. What is your overall impression of remedy performance following signing of the RODs for OU A, OU B Marine, OU B Terrestrial, OU D, and OU NSC, completion of the corrective action plan for OU C, and implementation of the remedies at the BNC? Do you believe the remedies meet the intent of the RODs/corrective action plan for these sites? Do you feel the remedies continue to be effective? Please indicate the basis for your assessment as it relates to the implementation and effectiveness of remedies at the BNC.

   Response: I have not been closely involved with any project decision making at OU B terrestrial, OU D or OU NSC so my responses are limited to OU B and OU A, Charleston Beach. I believe that the PCB remedy is performing as designed and has lowered PCB sediment concentrations in Sinclair Inlet. However, in order to confirm PCB concentrations remain protective it is recommended that EPA method 1668 is used for PCB analysis. This will help avoid issues with reporting limits and non-detects that were prevalent in the 2018 long term monitoring event.

3. The fourth Five-Year Review (2017) indicates that the protectiveness determination for OU A is Short-Term Protective. Following the January 2019 *Operable Unit A Charleston Beach Shoreline Repair Design Review*, what is your specific knowledge regarding progress towards implementing a permanent repair

of the OU A remedy. Please indicate the basis for your assessment regarding progress made towards a permanent repair of the OU A remedy.

Response: Ecology did not concur that the remedy was short term protective, per the non-concurrence letter sent to the Navy on September 7, 2021. As the 30% Basis of Design – shoreline repair is currently under review by project stakeholders I am unware of the progress towards a permanent repair.

4. The fourth Five-Year Review (2017) for the BNC indicates that the protectiveness determination for OU B Terrestrial is deferred and states that evaluations of OU B Terrestrial as a source of mercury to the marine environment are incomplete. What is your specific knowledge regarding the progress of a source control evaluation and a protectiveness determination for the remedy at OU B Terrestrial? Please indicate the basis for your assessment of progress made toward a source control evaluation and a protectiveness determination at OU B Terrestrial.

   Response: I have not been closely involved in OU B Terrestrial decision making so I cannot comment on the progress of the source control evaluation or the protectiveness determination.

5. The fourth five-year review (2017) for the BNC deferred the protectiveness determination for OU B Marine and states that the sources of mercury to OU B Marine (e.g., Outfall 15 drainage basin and a potential source located between Dry Docks 5 and 6) are not sufficiently understood. The fourth five-year review also indicates that the Navy is engaged with stakeholders to develop a focused feasibility study and identify a remedy for OU B Marine. What is your specific knowledge regarding the progress of the focused feasibility study and a protectiveness determination for the remedy at OU B Marine? Please indicate the basis for your assessment regarding progress of the focused feasibility study and a protectiveness determination at OU B Marine.

   Response: I was involved with the early development of the mercury FFS, but have not reviewed the draft OU B Focused Feasibility Study that was provided to stakeholders in May 2021. A concern that was raised during the early stages of the FFS development was the use of the existing OU B marine PCB site boundary as a basis for the mercury FFS boundary. Ecology believes that this is an arbitrary use of the previous PCB boundary that would not be representative of current site conditions, and would not meet the definition of a 'site' per CERCLA and MTCA definitions.

6. To your knowledge, since the completion of the fourth five-year review (2017), have there been any new scientific findings that relate to projecting potential site risks which might call into question the protectiveness of the remedies for OU A, OU B Marine, OU B Terrestrial, OU C, OU D, and OU NSC?

   Response: Although I have not been involved in the PFAS Site Inspection development, it is recommended that the Navy take in to consideration the recommendations of the CERCLA project team. To ensure the risks to human and ecological receptors are understood, all media and pathways should be studied to create a robust conceptual site model.

7. To the best of your knowledge, are institutional controls and operations and maintenance procedures being utilized at the BNC consistent with the terms of the RODs/corrective action plan?

   Response: To my knowledge as it pertains to OU B marine, yes.

8. Since the completion of the fourth five-year review (2017) have there been any complaints, violations, or other incidents related to the BNC installation restoration issues that required a response by your office? If so, please provide details of the events and results of the responses.

   Response: I do not know of any complaints, violations or other incidents related to the BNC installation restoration. I did however provide technical assistance to the Office of the Attorney General during the 2018/9 lawsuit related to the in water hull cleaning of the ex-Independence.

9. To the best of your knowledge, has the on-going program of groundwater monitoring, institutional controls inspection and maintenance, cap, shoreline, and storm drain inspection and maintenance, and sediment and marine biota monitoring at the BNC following implementation of the remedies been sufficiently thorough and frequent to meet the goals of the RODs/corrective action plan? Please indicate the basis for your assessment. Please indicate the basis for your assessment as it relates to monitoring, inspections, and/or maintenance activities.

   Response: It is again recommended that during the long term PCB sediment monitoring events, EPA method should be used during analysis to avoid the issues with non-detects found in the 2018 long term monitoring event.

10. Are you aware of any community concerns regarding the remedies in place at the BNC? If so, please give details.

    Response: No.

11. Do you have any other comments, concerns, or suggestions regarding the effectiveness of the remedies in place to protect human health and the environment at the BNC?

    Response: Ecology recommends that as and when information on the Navy Shipyard Infrastructure Optimization Plan (SIOP) and the Multi-Mission Dry Dock (M2D2) project becomes available it is shared with the project team and incorporated in to the development of project deliverables. Any sampling performed as part of these projects should be done under appropriate QA/QC procedures so it can be considered usable in the CERCLA decision making process. Similarly, any SIOP/M2D2 dredging or construction should be planned in close coordination with the CERCLA project team to reduce impacts to previous remedies, and maximize the potential for opportunistic dredging.

INTERVIEW RECORD FOR FIFTH FIVE-YEAR REVIEW
Bremerton Naval Complex
Bremerton, WA

Individual Contacted:	Chris Eckley
Title: Environmental Scientist	
Organization: US EPA Region-10	

1. Please describe your specific knowledge of the Bremerton Naval Complex (BNC), the Records of Decision (RODs) for Operable Unit (OU) NSC, OU A, OU B Marine, OU B Terrestrial, and OU D, the implementation of the remedies at these operable units, the corrective action plan for OU C, and the monitoring and maintenance that has taken place.

Response: I have attended technical team/stakeholder meetings associated with BNC for the last decade. Most of my knowledge is regarding OUB Marine, and I have limited knowledge of the other operable units. Specifically, within OUB Marine, my focus has been on mercury pollution.

2. What is your overall impression of remedy performance following signing of the RODs for OU A, OU B Marine, OU B Terrestrial, OU D, and OU NSC, completion of the corrective action plan for OU C, and implementation of the remedies at the BNC? Do you believe the remedies meet the intent of the RODs/corrective action plan for these sites? Do you feel the remedies continue to be effective? Please indicate the basis for your assessment as it relates to the implementation and effectiveness of remedies at the BNC.

Response: Because my focus has been on mercury pollution in OUB Marine, we haven't seen any remedies proposed and so it is too early to comment on performance.

3. The fourth Five-Year Review (2017) indicates that the protectiveness determination for OU A is Short-Term Protective. Following the January 2019 *Operable Unit A Charleston Beach Shoreline Repair Design Review*, what is your specific knowledge regarding progress towards implementing a permanent repair of the OU A remedy. Please indicate the basis for your assessment regarding progress made towards a permanent repair of the OU A remedy.

Response: Not something I have been tracking

4. The fourth Five-Year Review (2017) for the BNC indicates that the protectiveness determination for OU B Terrestrial is deferred and states that evaluations of OU B Terrestrial as a source of mercury to the marine environment are incomplete. What is your specific knowledge regarding the progress of a source control evaluation and a protectiveness determination for the remedy at OU B Terrestrial? Please indicate the basis for your assessment of progress made toward a source control evaluation and a protectiveness determination at OU B Terrestrial.

Response: I have been tracking the work the USGS has performed in identifying sources of mercury from the terrestrial environment to the marine system. I have attended meetings presenting these results and have reviewed the sampling plans and summary reports. In general, it seems like the information being collecting is helpful in addressing the data gaps/needs to identify sources of mercury being transported from the terrestrial environment to the marine environment.

5. The fourth five-year review (2017) for the BNC deferred the protectiveness determination for OU B Marine and states that the sources of mercury to OU B Marine (e.g., Outfall 15 drainage basin and a potential source located between Dry Docks 5 and 6) are not sufficiently understood. The fourth five-year review also indicates that the Navy is engaged with stakeholders to develop a focused feasibility study and identify a remedy for OU B Marine. What is your specific knowledge regarding the progress of the focused feasibility study and a protectiveness determination for the remedy at OU B Marine? Please indicate the basis for your assessment regarding progress of the focused feasibility study and a protectiveness determination at OU B Marine.

Response: I have participated in planning meetings leading up to the release of the FFS. I have received a copy of the FFS, but have not read it yet. My forthcoming comments on the FFS will address this comment.

6. To your knowledge, since the completion of the fourth five-year review (2017), have there been any new scientific findings that relate to projecting potential site risks which might call into question the protectiveness of the remedies for OU A, OU B Marine, OU B Terrestrial, OU C, OU D, and OU NSC?

Response: The indication that mercury levels were increasing (or at least not decreasing) during the most recent round of marine sediment sampling is new information that helps indicate that existing sources of mercury may exist and continue to impact the marine sediment. This suggests additional remedies may be needed.

7. To the best of your knowledge, are institutional controls and operations and maintenance procedures being utilized at the BNC consistent with the terms of the RODs/corrective action plan?

   Response: I'm not knowledgeable enough on this to comment.

8. Since the completion of the fourth five-year review (2017) have there been any complaints, violations, or other incidents related to the BNC installation restoration issues that required a response by your office? If so, please provide details of the events and results of the responses.

   Response:
   I'm not knowledgeable enough on this to comment.

9. To the best of your knowledge, has the on-going program of groundwater monitoring, institutional controls inspection and maintenance, cap, shoreline, and storm drain inspection and maintenance, and sediment and marine biota monitoring at the BNC following implementation of the remedies been sufficiently thorough and frequent to meet the goals of the RODs/corrective action plan? Please indicate the basis for your assessment. Please indicate the basis for your assessment as it relates to monitoring, inspections, and/or maintenance activities.

   Response:

With regards to mercury, there seems to have been ad adequate level of data collected.

10. Are you aware of any community concerns regarding the remedies in place at the BNC? If so, please give details.

    Response:

Not to my knowledge.

11. Do you have any other comments, concerns, or suggestions regarding the effectiveness of the remedies in place to protect human health and the environment at the BNC?

Response:

No additional comments.

INTERVIEW RECORD FOR FIFTH FIVE-YEAR REVIEW
Bremerton Naval Complex
Bremerton, WA

Individual Contacted:	Mahbub Alam
Title:	Cleanup Project Manager/Environmental Engineer 5
Organization:	WA Department of Ecology

1. Please describe your specific knowledge of the Bremerton Naval Complex (BNC), the Records of Decision (RODs) for Operable Unit (OU) NSC, OU A, OU B Marine, OU B Terrestrial, and OU D, the implementation of the remedies at these operable units, the corrective action plan for OU C, and the monitoring and maintenance that has taken place.

   Response:
   I have been working as a cleanup project manager for the OU A, OU BT, OU C, OU D, and OU NSC sites since October 2016 and as such I am quite familiar with all the site activities and the associated RODs. My knowledge on OU B marine is peripheral.

2. What is your overall impression of remedy performance following signing of the RODs for OU A, OU B Marine, OU B Terrestrial, OU D, and OU NSC, completion of the corrective action plan for OU C, and implementation of the remedies at the BNC? Do you believe the remedies meet the intent of the RODs/corrective action plan for these sites? Do you feel the remedies continue to be effective? Please indicate the basis for your assessment as it relates to the implementation and effectiveness of remedies at the BNC.

   Response:
   Overall, it is indeterminate whether the remedies at the BNC are effective. Remedies are not functioning as intended by ROD except for OU D, OU NSC and OU C. At OU A, the remedy is not protective as the 3 feet cover is not maintained. However, the Navy is working on a remedy repair and significant progress has been made. At OU B T groundwater chemical concentration has not decreased as anticipated rather increased in some instances. Chemicals from upland continue to discharge to marine environment. There are no lines of evidence so verify that the RAO “Reduce the potential for chemical transport and control the threat of recontamination of the adjacent marine environment” is making progress. Remedy activities such as storm system inspection, sealing cracks in pavement continued but whether they are effective to the extent needed is an unanswered question. Concentration of Hg in sediment is documented to have increased. However, Ecology believes other upland COCs may have increased in the marine surface water, sediment, and biota. More data collection is necessary to see whether upland COCs are making an impact in marine environment. Recent USGS study on metals near direct groundwater discharge zones is a first step in that direction to understand fate and transport of upland COCs.

Note to Navy: "corrective action plan" as written in the questionnaire should be cleanup action plan (CAP) per MTCA regulation.

3. The fourth Five-Year Review (2017) indicates that the protectiveness determination for OU A is Short-Term Protective. Following the January 2019 *Operable Unit A Charleston Beach Shoreline Repair Design Review*, what is your specific knowledge regarding progress towards implementing a permanent repair of the OU A remedy. Please indicate the basis for your assessment regarding progress made towards a permanent repair of the OU A remedy.

Response:
Ecology deemed protectiveness of OU A remedy as "not protective" in the last FYR. See non-concurrence letter from Ecology for details. However, the Navy has made good progress on a permanent remedy repair. A recommended alternative has been selected with stakeholder consensus and basis of design (30%) is almost complete.

4. The fourth Five-Year Review (2017) for the BNC indicates that the protectiveness determination for OU B Terrestrial is deferred and states that evaluations of OU B Terrestrial as a source of mercury to the marine environment are incomplete. What is your specific knowledge regarding the progress of a source control evaluation and a protectiveness determination for the remedy at OU B Terrestrial? Please indicate the basis for your assessment of progress made toward a source control evaluation and a protectiveness determination at OU B Terrestrial.

Response:
OU B Terrestrial remains a continual source of mercury to the marine environment. Some progress has been made to slip line a stormwater line (in construction to be complete next spring), which is the largest carrier of Hg to Sinclair Inlet. However, Dry Dock drainage system (indirect groundwater), direct groundwater, and stormwater discharge (unknown amount) continue to be a threat of recontamination. Ecology believes groundwater loading has not been accurately estimated in the draft source control evaluation for the OU B marine FFS. Source control as proposed in the FFS seems to be inadequate.

5. The fourth five-year review (2017) for the BNC deferred the protectiveness determination for OU B Marine and states that the sources of mercury to OU B Marine (e.g., Outfall 15 drainage basin and a potential source located between Dry Docks 5 and 6) are not sufficiently understood. The fourth five-year review also indicates that the Navy is engaged with stakeholders to develop a focused feasibility study and identify a remedy for OU B Marine. What is your specific knowledge regarding the progress of the focused feasibility study and a protectiveness determination for the remedy at OU B Marine? Please indicate the basis for your assessment regarding progress of the focused feasibility study and a protectiveness determination at OU B Marine.

   Response:
   Given that there is another Ecology project manager for the OU B Marine, I will defer this question to her. So far I know, the Navy has submitted a draft FFS in June this year.

6. To your knowledge, since the completion of the fourth five-year review (2017), have there been any new scientific findings that relate to projecting potential site risks which might call into question the protectiveness of the remedies for OU A, OU B Marine, OU B Terrestrial, OU C, OU D, and OU NSC?

   Response:
   Risks from the use and disposal of PFAS compounds could call into question the protectiveness of the remedy at all the OUs. The Navy has completed the preliminary assessment, which identified 22 potential areas for further investigation or Site Inspection (SI). The needs to follow EPA federal facilities SI guidance and conceptual site model to investigate the potential/confirmed PFAS source areas.

7. To the best of your knowledge, are institutional controls and operations and maintenance procedures being utilized at the BNC consistent with the terms of the RODs/~~corrective~~ cleanup action plan?

   Response:
   Institutional controls are in place per the RODs and cleanup action plan (CAP) at BNC to limit human exposure to site COCs. Operation and maintenance (O&M) activities are also consistent with ROD/CAP. However, the RODs are very vague, in general, and incorrect in couple of instances. It is indeterminate whether ROD O&M activities are effective in protecting human health and the environment.

8. Since the completion of the fourth five-year review (2017) have there been any complaints, violations, or other incidents related to the BNC installation restoration issues that required a response by your office? If so, please provide details of the events and results of the responses.

   Response:
   I am not aware of any complaints/violation.

9. To the best of your knowledge, has the on-going program of groundwater monitoring, institutional controls inspection and maintenance, cap, shoreline, and storm drain inspection and maintenance, and sediment and marine biota monitoring at the BNC following implementation of the remedies been sufficiently thorough and frequent to meet the goals of the RODs/~~corrective~~ action plan? Please indicate the basis for your assessment. Please indicate the basis for your assessment as it relates to monitoring, inspections, and/or maintenance activities.

   Response:
   See also Answer to question #7. Some of the monitoring in the upland area have no objectives to achieve remediation goals in the future. Decision criteria are obsolete and does not provide any new information in many cases. Some COCs are below background but monitoring has been conducted for years. Some COCs monitoring were stopped based on “nd” results even though these never met the regulatory levels. When better analytical methods are available, for example, EPA 1668 method for PCBs, low level PAHs and pesticides by 8270 SIM, they need to be reanalyzed.
   In inspections and maintenance, there needs to a proper follow up when deficiencies are reported. The Navy has made some progress on these fronts in the recent past. However, these need to institutionalized following project team recommendation.

10. Are you aware of any community concerns regarding the remedies in place at the BNC? If so, please give details.

    Response:
    No.

11. Do you have any other comments, concerns, or suggestions regarding the effectiveness of the remedies in place to protect human health and the environment at the BNC?

    Response:
    I appreciate that the BNC project team leadership, management, coordination has improved in the recent past, especially, coordination with upland and marine team. The

FYR should formulate a formal recommendation that institutionalize this coordination, lesson learned and further improvement.
In terms of effectiveness of the remedy, the Navy needs to rethink the waste in place remedy. The Navy has not demonstrated that the waste in place remedy is protective of the marine environment. The eventual cost of not doing source removal/control may be higher in the future.

INTERVIEW RECORD FOR FIFTH FIVE-YEAR REVIEW
Bremerton Naval Complex
Bremerton, WA

Individual Contacted:	Denice Taylor
Title: Environmental Scientist	
Organization: Suquamish Tribe	

1. Please describe your specific knowledge of the Bremerton Naval Complex (BNC), the Records of Decision (RODs) for Operable Unit (OU) NSC, OU A, OU B Marine, OU B Terrestrial, and OU D, the implementation of the remedies at these operable units, the corrective action plan for OU C, and the monitoring and maintenance that has taken place.

   Response:

   As the DoD CERCLA project manager for the Suquamish Tribe, I am familiar with BNC, as well as the specific RODS, remedies, monitoring and maintenance programs for OU NSC, OU A, OU B Marine, OU B Terrestrial and OU D.

2. What is your overall impression of remedy performance following signing of the RODs for OU A, OU B Marine, OU B Terrestrial, OU D, and OU NSC, completion of the corrective action plan for OU C, and implementation of the remedies at the BNC? Do you believe the remedies meet the intent of the RODs/corrective action plan for these sites? Do you feel the remedies continue to be effective? Please indicate the basis for your assessment as it relates to the implementation and effectiveness of remedies at the BNC.

   Response:

   I believe the remedies were generally implemented as intended by the RODs. However, as stated in the Fourth Five Year Review (5YR), the remedies for OU A, OU B Terrestrial and OU B Marine are not functioning as intended and have not achieved long-term goals for the protection of human health and the environment.

   Issues identified in the Fourth 5YR that remain of continuing concern include:

   - **Implementation of the remedy repair for the OU A shoreline at Charleston Beach**
   - **Control of ongoing sources of mercury and other contaminants from the upland areas to the marine environment**

- **the accumulation of mercury in marine sediments and aquatic organisms, which continues to present an unacceptable health risk via consumption of seafood**
- **potential impacts of PSNS construction projects and operations on in-place or future remedies**

The long-term success of monitored natural recovery for PCBs must also continue be evaluated. In addition, since the last 5YR, the potential presence of PFAS has been identified as a concern for both the terrestrial and marine environments.

3. In your experience, what effects have remedy implementation at the BNC had on your agency and the surrounding community?

   Response:

   As commented in previous Five Year Reviews, the actions taken have been important steps in reducing the contaminant load in Sinclair Inlet. However, the remedial actions have had limited direct benefit to tribal members as harvest restrictions remain in effect. In addition, armoring of the BNC shoreline, while generally effective in preventing erosion, is detrimental to the habitat of treaty-protected resources.

4. Are you aware of any concerns within your agency or the community regarding the remedies in place at the BNC? If so, please give details.

   Response:

   Please refer to responses to Question 2

5. To the best of your knowledge, are institutional controls and operations and maintenance procedures being utilized at the BNC consistent with the terms of the RODs/corrective action plan? Please indicate the basis for your assessment as it relates to inspections and maintenance activities.

   Response:

   Yes, although the Tribe does not generally regard the use of ICs, specifically fish advisories and harvest restrictions, as viable long-term remedies. In the Tribe's perspective, ICs are used to avoid and/or minimize exposure until the remedial objectives and goals for the sites are met. ICs alone do not reduce contaminant concentrations or control sources.

6. To the best of your knowledge, has the on-going program of environmental monitoring at the BNC following implementation of the remedies been sufficiently thorough and frequent to meet the goals of the RODs/corrective action plan? Please indicate the basis for your assessment as it relates to environmental monitoring activities.

   Response:

   The long-term monitoring programs were originally designed to meet the goals of the RODs. However, after two decades of data collection, they generally need to be updated to reflect current understanding of site dynamics, changes to regulatory criteria and approaches, and improvements to analytical methods. Monitoring for the yet to be implemented OU A remedy repair will also need to evaluate remedy performance and long-term protectiveness.

   In addition, while the last marine long-term monitoring effort demonstrated compliance with clean up levels for PCBs, the project team has not yet reached agreement on how to verify that natural recovery (as a remedy component) is continuing and/or stable, or how to integrate data from MILCON-related sampling into a decision framework for OU B Marine. Eventually, long-term monitoring for OU B Marine should evaluate source control efforts, as well as long-term protectiveness for both mercury and PCBs.

7. Do you have any other comments, concerns, or suggestions regarding the effectiveness of the remedies in place to protect human health and the environment at the BNC?

   Response:

   These sites must be understood in the context of an active Navy facility. Any in place remedy is subject to change and must continue to be actively monitored, even if compliance goals have been achieved.

   It is imperative that planning for future Navy MILCON activities, including the citing of a new dry dock, be coordinated with the CERCLA project teams to effectively evaluate any impacts to in place or planned remedies.

   To ensure that remedies for BNC are protective of treaty rights and resources in the long-term, issues need to be evaluated and addressed holistically. The terrestrial and marine environments are intrinsic aspects of the same environment. Since the last 5YR, the CERCLA project teams have made considerable progress in coordinating efforts and improving communication.

INTERVIEW RECORD FOR FIFTH FIVE-YEAR REVIEW
Bremerton Naval Complex
Bremerton, WA

Individual Contacted:	Erika Shaffer
Title:	Sediment Quality Specialist
Organization:	Washington Department of Natural Resources

1. Please describe your specific knowledge of the Bremerton Naval Complex (BNC), the Records of Decision (RODs) for Operable Unit (OU) NSC, OU A, OU B Marine, OU B Terrestrial, and OU D, the implementation of the remedies at these operable units, the corrective action plan for OU C, and the monitoring and maintenance that has taken place.

Response: I am the site project manager for WA DNR and am familiar with the BNC, RODs, remedies, and monitoring and maintenance for the above OUs

2. What is your overall impression of remedy performance following signing of the RODs for OU A, OU B Marine, OU B Terrestrial, OU D, and OU NSC, completion of the corrective action plan for OU C, and implementation of the remedies at the BNC? Do you believe the remedies meet the intent of the RODs/corrective action plan for these sites? Do you feel the remedies continue to be effective? Please indicate the basis for your assessment as it relates to the implementation and effectiveness of remedies at the BNC.

Response: Overall, remedies were implemented as intended, but are not currently functioning as well as intended and do not meet protection goals for human health and the environment. Key issues include the need for remedy repair at Charleston Beach, the still ongoing FFS for mercury contamination, and the need for ongoing source control efforts

3. In your experience, what effects have remedy implementation at the BNC had on your agency and the surrounding community?

Response: Portions of Sinclair Inlet are on state-owned aquatic lands and the ongoing need to control sources, particularly for mercury and PCBs, and the emerging concerns regarding PFAS impact sediment quality and the natural resources associated with it.

4. Are you aware of any concerns within your agency or the community regarding the remedies in place at the BNC? If so, please give details.

Response: Primary concerns are for the need to complete remedy repair and mercury FFS.

5. To the best of your knowledge, are institutional controls and operations and maintenance procedures being utilized at the BNC consistent with the terms of the RODs/corrective action plan? Please indicate the basis for your assessment as it relates to inspections and maintenance activities.

Response: Yes, however, as the manager of state owned aquatic lands, DNR prefers to avoid use of ICs that may impact current and future use of SOAL by the people of Washington state.

6. To the best of your knowledge, has the on-going program of environmental monitoring at the BNC following implementation of the remedies been sufficiently thorough and frequent to meet the goals of the RODs/corrective action plan? Please indicate the basis for your assessment as it relates to environmental monitoring activities.

Response: They have been generally sufficient, but would benefit from improved incorporation of other data sources and should be re-examined and updated to reflect current knowledge of site dynamics, analytical chemistry, and other current science

7. Do you have any other comments, concerns, or suggestions regarding the effectiveness of the remedies in place to protect human health and the environment at the BNC?

Response: Because the facility will continue to be active long term, for the remedies to remain effective, effective source control must be implemented not only in current facilities, but incorporated into any future projects. Monitoring should be continued as necessary to ensure that this source control is effective even after compliance goals are met.

INTERVIEW RECORD FOR FIFTH FIVE-YEAR REVIEW
Bremerton Naval Complex
Bremerton, WA

Individual Contacted:
Pamela M. Sargent, P.E

Title:
Senior Remedial Project Manager

Organization:
NAVFAC NW

1. Please describe your specific knowledge of the Bremerton Naval Complex (BNC), the Records of Decision (RODs) for Operable Unit (OU) NSC, OU A, OU B Marine, OU B Terrestrial, and OU D, the implementation of the remedies at these operable units, the corrective action plan for OU C, and the monitoring and maintenance that has taken place since implementation of the remedies.

   Response:
   As a previous RPM for both BNC terrestrial OUs and OU B Marine, and the lead for the last FYR, I am quite familiar with the all the BNC RODs, the OU C corrective action plan, the implementation of the RODs and the monitoring and maintenance of the remedies. Monitoring and inspections have been taking place regularly but maintenance has been infrequent. Coordination with the City of Bremerton for the annual inspection of OU D has become routine and is completed in a timely manner.

2. What is your overall impression of remedy performance following signing of the RODs at OU A, OU B Marine, OU B Terrestrial, OU D, and OU NSC, completion of the corrective action plan for OU C, and implementation of the remedies at the BNC? Please indicate the basis for your assessment as it relates to the implementation of remedies at the BNC.

   Response:
   Within the mission and security constraints of the Shipyard (an active industrial facility that operates 24/7/365) and the ERN program funding constraints, remedy performance at OU C, OU D, and OU NSC is good and remedy performance for OU B T and OU B Marine is poor due the ongoing mercury source control issues. My assessment is based on my time as the BNC terrestrial RPM, the OU B Marine RPM and the current sediment/remediation SME on the Waterfront Infrastructure Improvements and Shipyard Infrastructure Optimization Program teams. Also, I participate in regular Construction/CERLCA coordination meetings with the BNC RPMs.

3. To the best of your knowledge, has on-going maintenance of pavement and vegetative covers (caps) and storm drains within the terrestrial OUs been conducted regularly and timely? Has maintenance of these caps effectively met the goals to reduce the potential for human contact with chemicals of concern (COCs) in soil and to reduce the potential for infiltrating precipitation to transport chemicals to groundwater and Sinclair Inlet? Has storm drain maintenance effectively met the goals of reducing the potential for COCs to be discharged to Sinclair Inlet? Please indicate the basis for your assessment of the cap and storm drain maintenance activities in your response.

   Response:
   To the best of my knowledge, there has not been "regular" maintenance of pavement. There have been some repaving projects over the years since the terrestrial RODs were implemented but these have been executed mainly by the shipyard to address operational needs and not as a result of coordination with terrestrial team based the identified deficiencies found during cap inspections.

   To the best of my knowledge, there has been no regular maintenance of vegetative caps beyond some invasive species control at OU A and OU C and mowing of OU D grassy areas.

   Reduced infiltration potential cannot really be quantified because no baseline was established after remedy implementation but year on year relative changes have been noted.

   Human contact with impacted soil is limited by the presence of pavement (even if in poor condition) and vegetative covers. In addition, the implementation of the excavation management plan within the terrestrial OUs and the restrictions in the OU D agreement limit human contact with impacted soil.

   To the best of my knowledge, storm sewer catch basins are supposed to be routinely cleaned out but it has been unclear how the cleaning frequency is assigned and how these efforts can be tracked/quantified for reporting purposes.

   To the best of my knowledge, there have been some emergent storm sewer repairs since terrestrials RODs were implemented to address operational needs and not as a result of coordination with terrestrial team based the goal to minimize transport of COCs to Sinclair Inlet. Deteriorating storm sewer infrastructure has resulted in impacted soil from within the terrestrial OUs being transported to Sinclair Inlet.

   My assessment is based on my time as the BNC terrestrial RPM, the OU B Marine RPM and the current sediment/remediation SME on the Waterfront Infrastructure Improvements and Shipyard Infrastructure Optimization Program teams.

4. To the best of your knowledge, have the shoreline stabilization measures put in place at OU A, OU B Terrestrial, and OU B Marine as part of the remedies been maintained to effectively meet the goal of controlling potential erosion of fill material to Sinclair Inlet? Please indicate the basis for your assessment of shoreline stabilization measures that have occurred at OU A, OU B Terrestrial, and OU B Marine in your response.

   Response:
   There have been shoreline maintenance/repair projects since ROD implementation and planning/design for currently needed repairs is underway – see response to question 5 below for additional detail. Repair need identification/repair design/repair of shoreline protection is an inherently slow/long process but Sinclair Inlet is a relatively quiescent embayment and only minor shoreline erosion occurs with the exception of Charleston Beach. Shoreline protection has been adequate at preventing erosion of fill materials. Fill material is exposed along Charleston Beach (asbestos fire brick and slag) but these materials have not moved away from the site due to their weight. There was no baseline photo survey of the shoreline protection at the time of remedy implementation so changes can only be noted from inspection to inspection and not compared against a baseline state.

   My assessment is based on my time as the BNC terrestrial RPM, the OU B Marine RPM and the current sediment/remediation SME on the Waterfront Infrastructure Improvements and Shipyard Infrastructure Optimization Program teams. Also, I participate in regular Construction/CERLCA coordination meetings with the BNC RPMs.

5. The fourth Five-Year Review (2017) indicates that the protectiveness determination for OU A is Short-Term Protective. Following the January 2019 Operable Unit A Charleston Beach Shoreline Repair Design Review, what is your specific knowledge regarding progress towards implementing a permanent repair of the OU A remedy? Please indicate the basis for your assessment of progress made towards a permanent repair of the OU A remedy.

   Response:
   35% design for remedy repair has been completed and submitted to the stakeholders for review. Funding for completion of the remedy repair design and construction has been programmed into the overall ER budget. My response is based on updates provided by the terrestrial RPM at the last Bremerton Construction/CERCLA Coordination Meeting.

6. The fourth Five-Year Review (2017) for the BNC indicates that the protectiveness determination for OU B Terrestrial is deferred and states that evaluations of OU B Terrestrial as a source of mercury to the marine environment are incomplete. What is your specific knowledge regarding the progress of a source control evaluation and a protectiveness determination for the remedy at OU B Terrestrial? Please indicate

the basis for your assessment of progress made toward a source control evaluation and a protectiveness determination at OU B Terrestrial.

Response:
Mercury source control investigation work is ongoing so the protectiveness determination for OU B T is unlikely to change during this FYR cycle. My response is based on updates provided by the terrestrial RPM at the last Bremerton Construction/CERCLA Coordination Meeting.

7. The fourth Five-Year Review (2017) for the BNC deferred the protectiveness determination for OU B Marine and states that the sources of mercury to OU B Marine (e.g., Outfall 15 drainage basin and a potential source located between Dry Docks 5 and 6) are not sufficiently understood. The fourth five-year review also indicates that the Navy is engaged with stakeholders to develop a Focused Feasibility Study and identify a remedy for OU B Marine. What is your specific knowledge regarding the progress of the Focused Feasibility Study and a protectiveness determination for the remedy at OU B Marine? Please indicate the basis for your assessment regarding progress of the focused feasibility study and a protectiveness determination at OU B Marine.

   Response:
   Mercury source control investigation work is ongoing and the draft FFS for OU B Marine has just been submitted to the stakeholders for review. So, the protectiveness determination for OU B Marine is unlikely to change during this FYR cycle. My response is based on updates provided by the terrestrial and marine RPMs at the last Bremerton Construction/CERCLA Coordination Meeting.

8. Are you aware of any prior or pending land use or ownership changes since the signing of the RODs for OU A, OU B Marine, OU B Terrestrial, OU D, or OU NSC, or completion of the corrective action plan for OU C, that may impact the effectiveness of any component of the selected remedies?

   Response:
   There are no pending land use or ownership changes at this time that may impact the effectiveness of any component of the selected remedies. The ownership of OU D was previously transferred to the City of Bremerton with land use restrictions.

9. Use of groundwater from beneath the BNC is prohibited for any purpose except groundwater monitoring, in accordance with instructions NAVBASEKITSAPINST 5090.14 and PSNS&IMFINST 5090.50. Are you aware of any use of groundwater from beneath the installation for any purpose other than groundwater monitoring,

(e.g., for human consumption, equipment maintenance, or equipment decontamination)?

