FINAL
19 September 2014

Record of Decision

Operable Unit 3 Terrestrial – Naval Hospital Bremerton

Naval Hospital Bremerton
Bremerton, Washington

Department of the Navy
Naval Facilities Engineering Command Northwest
1101 Tautog Circle
Silverdale, WA 98315

NAVAL HOSPITAL BREMERTON
OPERABLE UNIT 3 TERRESTRIAL
RECORD OF DECISION

DECLARATION

SITE NAME AND LOCATION

Operable Unit 3 Terrestrial
Naval Hospital Bremerton
Bremerton, Washington

CERCLIS ID WA3170090044

STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedy for Naval Hospital Bremerton (NHB), Operable Unit 3 Terrestrial (OU 3T), in Bremerton, Washington, which was chosen in accordance with the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act, as amended by the Superfund Amendments and Reauthorization Act, and, to the extent practicable, the National Contingency Plan. This decision is based on the Administrative Record for this site.

The U.S. Navy and the U.S Environmental Protection Agency agree on the selected remedy.

ASSESSMENT OF THE SITE

Because of the nature of the explosive hazard posed by munitions and explosives of concern, the selected remedy described in this Record of Decision (ROD) is necessary to protect public health or welfare or the environment from potential residual explosive hazards.

DESCRIPTION OF THE SELECTED REMEDY

The selected remedy recognizes that the NHB area will remain in its current land use and that traditional plant harvests by the Suquamish Tribe may occur in the future. It concludes that the potential explosives hazard will be adequately controlled by means of land use controls that include deed restrictions if the property is transferred to another nonfederal entity, on-call support using the 911 system to report any discovery of discarded military munitions (DMM), continued implementation of the munitions education and awareness program, and long-term management (LTMgt) of DMM containing high explosives (DMM HE) at the NHB site. The LTMgt component of this alternative includes the following:

- A continued munitions-related education and awareness program for all personnel performing minor digging
- An enhanced munitions-related awareness and education training program for personnel supervising major digging projects

STATUTORY DETERMINATIONS

The selected remedy protects human health and the environment, protects the public from explosive safety hazards, complies with federal and state requirements that are applicable or relevant and appropriate to the remedial action, and is cost-effective.

Because DMM HE may remain in place at OU 3T-NHB, statutory reviews will be conducted at least every 5 years to evaluate whether the remedy remains protective of human health.

DATA CERTIFICATION CHECKLIST

The following information is included in the Decision Summary Section of this ROD; additional information can be found in the Administrative Record for OU 3T-NHB.

- Materials of concern and their estimated distribution (Sections 2.4 and 6.6)
- Baseline risk represented by the materials of concern (Section 8)
- Cleanup levels established for the materials of concern (Section 8)
- Current and reasonably anticipated future land use assumptions used in the baseline risk assessment and ROD (Section 7)
- Potential land and groundwater use that will be available at the site as a result of the selected remedy (Section 12.4)
- Estimated capital, annual operation and maintenance, and total present worth costs, discount rate, and the number of years over which the remedy cost estimates are projected (Section 12.3)
- Key factor(s) that led to selecting the remedy (Section 12.1)

RECORD OF DECISION
NAVAL HOSPITAL BREMERTON, BREMERTON, WASHINGTON
OPERABLE UNIT 3 TERRESTRIAL

Signature sheet for the foregoing Record of Decision for the Operable Unit 3 Terrestrial final action at Naval Hospital Bremerton, Bremerton, Washington, between the United States Navy and the United States Environmental Protection Agency.

T.A. Zwolfer
Captain, USN
Commanding Officer
NAVBASE Kitsap

26SEP2014
Date

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RECORD OF DECISION
NAVAL HOSPITAL BREMERTON, BREMERTON, WASHINGTON
OPERABLE UNIT 3 TERRESTRIAL

Signature sheet for the foregoing Record of Decision for the Operable Unit 3 Terrestrial final action at Naval Hospital Bremerton, Bremerton, Washington, between the United States Navy and the United States Environmental Protection Agency.