Response:
I am not aware of groundwater at BNC being used for any purpose beyond groundwater monitoring.

10. To the best of your knowledge, do institutional controls and operations and maintenance practices in use at the BNC meet the intent of the RODs/corrective action plan regarding limiting the potential for contact with or movement of contaminants left in place (e.g., in connection with excavation management, petroleum management, and storm drain system monitoring and maintenance)? Please indicate the basis for your assessment regarding institutional controls and operations and maintenance practices in use at the BNC.

    Response:
    See response to question 3. Above.

11. To the best of your knowledge, has the on-going program of groundwater monitoring, institutional controls inspection and maintenance, cap, shoreline, and storm drain inspection and maintenance, and sediment and marine biota monitoring at the BNC following implementation of the remedies been sufficiently thorough and frequent to meet the goals of the RODs/corrective action plan? Please indicate the basis for your assessment as it relates to monitoring, inspections, and/or maintenance activities.

    Response:
    There has been a lot of data gathered over the years since the remedy implementation but very little optimization of monitoring and inspection activities. Changes such baseline surveys for pavement inspections and shoreline inspections and then inspections performed by qualified inspectors using definitive, defensible criteria would help to ensure that necessary maintenance to remedies in place is identified and programmed to ensure remedies continue to meet remedial goals. Also without upland source control, the thoroughness and frequency of ongoing marine monitoring is somewhat immaterial.

    My assessment is based on my time as the BNC terrestrial RPM, the OU B Marine RPM and the current sediment/remediation SME on the Waterfront Infrastructure Improvements and Shipyard Infrastructure Optimization Program teams. Also, I participate in regular Construction/CERLCA coordination meetings with the BNC RPMs.

12. Are you aware of any community concerns regarding the remedies in place at the BNC? If so, please provide details.

    Response:
    No, the community is not really interested in these remedies so many years post-RODs.

13. Do you have any other comments, concerns, or suggestions regarding the effectiveness of the remedies in place to protect human health and the environment at the BNC?

    Response:
    The stakeholders, especially Ecology, EPA and the Suquamish Tribe, have several longstanding concerns concerning the protectiveness of the remedies in place. Specifically, stakeholders are concerned about erosion at Charleston Beach, on-going sources of mercury from terrestrial areas to sediment and marine waters of Sinclair Inlet, shoreline erosion along unhardened portions of the shoreline, impacts of construction projects on terrestrial and marine remedies in place, extended timelines to implement remedy maintenance projects, and presence of exposed asbestos brick and slag at Charleston Beach.

INTERVIEW RECORD FOR FIFTH FIVE-YEAR REVIEW
Bremerton Naval Complex
Bremerton, WA

Individual Contacted:	Will Kaage
Title:	Scientist III
Organization:	EA Engineering, Science, and Technology

1. Please describe your specific knowledge of the Bremerton Naval Complex (BNC), the Records of Decision (RODs) for Operable Unit (OU) NSC, OU A, OU B Marine, OU B Terrestrial, and OU D, the implementation of the remedies at these operable units, the corrective action plan for OU C, and the monitoring and maintenance that has taken place since implementation of the remedies.

   Response:

I have worked at BNC in varying capacities the past 6+ years. I have performed field work including LUC inspections, remedy inspections, shoreline inspections, and groundwater sampling. I have also managed projects at BNC for the past 3+years. Responsibilities include the development of planning documents for work to be performed at BNC as well as technical reports summarizing data collected and performing trend analysis. These results utilize ROD decision criteria for recommendations to the sampling program. Also produced has been remedy inspection reports outlining the prescribed remedy and the protectiveness and quality/status of the prescribed remedy. Utilization of the RODs and CAP is a centerpiece of the work I have performed at BNC

2. What is your overall impression of remedy performance following signing of the RODs at OU A, OU B Marine, OU B Terrestrial, OU D, and OU NSC, completion of the corrective action plan for OU C, and implementation of the remedies at the BNC? Please indicate the basis for your assessment as it relates to the implementation of remedies at the BNC.

   Response:

The prescribed remedy is in a constant state of flux at BNC. There is so much work going on all the time that some remedies are dynamic in quality. NAVFAC has done it’s best to work around operations at BNC while addressing issues with the prescribed remedies, contaminants of concern, and applicable mitigation to issues as they arise. I feel there does need to be further refinement of the decision criteria at BNC and there needs to be an end goal instead of just monitoring indefinitely. Also, there needs to be some repaving of many areas in the eastern portion of the CIA that would remedy many deficient pavement cap features.

3. To the best of your knowledge, has on-going maintenance of pavement and vegetative covers (caps) and storm drains within the terrestrial OUs been conducted regularly and timely? Has maintenance of these caps effectively met the goals to reduce the potential for human contact with chemicals of concern (COCs) in soil and

to reduce the potential for infiltrating precipitation to transport chemicals to groundwater and Sinclair Inlet? Has storm drain maintenance effectively met the goals of reducing the potential for COCs to be discharged to Sinclair Inlet? Please indicate the basis for your assessment of the cap and storm drain maintenance activities in your response.

Response:
Maintenance has been conducted regularly and timely. These maintenance processes have met the goals of reducing human contact with COCs from soil, however, have not limited transport of COCs to Sinclair Inlet. There currently is investigations in the process of examining how to remedy COC transport through the stormwater system to Sinclair Inlet, and that should remedy some of the pathways to Sinclair Inlet.

4. To the best of your knowledge, have the shoreline stabilization measures put in place at OU A, OU B Terrestrial, and OU B Marine as part of the remedies been maintained to effectively meet the goal of controlling potential erosion of fill material to Sinclair Inlet? Please indicate the basis for your assessment of shoreline stabilization measures that have occurred at OU A, OU B Terrestrial, and OU B Marine in your response.

Response:
A majority of the shoreline at OU A, and OU B T is in good condition. Charleston Beach at OU A is currently being planned for further erosion control and Segment 4 at OU B T is also planned for repair. These two problem areas are significant, however the planned work should remedy the issues.

5. The fourth Five-Year Review (2017) indicates that the protectiveness determination for OU A is Short-Term Protective. Following the January 2019 Operable Unit A Charleston Beach Shoreline Repair Design Review, what is your specific knowledge regarding progress towards implementing a permanent repair of the OU A remedy? Please indicate the basis for your assessment of progress made towards a permanent repair of the OU A remedy.

Response:
A permanent repair at Charleston Beach is currently being planned. This should eliminate the need for periodic replenishment of the feeder berm and fish mix.

6. The fourth Five-Year Review (2017) for the BNC indicates that the protectiveness determination for OU B Terrestrial is deferred and states that evaluations of OU B Terrestrial as a source of mercury to the marine environment are incomplete. What is your specific knowledge regarding the progress of a source control evaluation and a protectiveness determination for the remedy at OU B Terrestrial? Please indicate the basis for your assessment of progress made toward a source control evaluation and a protectiveness determination at OU B Terrestrial.

Response:

Work upcoming in 2021 include further groundwater monitoring as well as the addition of catch basin/manhole sediment monitoring. This sediment monitoring will further refine the fate and transport model and hopefully will be able to identify stormwater drainage basins of concern. Storm drain basins which high sediment levels and those with high COC concentrations will be further evaluated for additional sediment monitoring to better understand this pathway to Sinclair Inlet.

7. The fourth Five-Year Review (2017) for the BNC deferred the protectiveness determination for OU B Marine and states that the sources of mercury to OU B Marine (e.g., Outfall 15 drainage basin and a potential source located between Dry Docks 5 and 6) are not sufficiently understood. The fourth five-year review also indicates that the Navy is engaged with stakeholders to develop a Focused Feasibility Study and identify a remedy for OU B Marine. What is your specific knowledge regarding the progress of the Focused Feasibility Study and a protectiveness determination for the remedy at OU B Marine? Please indicate the basis for your assessment regarding progress of the focused feasibility study and a protectiveness determination at OU B Marine.

Response:

I work mostly with the upland portions of BNC and so my knowledge of the OU B Marine monitoring and planning is from what is gathered during joint team/stakeholder meetings. I have not been involved in the FFS nor have I been involved in OU B Marine.

8. Are you aware of any prior or pending land use or ownership changes since the signing of the RODs for OU A, OU B Marine, OU B Terrestrial, OU D, or OU NSC, or completion of the corrective action plan for OU C, that may impact the effectiveness of any component of the selected remedies?

Response:

The only change was the transfer of OU D to the City of Bremerton via quick deed, however, the subsurface portion of OU D is still under Navy monitoring requirements.

9. Use of groundwater from beneath the BNC is prohibited for any purpose except groundwater monitoring, in accordance with instructions NAVBASEKITSAPINST 5090.14 and PSNS&IMFINST 5090.50. Are you aware of any use of groundwater from beneath the installation for any purpose other than groundwater monitoring, (e.g., for human consumption, equipment maintenance, or equipment decontamination)?

Response:

No, I am not aware of any groundwater usage at BNC other than for monitoring.

10. To the best of your knowledge, do institutional controls and operations and maintenance practices in use at the BNC meet the intent of the RODs/corrective action plan regarding limiting the potential for contact with or movement of contaminants left in place (e.g., in connection with excavation management, petroleum management, and storm drain system monitoring and maintenance)? Please indicate the basis for your assessment regarding institutional controls and operations and maintenance practices in use at the BNC.

Response:
For the most part ICs and O&M practices have been followed at BNC. During LUCs we make note of any deficiencies such as uncovered stockpiles or stockpiles near catch basins without sediment socks. For the most part, deficient findings are not common.

11. To the best of your knowledge, has the on-going program of groundwater monitoring, institutional controls inspection and maintenance, cap, shoreline, and storm drain inspection and maintenance, and sediment and marine biota monitoring at the BNC following implementation of the remedies been sufficiently thorough and frequent to meet the goals of the RODs/corrective action plan? Please indicate the basis for your assessment as it relates to monitoring, inspections, and/or maintenance activities.

Response:
To meet the goals outlined in the RODs/CAP, yes, the on-going program has been sufficient. The RODs/CAP do not outline any remedy goals beyond continuing to monitor, even if some COCs are increasing.

12. Are you aware of any community concerns regarding the remedies in place at the BNC? If so, please provide details.

Response:
I am not aware of any community concerns other than that of the Suquamish Tribe regarding the remedies in place. They wonder what the end goal of all of this is.

13. Do you have any other comments, concerns, or suggestions regarding the effectiveness of the remedies in place to protect human health and the environment at the BNC?

Response:
None

INTERVIEW RECORD FOR FIFTH FIVE-YEAR REVIEW
Bremerton Naval Complex
Bremerton, WA

Individual Contacted:	Trevor Richardson
Title:	NPDES Program Manager
Organization:	PSNS & IMF

1. Please describe your specific knowledge of the Bremerton Naval Complex (BNC), the Records of Decision (RODs) for Operable Unit (OU) NSC, OU A, OU B Marine, OU B Terrestrial, and OU D, the implementation of the remedies at these operable units, the corrective action plan for OU C, and the monitoring and maintenance that has taken place since implementation of the remedies.

   Response: Minimal knowledge outside of recent and current remedy progress (such as closeout of PCB requirements, mercury issues) and implementation at OUB Terrestrial/Marine and OUA Charleston Beach (replenishment and reshaping). General knowledge of OUB Marine history.

2. What is your overall impression of remedy performance following signing of the RODs at OU A, OU B Marine, OU B Terrestrial, OU D, and OU NSC, completion of the corrective action plan for OU C, and implementation of the remedies at the BNC? Please indicate the basis for your assessment as it relates to the implementation of remedies at the BNC.

   Response: Can only speak for OUB Marine, it seems as though performance for the contaminants in the original ROD has been fair (removal of PCB requirements) however Hg will be a huge issue in the coming years.

3. To the best of your knowledge, has on-going maintenance of pavement and vegetative covers (caps) and storm drains within the terrestrial OUs been conducted regularly and timely? Has maintenance of these caps effectively met the goals to reduce the potential for human contact with chemicals of concern (COCs) in soil and to reduce the potential for infiltrating precipitation to transport chemicals to groundwater and Sinclair Inlet? Has storm drain maintenance effectively met the goals of reducing the potential for COCs to be discharged to Sinclair Inlet? Please indicate the basis for your assessment of the cap and storm drain maintenance activities in your response.

   Response: I can only speak for storm drain maintenance, which has been conducted regularly and timely to the best of my knowledge. Increased communication between NAVFAC NW and PSNS & IMF recently will help to improve any areas that need follow-up/additional maintenance.

4. To the best of your knowledge, have the shoreline stabilization measures put in place at OU A, OU B Terrestrial, and OU B Marine as part of the remedies been maintained to effectively meet the goal of controlling potential erosion of fill material to Sinclair Inlet? Please indicate the basis for your assessment of shoreline stabilization measures that have occurred at OU A, OU B Terrestrial, and OU B Marine in your response.

   Response: I do not have any knowledge of shore stabilization effectiveness.

5. The fourth Five-Year Review (2017) indicates that the protectiveness determination for OU A is Short-Term Protective. Following the January 2019 Operable Unit A Charleston Beach Shoreline Repair Design Review, what is your specific knowledge regarding progress towards implementing a permanent repair of the OU A remedy? Please indicate the basis for your assessment of progress made towards a permanent repair of the OU A remedy.

   Response: I have heard from the RPM that reshaping the beach is being considered to reduce the periodicity/increase the effectiveness of replenishment.

6. The fourth Five-Year Review (2017) for the BNC indicates that the protectiveness determination for OU B Terrestrial is deferred and states that evaluations of OU B Terrestrial as a source of mercury to the marine environment are incomplete. What is your specific knowledge regarding the progress of a source control evaluation and a protectiveness determination for the remedy at OU B Terrestrial? Please indicate the basis for your assessment of progress made toward a source control evaluation and a protectiveness determination at OU B Terrestrial.

   Response: I know a Focused Feasibility Study is in place to evaluate Hg source control alternatives, and that repair work on the storm drain line of concern should be underway soon. I have no knowledge of the protectiveness determination.

7. The fourth Five-Year Review (2017) for the BNC deferred the protectiveness determination for OU B Marine and states that the sources of mercury to OU B Marine (e.g., Outfall 15 drainage basin and a potential source located between Dry Docks 5 and 6) are not sufficiently understood. The fourth five-year review also indicates that the Navy is engaged with stakeholders to develop a Focused Feasibility Study and identify a remedy for OU B Marine. What is your specific knowledge regarding the progress of the Focused Feasibility Study and a protectiveness determination for the remedy at OU B Marine? Please indicate the basis for your assessment regarding progress of the focused feasibility study and a protectiveness determination at OU B Marine.

Response: I know the FFS is evaluating source control alternatives such as a tidal gate/check valve, storm drain repair/replacement, & treatment technologies. I have no knowledge of the protectiveness determination.

8. Are you aware of any prior or pending land use or ownership changes since the signing of the RODs for OU A, OU B Marine, OU B Terrestrial, OU D, or OU NSC, or completion of the corrective action plan for OU C, that may impact the effectiveness of any component of the selected remedies?

   Response: No.

9. Use of groundwater from beneath the BNC is prohibited for any purpose except groundwater monitoring, in accordance with instructions NAVBASEKITSAPINST 5090.14 and PSNS&IMFINST 5090.50. Are you aware of any use of groundwater from beneath the installation for any purpose other than groundwater monitoring, (e.g., for human consumption, equipment maintenance, or equipment decontamination)?

   Response: No.

10. To the best of your knowledge, do institutional controls and operations and maintenance practices in use at the BNC meet the intent of the RODs/corrective action plan regarding limiting the potential for contact with or movement of contaminants left in place (e.g., in connection with excavation management, petroleum management, and storm drain system monitoring and maintenance)? Please indicate the basis for your assessment regarding institutional controls and operations and maintenance practices in use at the BNC.

    Response: Yes. I manage the PSNS & IMF water program and work with shipyard employees, contractors, and NAVFAC Public Works to ensure excavation management and storm drain system monitoring and maintenance is conducted according the ROD/CAP requirements.

11. To the best of your knowledge, has the on-going program of groundwater monitoring, institutional controls inspection and maintenance, cap, shoreline, and storm drain inspection and maintenance, and sediment and marine biota monitoring at the BNC following implementation of the remedies been sufficiently thorough and frequent to meet the goals of the RODs/corrective action plan? Please indicate the basis for your assessment as it relates to monitoring, inspections, and/or maintenance activities.

    Response: To the best of my knowledge, yes.

12. Are you aware of any community concerns regarding the remedies in place at the BNC? If so, please provide details.

    Response: The only community concerns I am aware of come from stakeholders such as the Suquamish Tribe, who want to ensure the remedies are sufficient to protect their members against harmful effects of the contamination from the BNC and preserve the beneficial uses of the Inlet.

13. Do you have any other comments, concerns, or suggestions regarding the effectiveness of the remedies in place to protect human health and the environment at the BNC?

    Response: No.

INTERVIEW RECORD FOR FIFTH FIVE-YEAR REVIEW
Bremerton Naval Complex
Bremerton, WA

Individual Contacted:	Charles "Don" Clabaugh
Title:	Hydrogeologist
Organization:	USEPA

1. Please describe your specific knowledge of the Bremerton Naval Complex (BNC), the Records of Decision (RODs) for Operable Unit (OU) NSC, OU A, OU B Marine, OU B Terrestrial, and OU D, the implementation of the remedies at these operable units, the corrective action plan for OU C, and the monitoring and maintenance that has taken place.

   Response: I have reviewed the ROD, the last FYR and the most recent TAR reports.

2. What is your overall impression of remedy performance following signing of the RODs for OU A, OU B Marine, OU B Terrestrial, OU D, and OU NSC, completion of the corrective action plan for OU C, and implementation of the remedies at the BNC? Do you believe the remedies meet the intent of the RODs/corrective action plan for these sites? Do you feel the remedies continue to be effective? Please indicate the basis for your assessment as it relates to the implementation and effectiveness of remedies at the BNC.

   Response: Remedies for OUA and OUB Marine have been compromised and are no longer protective. OUA beach erosion of waste and soil that classifies as hazardous waste has occurred; groundwater pathway from OUA is of concern for metals COCs. OUB Marine remedy has become recontaminated with mercury. Remedies for OUB Terrestrial have been compromised by groundwater and stormwater pathways for mercury.

3. The fourth Five-Year Review (2017) indicates that the protectiveness determination for OU A is Short-Term Protective. Following the January 2019 *Operable Unit A Charleston Beach Shoreline Repair Design Review*, what is your specific knowledge regarding progress towards implementing a permanent repair of the OU A remedy. Please indicate the basis for your assessment regarding progress made towards a permanent repair of the OU A remedy.

Response: 30% design solution for Charleston Beach should be effective in eliminating waste erosion. Additional design elements for addressing metals in groundwater may be necessary to provide a permanent remedy; this will be informed by the ongoing USGS study.

4. The fourth Five-Year Review (2017) for the BNC indicates that the protectiveness determination for OU B Terrestrial is deferred and states that evaluations of OU B Terrestrial as a source of mercury to the marine environment are incomplete. What is your specific knowledge regarding the progress of a source control evaluation and a protectiveness determination for the remedy at OU B Terrestrial? Please indicate the basis for your assessment of progress made toward a source control evaluation and a protectiveness determination at OU B Terrestrial.

Response: The Source Control Memo in the OUB FFS presents several alternatives that address the OU B Terrestrial mercury sources. A protectiveness determination can be made after the source control preferred alternative is implemented.

5. The fourth five-year review (2017) for the BNC deferred the protectiveness determination for OU B Marine and states that the sources of mercury to OU B Marine (e.g., Outfall 15 drainage basin and a potential source located between Dry Docks 5 and 6) are not sufficiently understood. The fourth five-year review also indicates that the Navy is engaged with stakeholders to develop a focused feasibility study and identify a remedy for OU B Marine. What is your specific knowledge regarding the progress of the focused feasibility study and a protectiveness determination for the remedy at OU B Marine? Please indicate the basis for your assessment regarding progress of the focused feasibility study and a protectiveness determination at OU B Marine.

Response: Currently reviewing the OUB Marine Draft FFS; a protectiveness determination can be made after the FFS preferred alternative is implemented.

6. To your knowledge, since the completion of the fourth five-year review (2017), have there been any new scientific findings that relate to projecting potential site risks which might call into question the protectiveness of the remedies for OU A, OU B Marine, OU B Terrestrial, OU C, OU D, and OU NSC?

Response: The most recent TAR detected TCE above MTCA cleanup levels in OUB Terrestrial. Stormdrain studies have been useful in evaluating mercury pathways from OUB T to OUB M. USGS seep surveys have identified groundwater pathways from OUA and OUB T to OUB M.

7. To the best of your knowledge, are institutional controls and operations and maintenance procedures being utilized at the BNC consistent with the terms of the RODs/corrective action plan?

Response: Yes.

8. Since the completion of the fourth five-year review (2017) have there been any complaints, violations, or other incidents related to the BNC installation restoration issues that required a response by your office? If so, please provide details of the events and results of the responses.

Response: Not to my knowledge.

9. To the best of your knowledge, has the on-going program of groundwater monitoring, institutional controls inspection and maintenance, cap, shoreline, and storm drain inspection and maintenance, and sediment and marine biota monitoring at the BNC following implementation of the remedies been sufficiently thorough and frequent to meet the goals of the RODs/corrective action plan? Please indicate the basis for your assessment. Please indicate the basis for your assessment as it relates to monitoring, inspections, and/or maintenance activities.

Response: The decision making process for determining the frequency and COCs to monitor in groundwater need to be evaluated; the current program lacks DQOs necessary to provide data needed to update the CSM.

10. Are you aware of any community concerns regarding the remedies in place at the BNC? If so, please give details.

    Response: No.

11. Do you have any other comments, concerns, or suggestions regarding the effectiveness of the remedies in place to protect human health and the environment at the BNC?

    Response: No.

Appendix B:
2020 and 2021 OU A Soil and Sediment Sampling Results

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Table 1. Validated Results - Soil - SVOCs

				BR-OUA-G1				
Sample ID	**RSLs Residentail Soil =0.1 November 2020**	**Title 40 Code of Federal Regulations (CFR) 261.24 [20x] Criteria**	**CLARC Method A/B**	BR-OUA-G1-SB02-0-5	BR-OUA-G1-SB02P-0-5	BR-OUA-G1-SB02-5.5-8.5	BR-OUA-G1-SB02-5-5.5	BR-OUA-G1-SB02-8.5-9
Sample Date				12/18/20	12/18/20	12/18/20	12/18/20	12/18/20
Semivolatile Organic Compounds (UG/KG)								
2-Methylnaphthalene	24,000	--	--	0.538 U	0.529 U	0.592 U	0.552 U	0.583 U
3- and 4-Methylphenol	320,000	4,000,000	2,200	43.1 U	42.1 U	47.4 U	45.3 U	46.9 U
Acenaphthene	360,000	--	--	**1.66 J**	0.529 U	0.592 U	0.552 U	0.583 U
Acenaphthylene	--	--	--	**1.95 J**	0.529 U	0.592 U	0.552 U	0.583 U
Anthracene	1,800,000	--	--	**9.05**	**3.69**	**5.73**	1.1 U	**2.81 J**
Benzo(a)anthracene	1,100	--	190	**93.8 J**	**45.7 J**	**27.7**	**2.18 J**	**21.9**
Benzo(a)pyrene	110	--	--	**100 J**	**56.7 J**	**23.5**	**2.41 J**	**20.1**
Benzo(b)fluoranthene	1,100	--	--	**151 J**	**87.7 J**	**33.3**	**3.94**	**27.7**
Benzo(g,h,i)perylene	--	--	--	**40.8 J**	**29.1 J**	**11.5**	**1.65 J**	**8.65**
Benzo(k)fluoranthene	11,000	--	--	**56 J**	**32.7 J**	**13.6**	0.552 U	**11.5**
Bis(2-Ethylhexyl)phthalate	39,000	--	--	32.3 U	31.6 U	35.5 U	34 U	35.2 U
Carbazole	--	--	--	43.1 U	42.1 U	47.4 U	45.3 U	46.9 U
Chrysene	110,000	--	--	**112 J**	**59 J**	**31.7**	**1.98 J**	**25.1**
Dibenz(a,h)anthracene	110	--	--	**12.2**	**7.84**	**2.61 J**	1.1 U	**2.49 J**
Dibenzofuran	7,800	--	--	32.3 U	31.6 U	35.5 U	34 U	35.2 U
Fluoranthene	240,000	--	--	**133 J**	**59.5 J**	**48**	**1.57 J**	**32.8**
Fluorene	240,000	--	--	**1.59 J**	1.06 U	**1.73 J**	1.1 U	1.17 U
Indeno(1,2,3-cd)pyrene	1,100	--	1,100,000	**47.1 J**	**32 J**	**10.9**	1.1 U	**8.69**
Naphthalene	2,000	--	--	0.538 U	0.529 U	0.592 U	0.552 U	0.583 U
Phenanthrene	--	--	--	**36.9**	**12.9**	**29.6**	1.1 U	**13.1**
Phenol	1,900,000	--	--	43.1 U	42.1 U	47.4 U	45.3 U	46.9 U
Pyrene	180,000	--	--	**176 J**	**82.7 J**	**61.6**	**2.18 J**	**43.2**

Notes:
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Table 1. Validated Results - Soil - SVOCs

				BR-OUA-G2				
Sample ID	**RSLs Residentail Soil =0.1 November 2020**	**Title 40 Code of Federal Regulations (CFR) 261.24 [20x] Criteria**	**CLARC Method A/B**	BR-OUA-G2-SB03-0-5	BR-OUA-G2-SB03P-0-5	BR-OUA-G2-SB03-5.5-8.5	BR-OUA-G2-SB03-5-5.5	BR-OUA-G2-SB03-8.5-9
Sample Date				12/18/20	12/18/20	12/18/20	12/18/20	12/18/20
Semivolatile Organic Compounds (UG/KG)								
2-Methylnaphthalene	24,000	--	--	2.73 J	0.53 U	0.548 U	0.548 U	0.538 U
3- and 4-Methylphenol	320,000	4,000,000	2,200	41.8 U	43.3 U	42.7 U	43.8 U	43.9 U
Acenaphthene	360,000	--	--	4.64	0.53 U	0.548 U	0.548 U	0.538 U
Acenaphthylene	--	--	--	4.45	3.68	0.548 U	0.548 U	0.538 U
Anthracene	1,800,000	--	--	22.3	5.36	1.76 J	1.81 J	1.08 U
Benzo(a)anthracene	1,100	--	190	136 J	37.5 J	12.7	12.1	2.38 J
Benzo(a)pyrene	110	--	--	158 J	54.5 J	16.6	18.9	2.35 J
Benzo(b)fluoranthene	1,100	--	--	219 J	86 J	23.8	21.5	3.05 J
Benzo(g,h,i)perylene	--	--	--	67.8 J	33.5 J	7.66	10.5	1.08 U
Benzo(k)fluoranthene	11,000	--	--	86.6 J	29.7 J	9.51	8.47	0.538 U
Bis(2-Ethylhexyl)phthalate	39,000	--	--	31.4 U	32.4 U	32 U	32.9 U	32.9 U
Carbazole	--	--	--	41.8 U	43.3 U	42.7 U	43.8 U	43.9 U
Chrysene	110,000	--	--	162 J	50.7 J	17.4	14.9	2.12 J
Dibenz(a,h)anthracene	110	--	--	19.2	8.85	2.03 J	2.04 J	1.08 U
Dibenzofuran	7,800	--	--	31.4 U	32.4 U	32 U	32.9 U	32.9 U
Fluoranthene	240,000	--	--	226 J	52.9 J	21.2	17.7	2.4 J
Fluorene	240,000	--	--	5.01	1.06 U	1.1 U	1.1 U	1.08 U
Indeno(1,2,3-cd)pyrene	1,100	--	1,100,000	78.7 J	37.5 J	8.99	10.6	1.08 U
Naphthalene	2,000	--	--	3.67	0.53 U	0.548 U	0.548 U	0.538 U
Phenanthrene	--	--	--	113	11.4	5.61	9.47	1.08 U
Phenol	1,900,000	--	--	41.8 U	25.1 J	42.7 U	43.8 U	43.9 U
Pyrene	180,000	--	--	255 J	70.5 J	21.5	24.5	3.01 J

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Table 1. Validated Results - Soil - SVOCs

				BR-OUA-H2				BR-OUA-I3		
Sample ID	**RSLs Residentail Soil =0.1 November 2020**	**Title 40 Code of Federal Regulations (CFR) 261.24 [20x] Criteria**	**CLARC Method A/B**	BR-OUA-H2-SB04-0-5	BR-OUA-H2-SB04-5.5-8.5	BR-OUA-H2-SB04-5-5.5	BR-OUA-H2-SB04-8.5-9	BR-OUA-I3-SB05-0-5.5	BR-OUA-I3-SB05P-0-5.5	BR-OUA-I3-SB05-5.5-6
Sample Date				12/17/20	12/17/20	12/17/20	12/17/20	12/17/20	12/17/20	12/17/20
Semivolatile Organic Compounds (UG/KG)										
2-Methylnaphthalene	24,000	--	--	2.65 U	0.527 U	**2.14 J**	0.581 U	0.554 U	0.541 U	2.84 U
3- and 4-Methylphenol	320,000	4,000,000	2,200	42.2 U	41.9 U	43.4 U	45.6 U	44 U	43.9 U	226 U
Acenaphthene	360,000	--	--	2.65 U	0.527 U	**14.7**	0.581 U	0.554 U	0.541 U	2.84 U
Acenaphthylene	--	--	--	2.65 U	0.527 U	**2.18 J**	0.581 U	0.554 U	0.541 U	2.84 U
Anthracene	1,800,000	--	--	5.31 U	**2.11 J**	**24.3**	1.16 U	**2.47 J**	**4.27**	**8.57 J**
Benzo(a)anthracene	1,100	--	190	**20.6**	**8.46**	**56.2**	1.16 U	**19.2 J**	**78.8 J**	**62.1**
Benzo(a)pyrene	110	--	--	**26.9**	**9.57**	**58.2**	1.16 U	**23 J**	**129 J**	**137**
Benzo(b)fluoranthene	1,100	--	--	**34.1**	**12.8**	**64.2**	0.581 U	**31.1 J**	**141 J**	**143**
Benzo(g,h,i)perylene	--	--	--	**17.3 J**	**7.09**	**37.5**	1.16 U	**12.5**	**72.1**	**94.7**
Benzo(k)fluoranthene	11,000	--	--	**11.4 J**	**4.94**	**27.6**	0.581 U	**11.7**	**53.6**	**51.3**
Bis(2-Ethylhexyl)phthalate	39,000	--	--	31.6 U	31.4 U	32.5 U	**281 J**	33 U	32.9 U	169 U
Carbazole	--	--	--	42.2 U	41.9 U	43.4 U	45.6 U	44 U	43.9 U	226 U
Chrysene	110,000	--	--	**30**	**10.4**	**67.6**	0.581 U	**22.9 J**	**103 J**	**80.1**
Dibenz(a,h)anthracene	110	--	--	5.31 U	**1.43 J**	**9.66**	1.16 U	**2.96 J**	**13.9**	**15.9 J**
Dibenzofuran	7,800	--	--	31.6 U	31.4 U	32.5 U	34.2 U	33 U	32.9 U	169 U
Fluoranthene	240,000	--	--	**29.3**	**14.5**	**106**	1.16 U	**27.2 J**	**85.1 J**	**59.2**
Fluorene	240,000	--	--	5.31 U	1.05 U	**9.93**	1.16 U	1.11 U	1.08 U	5.68 U
Indeno(1,2,3-cd)pyrene	1,100	--	1,100,000	**11.9 J**	**6.19**	**37.3**	1.16 U	**13.2**	**67.1**	**86.5**
Naphthalene	2,000	--	--	2.65 U	0.527 U	**1.82 J**	0.581 U	0.554 U	0.541 U	**13.6 J**
Phenanthrene	--	--	--	**16.3 J**	**8.57**	**101**	1.16 U	**9.65**	**13.9**	**34.1**
Phenol	1,900,000	--	--	42.2 U	41.9 U	43.4 U	45.6 U	44 U	43.9 U	226 U
Pyrene	180,000	--	--	**41.6**	**18.2**	**134**	0.581 U	**35.7 J**	**147 J**	**93.2**

Notes:
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Page 1 of 1

Table 1. Validated Results - Soil - SVOCs

Sample ID	RSLs Residentail Soil =0.1 November 2020	Title 40 Code of Federal Regulations (CFR) 261.24 [20x] Criteria	CLARC Method A/B	BR-OUA-J2				BR-OUA-K3			
				BR-OUA-J2-SB06-0-5	BR-OUA-J2-SB06-5.5-8.5	BR-OUA-J2-SB06-5-5.5	BR-OUA-J2-SB06-8.5-9	BR-OUA-K3-SB07-0-6	BR-OUA-K3-SB07-6.5-9.5	BR-OUA-K3-SB07-6-6.5	BR-OUA-K3-SB07-9.5-10
Sample Date				12/16/20	12/16/20	12/16/20	12/16/20	12/16/20	12/16/20	12/16/20	12/16/20
Semivolatile Organic Compounds (UG/KG)											
2-Methylnaphthalene	24,000	--	--	2.72 U	24.9 J	5.57 U	5.99 U	2.69 U	5.81 U	2.8 U	313
3- and 4-Methylphenol	320,000	4,000,000	2,200	42.9 U	229 U	445 U	240 U	218 U	468 U	45.1 U	453 U
Acenaphthene	360,000	--	--	2.72 U	174	93.8	214	9.52 J	134	16.1 J	1,400
Acenaphthylene	--	--	--	2.72 U	5.8 U	24.7 J	5.99 U	2.69 U	5.81 U	9.37 J	28.5 U
Anthracene	1,800,000	--	--	19.3	555	385	755	29.6	503	88.6	4,040
Benzo(a)anthracene	1,100	--	190	217	3,240	3,620	3,510	253 J	3,440	709	15,000
Benzo(a)pyrene	110	--	--	224	2,810	3,660	3,100	239 J	3,180	635	12,000
Benzo(b)fluoranthene	1,100	--	--	297	3,790	4,850	4,010	306 J	4,000	834	15,200
Benzo(g,h,i)perylene	--	--	--	121	1,160	1,650	1,220	158 J	1,480	380	6,010
Benzo(k)fluoranthene	11,000	--	--	121	1,490	1,860	1,650	125 J	1,640	332	6,180
Bis(2-Ethylhexyl)phthalate	39,000	--	--	32.2 U	172 U	334 U	180 U	163 U	351 U	33.9 U	340 U
Carbazole	--	--	--	42.9 U	332 J	445 U	310 J	218 U	468 U	64.6 J	314 J
Chrysene	110,000	--	--	255	3,640	4,190	3,980	293 J	3,840	793	16,900
Dibenz(a,h)anthracene	110	--	--	32.2	376	496	415	40.6	453	106	1,790
Dibenzofuran	7,800	--	--	32.2 U	99.2 J	334 U	163 J	163 U	351 U	20.7 J	340 U
Fluoranthene	240,000	--	--	316	5,010	4,920	5,680	368 J	4,930	1,040	24,500
Fluorene	240,000	--	--	5.44 U	169	82.9	201	9.46 J	122	15.2 J	1,510
Indeno(1,2,3-cd)pyrene	1,100	--	1,100,000	132	1,350	1,960	1,540	166 J	1,730	427	6,850
Naphthalene	2,000	--	--	2.72 U	23.7 J	5.57 U	5.99 U	2.69 U	5.81 U	10.4 J	527
Phenanthrene	--	--	--	97.6	2,560	1,730	2,870	156 J	1,930	318	17,400
Phenol	1,900,000	--	--	55.1 J	256 J	445 U	135 J	218 U	468 U	45.1 U	453 U
Pyrene	180,000	--	--	418	6,220	6,430	6,210	473 J	6,020	1,210	29,000

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Table 1. Validated Results - Soil - SVOCs

				BR-OUA-L2				
Sample ID	**RSLs Residentail Soil =0.1 November 2020**	**Title 40 Code of Federal Regulations (CFR) 261.24 [20x] Criteria**	**CLARC Method A/B**	BR-OUA-L2-SB08-0-5	BR-OUA-L2-SB08P-0-5	BR-OUA-L2-SB08-5.5-8.5	BR-OUA-L2-SB08-5-5.5	BR-OUA-L2-SB08-8.5-9
Sample Date				12/16/20	12/16/20	12/16/20	12/16/20	12/16/20
Semivolatile Organic Compounds (UG/KG)								
2-Methylnaphthalene	24,000	--	--	0.553 U	0.549 U	6.05 U	110 U	0.623 U
3- and 4-Methylphenol	320,000	4,000,000	2,200	43.7 U	43.4 U	484 U	4470 U	49.8 U
Acenaphthene	360,000	--	--	0.553 U	0.549 U	**83.4**	**1,780**	0.623 U
Acenaphthylene	--	--	--	0.553 U	**2.16 J**	6.05 U	110 U	0.623 U
Anthracene	1,800,000	--	--	**6.44**	**5.87**	**375**	**6,450**	1.25 U
Benzo(a)anthracene	1,100	--	190	**32.1**	**40.2**	**2,810**	**43,000**	**4.78**
Benzo(a)pyrene	110	--	--	**34.8 J**	**47.8 J**	**2,480**	**40,200**	**4.05 J**
Benzo(b)fluoranthene	1,100	--	--	**45.3 J**	**70.4 J**	**3,290**	**49,400**	**5.21**
Benzo(g,h,i)perylene	--	--	--	**22.9**	**29.4**	**1,210**	**22,600**	**2.39 J**
Benzo(k)fluoranthene	11,000	--	--	**18.1 J**	**27.5 J**	**1,310**	**20,800**	**2.05 J**
Bis(2-Ethylhexyl)phthalate	39,000	--	--	32.7 U	32.5 U	363 U	3350 U	37.4 U
Carbazole	--	--	--	43.7 U	43.4 U	484 U	**19,200 J**	49.8 U
Chrysene	110,000	--	--	**37.5 J**	**53.1 J**	**2,890**	**49,100**	**4.44**
Dibenz(a,h)anthracene	110	--	--	**5.67**	**7.68**	**363**	**6,400**	1.25 U
Dibenzofuran	7,800	--	--	32.7 U	32.5 U	363 U	**7,860 J**	37.4 U
Fluoranthene	240,000	--	--	**58.3**	**63.1**	**5,160**	**63,500**	**7.5**
Fluorene	240,000	--	--	**1.53 J**	1.1 U	**69.5**	**1,830**	1.25 U
Indeno(1,2,3-cd)pyrene	1,100	--	1,100,000	**24.3**	**32.7**	**1,460**	**25,000**	**2.67 J**
Naphthalene	2,000	--	--	0.553 U	0.549 U	6.05 U	110 U	0.623 U
Phenanthrene	--	--	--	**24.8**	**15.1**	**1,360**	**32,500**	**2.05 J**
Phenol	1,900,000	--	--	43.7 U	43.4 U	484 U	4470 U	49.8 U
Pyrene	180,000	--	--	**64.7**	**78.8**	**5,410**	**82,700**	**8.39**

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Table 1. Validated Results - Soil - SVOCs

Sample ID	RSLs Residentail Soil =0.1 November 2020	Title 40 Code of Federal Regulations (CFR) 261.24 [20x] Criteria	CLARC Method A/B	BR-OUA-M3				
				BR-OUA-M3-SB09-0-6	BR-OUA-M3-SB09P-0-6	BR-OUA-M3-SB09-6.5-9.5	BR-OUA-M3-SB09-6-6.5	BR-OUA-M3-SB09-9.5-10
Sample Date				12/15/20	12/15/20	12/15/20	12/15/20	12/15/20
Semivolatile Organic Compounds (UG/KG)								
2-Methylnaphthalene	24,000	--	--	**19.8**	**11 J**	0.557 U	**3.18 J**	0.579 U
3- and 4-Methylphenol	320,000	4,000,000	2,200	217 U	219 U	45.8 U	**46.8 J**	46.6 U
Acenaphthene	360,000	--	--	2.62 U	2.76 U	0.557 U	**8.42**	0.579 U
Acenaphthylene	--	--	--	**8.48 J**	**11.5 J**	0.557 U	**14.2**	0.579 U
Anthracene	1,800,000	--	--	**18**	**28.8**	1.11 U	**69.1**	1.16 U
Benzo(a)anthracene	1,100	--	190	**126**	**157**	**4.75**	**<u>366</u>**	**1.79 J**
Benzo(a)pyrene	110	--	--	**143 J**	**226 J**	**4.49**	**401**	1.16 U
Benzo(b)fluoranthene	1,100	--	--	**231 J**	**333 J**	**7.05**	**681**	**2.14 J**
Benzo(g,h,i)perylene	--	--	--	**118 J**	**210 J**	**3.78**	**195**	1.16 U
Benzo(k)fluoranthene	11,000	--	--	**75.8 J**	**110 J**	**2.52 J**	**189**	0.579 U
Bis(2-Ethylhexyl)phthalate	39,000	--	--	162 U	164 U	34.3 U	33.8 U	35 U
Carbazole	--	--	--	217 U	219 U	45.8 U	45 U	46.6 U
Chrysene	110,000	--	--	**146**	**192**	**5.01**	**408**	0.579 U
Dibenz(a,h)anthracene	110	--	--	**28.4**	**45.4**	1.11 U	**47.1**	1.16 U
Dibenzofuran	7,800	--	--	162 U	164 U	34.3 U	33.8 U	35 U
Fluoranthene	240,000	--	--	**214**	**288**	**8.61**	**662**	**1.92 J**
Fluorene	240,000	--	--	5.24 U	5.51 U	1.11 U	**7.9**	1.16 U
Indeno(1,2,3-cd)pyrene	1,100	--	1,100,000	**128 J**	**212 J**	**3.9**	**240**	1.16 U
Naphthalene	2,000	--	--	**19.4**	**13.8 J**	0.557 U	**5.14**	0.579 U
Phenanthrene	--	--	--	**61.7**	**110**	**3.27 J**	**219**	1.16 U
Phenol	1,900,000	--	--	**165 J**	**219 J**	45.8 U	**236 J**	46.6 U
Pyrene	180,000	--	--	**224**	**300**	**8.6**	**663**	**1.87 J**

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Table 1. Validated Results - Soil - SVOCs

				BR-OUA-N2			
Sample ID	**RSLs Residentail Soil =0.1 November 2020**	**Title 40 Code of Federal Regulations (CFR) 261.24 [20x] Criteria**	**CLARC Method A/B**	BR-OUA-N2-SB10-0-5	BR-OUA-N2-SB10-5.5-8.5	BR-OUA-N2-SB10-5-5.5	BR-OUA-N2-SB10-8.5-9
Sample Date				12/15/20	12/15/20	12/15/20	12/15/20
Semivolatile Organic Compounds (UG/KG)							
2-Methylnaphthalene	24,000	--	--	0.535 U	**3.46 J**	0.562 U	0.561 U
3- and 4-Methylphenol	320,000	4,000,000	2,200	**51.4 J**	**82.5 J**	45 U	45.2 U
Acenaphthene	360,000	--	--	0.535 U	**6.53**	**8.21**	**1.63 J**
Acenaphthylene	--	--	--	0.535 U	**19.9**	**17.8**	**4.45**
Anthracene	1,800,000	--	--	**5.56**	**39.8**	**77.2**	**11.2**
Benzo(a)anthracene	1,100	--	190	**62**	**292**	**451**	**66.8 J**
Benzo(a)pyrene	110	--	--	**65.5**	**311**	**414**	**69.8 J**
Benzo(b)fluoranthene	1,100	--	--	**90.1**	**481**	**644**	**106 J**
Benzo(g,h,i)perylene	--	--	--	**33.6**	**154**	**208**	**58.2 J**
Benzo(k)fluoranthene	11,000	--	--	**35.2**	**208**	**246**	**38.2 J**
Bis(2-Ethylhexyl)phthalate	39,000	--	--	32.5 U	33.4 U	33.7 U	33.9 U
Carbazole	--	--	--	43.4 U	**24.5 J**	45 U	45.2 U
Chrysene	110,000	--	--	**74.4**	**341**	**494**	**76 J**
Dibenz(a,h)anthracene	110	--	--	**9.31**	**42.8**	**58.1**	**15.7**
Dibenzofuran	7,800	--	--	32.5 U	33.4 U	33.7 U	33.9 U
Fluoranthene	240,000	--	--	**86.1**	**426**	**726**	**121 J**
Fluorene	240,000	--	--	1.07 U	**7.42**	**9.31**	**2.6 J**
Indeno(1,2,3-cd)pyrene	1,100	--	1,100,000	**37.7**	**192**	**257**	**65.5 J**
Naphthalene	2,000	--	--	0.535 U	**4.58**	0.562 U	0.561 U
Phenanthrene	--	--	--	**26.4**	**131**	**261**	**46.4 J**
Phenol	1,900,000	--	--	**106 J**	**383**	**41.2 J**	45.2 U
Pyrene	180,000	--	--	**117**	**462**	**714**	**109 J**

Notes:
Shading indicates exceedance of RSLs Residentail Soil =0.1 November 2020
Bold outside box indicates exceedance of Title 40 Code of Federal Regulations (CFR) 261.24 [20x] Criteria
Underline indicates exceedance of CLARC Method A/B
J - Analyte present. Value may or may not be accurate or precise
U - The material was analyzed for, but not detected
UG/KG - Micrograms per kilogram

Table 1. Validated Results - Soil - SVOCs

				BR-OUA-O2			
Sample ID	**RSLs Residentail Soil =0.1 November 2020**	**Title 40 Code of Federal Regulations (CFR) 261.24 [20x] Criteria**	**CLARC Method A/B**	BR-OUA-O2-SB11-0-6	BR-OUA-O2-SB11-6.5-9.5	BR-OUA-O2-SB11-6-6.5	BR-OUA-O2-SB11-9.5-10
Sample Date				12/14/20	12/14/20	12/14/20	12/14/20
Semivolatile Organic Compounds (UG/KG)							
2-Methylnaphthalene	24,000	--	--	**3.15 J**	0.551 U	**2.56 J**	**3.14 J**
3- and 4-Methylphenol	320,000	4,000,000	2,200	42.4 U	44.1 U	42.7 U	47.5 U
Acenaphthene	360,000	--	--	**2.11 J**	0.551 U	**1.97 J**	0.586 U
Acenaphthylene	--	--	--	**4.84**	0.551 U	0.527 U	0.586 U
Anthracene	1,800,000	--	--	**13.7**	**3.44 J**	**8.45**	**1.88 J**
Benzo(a)anthracene	1,100	--	190	**93.9**	**19.7**	**19.1**	**14.8**
Benzo(a)pyrene	110	--	--	**109**	**25.1**	**19**	**17.6**
Benzo(b)fluoranthene	1,100	--	--	**172**	**33**	**23.9**	**21.9**
Benzo(g,h,i)perylene	--	--	--	**51.1**	**14.3**	**15.4**	**14.9**
Benzo(k)fluoranthene	11,000	--	--	**62**	**12.1**	**9.71**	**8.61**
Bis(2-Ethylhexyl)phthalate	39,000	--	--	31.8 U	33.1 U	32.1 U	35.6 U
Carbazole	--	--	--	42.4 U	44.1 U	42.7 U	47.5 U
Chrysene	110,000	--	--	**103**	**22.6**	**21.2**	**16.6**
Dibenz(a,h)anthracene	110	--	--	**14**	**3.59 J**	**3.15 J**	**2.81 J**
Dibenzofuran	7,800	--	--	31.8 U	33.1 U	32.1 U	35.6 U
Fluoranthene	240,000	--	--	**166**	**32.4**	**41.2**	**21.8**
Fluorene	240,000	--	--	**2.5 J**	1.1 U	**3.14 J**	1.17 U
Indeno(1,2,3-cd)pyrene	1,100	--	1,100,000	**61.4**	**15.6**	**15.1**	**14.8**
Naphthalene	2,000	--	--	**2.73 J**	0.551 U	0.527 U	0.586 U
Phenanthrene	--	--	--	**65**	**16.9**	**31.2**	**9.97**
Phenol	1,900,000	--	--	**48.2 J**	44.1 U	42.7 U	47.5 U
Pyrene	180,000	--	--	**170**	**35.2**	**39.2**	**23.6**

Notes:
Shading indicates exceedance of RSLs Residentail Soil =0.1 November 2020
Bold outside box indicates exceedance of Title 40 Code of Federal Regulations (CFR) 261.24 [20x] Criteria
Underline indicates exceedance of CLARC Method A/B
J - Analyte present. Value may or may not be accurate or precise
U - The material was analyzed for, but not detected
UG/KG - Micrograms per kilogram

Table 1. Validated Results - Soil - SVOCs

				BR-OUA-P1			
Sample ID	**RSLs Residentail Soil =0.1 November 2020**	**Title 40 Code of Federal Regulations (CFR) 261.24 [20x] Criteria**	**CLARC Method A/B**	BR-OUA-P1-SB12-0-5	BR-OUA-P1-SB12-5.5-8.5	BR-OUA-P1-SB12-5-5.5	BR-OUA-P1-SB12-8.5-9
Sample Date				12/14/20	12/14/20	12/14/20	12/14/20
Semivolatile Organic Compounds (UG/KG)							
2-Methylnaphthalene	24,000	--	--	2.7 U	2.74 U	2.75 U	0.556 U
3- and 4-Methylphenol	320,000	4,000,000	2,200	219 U	224 U	**379 J**	44.5 U
Acenaphthene	360,000	--	--	**10.5 J**	**13 J**	2.75 U	**1.86 J**
Acenaphthylene	--	--	--	2.7 U	**60**	**46.3**	**4.52**
Anthracene	1,800,000	--	--	**33.6**	**120**	**27.9**	**8.89**
Benzo(a)anthracene	1,100	--	190	**162**	<u>**823**</u>	**65.5**	**45.8**
Benzo(a)pyrene	110	--	--	**161**	**1,200**	**109**	**61.2**
Benzo(b)fluoranthene	1,100	--	--	**247**	**1,700**	**242**	**98.8**
Benzo(g,h,i)perylene	--	--	--	**70.5**	**483**	**133**	**27.6**
Benzo(k)fluoranthene	11,000	--	--	**94.9**	**601**	**75.5**	**36.1**
Bis(2-Ethylhexyl)phthalate	39,000	--	--	164 U	168 U	**386 J**	33.4 U
Carbazole	--	--	--	219 U	224 U	220 U	44.5 U
Chrysene	110,000	--	--	**189**	**860**	**97.8**	**50.9**
Dibenz(a,h)anthracene	110	--	--	**20.3**	**109**	**31.9**	**6.52**
Dibenzofuran	7,800	--	--	164 U	168 U	165 U	33.4 U
Fluoranthene	240,000	--	--	**309**	**1,440**	**115**	**95.6**
Fluorene	240,000	--	--	**11.2 J**	**16.8 J**	5.49 U	**2.14 J**
Indeno(1,2,3-cd)pyrene	1,100	--	1,100,000	**85.4**	**605**	**164**	**34.5**
Naphthalene	2,000	--	--	2.7 U	**19.1**	2.75 U	**2.21 J**
Phenanthrene	--	--	--	**151**	**378**	**53.1**	**33.6**
Phenol	1,900,000	--	--	219 U	**1,340 J**	**1,540 J**	**107 J**
Pyrene	180,000	--	--	**311**	**1,530**	**113**	**105**

Notes:
Shading indicates exceedance of RSLs Residentail Soil =0.1 November 2020
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<u>Underline indicates exceedance of CLARC Method A/B</u>
J - Analyte present. Value may or may not be accurate or precise
U - The material was analyzed for, but not detected
UG/KG - Micrograms per kilogram

Table 1. Validated Results - Soil - SVOCs

				BR-OUA-P2			
Sample ID	**RSLs Residentail Soil =0.1 November 2020**	**Title 40 Code of Federal Regulations (CFR) 261.24 [20x] Criteria**	**CLARC Method A/B**	BR-OUA-P2-SB13-0-6	BR-OUA-P2-SB13-6.5-9.5	BR-OUA-P2-SB13-6-6.5	BR-OUA-P2-SB13-9.5-10
Sample Date				12/15/20	12/15/20	12/15/20	12/15/20
Semivolatile Organic Compounds (UG/KG)							
2-Methylnaphthalene	24,000	--	--	0.562 U	**20.6**	2.72 U	**5.04**
3- and 4-Methylphenol	320,000	4,000,000	2,200	**103 J**	44 U	**67.7 J**	43.6 U
Acenaphthene	360,000	--	--	**7.01**	**417**	**83.5**	**87.9**
Acenaphthylene	--	--	--	**2.72 J**	2.78 U	**28.8**	**1.81 J**
Anthracene	1,800,000	--	--	**27.7**	**1,100**	**242**	**232**
Benzo(a)anthracene	1,100	--	190	**92.7**	**1,380**	**464**	**296**
Benzo(a)pyrene	110	--	--	**79.1**	**1,230**	**520**	**261**
Benzo(b)fluoranthene	1,100	--	--	**126**	**1,520**	**816**	**343**
Benzo(g,h,i)perylene	--	--	--	**56.6**	**682**	**304**	**108**
Benzo(k)fluoranthene	11,000	--	--	**52**	**616**	**304**	**144**
Bis(2-Ethylhexyl)phthalate	39,000	--	--	33.7 U	33 U	32.6 U	32.7 U
Carbazole	--	--	--	**40 J**	**487**	**241 J**	**128 J**
Chrysene	110,000	--	--	**107**	**1,400**	**500**	**305**
Dibenz(a,h)anthracene	110	--	--	**12.6**	**189**	**71.2**	**30.6**
Dibenzofuran	7,800	--	--	33.7 U	**186 J**	**87 J**	**46.3 J**
Fluoranthene	240,000	--	--	**195**	**3,110**	**1,060**	**655**
Fluorene	240,000	--	--	**8.55**	**520**	**101**	**109**
Indeno(1,2,3-cd)pyrene	1,100	--	1,100,000	**59.9**	**762**	**359**	**130**
Naphthalene	2,000	--	--	0.562 U	**26**	2.72 U	**6.33**
Phenanthrene	--	--	--	**89.6**	**2,930**	**749**	**604**
Phenol	1,900,000	--	--	**611**	**47.6 J**	**1,200**	**125 J**
Pyrene	180,000	--	--	**172**	**2,820**	**1,010**	**609**

Notes:
Shading indicates exceedance of RSLs Residentail Soil =0.1 November 2020
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Underline indicates exceedance of CLARC Method A/B
J - Analyte present. Value may or may not be accurate or precise
U - The material was analyzed for, but not detected
UG/KG - Micrograms per kilogram

Table 2. Validated Results - Soil - PCBs

				BR-OUA-G1				
Sample ID	**RSLs Residentail Soil =0.1 November 2020**	**Title 40 Code of Federal Regulations (CFR) 261.24 [20x] Criteria**	**CLARC Method A/B**	BR-OUA-G1-SB02-0-5	BR-OUA-G1-SB02P-0-5	BR-OUA-G1-SB02-5.5-8.5	BR-OUA-G1-SB02-5-5.5	BR-OUA-G1-SB02-8.5-9
Sample Date				12/18/20	12/18/20	12/18/20	12/18/20	12/18/20
Pesticide/Polychlorinated Biphenyls (UG/KG)								
Aroclor-1260	240	50,000	500	**92.6 J**	**92.3 J**	118 U	22.6 U	23.3 U

Notes:
Shading indicates exceedance of RSLs Residentail Soil =0.1 November 2020
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Underline indicates exceedance of CLARC Method A/B
J - Analyte present. Value may or may not be accurate or precise
U - The material was analyzed for, but not detected
UG/KG - Micrograms per kilogram
Z - The chromatographic fingerprint does not resemble a petroleum product.

Table 2. Validated Results - Soil - PCBs

				BR-OUA-G2				
Sample ID	**RSLs Residentail Soil =0.1 November 2020**	**Title 40 Code of Federal Regulations (CFR) 261.24 [20x] Criteria**	**CLARC Method A/B**	BR-OUA-G2-SB03-0-5	BR-OUA-G2-SB03P-0-5	BR-OUA-G2-SB03-5.5-8.5	BR-OUA-G2-SB03-5-5.5	BR-OUA-G2-SB03-8.5-9
Sample Date				12/18/20	12/18/20	12/18/20	12/18/20	12/18/20
Pesticide/Polychlorinated Biphenyls (UG/KG)								
Aroclor-1260	240	50,000	500	**141 J**	**192**	21.8 U	112 U	21.8 U

Notes:
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Underline indicates exceedance of CLARC Method A/B
J - Analyte present. Value may or may not be accurate or precise
U - The material was analyzed for, but not detected
UG/KG - Micrograms per kilogram
Z - The chromatographic fingerprint does not resemble a petroleum product.

Table 2. Validated Results - Soil - PCBs

				BR-OUA-H2			
Sample ID	**RSLs Residentail Soil =0.1 November 2020**	**Title 40 Code of Federal Regulations (CFR) 261.24 [20x] Criteria**	**CLARC Method A/B**	BR-OUA-H2-SB04-0-5	BR-OUA-H2-SB04-5.5-8.5	BR-OUA-H2-SB04-5-5.5	BR-OUA-H2-SB04-8.5-9
Sample Date				12/17/20	12/17/20	12/17/20	12/17/20
Pesticide/Polychlorinated Biphenyls (UG/KG)							
Aroclor-1260	240	50,000	500	105 U	108 U	21.3 U	23.4 U

Notes:
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Bold outside box indicates exceedance of Title 40 Code of Federal Regulations (CFR) 261.24 [20x] Criteria
Underline indicates exceedance of CLARC Method A/B
J - Analyte present. Value may or may not be accurate or precise
U - The material was analyzed for, but not detected
UG/KG - Micrograms per kilogram
Z - The chromatographic fingerprint does not resemble a petroleum product.

Table 2. Validated Results - Soil - PCBs

				BR-OUA-I3			BR-OUA-J2			
Sample ID	**RSLs Residentail Soil =0.1 November 2020**	**Title 40 Code of Federal Regulations (CFR) 261.24 [20x] Criteria**	**CLARC Method A/B**	BR-OUA-I3-SB05-0-5.5	BR-OUA-I3-SB05P-0-5.5	BR-OUA-I3-SB05-5.5-6	BR-OUA-J2-SB06-0-5	BR-OUA-J2-SB06-5.5-8.5	BR-OUA-J2-SB06-5-5.5	BR-OUA-J2-SB06-8.5-9
Sample Date				12/17/20	12/17/20	12/17/20	12/16/20	12/16/20	12/16/20	12/16/20
Pesticide/Polychlorinated Biphenyls (UG/KG)										
Aroclor-1260	240	50,000	500	21.4 U	21.8 U	113 U	219 U	116 U	108 U	235 U

Notes:
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Underline indicates exceedance of CLARC Method A/B
J - Analyte present. Value may or may not be accurate or precise
U - The material was analyzed for, but not detected
UG/KG - Micrograms per kilogram
Z - The chromatographic fingerprint does not resemble a petroleum product.

Table 2. Validated Results - Soil - PCBs

				BR-OUA-K3			
Sample ID	**RSLs Residentail Soil =0.1 November 2020**	**Title 40 Code of Federal Regulations (CFR) 261.24 [20x] Criteria**	**CLARC Method A/B**	BR-OUA-K3-SB07-0-6	BR-OUA-K3-SB07-6.5-9.5	BR-OUA-K3-SB07-6-6.5	BR-OUA-K3-SB07-9.5-10
Sample Date				12/16/20	12/16/20	12/16/20	12/16/20
Pesticide/Polychlorinated Biphenyls (UG/KG)							
Aroclor-1260	240	50,000	500	21.8 U	119 U	22.6 U	115 U

Notes:
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Underline indicates exceedance of CLARC Method A/B
J - Analyte present. Value may or may not be accurate or precise
U - The material was analyzed for, but not detected
UG/KG - Micrograms per kilogram
Z - The chromatographic fingerprint does not resemble a petroleum product.

Table 2. Validated Results - Soil - PCBs

				BR-OUA-L2				
Sample ID	**RSLs Residentail Soil =0.1 November 2020**	**Title 40 Code of Federal Regulations (CFR) 261.24 [20x] Criteria**	**CLARC Method A/B**	BR-OUA-L2-SB08-0-5	BR-OUA-L2-SB08P-0-5	BR-OUA-L2-SB08-5.5-8.5	BR-OUA-L2-SB08-5-5.5	BR-OUA-L2-SB08-8.5-9
Sample Date				12/16/20	12/16/20	12/16/20	12/16/20	12/16/20
Pesticide/Polychlorinated Biphenyls (UG/KG)								
Aroclor-1260	240	50,000	500	21.8 U	21.7 U	<u>1380</u> J	216 U	25.1 U

Notes:
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<u>Underline indicates exceedance of CLARC Method A/B</u>
J - Analyte present. Value may or may not be accurate or precise
U - The material was analyzed for, but not detected
UG/KG - Micrograms per kilogram
Z - The chromatographic fingerprint does not resemble a petroleum product.

Table 2. Validated Results - Soil - PCBs

				BR-OUA-M3				
Sample ID	**RSLs Residentail Soil =0.1 November 2020**	**Title 40 Code of Federal Regulations (CFR) 261.24 [20x] Criteria**	**CLARC Method A/B**	BR-OUA-M3-SB09-0-6	BR-OUA-M3-SB09P-0-6	BR-OUA-M3-SB09-6.5-9.5	BR-OUA-M3-SB09-6-6.5	BR-OUA-M3-SB09-9.5-10
Sample Date				12/15/20	12/15/20	12/15/20	12/15/20	12/15/20
Pesticide/Polychlorinated Biphenyls (UG/KG)								
Aroclor-1260	240	50,000	500	105 U	108 U	22.9 U	111 U	23.3 U

Notes:
Shading indicates exceedance of RSLs Residentail Soil =0.1 November 2020
Bold outside box indicates exceedance of Title 40 Code of Federal Regulations (CFR) 261.24 [20x] Criteria
Underline indicates exceedance of CLARC Method A/B
J - Analyte present. Value may or may not be accurate or precise
U - The material was analyzed for, but not detected
UG/KG - Micrograms per kilogram
Z - The chromatographic fingerprint does not resemble a petroleum product.

Table 2. Validated Results - Soil - PCBs

				BR-OUA-N2			
Sample ID	**RSLs Residentail Soil =0.1 November 2020**	**Title 40 Code of Federal Regulations (CFR) 261.24 [20x] Criteria**	**CLARC Method A/B**	BR-OUA-N2-SB10-0-5	BR-OUA-N2-SB10-5.5-8.5	BR-OUA-N2-SB10-5-5.5	BR-OUA-N2-SB10-8.5-9
Sample Date				12/15/20	12/15/20	12/15/20	12/15/20
Pesticide/Polychlorinated Biphenyls (UG/KG)							
Aroclor-1260	240	50,000	500	106 U	110 U	112 U	22.9 U

Notes:
Shading indicates exceedance of RSLs Residentail Soil =0.1 November 2020
Bold outside box indicates exceedance of Title 40 Code of Federal Regulations (CFR) 261.24 [20x] Criteria
Underline indicates exceedance of CLARC Method A/B
J - Analyte present. Value may or may not be accurate or precise
U - The material was analyzed for, but not detected
UG/KG - Micrograms per kilogram
Z - The chromatographic fingerprint does not resemble a petroleum product.

Table 2. Validated Results - Soil - PCBs

				BR-OUA-O2			
Sample ID	**RSLs Residentail Soil =0.1 November 2020**	**Title 40 Code of Federal Regulations (CFR) 261.24 [20x] Criteria**	**CLARC Method A/B**	BR-OUA-O2-SB11-0-6	BR-OUA-O2-SB11-6.5-9.5	BR-OUA-O2-SB11-6-6.5	BR-OUA-O2-SB11-9.5-10
Sample Date				12/14/20	12/14/20	12/14/20	12/14/20
Pesticide/Polychlorinated Biphenyls (UG/KG)							
Aroclor-1260	240	50,000	500	105 U	110 U	20.8 U	23.9 U

Notes:
Shading indicates exceedance of RSLs Residentail Soil =0.1 November 2020
Bold outside box indicates exceedance of Title 40 Code of Federal Regulations (CFR) 261.24 [20x] Criteria
Underline indicates exceedance of CLARC Method A/B
J - Analyte present. Value may or may not be accurate or precise
U - The material was analyzed for, but not detected
UG/KG - Micrograms per kilogram
Z - The chromatographic fingerprint does not resemble a petroleum product.

Table 2. Validated Results - Soil - PCBs

				BR-OUA-P1			
Sample ID	**RSLs Residentail Soil =0.1 November 2020**	**Title 40 Code of Federal Regulations (CFR) 261.24 [20x] Criteria**	**CLARC Method A/B**	BR-OUA-P1-SB12-0-5	BR-OUA-P1-SB12-5.5-8.5	BR-OUA-P1-SB12-5-5.5	BR-OUA-P1-SB12-8.5-9
Sample Date				12/14/20	12/14/20	12/14/20	12/14/20
Pesticide/Polychlorinated Biphenyls (UG/KG)							
Aroclor-1260	240	50,000	500	214 U	**453**	**591**	111 U

Notes:
Shading indicates exceedance of RSLs Residentail Soil =0.1 November 2020
Bold outside box indicates exceedance of Title 40 Code of Federal Regulations (CFR) 261.24 [20x] Criteria
Underline indicates exceedance of CLARC Method A/B
J - Analyte present. Value may or may not be accurate or precise
U - The material was analyzed for, but not detected
UG/KG - Micrograms per kilogram
Z - The chromatographic fingerprint does not resemble a petroleum product.

Table 2. Validated Results - Soil - PCBs

				BR-OUA-P2			
Sample ID	**RSLs Residentail Soil =0.1 November 2020**	**Title 40 Code of Federal Regulations (CFR) 261.24 [20x] Criteria**	**CLARC Method A/B**	BR-OUA-P2-SB13-0-6	BR-OUA-P2-SB13-6.5-9.5	BR-OUA-P2-SB13-6-6.5	BR-OUA-P2-SB13-9.5-10
Sample Date				12/15/20	12/15/20	12/15/20	12/15/20
Pesticide/Polychlorinated Biphenyls (UG/KG)							
Aroclor-1260	240	50,000	500	109 U	111 U	**160 J**	21.4 U

Notes:
Shading indicates exceedance of RSLs Residentail Soil =0.1 November 2020
Bold outside box indicates exceedance of Title 40 Code of Federal Regulations (CFR) 261.24 [20x] Criteria
Underline indicates exceedance of CLARC Method A/B
J - Analyte present. Value may or may not be accurate or precise
U - The material was analyzed for, but not detected
UG/KG - Micrograms per kilogram
Z - The chromatographic fingerprint does not resemble a petroleum product.