Dennis Faulk
U.S. Environmental Protection Agency
Region 10 Program Manager

Date 9/29/14

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ABBREVIATIONS AND ACRONYMS

ARAR	applicable or relevant and appropriate requirement
ARPP	archaeological resources protection plans
BEQ	Bachelor Enlisted Quarters
BMP	best management practice
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CSM	conceptual site model
DDESB	Department of Defense Explosives Safety Board
DMM	discarded military munitions
DMM HE	discarded military munitions containing high explosive
DoD	U.S. Department of Defense
Ecology	Washington State Department of Ecology
EOD	Explosive Ordnance Disposal
EPA	U.S. Environmental Protection Agency
FS	feasibility study
GPS	global positioning system
GRA	general response action
HA	hazard assessment
HE	high explosives
JPHC	Jackson Park Housing Complex
LUC	land use control
LTMgt	long-term management
M	marine
MEC	munitions and explosives of concern
MHHW	mean high-high water
MILCON	military construction
MLLW	mean lower low water
mm	millimeter
MMR	Military Munitions Rule
MPPEH	material potentially presenting an explosive hazard
MSL	mean sea level
mV	millivolt
NAD	Naval Ammunition Depot
NAVFAC	Naval Facilities Engineering Command
NAVSEA	Naval Sea Systems Command

ABBREVIATIONS AND ACRONYMS

Navy	U.S. Navy
NBK	Naval Base Kitsap
NCP	National Contingency Plan
NFA	no further action
NGVD29	National Geodetic Vertical Datum of 1929
NHB	Naval Hospital Bremerton
NOSSA	Navy Ordnance Safety and Security Activity
NPL	National Priorities List
O&M	operation and maintenance
OU	operable unit
OU 3M	Operable Unit 3 Marine
OU 3T-NHB	Operable Unit 3 Terrestrial, Naval Hospital Bremerton
Pyro	pyrotechnic materials
RAB	Restoration Advisory Board
RAO	remedial action objective
RI	remedial investigation
ROD	Record of Decision
RT	remedial technology
SA	small ammunitions .50 caliber and smaller
SUBASE	Naval Submarine Base
T	terrestrial
TBC	to be considered
TCRA	time-critical removal action
TDEM	time-domain electromagnetic
UXO	unexploded ordnance

NAVAL HOSPITAL BREMERTON
OPERABLE UNIT 3 TERRESTRIAL
RECORD OF DECISION

DECISION SUMMARY

1.0 SITE NAME, LOCATION, AND DESCRIPTION

Naval Hospital Bremerton (NHB) is located in eastern Kitsap County, Washington, in the northern part of Bremerton, Washington. It consists of a hospital and support buildings within the northern portion of the former Naval Ammunition Depot (NAD) Puget Sound, an ammunition storage, assembly, and disassembly facility operated by the U.S. Navy (Navy) from 1904 to 1959. NHB is part of a 173-acre parcel that was purchased in 1932 to expand NAD Puget Sound.

Operable Unit 3 Terrestrial–NHB (OU 3T-NHB) occupies approximately 50 acres on a hillside and is adjacent to Ostrich Bay located to the east. The Operable Unit includes terrestrial uplands areas to the shoreline above mean high-high water (MHHW). The land surface elevations range from sea level to 140 feet above mean sea level (MSL). The location of NHB is shown on Figure 1-1.

NHB is a secure naval hospital base at which civilian access is controlled. Before 2005, the site was fenced along the northern, western, and southern property lines. In 2005, to increase security at NHB, the perimeter fence was extended along the eastern site boundary, connecting with the existing fence lines along the northern and southern NHB site boundaries. The current fencing encloses approximately 44 upland acres of NHB.

Of the 50 acres of NHB, 12 acres consist of a heavily wooded area in the northern and northwestern portions of the property, and 6.5 acres are associated with parking lots, grassed fields, and the helipad on Elwood Point. The remaining 31.5 acres are occupied by the hospital, various support structures, and the associated grounds, including the 15.5 acres that are paved or used for buildings.