Table 3. Validated Results - Soil - Metals

				BR-OUA-G1				
Sample ID	**RSLs Residentail Soil =0.1 November 2020**	**Title 40 Code of Federal Regulations (CFR) 261.24 [20x] Criteria**	**CLARC Method A/B**	BR-OUA-G1-SB02-0-5	BR-OUA-G1-SB02P-0-5	BR-OUA-G1-SB02-5.5-8.5	BR-OUA-G1-SB02-5-5.5	BR-OUA-G1-SB02-8.5-9
Sample Date				12/18/20	12/18/20	12/18/20	12/18/20	12/18/20
Total Metals (MG/KG)								
Arsenic	0.68	100	0.67	**14.1**	**8.56**	**7.68**	**45.2**	**22.5**
Barium	1,500	2,000	--	**195 J**	**112 J**	**30.3**	**115**	**60.9**
Cadmium	7.1	20	--	**1.46 J**	2.16 U	0.024 U	2.26 U	2.34 U
Chromium	0.3	100	--	**38.5**	**35.1**	**28.7**	**37.2**	**33.2**
Copper	310	--	--	**1,400 J**	**308 J**	**57.4**	**119**	**73**
Lead	400	100	--	**1,730 J**	**470 J**	**56**	**246**	**81.7**
Mercury	2.3	4	--	**0.66 J**	**0.63 J**	**0.18 J**	**0.23 J**	**0.11 J**
Nickel	150	--	--	**71.9 J**	**51.1 J**	**32.6**	**48.7**	**47.1**
Silver	39	100	--	2.13 U	2.16 U	0.024 U	2.26 U	2.34 U
Zinc	2,300	--	--	**1,930 J**	**701 J**	**155**	**542**	**279**

Notes:
Shading indicates exceedance of RSLs Residentail Soil =0.1 November 2020
Bold outside box indicates exceedance of Title 40 Code of Federal Regulations (CFR) 261.24 [20x] Criteria
Underline indicates exceedance of CLARC Method A/B
J - Analyte present. Value may or may not be accurate or precise
MG/KG - Milligrams per kilogram
U - The material was analyzed for, but not detected

Table 3. Validated Results - Soil - Metals

				BR-OUA-G2				
Sample ID	**RSLs Residentail Soil =0.1 November 2020**	**Title 40 Code of Federal Regulations (CFR) 261.24 [20x] Criteria**	**CLARC Method A/B**	BR-OUA-G2-SB03-0-5	BR-OUA-G2-SB03P-0-5	BR-OUA-G2-SB03-5.5-8.5	BR-OUA-G2-SB03-5-5.5	BR-OUA-G2-SB03-8.5-9
Sample Date				12/18/20	12/18/20	12/18/20	12/18/20	12/18/20
Total Metals (MG/KG)								
Arsenic	0.68	100	0.67	**13.4**	**28.2**	**5.32**	**10.2**	**4.99**
Barium	1,500	2,000	--	**369 J**	**251 J**	**293**	**1,100**	**423**
Cadmium	7.1	20	--	2.08 U	1.21 J	1.24 J	**6.36 J**	**1.86 J**
Chromium	0.3	100	--	**48.6**	**43.8**	**29.8**	**39.8**	**30.6**
Copper	310	--	--	**613**	**548**	**437**	**1,670**	**545**
Lead	400	100	--	**1,620**	**1,200**	**1,490**	**5,380**	**1,890**
Mercury	2.3	4	--	**1.4 J**	**1.7 J**	**0.77 J**	**1.6 J**	**0.5 J**
Nickel	150	--	--	**67.1**	**55.2**	**57.8**	**122**	**54.2**
Silver	39	100	--	2.08 U	2.18 U	2.12 U	**1.53 J**	2.19 U
Zinc	2,300	--	--	**1,510**	**1,470**	**1,630**	**6,710**	**2,980**

Notes:
Shading indicates exceedance of RSLs Residentail Soil =0.1 November 2020
Bold outside box indicates exceedance of Title 40 Code of Federal Regulations (CFR) 261.24 [20x] Criteria
Underline indicates exceedance of CLARC Method A/B
J - Analyte present. Value may or may not be accurate or precise
MG/KG - Milligrams per kilogram
U - The material was analyzed for, but not detected

Table 3. Validated Results - Soil - Metals

				BR-OUA-H2			
Sample ID	**RSLs Residentail Soil =0.1 November 2020**	**Title 40 Code of Federal Regulations (CFR) 261.24 [20x] Criteria**	**CLARC Method A/B**	BR-OUA-H2-SB04-0-5	BR-OUA-H2-SB04-5.5-8.5	BR-OUA-H2-SB04-5-5.5	BR-OUA-H2-SB04-8.5-9
Sample Date				12/17/20	12/17/20	12/17/20	12/17/20
Total Metals (MG/KG)							
Arsenic	0.68	100	0.67	**1.91 J**	**10.5**	**6.94**	**1.97 J**
Barium	1,500	2,000	--	**42.4**	**130**	**401**	**16.9**
Cadmium	7.1	20	--	2.12 U	2.02 U	**1.48 J**	2.21 U
Chromium	0.3	100	--	**16.1**	**29.4**	**26.3**	**17.3**
Copper	310	--	--	**44.6**	**241**	**610**	**28.4**
Lead	400	100	--	**89.3**	**575**	**2,220**	**8.16**
Mercury	2.3	4	--	**0.97 J**	**0.2 J**	**2.1 J**	**0.053 J**
Nickel	150	--	--	**26**	**57.1**	**144**	**27.8**
Silver	39	100	--	2.12 UJ	2.02 U	2.05 UJ	2.21 U
Zinc	2,300	--	--	**147**	**642**	**2,180**	**54.2 J**

Notes:
Shading indicates exceedance of RSLs Residentail Soil =0.1 November 2020
Bold outside box indicates exceedance of Title 40 Code of Federal Regulations (CFR) 261.24 [20x] Criteria
Underline indicates exceedance of CLARC Method A/B
J - Analyte present. Value may or may not be accurate or precise
MG/KG - Milligrams per kilogram
U - The material was analyzed for, but not detected

Table 3. Validated Results - Soil - Metals

				BR-OUA-I3			BR-OUA-J2			
Sample ID	**RSLs Residentail Soil =0.1 November 2020**	**Title 40 Code of Federal Regulations (CFR) 261.24 [20x] Criteria**	**CLARC Method A/B**	BR-OUA-I3-SB05-0-5.5	BR-OUA-I3-SB05P-0-5.5	BR-OUA-I3-SB05-5.5-6	BR-OUA-J2-SB06-0-5	BR-OUA-J2-SB06-5.5-8.5	BR-OUA-J2-SB06-5-5.5	BR-OUA-J2-SB06-8.5-9
Sample Date				12/17/20	12/17/20	12/17/20	12/16/20	12/16/20	12/16/20	12/16/20
Total Metals (MG/KG)										
Arsenic	0.68	100	0.67	**12.2**	**6.28**	**14.1**	**38.2**	**481**	**246**	**74.1**
Barium	1,500	2,000	--	**1,370 J**	**603 J**	**1,540**	**300**	**595**	**211**	**85.4**
Cadmium	7.1	20	--	**8.11 J**	**2.13 J**	**7.54 J**	**1.69 J**	**8.65 J**	**3.98 J**	2.39 U
Chromium	0.3	100	--	**34.6**	**30.6**	**31.7**	**48.1**	**246**	**158**	**125**
Copper	310	--	--	**3,050 J**	**1,310 J**	**7,920**	**1,260**	**5,490**	**1,920**	**1,410**
Lead	400	100	--	**10,500 J**	**3,050 J**	**11,900**	**1,810**	**3,670**	**1,170**	**465**
Mercury	2.3	4	--	**5.2 J**	**0.66 J**	**3.2 J**	**1.5 J**	**5 J**	**10.9 J**	**3.8 J**
Nickel	150	--	--	**178 J**	**83.9 J**	**226**	**79.3**	**168**	**80.7**	**55.6**
Silver	39	100	--	**4.32 J**	2.14 UJ	**3.14 J**	2.09 UJ	**4.05 J**	2.16 UJ	2.39 UJ
Zinc	2,300	--	--	**9,130 J**	**2,730 J**	**10,400**	**2,120**	**8,290**	**5,120**	**1,610**

Notes:
Shading indicates exceedance of RSLs Residentail Soil =0.1 November 2020
Bold outside box indicates exceedance of Title 40 Code of Federal Regulations (CFR) 261.24 [20x] Criteria
Underline indicates exceedance of CLARC Method A/B
J - Analyte present. Value may or may not be accurate or precise
MG/KG - Milligrams per kilogram
U - The material was analyzed for, but not detected

Table 3. Validated Results - Soil - Metals

Sample ID	RSLs Residentail Soil =0.1 November 2020	Title 40 Code of Federal Regulations (CFR) 261.24 [20x] Criteria	CLARC Method A/B	BR-OUA-K3 BR-OUA-K3-SB07-0-6	BR-OUA-K3 BR-OUA-K3-SB07-6.5-9.5	BR-OUA-K3 BR-OUA-K3-SB07-6-6.5	BR-OUA-K3 BR-OUA-K3-SB07-9.5-10
Sample Date				12/16/20	12/16/20	12/16/20	12/16/20
Total Metals (MG/KG)							
Arsenic	0.68	100	0.67	**30.8**	**104**	**51.5**	**111**
Barium	1,500	2,000	--	**228**	**247**	**88.9**	**173**
Cadmium	7.1	20	--	2.18 U	**3.13 J**	**3.66 J**	**1.37 J**
Chromium	0.3	100	--	**40.5**	**150**	**327**	**60.8**
Copper	310	--	--	**867**	**2,710**	**8,920**	**783**
Lead	400	100	--	**958**	**1,860**	**1,240**	**845**
Mercury	2.3	4	--	**0.38 J**	**5.4 J**	**71 J**	**0.84 J**
Nickel	150	--	--	**62.5**	**233**	**89.2**	**191**
Silver	39	100	--	**2.7 J**	**2.42 J**	2.14 UJ	**1.47 J**
Zinc	2,300	--	--	**1,390**	**3,080**	**2,290**	**2,110**

Notes:
Shading indicates exceedance of RSLs Residentail Soil =0.1 November 2020
Bold outside box indicates exceedance of Title 40 Code of Federal Regulations (CFR) 261.24 [20x] Criteria
Underline indicates exceedance of CLARC Method A/B
J - Analyte present. Value may or may not be accurate or precise
MG/KG - Milligrams per kilogram
U - The material was analyzed for, but not detected

Table 3. Validated Results - Soil - Metals

				BR-OUA-L2				
Sample ID	**RSLs Residentail Soil =0.1 November 2020**	**Title 40 Code of Federal Regulations (CFR) 261.24 [20x] Criteria**	**CLARC Method A/B**	BR-OUA-L2-SB08-0-5	BR-OUA-L2-SB08P-0-5	BR-OUA-L2-SB08-5.5-8.5	BR-OUA-L2-SB08-5-5.5	BR-OUA-L2-SB08-8.5-9
Sample Date				12/16/20	12/16/20	12/16/20	12/16/20	12/16/20
Total Metals (MG/KG)								
Arsenic	0.68	100	0.67	**6.35**	**3.9 J**	**2,260**	**151**	**2.91 J**
Barium	1,500	2,000	--	**219**	**211**	**188**	**343**	**18.3**
Cadmium	7.1	20	--	**1.68 J**	**1.26 J**	**3.19 J**	**6.64 J**	2.39 U
Chromium	0.3	100	--	**26.3**	**21.4**	**144**	**296**	**18.1**
Copper	310	--	--	**1,160 J**	**321 J**	**4,380**	**2,250**	**35.1**
Lead	400	100	--	**1,280**	**1,220**	**1,490**	**1,990**	**42.6**
Mercury	2.3	4	--	**0.55 J**	**0.35 J**	**22.7 J**	**7.9 J**	**0.26 J**
Nickel	150	--	--	**66.8 J**	**45.5 J**	**166**	**369**	**33.4**
Silver	39	100	--	2.14 UJ	2.18 UJ	**2.78 J**	2.22 UJ	2.39 UJ
Zinc	2,300	--	--	**1,710**	**1,400**	**3,900**	**3,700**	**435**

Notes:
Shading indicates exceedance of RSLs Residentail Soil =0.1 November 2020
Bold outside box indicates exceedance of Title 40 Code of Federal Regulations (CFR) 261.24 [20x] Criteria
Underline indicates exceedance of CLARC Method A/B
J - Analyte present. Value may or may not be accurate or precise
MG/KG - Milligrams per kilogram
U - The material was analyzed for, but not detected

Table 3. Validated Results - Soil - Metals

				BR-OUA-M3				
Sample ID	**RSLs Residentail Soil =0.1 November 2020**	**Title 40 Code of Federal Regulations (CFR) 261.24 [20x] Criteria**	**CLARC Method A/B**	BR-OUA-M3-SB09-0-6	BR-OUA-M3-SB09P-0-6	BR-OUA-M3-SB09-6.5-9.5	BR-OUA-M3-SB09-6-6.5	BR-OUA-M3-SB09-9.5-10
Sample Date				12/15/20	12/15/20	12/15/20	12/15/20	12/15/20
Total Metals (MG/KG)								
Arsenic	0.68	100	0.67	**6.7 J**	**7.02 J**	**2.65 J**	**4.45 J**	**2.02 J**
Barium	1,500	2,000	--	**355**	**422**	**16.6**	**90.9**	**14.2**
Cadmium	7.1	20	--	**2.2 J**	**2.84 J**	2.27 U	**2.61 J**	2.26 U
Chromium	0.3	100	--	**57.8 J**	**98.5 J**	**31.3**	**125**	**16**
Copper	310	--	--	**1,270 J**	**1,730 J**	**212**	**1,890**	**27.1**
Lead	400	100	--	**2,240**	**2,600**	**37.5**	**321**	**14.5**
Mercury	2.3	4	--	**6.9**	**6.6**	**1.9**	**11.9**	**0.86**
Nickel	150	--	--	**62.8 J**	**189 J**	**42.1**	**56.7**	**28.1**
Silver	39	100	--	2.17 U	2.19 U	2.27 U	2.21 U	2.26 U
Zinc	2,300	--	--	**1,800 J**	**2,550 J**	**359**	**1,410**	**104**

Notes:
Shading indicates exceedance of RSLs Residentail Soil =0.1 November 2020
Bold outside box indicates exceedance of Title 40 Code of Federal Regulations (CFR) 261.24 [20x] Criteria
Underline indicates exceedance of CLARC Method A/B
J - Analyte present. Value may or may not be accurate or precise
MG/KG - Milligrams per kilogram
U - The material was analyzed for, but not detected

Table 3. Validated Results - Soil - Metals

				BR-OUA-N2			
Sample ID	**RSLs Residentail Soil =0.1 November 2020**	**Title 40 Code of Federal Regulations (CFR) 261.24 [20x] Criteria**	**CLARC Method A/B**	BR-OUA-N2-SB10-0-5	BR-OUA-N2-SB10-5.5-8.5	BR-OUA-N2-SB10-5-5.5	BR-OUA-N2-SB10-8.5-9
Sample Date				12/15/20	12/15/20	12/15/20	12/15/20
Total Metals (MG/KG)							
Arsenic	0.68	100	0.67	**4.6 J**	**3.53 J**	**5.45**	**5.67**
Barium	1,500	2,000	--	**60**	**76.3**	**76.3**	**26.5 J**
Cadmium	7.1	20	--	2.15 U	**1.25 J**	**4.75**	2.27 U
Chromium	0.3	100	--	**24.2**	**93.5**	**164**	**25.2 J**
Copper	310	--	--	**102**	**1,170**	**19,000**	**102 J**
Lead	400	100	--	**227**	**396**	**764**	**19**
Mercury	2.3	4	--	0.096 U	**6.9**	**7.7**	**0.22**
Nickel	150	--	--	**45.6**	**73**	**73.4**	**53.4**
Silver	39	100	--	2.15 U	2.21 U	2.21 U	2.27 U
Zinc	2,300	--	--	**252**	**585**	2,080	**233**

Notes:
Shading indicates exceedance of RSLs Residentail Soil =0.1 November 2020
Bold outside box indicates exceedance of Title 40 Code of Federal Regulations (CFR) 261.24 [20x] Criteria
Underline indicates exceedance of CLARC Method A/B
J - Analyte present. Value may or may not be accurate or precise
MG/KG - Milligrams per kilogram
U - The material was analyzed for, but not detected

Table 3. Validated Results - Soil - Metals

				BR-OUA-O2			
Sample ID	**RSLs Residentail Soil =0.1 November 2020**	**Title 40 Code of Federal Regulations (CFR) 261.24 [20x] Criteria**	**CLARC Method A/B**	BR-OUA-O2-SB11-0-6	BR-OUA-O2-SB11-6.5-9.5	BR-OUA-O2-SB11-6-6.5	BR-OUA-O2-SB11-9.5-10
Sample Date				12/14/20	12/14/20	12/14/20	12/14/20
Total Metals (MG/KG)							
Arsenic	0.68	100	0.67	**5.77 J**	**7.96 J**	**6.47 J**	**5.7 J**
Barium	1,500	2,000	--	**43.9**	**36.3**	**32.2**	**19.2**
Cadmium	7.1	20	--	2.07 U	2.04 U	2.02 U	2.34 U
Chromium	0.3	100	--	**34.1**	**106**	**21.5**	**20**
Copper	310	--	--	**299**	**203**	**288**	**77.7**
Lead	400	100	--	**91.8**	**207**	**65.9**	**84.7**
Mercury	2.3	4	--	**1.8**	**0.75**	**0.5**	**0.77**
Nickel	150	--	--	**46.5**	**41.7**	**38.6**	**34.1**
Silver	39	100	--	2.07 U	2.04 U	2.02 U	2.34 U
Zinc	2,300	--	--	**182**	**298**	**345**	**157**

Notes:
Shading indicates exceedance of RSLs Residentail Soil =0.1 November 2020
Bold outside box indicates exceedance of Title 40 Code of Federal Regulations (CFR) 261.24 [20x] Criteria
Underline indicates exceedance of CLARC Method A/B
J - Analyte present. Value may or may not be accurate or precise
MG/KG - Milligrams per kilogram
U - The material was analyzed for, but not detected

Table 3. Validated Results - Soil - Metals

				BR-OUA-P1			
Sample ID	**RSLs Residentail Soil =0.1 November 2020**	**Title 40 Code of Federal Regulations (CFR) 261.24 [20x] Criteria**	**CLARC Method A/B**	BR-OUA-P1-SB12-0-5	BR-OUA-P1-SB12-5.5-8.5	BR-OUA-P1-SB12-5-5.5	BR-OUA-P1-SB12-8.5-9
Sample Date				12/14/20	12/14/20	12/14/20	12/14/20
Total Metals (MG/KG)							
Arsenic	0.68	100	0.67	**7.55 J**	**4.6 J**	**5.02 J**	**2.83 J**
Barium	1,500	2,000	--	**43.4**	**49.9**	**45.1**	**21.9**
Cadmium	7.1	20	--	2.15 U	**3.08 J**	**2.48 J**	2.06 U
Chromium	0.3	100	--	**49**	**189**	**189**	**54.7**
Copper	310	--	--	**406**	**3,280**	**3,160**	**788**
Lead	400	100	--	**118**	**388**	**406**	**106**
Mercury	2.3	4	--	**11.7**	**57.8**	**4.6**	**2.1**
Nickel	150	--	--	**41.4**	**45.5**	**52**	**33.5**
Silver	39	100	--	2.15 U	2.24 U	2.07 U	2.06 U
Zinc	2,300	--	--	**281**	**1,630**	**1,050**	**497**

Notes:
Shading indicates exceedance of RSLs Residentail Soil =0.1 November 2020
Bold outside box indicates exceedance of Title 40 Code of Federal Regulations (CFR) 261.24 [20x] Criteria
Underline indicates exceedance of CLARC Method A/B
J - Analyte present. Value may or may not be accurate or precise
MG/KG - Milligrams per kilogram
U - The material was analyzed for, but not detected

Table 3. Validated Results - Soil - Metals

				BR-OUA-P2			
Sample ID	**RSLs Residentail Soil =0.1 November 2020**	**Title 40 Code of Federal Regulations (CFR) 261.24 [20x] Criteria**	**CLARC Method A/B**	BR-OUA-P2-SB13-0-6	BR-OUA-P2-SB13-6.5-9.5	BR-OUA-P2-SB13-6-6.5	BR-OUA-P2-SB13-9.5-10
Sample Date				12/15/20	12/15/20	12/15/20	12/15/20
Total Metals (MG/KG)							
Arsenic	0.68	100	0.67	**2.28 J**	**1.83 J**	**11.5**	**2.88 J**
Barium	1,500	2,000	--	**32**	**28.6**	**80.5**	**30.6**
Cadmium	7.1	20	--	2.05 U	2.23 U	**1.79 J**	2.17 U
Chromium	0.3	100	--	**42.1**	**30**	**122**	**35.1**
Copper	310	--	--	**1,010**	**263**	**1,380**	**461**
Lead	400	100	--	**84.4**	**30**	**145**	**44.6**
Mercury	2.3	4	--	**2.3**	**0.82**	**5.5**	**0.66**
Nickel	150	--	--	**28.8**	**29**	**71.2**	**40.2**
Silver	39	100	--	2.05 U	2.23 U	1.99 U	2.17 U
Zinc	2,300	--	--	**219**	**101**	**945**	**613**

Notes:
Shading indicates exceedance of RSLs Residentail Soil =0.1 November 2020
Bold outside box indicates exceedance of Title 40 Code of Federal Regulations (CFR) 261.24 [20x] Criteria
Underline indicates exceedance of CLARC Method A/B
J - Analyte present. Value may or may not be accurate or precise
MG/KG - Milligrams per kilogram
U - The material was analyzed for, but not detected

Table 4. Validated Results - Soil - TPH

				BR-OUA-G1			BR-OUA-G2		
Sample ID	**RSLs Residentail Soil =0.1 November 2020**	**Title 40 Code of Federal Regulations (CFR) 261.24 [20x] Criteria**	**CLARC Method A/B**	BR-OUA-G1-SB02-0-5	BR-OUA-G1-SB02P-0-5	BR-OUA-G1-SB02-5.5-8.5	BR-OUA-G2-SB03-0-5	BR-OUA-G2-SB03P-0-5	BR-OUA-G2-SB03-5.5-8.5
Sample Date				12/18/20	12/18/20	12/18/20	12/18/20	12/18/20	12/18/20
Total Petroleum Hydrocarbons (UG/KG)									
TPH-diesel range	--	--	2,000,000	12,000 U	11,000 U	15,000 U	**18,000 J**	**18,000 J**	10,000 U
TPH-gas range	--	--	100,000	**590 J**	1,800 U	1,500 U	1,500 U	1,600 U	1,600 U
TPH-residual range	--	--	--	**47,000 J**	**41,000 J**	**65,000 J**	**88,000 J**	**99,000 J**	**33,000 J**

Notes:
Shading indicates exceedance of RSLs Residentail Soil =0.1 November 2020
Bold outside box indicates exceedance of Title 40 Code of Federal Regulations (CFR) 261.24 [20x] Criteria
Underline indicates exceedance of CLARC Method A/B
H - The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of heavier molecular weight constituents than the calibration standard.
J - Analyte present. Value may or may not be accurate or precise
MG/KG - Milligrams per kilogram
NS - Not sampled
O - The chromatographic fingerprint of the sample resembles an oil, but does not match the calibration standard.
U - The material was analyzed for, but not detected
Z - The chromatographic fingerprint does not resemble a petroleum product.

Table 4. Validated Results - Soil - TPH

				BR-OUA-H2		BR-OUA-I3		BR-OUA-J2	
Sample ID	**RSLs Residentail Soil =0.1 November 2020**	**Title 40 Code of Federal Regulations (CFR) 261.24 [20x] Criteria**	**CLARC Method A/B**	BR-OUA-H2-SB04-0-5	BR-OUA-H2-SB04-5.5-8.5	BR-OUA-I3-SB05-0-5.5	BR-OUA-I3-SB05P-0-5.5	BR-OUA-J2-SB06-0-5	BR-OUA-J2-SB06-5.5-8.5
Sample Date				12/17/20	12/17/20	12/17/20	12/17/20	12/16/20	12/16/20
Total Petroleum Hydrocarbons (UG/KG)									
TPH-diesel range	--	--	2,000,000	9,200 U	13,000 U	15,000 U	**28,000**	**130,000**	**210,000**
TPH-gas range	--	--	100,000	1,600 U	1,700 U	**1,800 J**	**5,700**	2,100 U	2,600 J
TPH-residual range	--	--	--	**43,000 J**	**62,000 J**	**49,000 J**	**100,000 J**	**310,000**	**530,000**

Notes:
Shading indicates exceedance of RSLs Residentail Soil =0.1 November 2020
Bold outside box indicates exceedance of Title 40 Code of Federal Regulations (CFR) 261.24 [20x] Criteria
Underline indicates exceedance of CLARC Method A/B
H - The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of heavier molecular weight constituents than the calibration standard.
J - Analyte present. Value may or may not be accurate or precise
MG/KG - Milligrams per kilogram
NS - Not sampled
O - The chromatographic fingerprint of the sample resembles an oil, but does not match the calibration standard.
U - The material was analyzed for, but not detected
Z - The chromatographic fingerprint does not resemble a petroleum product.

Table 4. Validated Results - Soil - TPH

				BR-OUA-K3		BR-OUA-L2		
Sample ID	**RSLs Residentail Soil =0.1 November 2020**	**Title 40 Code of Federal Regulations (CFR) 261.24 [20x] Criteria**	**CLARC Method A/B**	BR-OUA-K3-SB07-0-6	BR-OUA-K3-SB07-6.5-9.5	BR-OUA-L2-SB08-0-5	BR-OUA-L2-SB08P-0-5	BR-OUA-L2-SB08-5.5-8.5
Sample Date				12/16/20	12/16/20	12/16/20	12/16/20	12/16/20
Total Petroleum Hydrocarbons (UG/KG)								
TPH-diesel range	--	--	2,000,000	**25,000 J**	**190,000**	11,000 U	14,000 U	**160,000**
TPH-gas range	--	--	100,000	**4,500 J**	**1,000 J**	**2,900 J**	**5,800 J**	**700 J**
TPH-residual range	--	--	--	**84,000 J**	**390,000**	**42,000 J**	**50,000 J**	**350,000**

Notes:
Shading indicates exceedance of RSLs Residentail Soil =0.1 November 2020
Bold outside box indicates exceedance of Title 40 Code of Federal Regulations (CFR) 261.24 [20x] Criteria
<u>Underline indicates exceedance of CLARC Method A/B</u>
H - The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of heavier molecular weight constituents than the calibration standard.
J - Analyte present. Value may or may not be accurate or precise
MG/KG - Milligrams per kilogram
NS - Not sampled
O - The chromatographic fingerprint of the sample resembles an oil, but does not match the calibration standard.
U - The material was analyzed for, but not detected
Z - The chromatographic fingerprint does not resemble a petroleum product.

Table 4. Validated Results - Soil - TPH

				BR-OUA-M3		BR-OUA-N2		BR-OUA-O2	
Sample ID	**RSLs Residentail Soil =0.1 November 2020**	**Title 40 Code of Federal Regulations (CFR) 261.24 [20x] Criteria**	**CLARC Method A/B**	BR-OUA-M3-SB09-0-6	BR-OUA-M3-SB09-6.5-9.5	BR-OUA-N2-SB10-0-5	BR-OUA-N2-SB10-5.5-8.5	BR-OUA-O2-SB11-0-6	BR-OUA-O2-SB11-6.5-9.5
Sample Date				12/15/20	12/15/20	12/15/20	12/15/20	12/14/20	12/14/20
Total Petroleum Hydrocarbons (UG/KG)									
TPH-diesel range	--	--	2,000,000	**55,000**	7,900 U	7,400 U	**36,000**	**11,000 J**	6,300 U
TPH-gas range	--	--	100,000	**740 J**	2,000 U	**460 J**	2,100 U	**1,500 J**	**510 J**
TPH-residual range	--	--	--	**250,000**	26,000 U	23,000 U	**130,000**	**52,000 J**	21,000 U

Notes:
Shading indicates exceedance of RSLs Residentail Soil =0.1 November 2020
Bold outside box indicates exceedance of Title 40 Code of Federal Regulations (CFR) 261.24 [20x] Criteria
Underline indicates exceedance of CLARC Method A/B
H - The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of heavier molecular weight constituents than the calibration standard.
J - Analyte present. Value may or may not be accurate or precise
MG/KG - Milligrams per kilogram
NS - Not sampled
O - The chromatographic fingerprint of the sample resembles an oil, but does not match the calibration standard.
U - The material was analyzed for, but not detected
Z - The chromatographic fingerprint does not resemble a petroleum product.

Table 4. Validated Results - Soil - TPH

				BR-OUA-P1		BR-OUA-P2	
Sample ID	**RSLs Residentail Soil =0.1 November 2020**	**Title 40 Code of Federal Regulations (CFR) 261.24 [20x] Criteria**	**CLARC Method A/B**	BR-OUA-P1-SB12-0-5	BR-OUA-P1-SB12-5.5-8.5	BR-OUA-P2-SB13-0-6	BR-OUA-P2-SB13-6.5-9.5
Sample Date				12/14/20	12/14/20	12/15/20	12/15/20
Total Petroleum Hydrocarbons (UG/KG)							
TPH-diesel range	--	--	2,000,000	**28,000 J**	**190,000**	**55,000**	**190,000**
TPH-gas range	--	--	100,000	**1,700 J**	**840 J**	**1,700 J**	**4,000**
TPH-residual range	--	--	--	**63,000 J**	**680,000**	**240,000**	**730,000**

Notes:
Shading indicates exceedance of RSLs Residentail Soil =0.1 November 2020
Bold outside box indicates exceedance of Title 40 Code of Federal Regulations (CFR) 261.24 [20x] Criteria
Underline indicates exceedance of CLARC Method A/B
H - The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of heavier molecular weight constituents than the calibration standard.
J - Analyte present. Value may or may not be accurate or precise
MG/KG - Milligrams per kilogram
NS - Not sampled
O - The chromatographic fingerprint of the sample resembles an oil, but does not match the calibration standard.
U - The material was analyzed for, but not detected
Z - The chromatographic fingerprint does not resemble a petroleum product.

Table 5. Validated Results - Soil - TCLP Metals

				BR-OUA-G1		BR-OUA-G2		BR-OUA-H2	
Sample ID	**RSLs Residentail Soil =0.1 November 2020**	**Title 40 Code of Federal Regulations (CFR) 261.24 [20x] Criteria**	**CLARC Method B**	BR-OUA-G1-SB02-0-5	BR-OUA-G1-SB02-5.5-8.5	BR-OUA-G2-SB03-0-5	BR-OUA-G2-SB03-5.5-8.5	BR-OUA-H2-SB04-0-5	BR-OUA-H2-SB04-5.5-8.5
Sample Date				12/18/20	12/18/20	12/18/20	12/18/20	12/17/20	12/17/20
TCLP Metals (UG/L)									
Arsenic	--	5,000	--	50 U	50 U	50 U	50 U	50 U	50 U
Barium	--	100,000	--	**220**	**180**	**250**	**460**	**330**	**340**
Cadmium	--	1,000	--	50 U	50 U	50 U	50 U	50 U	50 U
Chromium	--	5,000	--	50 U	50 U	50 U	50 U	50 U	50 U
Lead	--	5,000	--	**430**	**120**	**610**	**1670**	**550**	**800**
Mercury	--	200	--	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U

Notes:
Shading indicates exceedance of RSLs Residentail Soil =0.1 November 2020
Bold outside box indicates exceedance of Title 40 Code of Federal Regulations (CFR) 261.24 [20x] Criteria
Underline indicates exceedance of CLARC Method B
J - Analyte present. Value may or may not be accurate or precise
MG/L - Milligrams per liter
NS - Not sampled
U - The material was analyzed for, but not detected

Table 5. Validated Results - Soil - TCLP Metals

				BR-OUA-I3	BR-OUA-J2		BR-OUA-K3		BR-OUA-L2	
Sample ID	**RSLs Residentail Soil =0.1 November 2020**	**Title 40 Code of Federal Regulations (CFR) 261.24 [20x] Criteria**	**CLARC Method B**	BR-OUA-I3-SB05-0-5.5	BR-OUA-J2-SB06-0-5	BR-OUA-J2-SB06-5.5-8.5	BR-OUA-K3-SB07-0-6	BR-OUA-K3-SB07-6.5-9.5	BR-OUA-L2-SB08-0-5	BR-OUA-L2-SB08-5.5-8.5
Sample Date				12/17/20	12/16/20	12/16/20	12/16/20	12/16/20	12/16/20	12/16/20
TCLP Metals (UG/L)										
Arsenic	--	5,000	--	50 U	50 U	50 U	50 U	50 U	50 U	**560**
Barium	--	100,000	--	**570**	**470**	**380**	**730**	**330**	**560**	**410**
Cadmium	--	1,000	--	50 U	50 U	**44 J**	**94 J**	50 U	50 U	**33 J**
Chromium	--	5,000	--	50 U	50 U	**240**	**42 J**	**37 J**	50 U	**73 J**
Lead	--	5,000	--	**6820**	**4780**	**2920**	**5190**	**1210**	**7250**	**13000**
Mercury	--	200	--	0.2 U	0.2 U	**0.16 J**	0.2 U	0.2 U	0.2 U	**2.8 J**

Notes:
Shading indicates exceedance of RSLs Residentail Soil =0.1 November 2020
Bold outside box indicates exceedance of Title 40 Code of Federal Regulations (CFR) 261.24 [20x] Criteria
Underline indicates exceedance of CLARC Method B
J - Analyte present. Value may or may not be accurate or precise
MG/L - Milligrams per liter
NS - Not sampled
U - The material was analyzed for, but not detected

Table 5. Validated Results - Soil - TCLP Metals

				BR-OUA-M3		BR-OUA-N2		BR-OUA-O2	
Sample ID	**RSLs Residentail Soil =0.1 November 2020**	**Title 40 Code of Federal Regulations (CFR) 261.24 [20x] Criteria**	**CLARC Method B**	BR-OUA-M3-SB09-0-6	BR-OUA-M3-SB09-6.5-9.5	BR-OUA-N2-SB10-0-5	BR-OUA-N2-SB10-5.5-8.5	BR-OUA-O2-SB11-0-6	BR-OUA-O2-SB11-6.5-9.5
Sample Date				12/15/20	12/15/20	12/15/20	12/15/20	12/14/20	12/14/20
TCLP Metals (UG/L)									
Arsenic	--	5,000	--	50 U	50 U	50 U	50 U	50 U	50 U
Barium	--	100,000	--	**660**	**130**	**230**	**360**	**200**	**180**
Cadmium	--	1,000	--	50 U	50 U	50 U	50 U	50 U	50 U
Chromium	--	5,000	--	**32 J**	**48 J**	50 U	**60 J**	50 U	50 U
Lead	--	5,000	--	**3740**	**110**	**390**	**560**	**170**	**750**
Mercury	--	200	--	**0.13 J**	**0.085 J**	0.2 U	**0.11 J**	0.2 U	0.2 U

Notes:
Shading indicates exceedance of RSLs Residentail Soil =0.1 November 2020
Bold outside box indicates exceedance of Title 40 Code of Federal Regulations (CFR) 261.24 [20x] Criteria
Underline indicates exceedance of CLARC Method B
J - Analyte present. Value may or may not be accurate or precise
MG/L - Milligrams per liter
NS - Not sampled
U - The material was analyzed for, but not detected

Table 5. Validated Results - Soil - TCLP Metals

				BR-OUA-P1		BR-OUA-P2	
Sample ID	**RSLs Residentail Soil =0.1 November 2020**	**Title 40 Code of Federal Regulations (CFR) 261.24 [20x] Criteria**	**CLARC Method B**	BR-OUA-P1-SB12-0-5	BR-OUA-P1-SB12-5.5-8.5	BR-OUA-P2-SB13-0-6	BR-OUA-P2-SB13-6.5-9.5
Sample Date				12/14/20	12/14/20	12/15/20	12/15/20
TCLP Metals (UG/L)							
Arsenic	--	5,000	--	50 U	50 U	50 U	50 U
Barium	--	100,000	--	**180**	**330**	**150**	**110**
Cadmium	--	1,000	--	50 U	50 U	50 U	50 U
Chromium	--	5,000	--	50 U	**210**	**75 J**	**57 J**
Lead	--	5,000	--	**110**	**950**	**180**	**180**
Mercury	--	200	--	**2.0**	**2.2**	**0.098 J**	0.2 U

Notes:
Shading indicates exceedance of RSLs Residentail Soil =0.1 November 2020
Bold outside box indicates exceedance of Title 40 Code of Federal Regulations (CFR) 261.24 [20x] Criteria
Underline indicates exceedance of CLARC Method B
J - Analyte present. Value may or may not be accurate or precise
MG/L - Milligrams per liter
NS - Not sampled
U - The material was analyzed for, but not detected

Table 6. Validated Results - Sediment - SVOCs

				BR-OUA-C5		BR-OUA-D4	BR-OUA-E3	BR-OUA-E5	BR-OUA-F4	BR-OUA-G3	BR-OUA-G5
Sample ID	**RSLs Res Soil HQ=0.1, Nov 2020**	**Washington State Marine Sediment Criteria**	**Washington State Marine Sediment Criteria AETS**	BR-OUA-C5-SD01-0221	BR-OUA-C5-SD01P-0221	BR-OUA-D4-SD02-0221	BR-OUA-E3-SD03-0221	BR-OUA-E5-SD04-0221	BR-OUA-F4-SD05-0221	BR-OUA-G3-SD06-0221	BR-OUA-G5-SD07-0221
Sample Date				2/3/21	2/3/21	2/3/21	2/3/21	2/3/21	2/3/21	2/3/21	2/3/21
Chemical Name											
Semivolatile Organic Compounds (UG/KG)											
2-Methylnaphthalene	24,000	38,000	670	0.566 U	0.55 U	**4.91**	0.52 U	0.572 U	0.583 U	0.518 U	**2.1 J**
Acenaphthene	360,000	66,000	1,300	0.566 U	0.55 U	**5.74**	0.52 U	0.572 U	0.583 U	0.518 U	0.711 UJ
Acenaphthylene	--	--	--	0.566 U	0.55 U	**6.55**	0.52 U	0.572 U	0.583 U	0.518 U	0.711 UJ
Anthracene	1,800,000	--	--	1.13 U	1.1 U	**11.1**	**1.42 J**	1.14 U	1.17 U	**2.58 J**	**7.08 J**
Benzo(a)anthracene	1,100	99,000	1,600	1.13 U	1.1 U	**35.2**	**4.78**	**3.03 J**	1.17 U	**12.3**	**13.1 J**
Benzo(a)pyrene	110	--	--	1.13 U	1.1 U	**38.5**	**5.69**	**3.7 J**	1.17 U	**15.5**	**22.3 J**
Benzo(b)fluoranthene	1,100	31,000	670	0.566 U	0.55 U	**75.4**	**10.1**	**6.51**	0.583 U	**26.7**	**33.3 J**
Benzo(g,h,i)perylene	--	--	--	1.13 U	1.1 U	**18.5 J**	**3.9**	**3.15 J**	1.17 U	**9.55**	**17.8 J**
Benzo(k)fluoranthene	11,000	--	--	0.566 U	0.55 U	**25.8**	**3.48**	**2.5 J**	0.583 U	**9.49**	**11.7 J**
Chrysene	110,000	12,000	230	0.566 U	0.55 U	**59.9**	**5.64**	**4.65**	0.583 U	**15.3**	**32.7 J**
Dibenz(a,h)anthracene	110	15,000	540	1.13 U	1.1 U	**4.25**	1.04 U	1.14 U	1.17 U	**1.79 J**	**3.95 J**
Fluoranthene	240,000	23,000	540	1.13 U	1.1 U	**94.7**	**6.21**	**3.99**	1.17 U	**21.4**	**16.2 J**
Fluorene	240,000	380	22	1.13 U	1.1 U	**9.13**	1.04 U	1.14 U	1.17 U	1.04 U	1.42 UJ
Indeno(1,2,3-cd)pyrene	1,100	--	--	1.13 U	1.1 U	**21.9**	**3.13 J**	**3.54 J**	1.17 U	**9.11**	**19.1 J**
Naphthalene	2,000	99,000	2,100	0.566 U	0.55 U	**5.39**	**1.55 J**	0.572 U	0.583 U	**1.74 J**	**2.89 J**
Phenanthrene	--	100,000	1,500	1.13 U	1.1 U	**66.8**	**2.18 J**	**1.83 J**	1.17 U	**4.84**	**7.71 J**
Pyrene	180,000	100,000	2,600	0.566 U	0.55 U	**102**	**7.56**	**3.44 J**	0.583 U	**22.4**	**15.2 J**

Notes:
Grey shading indicates exceedance of the RSLs Res Soil HQ=0.1, Nov 2020; First Value.
Bold outside box indicates exceedance of the Washington State Marine Sediment Criteria
Underline indicates exceedance of Washington State Marine Sediment Criteria AETS
J - Analyte present. Value may or may not be accurate or precise
MG/KG - Milligrams per kilogram
NS - Not sampled
PCT - Percent
PCT/P - Percent Pass
U - The material was analyzed for, but not detected
UG/KG - Micrograms per kilogram
Bold text indicates detection

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Table 7. Validated Results - Sediment - Metals

Sample ID	**RSLs Res Soil HQ=0.1, Nov 2020**	**Washington State Marine Sediment Criteria**	**Washington State Marine Sediment Criteria AETS**	Natural Background Concentrations	BR-OUA-C5-SD01-0221	BR-OUA-C5-SD01P-0221	BR-OUA-D4-SD02-0221	BR-OUA-E3-SD03-0221	BR-OUA-E5-SD04-0221	BR-OUA-F4-SD05-0221	BR-OUA-G3-SD06-0221	BR-OUA-G5-SD07-0221
Sample Date					2/3/21	2/3/21	2/3/21	2/3/21	2/3/21	2/3/21	2/3/21	2/3/21
Chemical Name												
Total Metals (MG/KG)												
Arsenic	0.68	57	57	11	**2.29 J**	**2.9 J**	**2.68 J**	**2.28 J**	**3.45 J**	**2.36 J**	**4.09 J**	**1.6 J**
Barium	1,500	--	--	--	**13.4**	**10.3**	**13**	**12.5**	**8.63**	**9.25**	**16.9**	**10.9**
Chromium	0.3	260	260	62	**17.5**	**19.2**	**16.8**	**21.2**	**14.9**	**14.9**	**15.4**	**11**
Copper	310	390	390	45	**18.5**	**20.4**	**31.3**	**27.8**	**13.4**	**17.9**	**28.5**	**23.1**
Lead	40	450	450	21	**5.95 J**	**3.7 J**	**37.4**	**52.8**	**9.3**	**35.9 J**	**62.9**	**28.5**
Mercury	2.3	0.41	0.41	0.2	**0.039**	**0.045**	**0.067**	**0.045**	**0.15**	**0.32**	**0.058**	**0.15**
Nickel	150	--	--	50	**35**	**33.2**	**29.6**	**37.1**	**19.9**	**28**	**30**	**17**
Zinc	2,300	410	410	93	**39.1 J**	**36.8 J**	**69.1 J**	**67.6 J**	**28.4 J**	**55.3 J**	**95.5 J**	**58.5 J**

Notes:
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Bold outside box indicates exceedance of the Washington State Marine Sediment Criteria
Underline indicates exceedance of Washington State Marine Sediment Criteria AETS
J - Analyte present. Value may or may not be accurate or precise
MG/KG - Milligrams per kilogram
NS - Not sampled
PCT - Percent
PCT/P - Percent Pass
U - The material was analyzed for, but not detected
UG/KG - Micrograms per kilogram
Bold text indicates detection

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Appendix C:
Site Inspection Documentation

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Five-Year Review Site Inspection Checklist
Bremerton Naval Complex
Puget Sound Naval Shipyard Complex

SITE INFORMATION	
Site name:	Operable Unit A__________
Location **Region** **EPA ID**	Bremerton, Kitsap County, Washington Region 10 WA2170023418
Date of inspection:	04 August 2021 (Inspection conducted at low tide)
Weather:	Sunny, clear, calm

Inspection Performed By:

Liberty JV Staff: Jeff Fetters and Seth Wing

Navy Staff Present: None

Remedy Includes:

Operable Unit A: Shoreline stabilization, upgraded cap, monitoring groundwater, and institutional controls.

Operable Unit B Terrestrial: Paving, shoreline protection, comprehensive stormwater system restoration, monitoring, and institutional controls.

Operable Unit B Marine: Sediment dredging, confined aquatic disposal of unsuitable sediments, in situ capping, enhanced natural recovery, habitat restoration, shoreline stabilization, monitoring, maintenance and institutional controls.

Operable Unit D: Site-wide capping, stormwater cleaning and inspection, stormwater drain repairs, groundwater monitoring, and institutional controls.

Operable Unit NSC: Pavement upgrades, stormwater drain cleaning, stormwater repairs, monitoring, and institutional controls.

Operable Unit C: Monitoring and institutional controls.

Attachments: ☐ Site map attached

Prior to the Site Inspection, were the following documents reviewed?

2020 Operation and Maintenance and Institutional Control Plan	☒ Yes	☐ No
Fourth Five Year Review	☒ Yes	☐ No
Annual Remedy Inspection Report	☒ Yes	☐ No
Other:	____________________	

ACCESS AND INSTITUTIONAL CONTROLS ☐ Not Applicable

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map ☒ Gates secured ☐ N/A
Remarks: No damaged fencing visible, but most of the OU can be accessed by the general public from the shoreline or nearby highway.

B. Other Access Restrictions

1. **Security measures** ☐ Location shown on site map ☒ N/A
Remarks:

2. **Signage** ☒ Present ☐ N/A
Remarks: Some signs are visible, but are minimal and hard to find. Several signs are faded and in disrepair.

C. Institutional Controls (ICs)

1. **Groundwater Restrictions (restricted to monitoring purposes only)**
Can groundwater be withdrawn or accessed? ☐ Yes ☒ No ☐ N/A
<u>Any observations of Groundwater Use for:</u>
Human consumption? ☐ Yes ☒ No ☐ N/A
Equipment maintenance? ☐ Yes ☒ No ☐ N/A
Equipment decontamination? ☐ Yes ☒ No ☐ N/A

Do ICs appear to be inadequate based on observable site conditions?
☐ Yes ☒ No ☐ N/A
(If "Yes" to any question above, explain)
Remarks: Well 204 can be opened by hand and the inner casing plug was not inserted into the pipe correctly, allowing for easy access.

2. **Excavation Management**
Unattended excavations? ☐ Yes ☒ No ☐ N/A
Breach of the pavement cap and vegetative covers? ☐ Yes ☒ No ☐ N/A

Do ICs appear to be inadequate based on observable site conditions?
☐ Yes ☒ No ☐ N/A
(If "Yes", explain)
Remarks: No pavement present near railroad tracks. Few fire brick were noted in the unpaved area surrounding the railroad tracks.

3. **Land Use Restrictions**
Is land use industrial at the site? ☒ Yes ☐ No ☐ N/A
Are there any construction activities currently underway at the site that appear to be residential in nature? ☐ Yes ☒ No ☐ N/A
Any residential type facilities such as childcare, housing, and schools located within the OU?
☐ Yes ☒ No ☐ N/A
Do ICs appear to be inadequate based on observable site conditions?
☐ Yes ☒ No ☐ N/A
Remarks:

4. **Fish and Shellfish Harvesting Restriction** *(applies to OU A only)*
Any observations or evidence of fish and shellfish harvesting?
☐ Yes ☒ No ☐ N/A
Do ICs appear to be inadequate based on observable site conditions?
☐ Yes ☒ No ☐ N/A
Remarks:

D. General

1. **Vandalism/trespassing** ☒ Location shown on site map ☐ No vandalism evident
Remarks: On the first day of the of the inspections, a small inflatable boat with an attached outboard motor was noticed Charleston Beach. When OU A was inspected, on the third day of the inspections, the small inflatable boat was observed locked to a log on Charleston Beach with its outboard motor placed on the inside of the boat, suggesting the small boat had been recently used.

2. **Off-site adjacent land use changes** ☒ N/A
Remarks:

PAVEMENT AND VEGETATIVE CAPS ☐ Not Applicable

A. Roads

1. **Roads damaged** ☐ Location shown on site map ☒ Roads adequate ☐ N/A
Remarks:

B. Cap and Cover Integrity

1. **Is pavement cap maintained?** ☒ Yes ☐ No ☐ N/A
Remarks:

2. **Is vegetation cap maintained?** ☒ Yes ☐ No ☐ N/A
Remarks: Vegetation cap at the top of the shoreline rock wall is very dry and does not appear to be irrigated. An area of disturbed vegetation was observed in the southwestern portion of Zone 1 related to recent (December 2020) soil characterization activities.

3. **Areas of poor drainage, gaps, cracks, or other pavement deficiencies?**
☐ Yes ☒ No ☐ N/A
Remarks:

4. **Observations of recent repairs to existing pavement area?**
☐ Yes ☒ No ☐ N/A
Remarks:

5. **Asphalt or concrete cap is allowing infiltration of stormwater?**
☐ Yes ☒ No ☐ N/A
Remarks:

6.	**Localized settlement or ponding greater than 6 inches in depth?** ☐ Yes ☒ No ☐ N/A Remarks:
7.	**Vegetated cover is eroding or settling?** ☐ Yes ☒ No ☐ N/A Remarks:
8.	**Vegetation on vegetated cover is unhealthy or sparse?** ☒ Yes ☐ No ☐ N/A Remarks: Vegetation cap at the top of the shoreline rock wall is very dry and does not appear to be irrigated.
9.	**Topsoil layer on vegetated cover is inadequate to support healthy plant life?** ☐ Yes ☒ No ☐ N/A Remarks:
10.	**Native soil or plant roots are visible along vegetated cover bank areas?** ☐ Yes ☒ No ☐ N/A Remarks:

CATCH BASINS/STORM DRAIN SYSTEM ☐ Not Applicable	
1.	**Observations of stormwater piping structural damage (cracking or settling)?** ☐ Yes ☒ No ☐ N/A Remarks:
2.	**Stormwater catch basins appear to be in poor condition?** ☐ Yes ☒ No ☐ N/A Remarks:
3.	**Evidence of standing water?** ☐ Yes ☒ No ☐ N/A Remarks:
4.	**Observations or evidence of poor drainage?** ☐ Yes ☒ No ☐ N/A Remarks:
5.	**Evidence of recent repairs or expansions to the stormwater system?** ☐ Yes ☒ No ☐ N/A Remarks:

SHORELINE ☐ Not Applicable	
A. Armor rock seawall	
1.	**Any indication of a recent change in rock distribution, slope or armoring?** ☒ Yes ☐ No ☐ N/A Remarks: Some areas appear to have sparse armor rock, notably at the southwest end of shoreline segment 43 and northeast end of shoreline segment 44.

2. Observations of petroleum seepage or sheen?

☐ Yes ☒ No ☐ N/A

Remarks:

3. Are there areas of exposed fill, construction debris, or scrap metal?

☒ Yes ☐ No ☐ N/A

Remarks: A small number of bricks, glass, and clay pipe were scattered across the beach, predominately southwest of Charleston Beach. Few scattered bricks were observed on the lower portion of Charleston Beach. None of the material appear to be recently placed.

4. Is there evidence of erosion, sloughing or settlement?

☐ Yes ☒ No ☐ N/A

Remarks:

- Erosion gauges A and C are visible across Charleston Beach. Approximately 18" of erosion gauges A and approximately 3" of erosion gauges C were visible. Erosion gauges B and D were not located.
- "Fish mix" rock material is visible at the top portion of the beach. Large armor rock is visible in the southwest portion of the fish mix berm.
- There is possible erosion at northeast end of Charleston beach. Where the rock wall has an inward turn, large armor rocks are not as high in density as surrounding area.

5. Are holes or undercutting present where the vegetated berm meets the seawall?

☐ Yes ☒ No ☐ N/A

Remarks:

B. Sheet pile wall *(located in OU A)*

1. Any corrosion, cracking, or deflection of sheet pile?

☐ Yes ☒ No ☐ N/A

Remarks:

2. Any evidence of breakthrough exposing fill?

☐ Yes ☒ No ☐ N/A

Remarks:

3. Any evidence of erosion from behind the structure?

☐ Yes ☒ No ☐ N/A

Remarks:

4. **Any observations of water flowing from openings or cracks?**

☐ Yes ☒ No ☐ N/A

Remarks:

5. Any evidence of petroleum seepage or sheen?

☐ Yes ☒ No ☐ N/A

Remarks:

Five-Year Review Site Inspection Checklist
Bremerton Naval Complex
Puget Sound Naval Shipyard Complex

SITE INFORMATION	
Site name:	Operable Unit C__________
Location **Region** **EPA ID**	Bremerton, Kitsap County, Washington Region 10 WA2170023418
Date of inspection:	02 August 2021
Weather:	Sunny, clear, calm

Inspection Performed By:

Liberty JV Staff: Jeff Fetters and Seth Wing

Navy Staff Present: None

Remedy Includes:

Operable Unit A: Shoreline stabilization, upgraded cap, monitoring groundwater, and institutional controls.

Operable Unit B Terrestrial: Paving, shoreline protection, comprehensive stormwater system restoration, monitoring, and institutional controls.

Operable Unit B Marine: Sediment dredging, confined aquatic disposal of unsuitable sediments, in situ capping, enhanced natural recovery, habitat restoration, shoreline stabilization, monitoring, maintenance and institutional controls.

Operable Unit D: Site-wide capping, stormwater cleaning and inspection, stormwater drain repairs, groundwater monitoring, and institutional controls.

Operable Unit NSC: Pavement upgrades, stormwater drain cleaning, stormwater repairs, monitoring, and institutional controls.

Operable Unit C: Monitoring and institutional controls.

Attachments: ☐ Site map attached

Prior to the Site Inspection, were the following documents reviewed?

2020 Operation and Maintenance and Institutional Control Plan	☒ Yes	☐ No
Fourth Five Year Review	☒ Yes	☐ No
Annual Remedy Inspection Report	☒ Yes	☐ No
Other:	____________________	

ACCESS AND INSTITUTIONAL CONTROLS ☐ Not Applicable

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map ☐ Gates secured ☒ N/A
Remarks: Fencing is in a state of disrepair, but is not part of the IC.

B. Other Access Restrictions

1. **Security measures** ☐ Location shown on site map ☒ N/A
Remarks: At least one gate is open, but this is not part of the IC. OU C is also fully contained within the gates of Navy Base Bremerton and is not accessible to the general public.

2. **Signage** ☒ Present ☐ N/A
Remarks: No signs signaling OU C, but several signs stating “Construction Area” are visible.

C. Institutional Controls (ICs)

1. **Groundwater Restrictions (restricted to monitoring purposes only)**

Can groundwater be withdrawn or accessed?	☒ Yes	☐ No	☐ N/A
<u>Any observations of Groundwater Use for:</u>			
Human consumption?	☐ Yes	☒ No	☐ N/A
Equipment maintenance?	☐ Yes	☒ No	☐ N/A
Equipment decontamination?	☐ Yes	☒ No	☐ N/A

Do ICs appear to be inadequate based on observable site conditions?
☐ Yes ☒ No ☐ N/A

(If “Yes” to any question above, explain)
Remarks: One well, with an unidentified well number, is not secured and does not have an inner casing plug or lock. This well may not be included in recent well maps and maybe a remnant of the former steam sparging system. It is located on the concrete pad, in the southwest corner, at approximately 47.56019, -122.64374.

2. **Excavation Management**

Unattended excavations?	☐ Yes	☒ No	☐ N/A
Breach of the pavement cap and vegetative covers?	☐ Yes	☒ No	☐ N/A

Do ICs appear to be inadequate based on observable site conditions?
☐ Yes ☒ No ☐ N/A

(If “Yes”, explain)
Remarks:

3. **Land Use Restrictions**
Is land use industrial at the site? ☒ Yes ☐ No ☐ N/A
Are there any construction activities currently underway at the site that appear to be residential in nature? ☐ Yes ☒ No ☐ N/A
Any residential type facilities such as childcare, housing, and schools located within the OU? ☐ Yes ☒ No ☐ N/A
Do ICs appear to be inadequate based on observable site conditions? ☐ Yes ☒ No ☐ N/A
Remarks:

4. **Fish and Shellfish Harvesting Restriction** *(applies to OU A only)*
Any observations or evidence of fish and shellfish harvesting? ☐ Yes ☐ No ☒ N/A
Do ICs appear to be inadequate based on observable site conditions? ☐ Yes ☐ No ☒ N/A
Remarks:

D. General

1. Vandalism/trespassing ☐ Location shown on site map ☒ No vandalism evident
Remarks: With open gates, it is relatively easy for those with access to the Navy base to access this site.

2. Off-site adjacent land use changes ☒ N/A
Remarks:

PAVEMENT AND VEGETATIVE CAPS ☐ Not Applicable

A. Roads

1. Roads damaged ☐ Location shown on site map ☒ Roads adequate ☐ N/A
Remarks:

B. Cap and Cover Integrity

1. Is pavement cap maintained? ☒ Yes ☐ No ☐ N/A
Remarks:

2.	**Is vegetation cap maintained?** Remarks:	☒ Yes	☐ No	☐ N/A
3.	**Areas of poor drainage, gaps, cracks, or other pavement deficiencies?** Remarks:	☐ Yes	☒ No	☐ N/A
4.	**Observations of recent repairs to existing pavement area?** Remarks:	☐ Yes	☒ No	☐ N/A
5.	**Asphalt or concrete cap is allowing infiltration of stormwater?** Remarks:	☐ Yes	☒ No	☐ N/A
6.	**Localized settlement or ponding greater than 6 inches in depth?** Remarks:	☐ Yes	☒ No	☐ N/A
7.	**Vegetated cover is eroding or settling?** Remarks:	☐ Yes	☒ No	☐ N/A
8.	**Vegetation on vegetated cover is unhealthy or sparse?** Remarks:	☐ Yes	☒ No	☐ N/A
9.	**Topsoil layer on vegetated cover is inadequate to support healthy plant life?** Remarks:	☐ Yes	☒ No	☐ N/A
10.	**Native soil or plant roots are visible along vegetated cover bank areas?** Remarks:	☐ Yes	☐ No	☒ N/A

CATCH BASINS/STORM DRAIN SYSTEM ☐ Not Applicable	
1.	**Observations of stormwater piping structural damage (cracking or settling)?** ☐ Yes ☒ No ☐ N/A Remarks:
2.	**Stormwater catch basins appear to be in poor condition?** ☐ Yes ☒ No ☐ N/A Remarks:
3.	**Evidence of standing water?** ☐ Yes ☒ No ☐ N/A Remarks:
4.	**Observations or evidence of poor drainage?** ☐ Yes ☒ No ☐ N/A Remarks:
5.	**Evidence of recent repairs or expansions to the stormwater system?** ☐ Yes ☒ No ☐ N/A Remarks:

SHORELINE ☒ Not Applicable	
A. Armor rock seawall	
1.	**Any indication of a recent change in rock distribution, slope or armoring?** ☐ Yes ☐ No ☒ N/A Remarks:
2.	**Observations of petroleum seepage or sheen?** ☐ Yes ☐ No ☒ N/A Remarks:
3.	**Are there areas of exposed fill, construction debris, or scrap metal?** ☐ Yes ☐ No ☒ N/A Remarks:
4.	**Is there evidence of erosion, sloughing or settlement?** ☐ Yes ☐ No ☒ N/A Remarks:
5.	**Are holes or undercutting present where the vegetated berm meets the seawall?** ☐ Yes ☐ No ☒ N/A Remarks:

B. Sheet pile wall *(located in OU A)*
1. Any corrosion, cracking, or deflection of sheet pile? ☐ Yes ☐ No ☒ N/A Remarks:
2. Any evidence of breakthrough exposing fill? ☐ Yes ☐ No ☒ N/A Remarks:
3. Any evidence of erosion from behind the structure? ☐ Yes ☐ No ☒ N/A Remarks:
4. **Any observations of water flowing from openings or cracks?** ☐ Yes ☐ No ☒ N/A Remarks:
5. Any evidence of petroleum seepage or sheen? ☐ Yes ☐ No ☒ N/A Remarks:

Five-Year Review Site Inspection Checklist
Bremerton Naval Complex
Puget Sound Naval Shipyard Complex

SITE INFORMATION	
Site name:	Operable Unit D__________
Location **Region** **EPA ID**	Bremerton, Kitsap County, Washington Region 10 WA2170023418
Date of inspection:	04 August 2021
Weather:	Sunny, clear, calm

Inspection Performed By:

Liberty JV Staff: Jeff Fetters and Seth Wing

Navy Staff Present: None

Remedy Includes:

Operable Unit A: Shoreline stabilization, upgraded cap, monitoring groundwater, and institutional controls.

Operable Unit B Terrestrial: Paving, shoreline protection, comprehensive stormwater system restoration, monitoring, and institutional controls.

Operable Unit B Marine: Sediment dredging, confined aquatic disposal of unsuitable sediments, in situ capping, enhanced natural recovery, habitat restoration, shoreline stabilization, monitoring, maintenance and institutional controls.

Operable Unit D: Site-wide capping, stormwater cleaning and inspection, stormwater drain repairs, groundwater monitoring, and institutional controls.

Operable Unit NSC: Pavement upgrades, stormwater drain cleaning, stormwater repairs, monitoring, and institutional controls.

Operable Unit C: Monitoring and institutional controls.

Attachments: ☐ Site map attached

Prior to the Site Inspection, were the following documents reviewed?

2020 Operation and Maintenance and Institutional Control Plan	☒ Yes	☐ No
Fourth Five Year Review	☒ Yes	☐ No
Annual Remedy Inspection Report	☒ Yes	☐ No
Other:	____________________	

ACCESS AND INSTITUTIONAL CONTROLS ☐ Not Applicable

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map ☐ Gates secured ☒ N/A
Remarks: This OU is a public park with public access.

B. Other Access Restrictions

1. **Security measures** ☐ Location shown on site map ☒ N/A
Remarks:

2. **Signage** ☐ Present ☒ N/A
Remarks:

C. Institutional Controls (ICs)

1. **Groundwater Restrictions (restricted to monitoring purposes only)**

Can groundwater be withdrawn or accessed? ☐ Yes ☐ No ☒ N/A

<u>Any observations of Groundwater Use for:</u>

Human consumption? ☐ Yes ☐ No ☒ N/A
Equipment maintenance? ☐ Yes ☐ No ☒ N/A
Equipment decontamination? ☐ Yes ☐ No ☒ N/A

Do ICs appear to be inadequate based on observable site conditions?
☐ Yes ☐ No ☒ N/A

(If "Yes" to any question above, explain)
Remarks:

2. **Excavation Management**

Unattended excavations? ☐ Yes ☒ No ☐ N/A
Breach of the pavement cap and vegetative covers? ☐ Yes ☒ No ☐ N/A

Do ICs appear to be inadequate based on observable site conditions?
☐ Yes ☒ No ☐ N/A

(If "Yes", explain)
Remarks:

3. **Land Use Restrictions**

Is land use industrial at the site? ☐ Yes ☒ No ☐ N/A

Are there any construction activities currently underway at the site that appear to be residential in nature? ☐ Yes ☒ No ☐ N/A

Any residential type facilities such as childcare, housing, and schools located within the OU?
☐ Yes ☒ No ☐ N/A

Do ICs appear to be inadequate based on observable site conditions?
☐ Yes ☒ No ☐ N/A

Remarks:

4. **Fish and Shellfish Harvesting Restriction** *(applies to OU A only)*
Any observations or evidence of fish and shellfish harvesting?
☐ Yes ☒ No ☐ N/A

Do ICs appear to be inadequate based on observable site conditions?
☐ Yes ☒ No ☐ N/A

Remarks:

D. General

1. Vandalism/trespassing ☐ Location shown on site map ☒ No vandalism evident
Remarks:

2. Off-site adjacent land use changes ☒ N/A
Remarks:

PAVEMENT AND VEGETATIVE CAPS ☐ Not Applicable

A. Roads

1. Roads damaged ☐ Location shown on site map ☒ Roads adequate ☐ N/A
Remarks:

B. Cap and Cover Integrity

1. Is pavement cap maintained? ☒ Yes ☐ No ☐ N/A
Remarks: Paving stone used for sidewalks are not impervious to free-flowing liquid.

2. Is vegetation cap maintained? ☒ Yes ☐ No ☐ N/A
Remarks:

3. Areas of poor drainage, gaps, cracks, or other pavement deficiencies?
☒ Yes ☐ No ☐ N/A
Remarks: Paving stones have cracks between them, as designed.

4. Observations of recent repairs to existing pavement area?
☐ Yes ☒ No ☐ N/A
Remarks:

5. Asphalt or concrete cap is allowing infiltration of stormwater?
☐ Yes ☒ No ☐ N/A
Remarks: The areas that are concrete or asphalt are well maintained, but areas beyond that will allow infiltration of water.

6. Localized settlement or ponding greater than 6 inches in depth?
☒ Yes ☐ No ☐ N/A
Remarks: Paving stones at the south end of the OU have noticeable settlement up to 6 inches in depth.

7. Vegetated cover is eroding or settling?
☐ Yes ☒ No ☐ N/A
Remarks:

8. Vegetation on vegetated cover is unhealthy or sparse?
☐ Yes ☒ No ☐ N/A
Remarks:

9. Topsoil layer on vegetated cover is inadequate to support healthy plant life?
☐ Yes ☒ No ☐ N/A
Remarks:

10. Native soil or plant roots are visible along vegetated cover bank areas?
☐ Yes ☒ No ☐ N/A
Remarks:

CATCH BASINS/STORM DRAIN SYSTEM ☐ Not Applicable

1. Observations of stormwater piping structural damage (cracking or settling)?
☐ Yes ☒ No ☐ N/A
Remarks:

2. Stormwater catch basins appear to be in poor condition?
☐ Yes ☒ No ☐ N/A
Remarks:

3. Evidence of standing water? ☐ Yes ☒ No ☐ N/A
Remarks:

4. Observations or evidence of poor drainage? ☐ Yes ☒ No ☐ N/A
Remarks:

5. Evidence of recent repairs or expansions to the stormwater system?
☐ Yes ☒ No ☐ N/A
Remarks:

SHORELINE ☐ Not Applicable

A. Armor rock seawall

1. Any indication of a recent change in rock distribution, slope or armoring?
☐ Yes ☒ No ☐ N/A
Remarks:

2. Observations of petroleum seepage or sheen?
☐ Yes ☒ No ☐ N/A
Remarks:

3. Are there areas of exposed fill, construction debris, or scrap metal?
☐ Yes ☒ No ☐ N/A
Remarks:

4. Is there evidence of erosion, sloughing or settlement?
☐ Yes ☒ No ☐ N/A
Remarks:

5. Are holes or undercutting present where the vegetated berm meets the seawall?
☐ Yes ☒ No ☐ N/A
Remarks:

B. Sheet pile wall *(located in OU A)*

1. Any corrosion, cracking, or deflection of sheet pile?
☐ Yes ☐ No ☒ N/A
Remarks:

2. Any evidence of breakthrough exposing fill?
☐ Yes ☐ No ☒ N/A
Remarks:

3. Any evidence of erosion from behind the structure?
☐ Yes ☐ No ☒ N/A
Remarks:

4. **Any observations of water flowing from openings or cracks?**
☐ Yes ☐ No ☒ N/A
Remarks:

5. Any evidence of petroleum seepage or sheen?
☐ Yes ☐ No ☒ N/A
Remarks:

Five-Year Review Site Inspection Checklist
Bremerton Naval Complex
Puget Sound Naval Shipyard Complex

SITE INFORMATION	
Site name:	Operable Unit B T______
Location **Region** **EPA ID**	Bremerton, Kitsap County, Washington Region 10 WA2170023418
Date of inspection:	03 August 2021
Weather:	Sunny, clear, calm

Inspection Performed By:

Liberty JV Staff: Jeff Fetters and Seth Wing

Navy Staff Present: None

Remedy Includes:

Operable Unit A: Shoreline stabilization, upgraded cap, monitoring groundwater, and institutional controls.

Operable Unit B Terrestrial: Paving, shoreline protection, comprehensive stormwater system restoration, monitoring, and institutional controls.

Operable Unit B Marine: Sediment dredging, confined aquatic disposal of unsuitable sediments, in situ capping, enhanced natural recovery, habitat restoration, shoreline stabilization, monitoring, maintenance and institutional controls.

Operable Unit D: Site-wide capping, stormwater cleaning and inspection, stormwater drain repairs, groundwater monitoring, and institutional controls.

Operable Unit NSC: Pavement upgrades, stormwater drain cleaning, stormwater repairs, monitoring, and institutional controls.

Operable Unit C: Monitoring and institutional controls.