In 2005, the Navy performed a wetland assessment on the NHB site and identified three wetlands: Wetland A, Wetland B, and Wetland C. A second wetland delineation study was conducted in 2011 (U.S. Navy 2011) to support the evaluation of remedial alternatives for the site. All three wetlands are shown on Figure 1-2. Wetland C subsareas (freshwater/salt water areas) are shown on Figure 1-3. Wetland A is a small (approximately 103 square feet), palustrine (nontidal wetland dominated by trees, shrubs, and persistent emergent vegetation),

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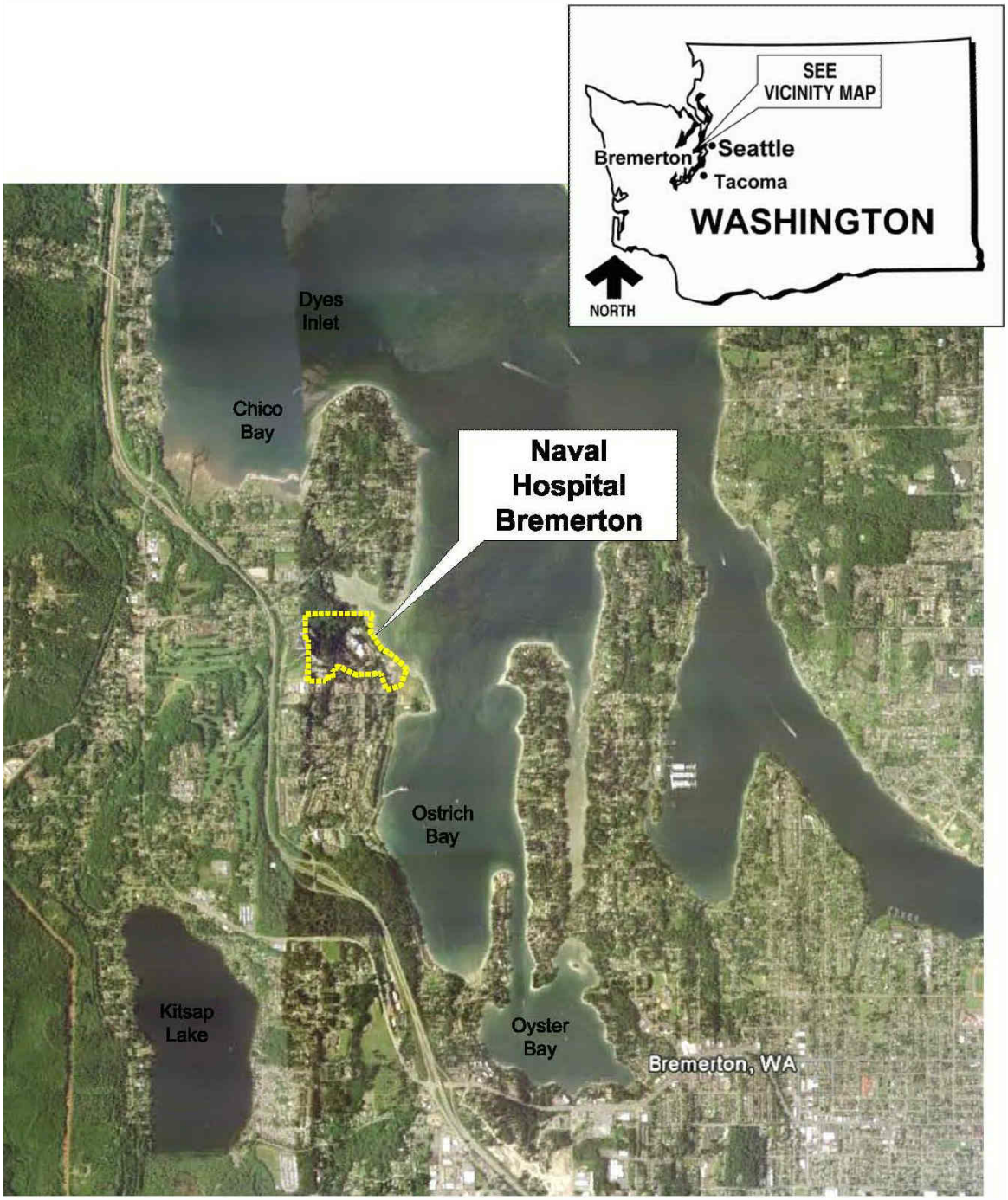