Attachments: ☐ Site map attached

Prior to the Site Inspection, were the following documents reviewed?

2020 Operation and Maintenance and Institutional Control Plan	☒ Yes	☐ No
Fourth Five Year Review	☒ Yes	☐ No
Annual Remedy Inspection Report	☒ Yes	☐ No
Other:	____________________	

ACCESS AND INSTITUTIONAL CONTROLS ☐ Not Applicable

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map ☒ Gates secured ☐ N/A
Remarks: No damaged fencing found.

B. Other Access Restrictions

1. **Security measures** ☐ Location shown on site map ☒ N/A
Remarks: Secured area off limits to the general public.

2. **Signage** ☒ Present ☐ N/A
Remarks:

C. Institutional Controls (ICs)

1. **Groundwater Restrictions (restricted to monitoring purposes only)**

	Yes	No	N/A
Can groundwater be withdrawn or accessed?	☐	☒	☐
<u>Any observations of Groundwater Use for:</u>			
Human consumption?	☐	☒	☐
Equipment maintenance?	☐	☒	☐
Equipment decontamination?	☐	☒	☐
Do ICs appear to be inadequate based on observable site conditions?	☐	☒	☐

(If "Yes" to any question above, explain)
Remarks:
- Wells 432, 713, 715 R, 736, and 809 are missing one or more bolts on their covers.
- The cover bolts for Well LTMP-2 are rusted and cannot be tightened.

2. **Excavation Management**

	Yes	No	N/A
Unattended excavations?	☒	☐	☐
Breach of the pavement cap and vegetative covers?	☒	☐	☐
Do ICs appear to be inadequate based on observable site conditions?	☐	☒	☐

(If "Yes", explain)
Remarks:
- Southwest of building 431 is an area of active excavation where soil is being removed.
- Northwest corner of building 431 is an area being excavated and a newly opened trench.
- West of building 1157 is an exposed area, approximately 30 x 4 feet, that looks like it was recently excavated.
- West of building 431, 3 x 3 area of cut asphalt with apparent exposed soil.
- Southeast corner of building 431 active excavation.
- West of building 78 is an area of active trenching, approximately 3 x 20 feet.
- South of building 850A, two area of active excavations.
- Area north of powerplant marked for future excavation.

3. **Land Use Restrictions**
Is land use industrial at the site? ☒ Yes ☐ No ☐ N/A
Are there any construction activities currently underway at the site that appear to be residential in nature? ☐ Yes ☒ No ☐ N/A
Any residential type facilities such as childcare, housing, and schools located within the OU? ☐ Yes ☒ No ☐ N/A
Do ICs appear to be inadequate based on observable site conditions? ☐ Yes ☒ No ☐ N/A
Remarks:

4. **Fish and Shellfish Harvesting Restriction** *(applies to OU A only)*
Any observations or evidence of fish and shellfish harvesting? ☐ Yes ☒ No ☐ N/A
Do ICs appear to be inadequate based on observable site conditions? ☐ Yes ☒ No ☐ N/A
Remarks:

D. General

1. Vandalism/trespassing ☐ Location shown on site map ☒ No vandalism evident
Remarks:

2. Off-site adjacent land use changes ☒ N/A
Remarks:

PAVEMENT AND VEGETATIVE CAPS ☐ Not Applicable

A. Roads

1. Roads damaged ☒ Location shown on site map ☐ Roads adequate ☐ N/A
Remarks: Roads damaged or cracked in many locations.

B. Cap and Cover Integrity

1. Is pavement cap maintained? ☒ Yes ☐ No ☐ N/A
Remarks:

2. Is vegetation cap maintained? ☐ Yes ☐ No ☒ N/A
Remarks:

3. Areas of poor drainage, gaps, cracks, or other pavement deficiencies?

☒ Yes ☐ No ☐ N/A

Remarks: Several locations found with cracks or deficiencies in the pavement.

4. Observations of recent repairs to existing pavement area?

☒ Yes ☐ No ☐ N/A

Remarks:
- An area south of building 850 has new concrete, where excavation likely occurred. This area is approximately 20 x 10 feet in size. Across the street from this is an active excavation area. Fencing is around both areas.
- New asphalt is visible along a recently trenched area near building 857.
- Area southeast of building 851 (recycling area) has new concrete surface, within the "last 4 months" per on-site personnel.

5. Asphalt or concrete cap is allowing infiltration of stormwater?

☒ Yes ☐ No ☐ N/A

Remarks:
- Area next to railroad tracks on the far west end of OU B T is not paved, but covered with large gravel.
- South of electrical substation 1035 is a pothole in the pavement where the cap is compromised.
- Pavement southwest of building 1108 has exposed soil/gravel.
- Pavement was removed around a fire hydrant between buildings 368 and 1179, approximately 5 x 4 feet in size.
- Soil is exposed and pavement has been removed at an area northeast of building 368, approximately 6 x 6 feet in size.
- South of building 1160 is an area of very poor concrete, where soil and gravel are filling open areas.
- Many of the steam utility trench covers are in poor condition across the OU.

6. Localized settlement or ponding greater than 6 inches in depth?

☒ Yes ☐ No ☐ N/A

Remarks:
- Area of subsidence at the northwest corner of building 427.
- Area of subsidence southwest of building 550 that appears to have been previously patched.

7. Vegetated cover is eroding or settling?

☐ Yes ☐ No ☒ N/A

Remarks:

8. Vegetation on vegetated cover is unhealthy or sparse?

☐ Yes ☐ No ☒ N/A

Remarks:

9. Topsoil layer on vegetated cover is inadequate to support healthy plant life?

☐ Yes ☐ No ☒ N/A

Remarks:

10.	**Native soil or plant roots are visible along vegetated cover bank areas?** ☐ Yes ☐ No ☒ N/A Remarks:	

CATCH BASINS/STORM DRAIN SYSTEM ☐ Not Applicable	
1.	**Observations of stormwater piping structural damage (cracking or settling)?** ☐ Yes ☒ No ☐ N/A Remarks:
2.	**Stormwater catch basins appear to be in poor condition?** ☐ Yes ☒ No ☐ N/A Remarks: • Most stormwater drains do not have filter fabric. • Copper drainpipes observed at building 107 and 147.
3.	**Evidence of standing water?** ☐ Yes ☒ No ☐ N/A Remarks:
4.	**Observations or evidence of poor drainage?** ☐ Yes ☒ No ☐ N/A Remarks:
5.	**Evidence of recent repairs or expansions to the stormwater system?** ☐ Yes ☒ No ☐ N/A Remarks:

SHORELINE ☐ Not Applicable	
A. Armor rock seawall	
1.	**Any indication of a recent change in rock distribution, slope or armoring?** ☒ Yes ☐ No ☐ N/A Remarks: • Rock armor close to building 944 has a change in the size of rock present, suggesting erosion. • Rock armor on the shore south of building 368 no longer has large rocks on it, only small ones, suggesting erosion.
2.	**Observations of petroleum seepage or sheen?** ☐ Yes ☒ No ☐ N/A Remarks:
3.	**Are there areas of exposed fill, construction debris, or scrap metal?** ☐ Yes ☒ No ☐ N/A Remarks:
4.	**Is there evidence of erosion, sloughing or settlement?** ☒ Yes ☐ No ☐ N/A Remarks: Several areas have visible erosion.
5.	**Are holes or undercutting present where the vegetated berm meets the seawall?** ☐ Yes ☒ No ☐ N/A Remarks:
B. Sheet pile wall *(located in OU A)*	
1.	**Any corrosion, cracking, or deflection of sheet pile?** ☐ Yes ☐ No ☒ N/A Remarks:
2.	**Any evidence of breakthrough exposing fill?** ☐ Yes ☐ No ☒ N/A Remarks:
3.	**Any evidence of erosion from behind the structure?** ☐ Yes ☐ No ☒ N/A Remarks:
4.	**Any observations of water flowing from openings or cracks?** ☐ Yes ☐ No ☒ N/A Remarks:
5.	**Any evidence of petroleum seepage or sheen?** ☐ Yes ☐ No ☒ N/A Remarks:

Five-Year Review Site Inspection Checklist
Bremerton Naval Complex
Puget Sound Naval Shipyard Complex

SITE INFORMATION	
Site name:	Operable Unit NSC_______
Location **Region** **EPA ID**	Bremerton, Kitsap County, Washington Region 10 WA2170023418
Date of inspection:	02 August 2021
Weather:	Sunny, clear, calm

Inspection Performed By:

Liberty JV Staff: Jeff Fetters and Seth Wing

Navy Staff Present: None

Remedy Includes:

Operable Unit A: Shoreline stabilization, upgraded cap, monitoring groundwater, and institutional controls.

Operable Unit B Terrestrial: Paving, shoreline protection, comprehensive stormwater system restoration, monitoring, and institutional controls.

Operable Unit B Marine: Sediment dredging, confined aquatic disposal of unsuitable sediments, in situ capping, enhanced natural recovery, habitat restoration, shoreline stabilization, monitoring, maintenance and institutional controls.

Operable Unit D: Site-wide capping, stormwater cleaning and inspection, stormwater drain repairs, groundwater monitoring, and institutional controls.

Operable Unit NSC: Pavement upgrades, stormwater drain cleaning, stormwater repairs, monitoring, and institutional controls.

Operable Unit C: Monitoring and institutional controls.

Attachments: ☐ Site map attached

Prior to the Site Inspection, were the following documents reviewed?

2020 Operation and Maintenance and Institutional Control Plan	☒ Yes	☐ No
Fourth Five Year Review	☒ Yes	☐ No
Annual Remedy Inspection Report	☒ Yes	☐ No
Other:	____________________	

ACCESS AND INSTITUTIONAL CONTROLS ☐ Not Applicable

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map ☒ Gates secured ☐ N/A
Remarks: No damaged fencing found.

B. Other Access Restrictions

1. **Security measures** ☐ Location shown on site map ☒ N/A
Remarks: Highly secured area.

2. **Signage** ☒ Present ☐ N/A
Remarks:

C. Institutional Controls (ICs)

1. **Groundwater Restrictions (restricted to monitoring purposes only)**
Can groundwater be withdrawn or accessed? ☐ Yes ☒ No ☐ N/A
<u>Any observations of Groundwater Use for:</u>
Human consumption? ☐ Yes ☒ No ☐ N/A
Equipment maintenance? ☐ Yes ☒ No ☐ N/A
Equipment decontamination? ☐ Yes ☒ No ☐ N/A

Do ICs appear to be inadequate based on observable site conditions?
☐ Yes ☒ No ☐ N/A
(If "Yes" to any question above, explain)
Remarks:

2. **Excavation Management**
Unattended excavations? ☐ Yes ☒ No ☐ N/A
Breach of the pavement cap and vegetative covers? ☒ Yes ☐ No ☐ N/A

Do ICs appear to be inadequate based on observable site conditions?
☐ Yes ☒ No ☐ N/A
(If "Yes", explain)
Remarks:
- Active excavation east building 494
- West of building 971 is a small area (approximately 8' x 16') where soil is exposed. This area is fenced off and is likely part of the larger excavation occurring at nearby building 494.
- There appears to be construction activities west of building 556.

3. **Land Use Restrictions**
Is land use industrial at the site? ☒ Yes ☐ No ☐ N/A
Are there any construction activities currently underway at the site that appear to be residential in nature? ☐ Yes ☒ No ☐ N/A
Any residential type facilities such as childcare, housing, and schools located within the OU? ☐ Yes ☒ No ☐ N/A
Do ICs appear to be inadequate based on observable site conditions? ☐ Yes ☒ No ☐ N/A
Remarks:

4. **Fish and Shellfish Harvesting Restriction** *(applies to OU A only)*
Any observations or evidence of fish and shellfish harvesting? ☐ Yes ☒ No ☐ N/A
Do ICs appear to be inadequate based on observable site conditions? ☐ Yes ☒ No ☐ N/A
Remarks:

D. General

1. Vandalism/trespassing ☐ Location shown on site map ☒ No vandalism evident
Remarks:

2. Off-site adjacent land use changes ☒ N/A
Remarks:

PAVEMENT AND VEGETATIVE CAPS ☐ Not Applicable

A. Roads

1. Roads damaged ☐ Location shown on site map ☒ Roads adequate ☐ N/A
Remarks:

B. Cap and Cover Integrity

1. Is pavement cap maintained? ☒ Yes ☐ No ☐ N/A
Remarks:
- Pavement and concrete are cracked in some area, especially near steam utility trenches.
- Asphalt is cracked between building 1245 and 449.
- Some asphalt defects are visible north of building 816.

2.	**Is vegetation cap maintained?** Remarks:	☐ Yes	☐ No	☒ N/A
3.	**Areas of poor drainage, gaps, cracks, or other pavement deficiencies?** Remarks: Several areas of cracked pavement were noted.	☒ Yes	☐ No	☐ N/A
4.	**Observations of recent repairs to existing pavement area?** Remarks: • Recent trenching and repaving north of building 556 and 467. • Newly installed concrete south and east of building 449. • New asphalt visible south and between building 556 and 802.	☒ Yes	☐ No	☐ N/A
5.	**Asphalt or concrete cap is allowing infiltration of stormwater?** Remarks:	☐ Yes	☒ No	☐ N/A
6.	**Localized settlement or ponding greater than 6 inches in depth?** Remarks: Locations of settling >6” northwest of building 816 and north of building70 is visible.	☒ Yes	☐ No	☐ N/A
7.	**Vegetated cover is eroding or settling?** Remarks:	☐ Yes	☐ No	☒ N/A
8.	**Vegetation on vegetated cover is unhealthy or sparse?** Remarks:	☐ Yes	☐ No	☒ N/A
9.	**Topsoil layer on vegetated cover is inadequate to support healthy plant life?** Remarks:	☐ Yes	☐ No	☒ N/A
10.	**Native soil or plant roots are visible along vegetated cover bank areas?** Remarks:	☐ Yes	☐ No	☒ N/A

CATCH BASINS/STORM DRAIN SYSTEM ☐ Not Applicable

1. **Observations of stormwater piping structural damage (cracking or settling)?**
☐ Yes ☒ No ☐ N/A
Remarks:

2. **Stormwater catch basins appear to be in poor condition?**
☐ Yes ☒ No ☐ N/A
Remarks:

3. **Evidence of standing water?** ☐ Yes ☒ No ☐ N/A
Remarks:

4. **Observations or evidence of poor drainage?** ☐ Yes ☒ No ☐ N/A
Remarks:

5. **Evidence of recent repairs or expansions to the stormwater system?**
☐ Yes ☒ No ☐ N/A
Remarks:

SHORELINE ☒ Not Applicable

A. Armor rock seawall

1. **Any indication of a recent change in rock distribution, slope or armoring?**
☐ Yes ☐ No ☒ N/A
Remarks:

2. **Observations of petroleum seepage or sheen?**
☐ Yes ☐ No ☒ N/A
Remarks:

3. **Are there areas of exposed fill, construction debris, or scrap metal?**
☐ Yes ☐ No ☒ N/A
Remarks:

4. **Is there evidence of erosion, sloughing or settlement?**
☐ Yes ☐ No ☒ N/A
Remarks:

5. **Are holes or undercutting present where the vegetated berm meets the seawall?**
☐ Yes ☐ No ☒ N/A
Remarks:

B. Sheet pile wall *(located in OU A)*
1. Any corrosion, cracking, or deflection of sheet pile? ☐ Yes ☐ No ☒ N/A Remarks:
2. Any evidence of breakthrough exposing fill? ☐ Yes ☐ No ☒ N/A Remarks:
3. Any evidence of erosion from behind the structure? ☐ Yes ☐ No ☒ N/A Remarks:
4. **Any observations of water flowing from openings or cracks?** ☐ Yes ☐ No ☒ N/A Remarks:
5. Any evidence of petroleum seepage or sheen? ☐ Yes ☐ No ☒ N/A Remarks:

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Appendix D:
Crosswalk between CERCLA and MTCA Requirements

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Crosswalk between CERCLA Five-Year Review Report and the MTCA Periodic Review Criteria for Operable Unit C

MTCA Periodic Review Criteria	Discussion in Five-Year Review
The effectiveness of ongoing or completed clean-up actions, including the effectiveness of engineering controls and institutional controls in limiting exposure to hazardous substances remaining at the site [WAC 173-340-420 (4) (a)]	Conclusions are primarily found in Section 5.1, with a specific discussion regarding institutionalcontrols in Section 2.8.
New scientific information for individual hazardous substances or mixtures present at thesite [WAC 173-340-420 (4) (b)]	An assessment of changes in toxicological information for site contaminants is included inSection 5.2.
New applicable state and federal laws for hazardous substances present at the site [WAC173-340-420 (4) (c)]	Any new state or federal laws pertaining to theremedial action are discussed in Section 5.2.
Current and projected site and resource uses [WAC 173-340-420 (4) (d)]	Site and resource use is summarized in Section 2.5. OU C is currently used for industrial purposes. There have been no changes in current or projected future OU C land or resource uses.
The availability and practicality of more permanent remedies [WAC 173-340-420 (4) (e)]	The institutional controls in place for this OU prevent exposure to residual soil contaminants. While higher preference is given to active cleanuptechnologies during ROD and CAP decision making, the selection of institutional controls in the OU C CAP remains protective of human health and the environment.
The availability of improved analytical techniquesto evaluate compliance with cleanup levels [WAC173-340-420 (4) (f)]	Any changes in analytical techniques which would affect evaluation of the remedy are discussed in Section 5.2. The analytical methods used at the time of the remedial investigation and issuance of the OU C CAP were provided reporting limits below MTCA cleanup levels. The presence of improved analytical techniques would not affect decisions or recommendations made for OU C.

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Appendix E:
Stakeholder Comment Resolution

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Responses to Agency/Stakeholder Comments
Draft Fifth Five Year Review
Bremerton Naval Complex, Bremerton, Washington

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Washington Department of Ecology						
Comments by: Mahbub Alam (mala461@ecy.wa.gov) **Comments Received: 4/4/2022**						
ECY 1	General	The FYR did not include a sitewide protectiveness determination and statement in the executive summary but a sitewide protective statement was included in Chapter 7. When a site has multiple OUs, a sitewide determination is also made. See page 6 of the USEPA OSWER memorandum # OLEM 9200.0-89 (Transmittal of the Five-Year Review Recommended Template dated January 20, 2016). The sitewide protective statement was written in Chapter 7 as "Protection Deferred". Sitewide protectiveness determination and statement is usually based on the least protective OU. As such, it should be "Not Protective". The Navy has followed this rationale in NBK Keyport and Bangor FYR.	The Sitewide Protectiveness Statement will be added to the Executive Summary, and it will be revised to indicate "Not Protective."			
ECY 2	General	Ecology does not agree with Navy's protectiveness determination of the OU A as "Short-Term Protective". During 4th FYR, Ecology along with the USEPA and the Tribe determined the remedy at OU A is" Not Protective". While the Navy is working on a Remedy repair at OU A, the construction has not started (no change in remedy status since last FYR). As such, the protectiveness determination should be "Not Protective".	During review of the 4th FYR, the Navy respectfully disagreed with the assertion that the OU A remedy was not short-term protective. As stated at the time, the condition of OU A had not changed since the Record of Decision (ROD) was signed (no new condition), and, as stated in the comment, no change in the remedy status has occurred since the last five-year review (FYR). Additionally, the remedy implemented at OU A is considered short-term protective based on the interim erosion protection measures being implemented at Charleston Beach. Once the repair is complete, the remedy will be protective; therefore, "Short-Term Protective" is appropriate.	Upon further discussion with the Navy FYR Subject Matter Expert (SME), the protectiveness determination for OU A has been changed to "Protectiveness Deferred," based on lead results in soil detected along the Charleston Beach shoreline that indicate a change in conditions since the ROD. During the 30 June 2022 stakeholder meeting, Ecology also expressed concern that the 3 feet of fish mix cover was not maintained during the FYR period. The text in Section 2.2.3.1 (Shoreline) has been revised to state the following: "*In 2017, approximately 114 tons (78 cubic yards) of fish mix was added to the shoreline. During this FYR period, the gauges that could be measured (Gauge B was completely covered) indicated greater than 3 feet of fish mix cover at Charleston Beach.*"	Accepted; based on need for additional data collection and evaluation of lead concentrations in soil at the site. Consider revising the milestone date for the recommendation related to the evaluation of lead in soil so that it will be finalized and can be included in the next 5YR (October 2027) The milestone date for the completion of the shoreline remedy repair is Aug 2024. Although soil sampling will occur during remedy construction, project team input (regulatory levels, CSM, etc) should begin during the repair design process.	The requested change has been made to the document text. The milestone date for the "Lead concentration in soil" issue in Table ES-3 and Section 6 has been modified to December 2025, to allow the information to be included in the next FYR report.

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Washington Department of Ecology						
ECY 3	General	The Navy has answered the Question B: "Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy selection still valid?" as "Yes" (Table 5-1 and associated discussion). For many COCs in multiple OUs, current regulatory levels are different, lower in most cases. As such ROD RG, if established today, would be lower. For TCE, the risk even exceeds MTCA target cancer risk due to changes in water quality criteria (WQC) (see page 5-19 & 6-7 of the FYR). Yet the answer is listed as "Yes", which should be "No". Ecology recommends reviewing this issue for all COCs, and if there is one COC for which the regulatory level changed, the answer should be "No". Note that if the RG is adjusted to PQL due to regulatory level below quantitation (and the PQL has not changed), the protectiveness determination will not change but the answer to Question B will still be "No".	The Navy respectfully disagrees that any single regulatory level that is currently lower than the level used in the ROD triggers a "No" answer to Question B for the overall Puget Sound Naval Shipyard (PSNS) installation. The goal of the technical assessment is to determine protectiveness of the remedy, and the effect on protectiveness of changes on regulatory levels is discussed thoroughly in Section 5 of the FYR.	Based on the discussion at the 30 June 2022 stakeholder meeting, the answer to Question B for OU B Terrestrial has been revised to indicate "No" in Tables ES-1 and 5-1.	Accepted.	Comment noted.
ECY 4	Page vi	"*Recommendations for BNC are provided by the stakeholders, which consist of the USEPA, Ecology, the Washington State Department of Natural Resources, and the Suquamish Tribe*". I am not sure all recommendations were provided the stakeholders. Please clarify.	The sentence has been revised as follows: "***Some*** *recommendations for BNC are provided by the stakeholders, which consist of the USEPA, Ecology, the Washington State Department of Natural Resources, and the Suquamish Tribe.*"			
ECY 5	Page x Page 6-1	"Issue: Conceptual Site Model" Shouldn't OU NSC, OU D be listed under this general CSM update category as these OUs abut OU B Marine. "Issue: LTM monitoring frequency" & "Issue: LTM monitoring network" Shouldn't OU NSC, OU D be listed under these general categories?	The issues regarding the conceptual site model (CSM) and long-term monitoring (LTM) frequency have been revised to include OU D and OU NSC.			
ECY 6	Page x Page 6-1	"OU(s) without Issues/Recommendations Identified in the Five-Year Review:" Update based on previous comment.	The text was revised to remove OU D and OU NSC from the table that identifies "OU(s) without Issues/Recommendations Identified in the Five-Year Review."			

Responses to Agency/Stakeholder Comments
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Washington Department of Ecology						
ECY 7	Page x Page 6-1&2	"Issue: LTM monitoring network" How this issue is affecting current protectiveness but the other issues ("Issue: Conceptual Site Model" & "Issue: LTM monitoring frequency") are not affecting current protectiveness. Please clarify.	The text has been revised to indicate "No" under the category "Affect Current Protectiveness" for the "Issue: LTM network."			
ECY 8	Page x Page 6-1&2	"TBD (in consult with the Navy)" Provide a Milestone date to track.	The milestone date has been revised to indicate "By the next FYR."			
ECY 9	Page 2-4	"*Ecology rates Sinclair Inlet as a Class A (excellent) body of water. Anadromous fish migration and rearing, commercial fish and shellfish reproduction and harvest, fishing, boating, water contact recreation and aesthetics, industrial water supply, and navigation are all examples of protected water uses under Class A.*" Ecology no longer uses class system (AA, A, B, C) to designate a waterbody. Instead, waterbody is classified according to its designated uses. Review the following website to update the information. Designated uses - Washington State Department of Ecology.	The following text has replaced the text quoted in the comment: "*Sinclair Inlet is designated as Excellent for Aquatic Life Use, which meets or exceeds the requirements for all uses including, but not limited to, salmonid migration and rearing; other fish migration, rearing, and spawning; clam, oyster, and mussel rearing and spawning; crustaceans and other shellfish (crabs, shrimp, crayfish, scallops, etc.) rearing and spawning. The recreational use is primary contact recreation, and the miscellaneous marine water uses are wildlife habitat, harvesting, commerce and navigation, boating, and aesthetics" (Ecology, 2022).*			
ECY 10	Page 2-7	"*The intertidal area created by removal of the riprap and excavation within the original footprint of OU A is now part of OU B Marine.*" While Ecology would like to address all sediment in BNC as part of OU B Marine (administratively easier), this is not reflected in the OU boundary maps and administrative process. See Figure 2-1 & 2-2 of the draft fifth FYR, and the detailed Figure 4-2 of the 4th FYR for the OU boundaries.	The Navy agrees with the comment. The sentence confuses the discussion and is not necessary. This sentence has been removed from the FYR.			

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Washington Department of Ecology						
ECY 11	Page 5-5	"*A Source Control Action Plan, combined with a Focused Feasibility Study (FFS), is currently in draft form and expected to be finalized in December 2021.*" Update the schedule with language stating the progress made so far (draft available, ongoing discussion).	The text has been revised to state the following: "*A Source Control Action Plan, combined with a Focused Feasibility Study (FFS), is expected to be finalized in* ***April 2023****.*"			
ECY 12	Page 5-5	"*Source control investigations and remedial actions undertaken within the boundaries of OU B Terrestrial may be administratively part of OU B Marine, not OU B Terrestrial, because they address exposures in the marine environment.*" Explain this as source control implementation is not included in OU B Marine cost calculation or remedy selection.	Explanation of the cost calculation or remedy selection will be addressed in the FFS.	Based on the discussion at the 30 June 2022 stakeholder meeting, the following statement has been added to Section 5.1.3.1: "*Related cost calculations and remedy selection will be discussed in the FFS.*"	Accepted.	Comment noted.
ECY 13	Page 5-5	"*This comparison is done to assess whether the currently calculated risk associated with the standard identified in the ROD is still within USEPA's acceptable excess cancer risk range of 10^{-4} to 10^{-6}, or below a hazard index of 1 for noncancer effects.*" Also, mention here or in the next paragraph the state MTCA ARAR of cancer risk that is different from CERCLA (10^{-6} to 10^{-5}), even though evaluation for HQs are the same. This cancer risk evaluation should be accounted for in the protectiveness determination of the remedy.	The following text has been added to Section 5.2.2: "In Washington state, the MTCA ARAR for cancer risk is 10^{-6} to 10^{-5} (WAC 173-340-705), although the MTCA hazard quotient requirements for noncancer risk are the same as cancer risk."	The text in Section 5.2.2 was revised as follows: "*This comparison is done to assess whether the currently calculated risk associated with the standard identified in the ROD is still within the USEPA acceptable excess cancer risk range of 10^{-6} to 10^{-4}, the Washington State MTCA ARAR for excess cancer risk of 10^{-6} to 10^{-5} (WAC 173-340-705), and below a hazard index of 1 for noncancer effects.*"	Requires additional revision to accurately reflect MTCA. Please revise to read: This comparison is done to assess whether the currently calculated risk associated with the standard identified in the ROD is still within the USEPA acceptable excess cancer risk range of 10^{-6} to 10^{-4}~~, the Washington State MTCA ARAR for excess cancer risk of~~ ~~10^{-6} to 10^{-5} (WAC 173-340-705),~~ and below a hazard index of 1 for noncancer effects and does not exceed the State of Washington MTCA ARAR for excess cancer risk of 10-6 for individual contaminants and 10-5 for cumulative risks or a hazard quotient of 1 for individual contaminant risks and a hazard index of 1 for cumulative risks.	The requested revision has been made to the text in Section 5.2.2.

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Washington Department of Ecology						
ECY 14	Page 6-6	"*Therefore, no remedial goals were established for groundwater at OU B Terrestrial. Instead, compliance criteria were established to "verify predictions that site groundwater is protective of the marine environment.*" What are these compliance criteria called? Which page of the ROD establish this? Since no groundwater cleanup levels were set in the ROD, these compliance criteria serve as remediation goals. Note groundwater must meet surface water quality ARARs before discharging to the marine water. The groundwater must not also contribute to exceedance of sediment quality standards and pose unacceptable risk to fish and shellfish consumption. Groundwater has continually exceeded the surface water quality ARARs and to date, the Navy has not established that the groundwater is not affecting marine environment even though the ROD says so without credible evidence. Extensive sampling and a properly developed fate and transport model can answer the issue. The Navy needs to be committed to this and a recommendation should be prepared in the FYR specifically addressing the issue (use recommendation #4 from page 6-7).	Page 12-6 of the ROD states: "On this basis, a conditional point of compliance was selected for groundwater at OU B Terrestrial." The text has been revised as follows: "*Instead,* ***conditional point of*** *compliance criteria were established to 'verify predictions that site groundwater is protective of the marine environment.'*" In regard to the fate and transport (F&T) model, the Navy is committed to completing a reevaluation of the fate and transport modeling. Section 6.0 (page 6-1) of the FYR includes the CSM as an issue for OU B Terrestrial and a recommendation to "Reevaluate fate and transport modeling assumptions and results to determine if terrestrial groundwater remedies remain protective and to support determination of regulatory points of compliance and compliance criteria."	"Conditional" was removed from the added text.	Agree to removal of "conditional". Ecology agrees updating the CSM is an issue affecting the protectiveness of several OUs. The fate and transport model evaluation is a key component of that update. The recommendation should recognize that relationship and identify specific work products or deliverables if possible. Review of compliance criteria would be part of the evaluation of protectiveness and not a separate decision point in updating the CSM. Any changes in the compliance criteria or the points of compliance would also be reflected in changes to the LTM plan. Consider revising the wording of the CSM recommendation to read: Reevaluate fate and transport modeling assumptions and results to update the CSM and determine if terrestrial groundwater remedies remain protective of human health and the marine environment. Findings will be documented in…..	The Navy agrees with this revision and has modified the Recommendation language for the CSM issue to read as follows: "Reevaluate fate and transport modeling assumptions and results to update the CSM and determine if terrestrial groundwater remedies remain protective of human health and the marine environment. Findings will be documented in an independent report, which is expected to be completed by December 2025 and a summary will be included in the next FYR report."

Responses to Agency/Stakeholder Comments
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Washington Department of Ecology						
ECY 15	Page 6-7	"*TCE has been consistently detected in three wells (410R, 432, and 707), with recent concentrations ranging from 2.1 µg/L to 41 µg/L, which exceed the surface WQC of 0.7 µg/L.*". What is the Navy's follow up action to verify if the groundwater meets WQC at the point of discharge? What is the source of TCE at well 410R?	A recommendation has been added to Section 6.1.2 as follows: "*Sample the Drydock System 5 effluent discharge for TCE to determine if the groundwater meets the WQC at the point of discharge.*" A milestone date to complete the sampling will be December 2024. The source of trichloroethene (TCE) at well 410R is former shipyard activities and it is located within the southern TCE plume. According to a 2009 Phase I Vapor Intrusion Evaluation report (URS, 2009), "Disposal of wastes, particularly in conjunction with the placement of fill during shipyard expansion, as well as past spills and leaks of industrial materials, has led to elevated levels of various VOCs in the subsurface. There is no ongoing source of VOCs to the subsurface, and, therefore, the existing sources of subsurface VOCs are the residual contamination in subsurface soil and groundwater."	The recommendation was revised as follows to include TCE degradation products: "*Sample the Drydock System 5 effluent discharge for TCE* ***and TCE degradation products*** *to determine if the groundwater meets the WQC at the point of discharge.*"	Accepted.	Comment noted.

Responses to Agency/Stakeholder Comments
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Washington Department of Ecology						
Comments by: Bonnie Brooks Comments Received: 4/4/2022						
ECY 16	General	In various places in the document "LTM monitoring" and FFS study" are referred to. I don't think there is any need to repeat the words "monitoring" and "study" since they are part of the acronyms.	The text has been revised as recommended.			
ECY 17	Page vii, 5-1 and 5-3	Ecology does not agree that the answer to question A is yes. The answer to question A in the 2017 FYR was no based on the need to conduct the bathymetric survey of the CAD pit and the thick cap area adjacent to OUA and because mercury source control had not been completed. From page 7-3 of the 2017 FYR: "In addition, mercury source control at BNC must be addressed for the OU B Marine remedy to be considered functional…". Page 5-4 of this FYR states "However, potential ongoing sources for mercury discharge include stormwater, dry dock discharges, and direct groundwater discharge at various locations throughout BNC. These potential ongoing sources will be identified and addressed through conducting mercury source control actions and the FFS study to identify potential remedial action alternatives." Ecology thinks the answer to question A is no since mercury sources have not been addressed.	The Navy respectfully disagrees. The completed remedial actions at OU B Marine were not intended to address mercury contamination, except for removal of sediment with elevated concentrations of mercury collocated with PCBs. A remedy has not been selected for mercury in the marine environment, as explained in more detail in Section 2.3.3.2. Subsequent risk assessment and investigations of mercury have been conducted and are ongoing.	The Navy has revised the OU B Marine answer to Question A to "no", consistent with the previous FYR report, based on the status of mercury source control.	Accepted.	Comment noted.
ECY 18	Page 2-6	Ecology has previously expressed to the Navy on multiple occasions that analyzing for PCB Aroclors is not appropriate to determine potential human health risks and has recommended analyzing for PCB congeners using USEPA method 1668.	The Navy is following the recommendations from the ROD. The remedial action objectives (RAOs) in the ROD addressed PCB Aroclors.			

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Washington Department of Ecology						
ECY 19	Page 2-20 and 4-18	Uncertainty related to the PCB results from the 2018 LTM sampling and analysis should be identified. To ensure protectiveness for both ecological and human health, Ecology continues to recommend that long term monitoring should include analysis of PCB congeners and analytical methods with a sufficiently low detection limit. Use of USEPA method 1668 would provide a more accurate determination of potential risks to human health and also comply with Sediment Management Standard requirements.	The PCB results meet the quality objective. As stated above, the RAOs in the ROD addressed PCB Aroclors.			
ECY 20	Page 2-25	Data from the sea water main break should be included in the non-LTM Monitoring section.	A discussion of the data is currently included in Section 2.3.3.3 Non-LTM, which states "Samples were subsequently analyzed for PCBs, hexavalent chromium, metals, and mercury. Mercury was the only analyte detected, with concentrations of 0.55 mg/L on 21 August 2019 and 1.36 mg/L on 28 August 2019." Note that these samples were collected to characterize dredge spoils and not to meet CERCLA objectives.	Sediment data that was previously collected as part of sea water main break will be included in the FFS development since the sampling took place prior to this FYR period. Data from the Drydock 4 salt water main break was included in the 4th FYR in Appendix A (2016i. Sediment Sampling for Salt Water Main Break, Waterfront Area, Vicinity of Dry Dock 4, Naval Base Kitsap-Bremerton. Prepared by NAVFAC NW. October 31, 2016.).	Accepted.	Comment noted.
ECY 21	Page 4-17 Figures 4-12 and 4-13	Figures are helpful and well done, but using a brighter color for grid numbers would make it easier to see them on a computer screen.	Figures have been revised as suggested.			
ECY 22	Page 4-18	PCBs: Should be "a" not "an" before LTM.	This text follows the rule of using "an" if the acronym starts with the sound of a vowel. "L" is a letter that has a vowel-sound; therefore, it needs "an."			
ECY 23	Page 5-16	Last sentence needs to be reworded to state that a site-specific cleanup level can be adjusted upward from the SCO to a maximum of the CSL. The SCO of 0.41 mg/kg and CSL of 0.59 mg/kg only apply to ecological receptors, which are evaluated on a point by point basis. Human health risks are evaluated using the natural background for mercury of 0.2 mg/kg which is evaluated as an area average on an area weighted basis.	The text has been revised as follows: "Subsequently, the sediment cleanup level is determined by adjusting upwards from the SCO ***to a maximum of the CSL*** based on technical possibility …"			

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ECY 24	Page 5-18	The cleanup level for mercury has not been determined yet. Site-specific cleanup levels can be adjusted upward from the SCO to the CSL for ecological receptors, which are evaluated on a point by point basis. Human health risks are evaluated using the natural background for mercury of 0.2 mg/kg which is evaluated as an area average on an area weighted basis.	Comment noted.			
ECY 25	Page 5-32	It is important that sediment and surface water samples be analyzed for PFAS and that the stormwater to surface water and sediment pathway be included as it is likely to be the most significant.	The PFAS Site Inspection will include all appropriate media, and results will be discussed in the next FYR.			
ECY 26	Page 6-4	Ecology believes that the remedy to lower PCB concentrations in sediment and marine tissue has met the intent of the corrective action that was agreed to at the time the ROD was signed. However, to ensure protectiveness for both ecological and human health and avoid the issues with reporting limits that occurred during the 2018 long term monitoring where all data was nondetect, Ecology continues to recommend that long term monitoring should include analysis of PCB congeners and analytical methods with a sufficiently low detection limit. Use of USEPA method 1668 would provide a more accurate determination of potential risks to human health and also comply with Sediment Management Standard requirements. In addition, when PCB Aroclors are analyzed, similar methods to what were historically used should be used so that results are comparable.	See response to comment #ECY 18.			

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ECY 27	Page 7-1	"…sampling will be conducted either in parallel with construction activities or after completion." Sampling should be conducted after non-remediation construction is completed, not during construction activities. If sampling does occur to support construction activities, the results may be useful to the project team when determining where to sample to support the remedial action.	Sampling conducted during construction activities would be confirmation sampling after dredging.			
ECY 28 New Comment Denice Taylor	Section 6 Issues/Recommendations OU B Marine/Institutional Controls				Please revise the recommendation to clarify that coordination on the M2D2/SIOP interface with BNC CERCLA remedies, specifically the OU B Marine in place remedy for PCBs and the future remedy for mercury, includes the CERCLA project team stakeholders. As written, it only addresses internal Navy coordination.	While the Navy appreciates the intent of the comment, communication regarding the M2D2/SIOP (MILCON) projects with CERCLA team stakeholders will continue to be coordinated by the Navy CERCLA team. The Navy CERCLA team will continue to communicate directly with CERCLA stakeholders as information relevant to the stakeholders becomes available.
ECY 29 New Comment Denice Taylor	Page 7-1				Ecology does not concur with the protectiveness determination of "deferred" for OU B Marine. The rationale presented by the Navy supports EPA's guidance on the use of a determination of "not protective" for sites where migration of contaminants (Hg) is uncontrolled and poses an unacceptable risk to human health and the environment. Both conditions have already been confirmed; additional data is not needed to determine if there are ongoing sources or unacceptable levels of risk related to mercury. As an aside, the endpoints the Navy identified in the protectiveness statement normally lead to remedy implementation, which implies that the actions to be taken are expected to be protective when complete. During remedy implementation, a determination of "will be protective" is likely.	Comment noted. The Navy maintains its stance that a Protectiveness Deferred determination is appropriate for OU B Marine, as the risk is mitigated by institutional controls.

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U.S. Environmental Protection Agency					
Comments by: Anne Christopher, Chris Eckley, Don Clabaugh, Elizabeth Allen **Comments received: 4/4/2022**					
EPA 1	Pg. vi, second paragraph, second sentence	The groundwater components of the terrestrial RODs are not functioning as intended if groundwater COCs are increasing. This should be included in the rationale for why OUA and OUBT are not functioning. Add a third sentence; "The OU A and OU B T RODs did not anticipate the metals concentrations in groundwater would increase and potentially impact marine ecological receptors and human health through seafood consumption."	The Navy respectfully disagrees with the addition. There is no evidence that groundwater discharges are harmful to ecological or human receptors. Increasing concentrations do not confirm an increase in risk, and the trend analysis does not take into account the absolute concentrations at a given location.	We are in the process of determining if the increasing gw concentrations are increasing risk at the site and in the meantime, we do not consider the remedies to be protective. Topic was discussed on RTC call. Phil/Joy to reassess the response.	Based on the discussion of other comments at the 30 June 2022 stakeholder meeting, the Navy agrees that some contaminants have increased but does not agree with a broad statement that COC concentrations are increasing. The results of the fate and transport model evaluations will be used to determine whether or not there is a risk to human health and the environment. The text in Section 5.1.1.2 has been revised to state: "The groundwater data (Section 4.3) indicate *conditions present at the time of the ROD largely remain constant, with the exception of some decreasing and increasing trends of specific COCs; some COCs remain below cleanup levels*."
EPA 2	Pg. vi, second paragraph, last sentence	"The ROD for OU B Marine specified mercury cleanup levels only for sediment dredging and disposal, and not long-term monitoring cleanup levels; therefore, the cleanup of mercury is not considered as part of the remedy." The OUB M ROD specified Remedial Action Levels for mercury for dredging and disposal. Even if a mercury CUL was not set in the ROD, the mercury cleanup is still considered part of the remedy. The remedy is functioning as intended by the ROD for PCBs, but it is not protective because of the current mercury concentrations. The Navy is doing the FFS to select a remedy that will be protective for mercury. Update this paragraph above accordingly.	The Navy respectfully disagrees. The completed remedial actions at OU B Marine were not intended to address mercury contamination, except for removal of sediment with elevated concentrations of mercury collocated with PCBs. A remedy has not been selected for mercury in the marine environment, as explained in more detail in Section 2.3.3.2. Subsequent risk assessment and investigations of mercury have been conducted and are ongoing.	USEPA disagrees with this RTC. Topic was discussed on RTC call. Phil/Joy to reassess the response.	The Navy maintains that OU B Marine should be "Protectiveness Deferred" until more information is available and a remedy can be selected.
EPA 3	Pg. vi, fourth paragraph, 2nd sentence	Some groundwater COC concentrations are increasing and there is no evidence that they will eventually decrease to below the RGs. Where groundwater flows to the marine environment a pathway to ecological receptors creates a potential human health risk from seafood consumption. The Navy should update the groundwater F&T model to determine if the Navy should just continue to rely on monitoring and ICs or should complete a more active approach to addressing the groundwater COCs.	The Navy is committed to completing a reevaluation of the fate and transport modeling. Section 6.0 (page 6-1) includes the CSM as an Issue for OU A and a recommendation to "Reevaluate fate and transport modeling assumptions and results to determine if terrestrial groundwater remedies remain protective and to support determination of regulatory points of compliance and compliance criteria."	Since the Navy has committed to doing the reevaluation of the F&T modeling, this paragraph should not just say that ICs and continued monitoring is all that is needed.	The text in the Executive Summary was revised to include the following: "…*; therefore, a reevaluation of the fate and transport modeling will be completed*."

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EPA 4	Pg. vii, paragraph 2	What is the significance of October 2023?	It is one year after the Fifth FYR will be finalized.	If the date is determined by collection and evaluation of additional data, then the date should be set as the completion date of the evaluation, not simply 1 year after the 5YR. Topic was discussed on RTC call. Phil/Joy to reassess the response.	Based on the discussion at the 30 June 2022 stakeholder meeting, the Navy RPMs consulted with the Navy FYR SME regarding the one-year deadline to resolve a "Protectiveness Deferred" determination. The Navy confirmed that the 1-year deadline is in Navy policy, not USEPA's, and that a deferred determination with a milestone timeline and commitment that the addendum will be completed within the given timeline is acceptable. A completion date of "End of FY 2024" has been added to Section 7.0 for OU A.
EPA 5	Pg. vii, Table ES-1	OUA and the western portion of OU B T groundwater monitoring wells have COC exceedances in LTM data. The protectiveness statement for OUA should be Deferred or Not Protective until the F&T model is updated and we confirm if groundwater from OUA poses a risk. The soil samples from Charleston Beach also failed TCLP for lead.	See response to #EPA 1. The Navy intends to reevaluate groundwater monitoring following the F&T update.	Since we don't know if the increasing gw concentrations and exceedances pose an increased risk, the remedy is not protective or deferred. Topic was discussed on RTC call. Phil/Joy to reassess the response.	The protectiveness statement for OU A has been revised to "Protectiveness Deferred" based on the TCLP results for lead.
EPA 6	Vii	Regarding: "The protectiveness of the OU B Marine remedy remains in question because of sources of mercury to OU B Marine" Revise to say "ongoing sources."	The text has been revised as recommended.		
EPA 7	Pg. vii, Table ES-1	If the Navy considers mercury source control part of the OUBM remedy, then the OUBM remedy is not functioning and the table should be updated.	See response to comment #EPA 2.	The Navy has chosen to include mercury source control as part of the OUBM remedy in the FFS so it should be included as part of the OUBM remedy for the 5YR as well. Topic was discussed on RTC call. Phil/Joy to reassess the response.	The Navy has revised the OU B Marine answer to Question A to "no," consistent with the previous FYR report, based on the status of mercury source control.
EPA 8	Pg. x	CSM: This issue does "affect current protectiveness," so change response to "yes." The project matrix pushed out the F&T model update to 2023, so update the milestone date.	The Navy will retain "No" regarding effect on current protectiveness for the CSM issue for OU A, OU B Marine, OU B Terrestrial, OU D, and OU NSC, as the results of the F&T modeling activity are required before determining whether protectiveness is affected by changes in site conditions. The Navy will reevaluate the CSM as part of the F&T modeling activity and will reevaluate protectiveness during the next FYR.	The fact that the CSM needs to be re-evaluated indicates that it does "affect current protectiveness." Topic was discussed on RTC call. Phil/Joy to reassess the response.	The Navy respectfully disagrees. The fact that a CSM is being re-evaluated does not mean current protectiveness has been affected.
EPA 9	Pg. xi	Add Charleston Beach repair to the Shoreline issue.	The text has been revised as recommended.		

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EPA 10	Pg. xii	Stormwater Outfalls: Is this just the Outfall 15 repairs or is this also the outfall check valves that were recommended in the Source Control Action Memo? Confirm in the Recommendation text.	The recommendation in Table ES-3 and Section 6 is specific to the stormwater system repairs. The Outfall 15 flapper valve repair is planned for award in FY24.	Then add the outfall check valves to this recommendation and list that they will be awarded in FY24.	The following text has been added to Table ES-3 and Section 6: *"…; repairs to the Outfall 15 flapper valve are planned to be awarded in FY 2024."* In addition, a bullet has been added to Section 5.1.3.1 that states: *"Repairs to the Outfall 15 flapper valve are planned to be awarded in FY 2024."*
EPA 11	Pg. xii	Mercury contamination: Add finalize the FFS and then prepare a new ROD or RODA…	The following sentence has been added to the mercury contamination issue in ES-3 and Section 6: "Complete the Source Control Action Plan, which is included as Appendix A of the FFS."	So are you adding "Finalize the FFS..."? If not, why not?	The text has been revised to include "Finalize the FFS…"
EPA 12	Pg. 1-1	"This FYR was conducted from May 2021 through June 2022" These dates don't match Table ES-2. Make the dates consistent throughout the document.	The text in Section 1.0 has been revised to read: "This FYR was conducted from April 2021 through August 2022…"		
EPA 13	Pg. 1-2	Table 1-1 OUD and NSC: should say stormwater "system" cleaning or repairs.	The text has been revised as recommended.		
EPA 14	Pg. 1-4, Table 1-2, OU A Land and Resource Use	Add fishing and recreation	The table has not been revised to include fishing and recreation as a land and resource use at OU A, because these activities are prohibited at OU A by institutional controls (ICs) and land-use controls (LUCs).		
EPA 15	Pg. 1-5	OUBT Primary Threat box should include drydock discharge of gw.	Discharge of groundwater from the drydock is covered by the existing language used to describe the primary threat for OU B Terrestrial: "Contaminant pathways to Sinclair Inlet include… direct groundwater discharge."	GW discharge through drydock discharge is different than direct GW discharge so it should be added. Topic was discussed on RTC call. Phil/Joy to reassess the response.	"Dry dock discharges" was added as a primary threat in Table 1-2.
EPA 16	Pg. 1-6	OU NSC Physical Characteristics: "limited groundwater exchange with Sinclair Inlet because of presence of quay wall and dry dock pumping" Confirm whether groundwater still seeps through the quay walls.	It is unclear if groundwater seeps through joints in the seawall (i.e., quay walls). However, groundwater flow dynamics referenced in the OU NSC and OU B remedial investigations indicate that groundwater flows primarily to the drydocks during low tide, and flow is reversed (from Sinclair Inlet to the terrestrial OUs) during high tide. Moderate to deep groundwater is able to flow below the seawall to Sinclair Inlet. This information has also been modeled by the U.S. Geological Survey (USGS) in the 2016 Numerical Simulation of Groundwater Flow at Puget Sound Naval Shipyard, Naval Base Kitsap, Bremerton, Washington (Jones et al., 2016). This report indicates that groundwater flowing beneath nearly all of the shipyard discharges to the dry-dock drainage systems, and only shallow groundwater flowing beneath the western end of the shipyard discharges directly to Sinclair Inlet.	I thought that the quay walls are not solid walls that actually contain gw.	The quay walls are concrete that extend about 30-40 feet below ground surface. They are solid walls, but deeper groundwater will flow beneath the quay walls. Shallower groundwater is, in large part, captured by the dry-dock drainage systems.
EPA 17	Figure 1-3	Confirm if seawall is the same as quay wall. If so, use the same language in the figure compared to the text.	Quay wall and seawall are the same. The text has been revised to "seawall" throughout the document.		

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EPA 18	Pg. 2-1	The F&T model update is now delayed to FY23. Update this date (Jan 2023) and re-evaluate our decision to suspend LTM until after the F&T update.	The text has been revised to read: "…which is anticipated to be awarded in FY 2023 and complete in FY 2024."	What decision has been made about LTM since the F&T model update is delayed?	The terrestrial LTM team (as discussed with the stakeholder team during the Terrestrial meeting on 23 June 2022) will complete groundwater sampling of shoreline wells for mercury in fall 2022. After the fall 2022 groundwater sampling event, the routine LTM groundwater sampling will be postponed until the F&T model has been updated and revision of the decision criteria can be completed.
EPA 19	Pg. 2-4	"Groundwater modeling (Jones et al., 2016) indicates tidal influence affects groundwater flow directions within approximately 700 feet of the shoreline." The statement is not true. Jones et al states that "Simulations with and without tides indicated that tides do not affect groundwater-flow directions farther than about one grid space (about 700 ft) inland from the shoreline." The statement means that tidal flow does not effect the second grid space, but it does not give an estimate of the distance of tidal influence from the shoreline other than to state that it is not more than 1050 feet (1.5 block-centered grid spaces) from the shoreline. Confirm if this is consistent with Kathy Conn's groundwater samples that proved to be mostly surface water.	The text was revised as follows: "Groundwater modeling (Jones et al., 2016) indicates that tidal influence ***does not*** affect groundwater flow directions farther than approximately 700 feet inland of the shoreline."		
EPA 20	Pg. 2-9	"The BOD was updated in the 60%, 90%, and 100% design phases and will be completed in fall 2022." Update this date if it gets delayed.	The text has been revised to indicate the basis of design (BOD) is expected to be completed in early FY2023.		
EPA 21	Pg. 2-9	Delete the statement that, "The pavement cap was essentially unchanged year to year. No new deficient areal features were observed" as it is contradicted by the following list of all the new deficient features from each year. After the 2019 paving project, was there a net decrease in deficient features over the 5 year period or was there still an increase in features?	The referenced statement has been removed from the text. The number of deficient features is not necessarily a measure of pavement integrity, as each feature can be in a small area or widespread. The 2019 pavement project improved pavement integrity in the area it affected.		
EPA 22	Pg. 2-10	Vegetated Cover: Is the vegetated cover just meant for erosion control or is it also supposed to serve as enhanced habitat? If it is meant for enhanced habitat and there are dead trees and dried out ground cover, those plants should be replaced and this should be added as a recommendation.	The vegetated cover is primarily landscaping that was planted in the unpaved bermed areas and is meant to serve as erosion control only.		

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EPA 23	Pg. 2-11	How many catch basins could not be inspected because they were blocked or could not be found?	This information is included in the related reports. The FYR only summarizes the activities that have taken place; the specific details are included in the inspection reports.	This is important information to summarize in the 5YR because it points out a deficiency in the catch basin inspections. Just list the number or percentage of catch basins that couldn't be inspected (don't need to list which ones).	The following text has been added to Section 2.2.3: *"Of the 99 inspection locations planned for inspection in 2021, 15 were unavailable for inspection due to obstructions or construction activities occurring in the area. Of the 84 inspection locations completed, 7 inspections were performed at alternate locations as the primary locations could not be inspected due to various reasons.* *The only catch basins for which inspections could not be completed were not due to parked vehicles but because they were underneath items in laydown areas (such as large steel plates), closed to personnel, or in an active construction zone with restricted access. PSNS is a very active shipyard and there will always be difficulty inspecting all planned locations due to the nature of site operations."*
EPA 24	Pg. 2-11	"OU A wells were analyzed in various combinations for total metals, chrysene, pesticides, and PCBs in 2020" Lead, silver, and thallium are not mentioned in Table 2-2, but they are included as metals COCs in Table 2-1. Please mention why data from these 3 COCs was not included.	Table 2-1 is a summary of land use, pathways, and constituents of concern at the time of the decision documents for each OU. The Long-Term Monitoring, Inspection, and Improvement Plan (Navy, 2021e) details the activities for LTM of groundwater and other sampling activities. It should be noted that the LTM program has been modified since the ROD based on evaluation of results.		
EPA 25	Pg. 2-14 and 2-15	Neither USEPAs RSLs nor Ecology's CLARC values are regulatory levels and should not be characterized as such.	The term "regulatory criteria" has been revised to "published criteria" in the introductory text to the list of criteria used for soil results comparison.		
EPA 26	Pg. 2-21	The text states that "a wide variety of marine studies completed during the RI indicated little or no ecological or human health risk from mercury." This statement is vague. Either amend the language or provide a citation/reference where information on the variety of different studies is provided.	The source of information in this paragraph is the document referenced at the beginning of the paragraph (Navy 2002c), *Final Remedial Investigation Report, Operable Unit B, Bremerton Naval Complex, Bremerton, Washington*, March 2002. The paragraph is intended to summarize information from the referenced remedial investigation.		
EPA 27	Pg. 2-21	Mercury Monitoring: This section provides a comprehensive description of the 2013 sampling; however, there is no description of the results/conclusions from these measurements. Add a summary of the results/conclusions.	All data are summarized in Section 4.3, which follows the USEPA Five-Year Review template. The mercury analysis is summarized in Section 4.3.2.		

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EPA 28	Pg. 2-25	"Mercury was the only analyte detected, with concentrations of 0.55 mg/L on 21 August 2019 and 1.36 mg/L on 28 August 2019" Confirm that the units for the mercury concentrations reported on this page are correctly reported as mg/L.	The units for mercury in this section were erroneously reported as milligrams per liter (mg/L) but were actually nanograms per liter (ng/L). The text has been corrected.		
EPA 29	Pg. 2-29	"During the 2020 inspection, approximately 2.5% of OU B Terrestrial areas were determined to have poor pavement cap integrity, consistent with the previous annual inspections conducted during this FYR period... Repairs to cap deficiencies of areal features (i.e., potholes) and linear features (i.e., cracks and deteriorated sealant) were carried out during the 2017, 2018, and 2019 inspections and maintenance of the OU B Terrestrial remedy." If repairs have been completed, why is the poor pavement cap integrity still 2.5%? Confirm if this is accurate.	Although pavement repairs were completed periodically, weathering and other damage have resulted in a consistent portion of pavement with poor integrity over time. As noted in the document, "Vegetation growth through deteriorated seals, alligator cracking, gapping/cracking, and potholes accounted for most of the deficiency observations. Construction affecting the cap, subsidence, and uplifting with vegetation growth have also been observed (Navy, 2021d)."	Add this description as a reason why the % poor pavement stayed the same.	The text in Section 2.4.3.1 was revised with the following: "*Although pavement repairs were completed periodically, weathering and other damage have resulted in a consistent portion of pavement with poor integrity over time.*"
EPA 30	Pg. 2-30	"Shoreline vegetation throughout OU B Terrestrial was sparse and dry and, in many areas, grass was the only cover, although kinnikinnick, non-native blackberry, Scotch broom, and English ivy plants were also observed." Confirm if the ROD specified what species of vegetation needed to be maintained or defined "adequate coverage." Sparse, dry invasive weeds does not seem to qualify as successful vegetated cover.	The ROD for OU B Terrestrial does not specify the species of vegetation to be used for cover where paving was not feasible. Inspections include observations of erosion as summarized in Section 2.4.3.1.		
EPA 31	Pg. 2-33	"It has been concluded through analyses of primary fate and transport mechanisms that site groundwater quality is sufficiently protective of the marine environment and no active groundwater remediation is warranted (Navy et al., 2004a). It has been demonstrated it is not practicable to meet cleanup levels throughout the OU within a reasonable restoration time frame." Change the first sentence to say "It was concluded in the ROD…that site groundwater quality was…remediation was" and the second sentence to "It was demonstrated in the ROD that is was…" Add a sentence that the F&T model will be updated to confirm if this conclusion is still believed to be accurate.	The referenced text has been removed in response to comment #DNR 4. As noted, the Fate and Transport Model will be updated.		
EPA 32	Pg. 2-45	Add a sentence that describes the net gain or loss of deficient pavement during the 5YR period.	The text has been revised as follows: "*The OU NSC poor rated pavement decreased by 0.2% (from 2.6% poor rated in fall 2017 to 2.4% poor rated in fall 2020) over the period addressed in the FYR.*"		

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EPA 33	Pg. 2-46	Provide an explanation why the measure of vegetated cover is related to erosion and adequate top soil instead of actual percent vegetation coverage.	The Annual Remedy Inspection Reports, which are where the information was obtained, do not provide the percentage of vegetation coverage. Very minimal vegetative cover is present in OU NSC.		
EPA 34	Pg. 2-46	"During dry weather inspections, catch basins inspected showed evidence of failing plaster patches on some of the piping, vegetation growth, and crumbling around the basin collar." Add a sentence addressing when the catch basin deficiencies will be repaired.	As stated in the Annual Remedy Inspection Reports, pavement and catch basin repairs are completed as needed and as funding allows.		
EPA 35	Pg. 3-3	Yearly climate change updates have not been provided to stakeholders.	The text in Table 3-2 pertaining to climate change yearly updates has been revised to read: *"A section will be added to the Annual Remedy Inspection Report that assesses the potential effect of climate change/sea level rise as observed over the last year."*		
EPA 36	Pg. 3-4	Add dates for Outfall 15 repair work to status of source control actions.	The text has been revised as follows: *"Source control actions planned for FY2024 include Outfall 15 flapper valve replacement. Storm system repairs are scheduled for completion by the end of calendar year 2022."*		
EPA 37	Pg. 4-10	Confirm that arsenic in Well 204 is increasing.	Per the 2020 Data Summary and Trend Analysis Report, "The trend for arsenic at Well 204 is increasing at the 80% confidence level; this has not changed since the previous trend analysis. The arsenic result in groundwater in 2020 at Well 204 was below the cleanup level."		
EPA 38	Pg. 4-14	"Mercury was analyzed in 2020 at OU NSC wells (310R, 380, and 386), but it was not detected above the detection limit or was below the established cleanup level (Navy, 2021c)." Depending on the analytical method, there can be a large range in detection limits for Hg. Revise the text to note that mercury was not detected while clarifying the actual detection limit.	This section represents a summary of analytical results. Detection and reporting limits can be found in the source document referenced in each subsection of Section 4.3.1.	Add the detection limit in parenthesis.	The detection limit for mercury, 0.00015 µg/L, has been added in parenthesis to Section 4.3.1.5.
EPA 39	Pg. 4-16	• "Copper and mercury were present at levels exceeding SCO and CSLs. • Natural background levels were exceeded for all metals, except chromium." List the number of samples with exceedances for both bullets.	The text has been revised as recommended to include the number of samples with exceedances.		

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U.S. Environmental Protection Agency					
EPA 40	Pg. 4-18	"Trends in mercury concentrations in sediment for this area are declining or show no trend." It's unclear what is meant by the statement regarding mercury concentration trends in sediment. One interpretation would be that trends in Hg concentrations over time were evaluated in individual grid cells, some of which showed decreasing trends, while others showed concentrations to be stable. Is this what is being referred to in the sentence, please clarify the language accordingly.	The text has been revised to state the following: "*The mercury trends in the 500-foot grids indicate a declining trend in approximately 8% of the grids, an increasing trend in approximately 3% of the grids, and no trend in the remaining 89% of the grids. In the 1,500-foot grids, 3% had a declining concentration, and the remaining 97% of the grids showed no trend.*"		
EPA 41	Pg. 4-18	Add a summary of all the concerns/issues Stakeholders had with the 2018 LTM data analysis and why the Navy justified that the data is considered usable.	The Navy respectfully declines to include the suggested text. The data validation was completed and documented in Section 3.2.1 of the 2018 LTM Report, and no issues were noted regarding the laboratory results.	Topic was discussed on RTC call. Phil/Joy to reassess the response.	The text in Section 4.3.2.2 (PCBs) has been revised to state the following: "*The stakeholders expressed concern related to the non-detect PCB results from the 2018 LTM sampling and analysis, based on historical results and a laboratory change in analytical procedures; however, 10 percent of the samples from locations considered "worst case" for PCB concentrations were reanalyzed and also resulted in non-detects.*"
EPA 42	Section 4.3	Add a subsection summarizing stormwater sediment data from USGS Scientific Investigations Report 2018–5087 and the Final Terrestrial Mercury Assessment Report (Outfall 15 Storm Drain Line Investigation) Operable Unit B Terrestrial Bremerton Naval	A subsection has been added as recommended.		
EPA 43	Pg. 4-21	"A small number of bricks, glass, and clay pipe were scattered across the beach, predominantly southwest of Charleston Beach. Few scattered bricks were observed on the lower portion of Charleston Beach." Confirm if this debris is thought to be landfill material that has eroded out of Charleston Beach or surficial garbage.	The debris is not thought to be landfill material that has eroded. The material is covered with barnacles and has been there for a long time. It is possible, though it cannot be confirmed, that the bricks were used as shoreline armoring prior to the ROD being implemented. The glass is likely washed-up surficial garbage/beach glass, which is commonly observed on Puget Sound beaches. The clay pipe is an abandoned City of Bremerton outfall that will be removed as part of the Charleston Beach remedy repair.	Add a statement that the debris is not thought to be landfill material. Include all of this detail provided if needed.	The text in Table 4-2 was revised to read as follows: "*Few scattered bricks were observed on the lower portion of Charleston Beach. None of the material appeared to be recently placed and is not thought to be landfill material because it is covered with barnacles and has been there for a long time. It is possible, though it cannot be confirmed, that the bricks were used as shoreline armoring prior to the ROD being implemented. The glass is likely washed-up surficial garbage/beach glass, which is commonly observed on Puget Sound beaches. The clay pipe is an abandoned City of Bremerton outfall that will be removed as part of the Charleston Beach remedy repair.*"

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U.S. Environmental Protection Agency					
EPA 44	Pg. 5-1	Change the Protectiveness Determination for OUA to Deferred and change OUB Marine's to Not Protective.	The Navy respectfully disagrees with a protectiveness determination of "Protectiveness Deferred" for OU A. No change in the remedy status has occurred since the last FYR. Additionally, the remedy implemented at OU A is considered short-term protective based on the interim erosion protection measures being implemented at Charleston Beach. Once the repair is complete, the remedy will be Protective; therefore "Short-Term Protective" is appropriate. The protectiveness determination of Deferred for OU B Marine is justified in Table ES-1 and Section 7.0. The protectiveness statements for OU A and OU B Marine will remain Short-Term Protective and Deferred, respectively.	Topic was discussed on RTC call. Phil/Joy to reassess the response.	Based on the discussion at the 30 June 2022 stakeholder meeting, the Navy RPMs consulted with the Navy FYR SME and the protectiveness determination for OU A has been changed to "Protectiveness Deferred" based on lead results in soil detected along the Charleston Beach shoreline that indicate a change in conditions since the ROD. The protectiveness statement for OU B Marine will remain "Protectiveness Deferred" until further information is obtained regarding ongoing mercury sources.
EPA 45	Pg. 5-2	"The groundwater data (Section 4.3) indicate the conditions present at the time of the ROD remain with little change." Multiple COCs are exceeding CULs and many wells show increasing trends, so the text in this sentence needs to be updated.	See response to comment #EPA 1. The text has been revised as follows: "The groundwater data (Section 4.3) indicate the conditions present at the time of the ROD remain ***with some fluctuations***."	USEPA disagrees with just saying "fluctuations." Fluctuations would imply that the concentrations go up and down and many wells have had consistent elevated or increasing trends. Topic was discussed on RTC call. Phil/Joy to reassess the response.	Based on the discussion of other comments at the 30 June 2022 stakeholder meeting, the Navy agrees that some contaminants have increased but does not agree with a broad statement that COC concentrations are increasing. The text in Section 5.1.1.2 has been revised to state: "*The groundwater data (Section 4.3) indicate conditions present at the time of the ROD largely remain constant, with the exception of some decreasing and increasing trends of specific COCs; some COCs remain below cleanup levels.*"
EPA 46	Pg. 5-2	"However, a re-evaluation of fate and transport modeling is scheduled to be awarded in fiscal year 2022." Update this to FY23.	The text has been revised as recommended.		
EPA 47	Pg. 5-2	"The Navy and the project team agree that fate and transport modeling, the USGS study, and the results of long-term monitoring will be used to review monitoring objectives, strategies, and decision criteria for the terrestrial OUs (Navy, 2021c). The groundwater uncertainties necessitate changing the protectiveness statement to Deferred.	The fate and transport model update and other information will be used to review the LTM program. However, a pending review of groundwater transport does not affect protectiveness at OU A. The Navy will retain the Short-Term Protective statement for OU A and will reevaluate the finding, if necessary, after the groundwater transport review is completed.	The fact that the F&T model needs to be updated means that the protectiveness is in question. That is why Deferred is appropriate, see USEPA guidance. Topic was discussed on RTC call. Phil/Joy to reassess the response.	Upon further discussion with the Navy FYR SME, the protectiveness determination for OU A has been changed to "Protectiveness Deferred", based on lead results in soil detected along the Charleston Beach shoreline that indicate a change in conditions since the ROD.