U.S. NAVY	**Figure 1-1** **Location Map** **Naval Hospital Bremerton**	Naval Hospital Bremerton OU 3T ROD

U.S.NAVY

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SCALE IN FEET

Figure 1-2
Delineated Wetland Boundaries

OU 3T-NHB
ROD

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U.S.NAVY

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SCALE IN FEET

Figure 1-3
Delineated Wetland C Boundaries

OU 3T-NHB
ROD

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forested wetland at the northeast corner of the NHB property. For security reasons, trees and shrubs around Wetland A were cut in the spring of 2005, exposing the soil to direct sunlight resulting in drier conditions. Wetland B is located along an old railroad bed that was built to extend a standard-gauge railroad to Bangor. Wetland B covers approximately 15,000 square feet and extends along most of the length of the old railroad bed. The railroad was cut through higher surrounding land, and seepage from this surrounding area is probably the source of the wet soil conditions. Wetland B is a palustrine, forested wetland. The railroad bed does not exhibit any stream characteristics. Wetland C is a Category I estuarine wetland (salt marsh) located along the northern half of the NHB shoreline. The on-site portion of Wetland C covers approximately 1.8 acres; the wetland extends off site to the north. Wetland C consists of both estuarine and freshwater wetlands (U.S. Navy 2011). Category I wetlands are considered rare, unique, and highly productive natural resources requiring a high level of protection to maintain their function and economic as well as environmental value (U.S. Navy 2011). The extent of tidal versus freshwater wetlands is shown on Figure 1-3.

In 1994, NAD Puget Sound was added to National Priorities List (NPL) established under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). NAD Puget Sound has been divided into various operable units for the purpose of site investigations and remediation activities. The NHB facility is designated as OU 3T-NHB to address potential environmental and human health exposure issues related to munitions and explosives of concern (MEC) within this portion of the former ammunition depot. The NHB facility is also part of the larger OU 1. OU 1 was established to address human health risk due to terrestrial chemical impacts in soil and groundwater and ingestion of shellfish from Ostrich Bay. There were no risks identified on the NHB facility property relative to chemical impacts to soil and or groundwater, and the OU 3T-NHB boundary does not extend into shellfish areas of Ostrich Bay.

Conditions at other operable units associated with the former NAD Puget Sound site are addressed in separate decision documents. The Navy's Jackson Park Housing Complex (JPHC) south of NHB and the intertidal area east of NHB constitute OU 3T-JPHC. Areas of Ostrich Bay adjacent to OU 3T-JPHC constitute the marine operable unit (OU 3M). The boundaries of OU 3T-JPHC, OU 3T-NHB, and OU 3M are shown on Figure 1-4.

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NOTE:

1. ALL PARCEL, MEANDER, SECTION, RIGHT 0F WAY AND GOVERNMENT LOT LINES, LINE OF MEAN AND EXTREME LOW TIDES AND STREET NAMES PER GIS MAPS PROVIDED BY KITSAP COUNTY.
2. SPOT ELEVATIONS AND CONTOUR LINES ESTABLISHED USING DIGITIZED INFORMATION FROM NOAA SOUNDING MAP, SEATTLE TO BREMERTON, MAP NO. 18449.
3. THE DEED FROM THE STATE OF WASHINGTON TO THE USA CONVEYS ALL THE TIDELANDS OWNED BY THE STATE IN FRONT OF GOVERNMENT LOTS 1, 2, 3, AND 4 (EXCEPT S. 208.1 FEET) IN SECTION 9 AND GOVERNMENT LOT 4 OF SECTION 4 ALL IN T.24N., R.1E., W.M. OUT TO A DEPTH NOT TO EXCEED 4 FATHOMS AT ORDINARY LOW WATER. THE TERM "ORDINARY LOW WATER" IS REFERRED TO IN STATE STATUTES BUT NOT DEFINED. FOR THE PURPOSE OF THIS MAP IT IS ASSUMED THE LINE OF "ORDINARY LOW WATER IS EQUAL TO THE LINE OF "MEAN LOW WATER" WITH AN ELEVATION OF APPROXIMATELY 2.8 FEET (MLLW) PER TIDAL BENCHMARK STATION BREMERTON. ROUNDED TO THE NEAREST FOOT THIS EQUATES TO A 4-FATHOMS DEPTH OF -21 FEET.
4. THIS MAP WAS PREPARED USING A COMPILATION OF DATA FROM SEVERAL SOURCES AND THE ACCURACY OF THE DATA IS UNKNOWN. NO FIELD SURVEY WAS PERFORMED.
5. OPERABLE UNIT BOUNDARIES FROM JPHC OU 3T ROD.
6. DEED AREA BETWEEN 4-FATHOMS LINE AND EXTREME LOW TIDE LINE.

U.S. NAVY	0 250 500 SCALE IN FEET	**Figure 1-4** **Operable Units at Former NAD Puget Sound**	OU 3T - NHB ROD

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2.0 SITE HISTORY, INVESTIGATIONS, REMOVALS, AND REMEDIAL ACTIONS

A chronology of substantive events at NHB related to site discovery, investigation, and remediation are listed in Table 2-1 and summarized in the following subsections. The DMM of interest at OU 3T-NHB is an explosively configured item equivalent to a 20-mm projectile or larger, which is referred to as discarded military munitions containing high explosive (DMM HE).

The data presented herein show that the historical activities leading to the current site conditions were inadvertent spillage and mishandling of materials that resulted in DMM at the site. There was no evidence of intentional, systematic disposal or burial of DMM HE.

Table 2-1
Chronology of Events at JPHC Relative to OU 3T-NHB

Event	Date
Sitewide Events	
Establishment of NAD Puget Sound	1904
Purchase of NHB property	1932
Closure of NAD Puget Sound and placement in caretaker status	1959
Demolition of most of NAD Puget Sound structures	1960s
Development of southern portion of NAD Puget Sound as JPHC	1960s
Conversion of northern 50 acres of NAD Puget Sound to NHB	1977
Beginning of operations at NHB	1980
Identification of JPHC-NHB as potential site of hazardous releases	1981
Discovery and preliminary assessments at JPHC-NHB	1983–1988
Ecology Enforcement Order	1992
Signing of DSMOA by the Navy and State of Washington	1994
Placement of JPHC-NHB on National Priorities List	1994
Separation of JPHC-NHB into OU 1 and OU 2	1995
Establishment of OU 3	2000
Further subdivision of OU 3 into OU 3T-JPHC, OU 3T-NHB, and OU 3M by interagency agreement of November 1	2004
First 5-year review	2005
Updated community relations plan for JPHC-NHB by the Navy	2009
Second 5-year review	2010
Munitions Enhanced Awareness Training	2013
Events at OU 1	
ROD for OU 1	2000
Completion of remedy construction for OU 1	2003
Two-year monitoring at Benzene Release Area; installation of Oxygen Release Compound®	2003
Additional investigation and remedy evaluation for Benzene Release Area	2005–2010

Table 2-1 (Continued)
Chronology of Events at JPHC Relative to OU 3T-NHB

Event	Date
Events at OU 3	
Munitions clearances and removal actions	1975, 1981, 1994, 1998–2001
Preliminary assessment/site inspection	2003
OU 3T Phase I RI activities	2003–2004
Total enclosure of NHB by fencing	2005
OU 3M Phase I RI/FS work plan and RI activities	2006
OU 3T-JPHC Phase II RI activities	2007
OU 3M Phase II RI/FS work plan	2009
OU 3T-NHB final TCRA report	2009
OU 3M Phase II RI/FS work plan	2009
OU 3T-NHB final RI/FS report	2010
Land Use Controls Management Plan	2013