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U.S. Environmental Protection Agency					
EPA 48	Pg. 5-3	"In addition to the Charleston Beach erosion issue, anthropogenic debris consistent with landfill material is present within the intertidal zone." Clarify if landfill material is present in other shoreline areas in addition to Charleston Beach.	Any landfill material observed has occurred only in the OU A Charleston Beach area, and no new landfill material has been observed in the last 5-year review period. The text has been revised as follows: "In addition to the Charleston Beach erosion issue, anthropogenic debris is present within the intertidal zone of OU A." As stated above in response to #EPA 43, the landfill material that has been observed is old material and has been there for a long period.		
EPA 49	Pg. 5-3	"These materials were present in/on the beach at the time the OU A and OU B Marine RODs were signed and do not constitute a new condition or concern." Clarify if this sentence is supposed to mean that this is an old issue that still has not been permanently fixed. If that is not the intent of this sentence, clarify the point of the sentence.	The issue has been addressed through installation of the shoreline protection system. The preceding sentence indicates that "The anthropogenic materials along the intertidal area at Charleston Beach have not been released to the environment during the last 5 years due to the shoreline erosion protection system (combination of riprap, sheet pile and fish mix berm)." Although the materials are present, the existing shoreline protection system prevents release to the environment.	If the landfill material is still on the beach since the time of the ROD, why hasn't it been cleaned up?	The materials have not been released to the environment and are within the shoreline protection area, as stated in the Draft FYR Report. Cleanup of these materials, which do not present a risk to human health or the environment, is not a priority for the Navy.
EPA 50	Pg. 5-4	"The generally decreasing trends in PCB and mercury levels and achievement of the OU B Marine MCUL for PCBs in 2014 and 2018 indicate natural recovery of sediments in OU B Marine is generally occurring. However, potential ongoing sources for mercury discharge include stormwater, dry dock discharge, and direct groundwater discharge at various locations throughout BNC." Add a sentence that the LTM data show that mercury concentrations are above natural background in OUB Marine and Outer Sinclair Inlet and pose a risk to human health and the environment. For this reason, the OUB Marine remedy is Not Protective.	The Navy respectfully disagrees. The completed remedial actions at OU B Marine were not intended to address mercury contamination, except for removal of sediment with elevated concentrations of mercury collocated with PCBs. A remedy has not been selected for mercury in the marine environment, as explained in more detail in Section 2.3.3.2. Subsequent risk assessment and investigations of mercury have been conducted and are ongoing. The OU B Marine protectiveness statement remains Deferred until more information is available, including additional sediment data.	Topic was discussed on RTC call. Phil/Joy to reassess the response.	Based on the discussion at the 30 June 2022 stakeholder meeting, the Navy RPMs consulted with the Navy FYR SME. The Navy has determined that a protectiveness determination of deferred is appropriate and in line with USEPA and Navy guidance. Institutional Controls are in place, limiting the quantity of seafood that should be ingested by individuals. With ICs in place, the site could technically be considered short term protective, but with the unknowns associated with upcoming in-water work, and the need to evaluate and implement source control, the Navy believes the deferred determination is most appropriate at this time.
EPA 51	Pg. 5-5	"A Source Control Action Plan, combined with a Focused Feasibility Study (FFS), is currently in draft form and expected to be finalized in December 2021." Update this date.	The text has been revised to state the following: "*A Source Control Action Plan, combined with a Focused Feasibility Study (FFS), is expected to be finalized in* ***April 2023***."	Is April 2023 still accurate?	Yes.
EPA 52	Pg. 5-5	"Source control investigations and remedial actions undertaken within the boundaries of OU B Terrestrial may be administratively part of OU B Marine, not OU B Terrestrial, because they address exposures in the marine environment." Even if the exposure occurs in OUB M, source control actions are considered part of the Terrestrial remedies. Update this sentence accordingly.	The Navy respectfully disagrees. While the source control actions may take place within the OU B Terrestrial boundary, they are still considered a part of source control under OU B Marine.	Then since the source control actions are an ongoing issue, OU B Marine is Not Protective. Topic was discussed on RTC call. Phil/Joy to reassess the response.	The protectiveness statement for OU B Marine will remain "Protectiveness Deferred" until further information is obtained regarding ongoing mercury sources.

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U.S. Environmental Protection Agency					
EPA 53	Pg. 5-5	"The monitoring data (Section 4.3) indicate that, overall, the low-risk conditions present at the time the ROD was executed have persisted. Monitoring is ongoing as contaminants are being managed in-place." Multiple COCs exceed their CULs and the trends are not decreasing. This contributes to the Not Protective determination.	See response to comment #EPA 50. The Navy has revised the text to read: "The monitoring data (Section 4.3) indicate that, overall, the conditions present at the time the ROD was executed have persisted." There have been no significant changes in site conditions, and mercury is actively being evaluated.		
EPA 54	Pg. 5-5	"However, a re-evaluation of fate and transport modeling is scheduled to be awarded in fiscal year 2022." Update this to FY23.	The text has been revised as suggested.		
EPA 55	Pg. 5-6	"Containment is achieved by assuring ICs are maintained in OU C." Clarify how is containment achieved with ICs?	The text has been revised as follows: "~~Containment is achieved by assuring~~ ICs are being maintained in OU C. Based on the available data and observations, containment of petroleum within OU C is effective."		
EPA 56	Pg. 6-1	Conceptual Site Model- draft says this issue does not affect current protectiveness and the milestone date is "estimated 2022." Change this to yes and change the date to 2023.	See response to comment #EPA 8. The Milestone Date has been updated to 2024.	The CSM does impact protectiveness. Topic was discussed on RTC call. Phil/Joy to reassess the response.	The Navy respectfully disagrees. The fact that a CSM is being re-evaluated does not mean current protectiveness has been affected.
EPA 57	Pg. 6-1	LTM monitoring network- this discussion should include considering the need to add additional monitoring wells to the network and to evaluate the location of existing wells and how they relate to updating the CSM.	Once the CSM is updated, the LTM program will be revisited.		
EPA 58	Pg. 6-2	OUBT Shoreline- Clarify if this is the emergency action repair for the current erosion or the longer term repair for Segment 4 that is combined with the Charleston Beach repair.	The first Shoreline action pertains to OU B Terrestrial and the emergency action repair at Segment 4. The Shoreline issue for OU A and OU B Terrestrial pertains to the longer term repair of the shoreline at Segment 4 and Charleston Beach.	Clarify this in the tables.	The text in Tables ES-3 and in Section 6 has been revised as requested.
EPA 59	Pg. 6-3	Stormwater Outfalls- Clarify if this is only the Outfall 15 repairs or if it also includes the flapper valve installations recommended in the Source Control Action memo.	See response to comment #EPA 10.	Clarify this in the tables.	The text in Tables ES-3 and in Section 6 has been revised as requested.
EPA 60	Pg. 6-3	Include an Issue/Recommendation to complete the Charleston Beach repair.	The text was revised as suggested. The shoreline issue at OU A and OU B Terrestrial includes both Charleston Beach and Segment 4 repairs.		
EPA 61	Pg. 6-3	Add an Issue/Recommendation to complete the PFAS SI because it does affect future protectiveness.	As stated in Section 6.1, "It should be noted that a base-wide PFAS Site Inspection (SI) is being planned and conducted. However, no data have been reported within the review period, and results of the PFAS SI will be discussed in the next FYR, as appropriate." Because no data have been collected, it is unknown if PFAS is present. Therefore, any discussions regarding current or future protectiveness will be covered in the next FYR.	It should be noted that the PFAS PA identified ~20 potential areas of concern. Topic was discussed on RTC call. Phil/Joy to reassess the response.	To remain consistent with FYRs for other installations, the Navy will keep the PFAS discussion under the "Chemicals of Emerging Concern" section of the FYR until validated data from the SI indicates that PFAS is an issue to be addressed at PSNS.

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EPA 62	Pg. 6-3	Add an Issue/Recommendation to coordinate the OUBM remedy with M2D2 and SIOP work.	The Navy respectfully declines to make the suggested change but will coordinate, as deemed appropriate.	Topic was discussed on RTC call. Phil/Joy to reassess the response.	The Navy has added an Issue/Recommendation to Section 6 (and the Executive Summary) that indicates Navy CERCLA and Project Management Office (PMO) staff will continue to coordinate activities related to M2D2/SIOP work to protect remedies in place.
EPA 63	Pg. 7-1	OU A- Change protectiveness Determination to "Protectiveness Deferred." Add to the statement that it is deferred based on the unknown impacts of groundwater migration of COCs.	See response to comment #EPA 44.		
EPA 64	Pg. 7-1	OU B Marine- Change protectiveness Determination to "Not Protective" since current sediment concentrations exceed natural background and risk-based CULs and mercury sources have not been controlled.	See response to #EPA 50.		
EPA 65	Pg. 7-1	OU B T- Change the statement "In the interim, the pathways for human exposure are being controlled" by adding the statement "except for the pathway for human health through fish consumption."	OU B Terrestrial ROD does not contain the fish consumption pathway. The exposure pathway of human health through fish consumption is included only for OU B Marine.		
EPA 66	Pg. 7-3	Sitewide Protectiveness Statement- Change to "Not Protective" because the Sitewide determination is supposed to be the same as the least protective determination for the OUs.	The Sitewide Protectiveness Statement has been revised to indicate "Not Protective."		

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Suquamish Tribe				
Comments by: Denice Taylor, Suquamish Tribe Comments Received: 4/5/2022				
ST 1	General Comment	Sitewide Protectiveness Statement: According to USEPA's September 13, 2012 memo clarifying the use of protectiveness determinations for CERCLA 5YRs, the sitewide protectiveness determination will generally be the same protectiveness determination as the least protective OU at the site. For BNC, the OU B Terrestrial remedy was found to be not protective. Following USEPA's direction, the sitewide protectiveness statement should be changed from protectiveness deferred to not protective. As detailed in later comments, the Tribe also believes the OU B Marine protectiveness determination should be changed from protectiveness deferred to not protective. This change would support the recommended revision to the sitewide determination. In addition, the proposed milestone date of October 2023 for updating protectiveness determinations for the site as a whole and the individual OUs appears unrealistic given the current status of projects necessary to the evaluation.	The Sitewide Protectiveness Statement has been added to the Executive Summary, and it will be revised to indicate "Not Protective". OU B Marine's protectiveness statement will remain "Protectiveness Deferred" as the Navy is in the process of evaluating mercury sources. The Navy understands that the timeline is in flux depending on completion of upcoming activities. The last sentences in the Executive Summary and in Section 7 have been modified to read, "A determination for OU B Marine will be delayed due to upcoming Multi-Mission Dry Dock (M2D2)/Shipyard Infrastructure Optimization Plan (SIOP) activities that will need to be completed prior to additional characterization of sediment at OU B Marine." The Planned Addendum Completion Date for sitewide protectiveness in Section 7.0 has been revised to "To Be Determined."	
ST 2	General Comment	Tables 1-2 and 2-1: Revise Land and Resource Use descriptions to include Suquamish Tribe's U&A for all OUs. Potential Receptors can be listed as subsistence tribal seafood harvesters	Table 2-1 is information taken directly from the ROD and has not been revised. The Land and Resource Use descriptions in Table 1-2 have been revised to include Suquamish Tribe Usual and Accustomed Fishing Area.	
ST 3	General Comment	Table 3-1: Given that stakeholders did not concur with all of the Navy's protectiveness determinations, and USEPA and Ecology submitted independent findings, what were the formal protectiveness determination from the last 5YR?	The Fourth FYR findings indicated that OU A was Short-term Protective, OU B Marine and OU B Terrestrial were Deferred, and OU C, OU D, and OU NSC were Protective.	
ST 4	General Comment	Section 4.4: ICs for terrestrial OUs include excavation management, but the site inspection observations do not indicate if observed excavations and exposed areas are being or were managed as directed by ICs. This correlation is needed to evaluate the effectiveness of the excavation management plan as an IC.	The Navy has issued the Excavation Management Plan to all contractors. Excavation permits are reviewed during the quarterly inspections, and violations, if any, are recorded. No violations have been identified during the inspections; therefore, there has been nothing to report in the site inspection reports.	Any excavation or utility work at the shipyard requires an Outage Request, which reserves the work area for a specific timeframe. Additionally, if the work includes excavation, then an excavation permit is a requirement of the Outage Request. NBK Environmental approves the excavation permits. Port operations has received a copy of the IC Plan and has NAVFAC OU B Marine RPM contact information. Port Operations has agreed to contact the RPM should an incident occur and will relay any issues to the RPM. The NAVFAC OU B Marine RPM will continue to coordinate with the shipyard SIOH/Waterfront Improvement team on projects within the OUB Marine boundary. The Navy will consider how to coordinate the information collected during site inspections and the permitting process to support the ROD requirement regarding IC compliance.

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Suquamish Tribe				
ST 5	General Comment	Section 5.3.1: Expand the discussion of the results of the site-wide PFAS PA to identify which OUs contain areas that are considered potential PFAS release areas recommended for additional investigation as part of an SI. Also, clarify that the existing LUCs only prevent exposure to groundwater as drinking water; they do not protect for all potential exposure routes. The primary exposure routes related to potential PFAS contamination have not been evaluated in detail.	The Navy will make the results from the PFAS Preliminary Assessment (PA) and PFAS SI Report available once they are both finalized. No changes will be made to text regarding the results of the PA or SI. Potential exposure routes will be discussed in the SI Report. No revisions have been made to the report text.	
ST 6	General Comment	Section 6.1: Site records indicate a potential for PFAS to be present at a number of areas throughout the PSNS. Although no sampling data have been reported within this review period, note when SI results are anticipated. The Tribe believes the presence of PFAS, if documented through sampling, is an issue that will effect both current and future protectiveness. The Tribe requests that the Navy act on the SI data when it becomes available rather than waiting for the next review period and suggests that the Navy propose a milestone data for completion of the SI.	No sampling has been conducted for PFAS during the Five Review Period, so there is nothing to report at this time. The Final Site Inspection Report is anticipated to be completed in September 2023. The report will be submitted for review prior to that time, and the need for further evaluation will be discussed. However, any discussions regarding current or future protectiveness will be covered in the Sixth FYR.	
ST 7	General Comment	Fate and transport modeling: Descriptions of the fate and transport modeling effort and its possible applications vary throughout the report. The Section 6 Issues and Recommendations table also exempts OU C, OU D and OU NSC from consideration. Revise the report to communicate consistently that it is anticipated the planned fate and transport modeling will apply to all the terrestrial OUs, with the possible exception of OU C, as well as OU B Marine. The results of the modeling will be used to review findings at the time of the ROD that the discharge of contaminated groundwater was not expected to have an negative impact on the marine environment of Sinclair Inlet and to update the current CSMs. Based on those evaluations, the project teams may review the protectiveness of the remedies in place, including LTM objectives and strategies for the terrestrial Ous. Also, update the milestone date to reflect project delays.	Section 6 has been revised to include OU D and OU NSC in the CSM/F&T table. OU C is exempt and will not be included. The milestone date has been updated to 2024 to reflect project delays. Once the CSM is updated, the LTM program will be revisited.	
ST 8	General Comment	LTM frequency and network: Throughout the report and in the Section 6 Issues and Recommendations table, revise the LTM-related discussions to reflect a more logical progression. After the evaluation and the planned fate and transport modeling effort, and any revisions to the CSMs, the project team may modify the monitoring objectives and strategies.	The Recommendation in Section 6 regarding LTM frequency has been revised to state the following: "***After the fate and transport model is updated**, the LTM sampling frequency/schedule will be **reevaluated and adjusted, if necessary,** to ensure that data collected can be used to update the **CSM and subsequently the LTM plan**.*"	
ST 9	OU A	Page 2-7: Suggest removing the first sentence of the third paragraph. There was no effort made to maintain the constructed beach prior to degree of erosion observed in 2007.	The first sentence has been removed to avoid confusion. In addition, the following sentence has been added: "*No maintenance was conducted on the beach between the 2002 mitigation action and the 2007 observance of debris.*"	

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Suquamish Tribe				
ST 10	OU A	Pages 2-7 and 2-8: Suggest review of text starting with the last paragraph on page 2-7 and continuing to page 2-8 with an eye to providing a clear linear narrative.	This text in the referenced paragraph has been revised as follows: "***However,*** *during discussions with upper Navy management, it was determined that* ***implementation of the permanent remedy as presented in the*** *2015 BOD would result in a loss of productive fish and shellfish habitat when compared to the post-Pier D mitigation state of the beach."*	
ST 11	OU A	Table 3-2: Review Charleston Beach remedy repair implementation and completion dates. The report states that construction is planned to begin in the summer 2023 and will be completed in June 2023.	The completion date is estimated to be late 2023; therefore, the date has been revised to indicate the year only (2023).	
ST 12	OU A	Page 4-16: Suggest presenting the data in a table and listing that appropriate PALs. As currently presented, it is hard to understand the context and magnitude of exceedances.	The data will be presented in Appendix B to the FYR.	
ST 13	OU A	Page 4-17, first full paragraph: Clarify that the extent of other soil and sediment to be removed and disposed of will be determined during design.	The last sentence in this paragraph has been revised to read: "*Other soil and sediment exceeding the PALs is planned to be* ***delineated,*** *removed, and disposed of based on the results from this sampling event (CH2M, 2021).*"	
ST 14	OU A	Pages 5-11 and 5-12, and Table 5-3, Groundwater ARARs: The agreement to revise the arsenic RG to 5 ug/l needs to be identified as an issue to be resolved and appropriately documented in the administrative record for OU A.	The text in Section 6.0 has been revised to include the revised remediation goal (RG) for arsenic as an issue with a milestone date by the next FYR.	
ST 15	OU A	Section 6 Issues and Recommendations: The administrative record for OU A will need to be updated, through an ESD or RODA, after completion of the Charleston Beach long-term remedy repair and to formally document a change to the RG for arsenic. Identify this as an issue for OU A and provide an expected milestone date. If it is agreed that this action does not affect the protectiveness determination, include in Section 6.1. Suggest also verifying that the boundary descriptions for OU A and OU B Marine have been appropriately documented in the respective records.	Comment noted. The Navy will formally document the change of the arsenic RG in a decision document and verify the boundary descriptions.	
ST 16	OU A	Section 7, Protectiveness Statement: The Tribe does not concur with the OU A protectiveness determination of short-term protective and believes that a finding of will be protective is more appropriate and in alignment with USEPA's use of protectiveness determinations, if remedy design is considered part of construction and implementation. If remedy design is not considered part of construction and implementation, the Tribe again recommends a finding of not protective.	The Navy considered a protectiveness determination of "Will be Protective" because the interim erosion protection measures are underway (in design). The Navy ultimately decided that the OU A protectiveness statement would remain "Short-term protective" because (1) there has been no change since the last FYR, which indicated "Short-term Protective"; (2) no construction has started even though the BOD is underway; and (3) the construction will result in long-term protection.	Upon further discussion with the Navy FYR SME, the protectiveness determination for OU A has been changed to "Protectiveness Deferred", based on lead results in soil detected along the Charleston Beach shoreline that indicate a change in conditions since the ROD.

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Suquamish Tribe				
ST 17	OU B Marine	Pages 2-18 and 2-19: Clarify what LUCs are in place to protect the remedy from construction projects conducted within OU B Marine. Also, the report states that the O&M and IC Plan require LUC inspections and monitoring, but also states that underwater inspections are not part of the O&M activities for OU B Marine. Considering that OU B Marine remedies are all underwater, what are the actual LUC inspection and monitoring requirements?	LUC requirements for OUB Marine are provided in the Final Institutional Control Plan for OU B Marine (Navy 2020e; September 2020). In brief, these are: • Port operations (COMNAVREG NW INST) monitors activities in the cap area to ensure no anchoring, dredging, construction, or other damaging activity; • Security routinely inspects the offshore areas and upland perimeter fencing; • Security Office ensures NBK access controls are maintained, including inspection of perimeter signs; and • The NAVFAC remedial project manager will evaluate construction projects proposed within OU B Marine.	Port operations has received a copy of the IC Plan and has NAVFAC OU B Marine RPM contact information. Port Operations has agreed to contact the RPM should an incident occur and will relay any issues to the RPM. The NAVFAC OU B Marine RPM will continue to coordinate with the shipyard SIOH/Waterfront Improvement team on projects within the OU B Marine boundary.
ST 18	OU B Marine	PCB Monitoring, pages 2-20 and 4-19: The Tribe continues to question the finding of 100% non-detects for PCBs in sediment and believes it is highly unlikely that PCBs were not present in any sediment samples above relevant detection levels after being consistently and widely detected for decades. Suggest additional discussion regarding the usability and limitations of the 2018 LTM PCB data. It should be noted that there were questions regarding the consistency of the analytical methods used in previous LTM efforts and that used in the 2018 effort. In addition, there were questions regarding TOC analysis and the range of detection limits for total OC-normalized PCB Aroclors (0.69 to 8.3 mg/kg OC) in the 1500' grid cells exceeded the clean up goal. Archived samples were also destroyed and the Navy was not able to request re-analysis of the data set.	Noted. The validated data were presented in the 2018 LTM Report in Section 3.2.1 (Navy 2020g).	See response to comment #EPA 41. The text in Section 4.3.2.2 (PCBs) was revised to state the following: "*The stakeholders expressed concern related to the non-detect PCB results from the 2018 LTM sampling and analysis, based on historical results and a laboratory change in analytical procedures; however, 10 percent of the samples from locations considered "worst case" for PCB concentrations were reanalyzed utilizing a micro-extraction in order to lower analytical detection limits, which also resulted in non-detects.*"
ST 19	OU B Marine	Table 3-2 and page 5-5: Provide additional details about what source control actions will be funded in FY24. Repairs to the Outfall 15 storm drain system, slated for summer 2022, should be included somewhere.	In FY 2024, the Outfall 15 flapper valve installation project will be awarded. This information has been added to Table 3-2 and Section 5.1.3.1.	Section 5.1.3.1 includes the following bullet: "*Repairs of the Outfall 15 storm drain system have been awarded and will be completed by summer 2022.*" The following text has been added to Table ES-3 and Section 6: "*…; repairs to the Outfall 15 flapper valve are planned to be awarded in FY 2024.*" The following bullet point has been added to Section 5.1.3.1: "*Repairs to the Outfall 15 flapper valve are planned to be awarded in FY 2024.*"

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Suquamish Tribe				
ST 20	OU B Marine	Page 4-17, the first paragraph under the subheading Mercury: The Tribe does not agree with the statement that, although mercury concentrations were higher in OU B Marine and Sinclair Inlet compared to reference areas, concentrations were also declining as mercury is buried in new, cleaner sediment or exported by natural processes. Factors related to evaluating natural recovery of mercury in sediments remains a primary data gap. In addition, how was the primary source of the mercury from BNC traced to the southern portion of the Outfall 15 drainage basin? Was this determined by a specific tracing or fingerprint study? Source control evaluation is currently ongoing and far from complete. Outfall 15 has been identified as a major contributing source, but the Tribe disagrees that is the only primary source. Suggest revising the language to reflect the current limits of understanding.	The Navy agrees that the processes by which mercury concentrations are declining is a data gap. The following text has been removed from Section 4.3.2.2: "…as mercury is buried in new, cleaner sediment, or exported by natural processes." The southern portion of the Outfall 15 drainage basin is considered a primary source of mercury based on sampling upstream in the Outfall 15 drainage system. To clarify, the text has been revised as follows: "***A** primary **contributing** source of the mercury from BNC can be traced to the southern portion of the Outfall 15 drainage basin. **Dry Dock and groundwater discharge are also considered potential sources**.*"	Based on the discussion at the 30 June 2022 stakeholder meeting, the first sentence in the last paragraph in Section 5.1.2.2 has been revised to remove mercury from the context of natural recovery.
ST 21	OU B Marine	Pages 4-17 to 4-18 and page 5-4, mercury trends: The report repeatedly states that LTM data reveal a generally decreasing trend for mercury in sediments. Please add the following from the 2018 LTM report to provide context: 2018 LTM trend testing for mercury data is not corroborated by the time-series plots of individual grid cells or the AWA mercury concentrations (500' grid, 1500' grid, combined) from 2003 – 2018, which show an increase in 2018. The 2018 AWAs for mercury are the highest values since the beginning of the LTM in 2003. Given these results, and the presence of ongoing sources, the Tribe does not believe that natural recovery of sediments in OU B Marine is generally occurring for mercury.	The following text has been added to the end of the Mercury subsection of Section 4.3.2.2: "*As stated in the 2018 OU B Marine Long-term Monitoring and OU A Intertidal Sediment Sampling Report (Navy, 2020g), 2018 trend testing for mercury data is not corroborated by the time-series plots of individual grid cells or the AWA mercury concentrations from 2003 to 2018, which show an increase in 2018. In the 500-foot grids, 63 of 71 mercury results were higher in 2018 than they were in 2014. In the 1,500-foot grids, the mercury results in all 32 grids were higher in 2018 than they were in 2014.*"	Based on the discussion at the 30 June 2022 stakeholder meeting, the first sentence in the last paragraph in Section 5.1.2.2 has been revised to remove mercury from the context of natural recovery.
ST 22	OU B Marine	Section 5.1.2, Question A: The remedy appears to have achieved clean up goals related to PCBs and in that regard may be seen as functioning as intended. However, if the remedy was intended to address mercury contamination, then clean up goals were not achieved. The remedy in place did not achieve overall reductions in mercury in sediment or tissue. The answer should be changed to "No".	The Navy respectfully disagrees. The completed remedial actions at OU B Marine were not intended to address mercury contamination, except for removal of sediment with elevated concentrations of mercury collocated with PCBs, as explained in more detail in Section 2.3.3.2. Subsequent risk assessment and investigations of mercury have been conducted and are ongoing.	The Navy has revised the OU B Marine answer to Question A to "no", consistent with the previous FYR report, based on the status of mercury source control.
ST 23	OU B Marine	Section 5.1.2.3: Provide additional detail describing the IC developed and implemented for OU B Marine. Indicate how the effectiveness of ICs is being evaluated.	See response to comment #ST 17 for a summary of the ICs for OU B Marine. Effectiveness is being evaluated through annual and FYR inspections and communication among Navy departments as indicated in Section 4.2 of the Institutional Control Plan, Operable Unit B Marine (Navy, 2020e).	
ST 24	OU B Marine	Section 5.2.2.2, page 5-18, second full paragraph: Revise the statement that BNC remedial actions have reduced the potential for chemical transport and control the threat of recontamination of the marine environment to reflect the fact that this is not true for mercury. It is also possible that other CoCs, particularly metals, continue to be discharged to the marine environment.	The referenced text in the FYR is intended to address PCB contamination, with mercury discussed in the subsequent subsection. For clarification, the text in the referenced paragraph has been revised to read: "*… Remedial actions have been implemented in the terrestrial areas of BNC to reduce the potential for **PCB** transport and control the threat of **PCB** recontamination of the adjacent marine environment from contaminant transport through…*"	

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Suquamish Tribe				
ST 25	OU B Marine	Section 5.2.2.2, page 5-18, third full paragraph: SMS now directs evaluation of bioaccumulative contaminants to include consideration of natural background levels when health-based clean up levels would be lower than background. Revise the discussion of mercury and identify the natural background concentration for mercury based on the BOLD data set.	The 2000 ROD did not select a cleanup goal specific to mercury in sediment. Rather, the ROD selected a combined action level of 6 mg/kg OC PCBs and 3 mg/kg mercury in sediment to achieve the RAO to selectively remove sediment concentrations of mercury collocated with PCBs. The Washington State Sediment Management Standards (SMS), Sediment Quality Standard (SQS) for mercury at the time the ROD was signed was 0.41 mg/kg, and the minimum cleanup level was 0.59 mg/kg. Currently, the sediment cleanup objective is the SQS of 0.41 mg/kg, and the sediment cleanup level remains 0.59 mg/kg. No change in ARARs for mercury in sediment has occurred since the signing of the ROD that would affect the selected remedy. We agree that the current version of SMS requires consideration of natural background concentrations and will incorporate that comparison into ongoing mercury investigation and risk assessment activities.	
ST 26	OU B Marine	Section 7, Protectiveness Statement: Because there are known ongoing sources of mercury and 2018 AWAs for mercury in sediment are the highest values since the beginning of the LTM in 2003, the Tribe believes there is ample evidence to state that the OU B Marine remedy is not protective of human health and the environment.	See response to comment #ST 22.	
ST 27	OU B Terrestrial	Section 2.4.3.2, page 2-33: Since the use of an attenuation factor was specified in the ROD, the agreement to no longer use an attenuation factor for groundwater monitoring results may need to be formally documented in the administrative record for the site.	Comment noted. The Navy will plan to document the decision in a Memo to File or decision document.	
ST 28	OU B Terrestrial	Section 5.1.3.2, page 5-5: The Tribe does not agree that monitoring data indicate that, overall, the low-risk conditions assumed to be present at the time the ROD was executed have persisted. There are known ongoing releases of mercury to the marine environment, which contributes to potential risks to human health and ecological receptors	The text has been revised as follows: *"The monitoring data (Section 4.3) indicate that, overall, the ~~low-risk~~ conditions present at the time the ROD was executed have persisted."* No significant changes in site conditions have occurred, and mercury is actively being evaluated.	
ST 29	OU B Terrestrial	Section 5.2, Question B: At the time of the ROD, it was assumed that the repairs to the storm drain system would address potential releases to the marine environment. It was also assumed that discharge of contaminated groundwater would not present unacceptable risks. Both of those assumptions are now in question. The answer to Question B should be changed to "No". Exposure pathways related to these releases are not controlled.	Additional information will be obtained once the F&T model is updated. However, at this time, no new information suggests that releases to the marine environment or discharge of contaminated groundwater have occurred. Therefore, the answer remains "yes."	
ST 30	OU B Terrestrial	Section 6, Issues and Recommendations: The table notes a milestone date of November 2023 for completion of stormwater system and outfall repairs to ensure OU B Marine is not subject to additional contamination. This date seems unrealistic. Although there is agreement on addressing Outfall 15 as soon as possible, the project team does not have all of the information necessary to undertake an evaluation and prioritization of additional repairs or modification of the OU B Terrestrial stormwater system. Provide additional detail about what is going to be accomplished by November 2023.	The details regarding the repairs to Outfall 15 have not been finalized; therefore, they will be detailed in the appropriate report after activities are complete and then summarized in the FYR that follows. The completion date for source control actions related to Outfall 15 has been updated to the end of calendar year 2024.	During the 30 June 2022 stakeholder call, the Tribe requested #ST 19 and #ST 30 be consistent. The Comment Response 01 to Comment #ST 30 is in response to the request to "provide additional detail about what is going to be accomplished by November 2023." The details of the repairs have not been finalized; however, the action is included in Table 3-2 and Section 6. The milestone date of the recommendation to complete stormwater system and outfall repairs was updated from November 2023 to December 2024.

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Suquamish Tribe				
ST 31	OU B Terrestrial	Section 7, Protectiveness Statement: The Tribe agrees with the determination of "Not Protective". However, because mercury sources are not controlled, there are ongoing risks to human health and the environment that are not controlled by ICs.	Comment noted.	
ST 32	OU D	Section 6.1.4: Suggest that groundwater monitoring requirements be addressed under OU B Terrestrial, which the Tribe recommends be re-evaluated following the fate and transport modeling update.	The Navy intends to reevaluate groundwater monitoring following the F&T model update. Therefore, Section 6.1.4 has been removed.	
ST 33	OU NSC	Section 2.7.3.2 and Section 4.3.1.5: The agreement to compare arsenic concentrations to the background value for groundwater may need to be formally documented in the administrative record for the site.	The Navy will plan to document the decision in a Memorandum to File or a decision document.	
ST 34	OU NSC	Section 6.1.5: The Tribe does not agree with the changes recommended in monitoring frequency. The LTM for OU NSC should be reviewed following the fate and transport modeling update. As explained in the OU NSC ROD, groundwater discharging through Drydock 6 was assumed not to have a significant impact on Sinclair Inlet. If ongoing studies indicate that groundwater discharging from Drydock 6, including groundwater from OU NSC, is determined to be contributing to unacceptable chemical impacts on the marine environment, additional measures addressing groundwater may be required.	The Navy intends to reevaluate groundwater monitoring following the F&T update. Therefore, Section 6.1.5 has been removed.	

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Department of Natural Resources			
Comments by: Erika Shaffer (Erika.Shaffer@dnr.wa.gov) **Comments received: 4/6/2022**			
DNR 1	Page vi-vii	The remedy is not protective for mercury, which is what is driving the need for the FFS. In addition, with the as yet unanswered questions regarding mercury sources and source control, it cannot be definitively said that monitoring and ICs are still sufficient for ground control.	The Navy respectfully disagrees. The completed remedial actions at OU B Marine were not intended to address mercury contamination, except for removal of sediment with elevated concentrations of mercury collocated with PCBs. At the completion of the additional sampling event and the mercury source control evaluation, the protectiveness of the remedy for OU B Marine will be reevaluated.
DNR 2	1-15	It might be helpful for clarity purposes to break apart OUB-T and OUB-Marine in this figure.	Noted. However, Terrestrial and Marine events are separated, with Terrestrial above the timeline and Marine under the timeline.
DNR 3	2-21	A brief statement regarding the PCB and mercury LTM results, which are then discussed in greater detail in a later section, would improve readability	The following text has been added: "*Declining total PCB Aroclor concentrations in sediment are corroborated by similar trends in PCB Aroclor concentrations in English sole fish tissue.*"
DNR 4	2-33	"It has been concluded through analyses of primary fate and transport mechanisms that site groundwater quality is sufficiently protective of the marine environment and no active groundwater remediation is warranted (Navy et al., 2004a)." This conclusion isn't necessarily still correct pending updates to the fate and transport model WRT mercury sources.	The text has been removed. Updated fate and transport modeling is forthcoming.
DNR 5	4-18	The statements on the trends of mercury concentrations in sediments are somewhat vague	The text has been revised to state the following: "*The mercury trends in the 500-foot grids indicate a declining trend in approximately 8% of the grids, an increasing trend in approximately 3% of the grids, and no trend in the remaining 89% of the grids. In the 1,500-foot grids, 3% had a declining concentration, and the remaining 97% of the grids showed no trend.*"
DNR 6	5-1	If the sediment concentrations of mercury are above natural background and human health risk level, then the OUB Marine remedy is not protective	The ROD for OU B Marine specified mercury cleanup levels only for sediment dredging and disposal, and not long-term monitoring cleanup levels; therefore, the cleanup of mercury is not considered a part of the remedy.
DNR 7	5-5	"Source control investigations and remedial actions undertaken within the boundaries of OU B Terrestrial may be administratively part of OU B Marine, not OU B Terrestrial, because they address exposures in the marine environment." Please clarify	See response to comment #ECY 12. If the activities occur within the OU B Terrestrial boundaries, the cost and determinations will be made as part of OU B Marine. All actions will be addressed under the FFS.
DNR 8	5-16	"Subsequently, the sediment cleanup level is determined by adjusting upwards from the SCO based on technical possibility and net adverse environmental impacts (Ecology, 2015b)." Clarify that it may be adjusted upward to no higher than the CSL	The text has been revised as recommended.
DNR 9	5-32	Based upon the uses of PFAS previously, sediments and stormwater should also be evaluated for PFAS in addition to groundwater	The PFAS Site Inspection will include all appropriate media within potential and confirmed PFAS release areas as determined by Department of Defense policy and guidance.