Notes:
DSMOA - Defense/State Memorandum of Agreement
Ecology - Washington State Department of Ecology
FS - feasibility study
JPHC - Jackson Park Housing Complex
NAD - Naval Ammunition Depot
NHB - Naval Hospital Bremerton
NPL - National Priorities List
OU - operable unit
OU 3M - Operable Unit 3–Marine
OU 3T - Operable Unit 3–Terrestrial
RI - remedial investigation
TCRA - time-critical removal action

2.1 SITE HISTORY

The Jackson Park Housing Complex–Naval Hospital Bremerton (JPHC-NHB) is the site of the former Naval Magazine Puget Sound (Naval Magazine), which was established in 1908 as an ammunition depot for the storage of ordnance. Operations expanded during World War I to include ordnance processing, projectile loading and cleaning, and ordnance demilitarization. The Naval Magazine became the Naval Ammunition Depot (NAD) Puget Sound around 1916. The northern expansion of NAD Puget Sound occurred in 1932 with the purchase of 173 acres that expanded the total area to approximately 425 acres. Construction of buildings in the area now occupied by the hospital began in 1936 (U.S. Navy 2010a). Operations at NAD Puget Sound were stepped up during World War II to support the war effort in the Pacific. After the end of World War II, the primary role of the facility shifted to ordnance demilitarization.

There are no documented military uses of the NHB property before 1932. Ammunition storage and transportation were the main functions of the NHB property from the mid-1930s until the closure of NAD Puget Sound in 1959. Seven NAD Puget Sound buildings were constructed on the NHB site. Buildings 82, 84, 87, 88, and 89 were constructed from 1936 to 1939 as storage magazines (Figure 2-1). Buildings 118 and 121 were built in 1943 for inert materials storage and projectile regrooving, respectively (Figure 2-2). A narrow-gauge railroad was extended to these buildings from the southern portion of NAD Puget Sound between 1940 and 1943. During World War II, the narrow-gauge railroad was converted to standard gauge, and the installation of rails connecting Elwood Point to Bangor was completed in the fall of 1944 (Figure 2-2). The conversion of this narrow-gauge rail system required the lowering of all the track beds by 18 inches to accommodate the larger standard-gauge railcars. This rail system was removed by 1968 (U.S. Navy 2010a).

There were no direct manufacturing activities conducted at NAD Puget sound. Activities such as propellant production and machining of shell casings did not take place at NAD Puget Sound. Historical records show the most common items assembled at the site were 20-mm projectiles, 40-mm projectiles, 5-inch projectiles, 14-inch projectiles, and 14-inch bag charges (Foster Wheeler 2002a).

By 1959, the ammunition depot was no longer needed at the property. NAD operations ceased, and the depot was placed in caretaker status. Portions of the former depot were deeded to Kitsap County, the City of Bremerton, and the State of Washington. Beginning around 1965, a portion of the remaining property was converted to military housing and renamed the Jackson Park Housing Complex. As housing construction continued in the early 1970s, the Navy demolished most of the remaining depot structures at the site. In 1977, approximately 50 acres of the northern portion of the former NAD Puget Sound was converted to use as NHB. The hospital became operational in 1980. The current structures associated with NHB are shown on Figure 2-3.

In 1981, JPHC-NHB was identified by U.S. Environmental Protection Agency (EPA) as a potential site of hazardous substance releases. In 1994, EPA placed the Jackson Park facility including NHB on the NPL, which is designed to categorize, rank, and expedite investigation and cleanup of the nation's primary hazardous waste sites. The CERCLIS ID for Jackson Park Housing Complex is WA3170090044. Operable Unit 3 Terrestrial – Naval Hospital Bremerton (OU 3T-NHB) is a part of Jackson Park Housing Complex. The site for the decision described herein is referred to as OU 3T-NHB.

In May 1995, JPHC was administratively divided into OU 1 and OU 2 to expedite the remedial actions. OU 1 includes the terrestrial portion of the site and the structures used to support former operations, such as piers and dolphin piles. OU 1 addresses human health risks from terrestrial

chemical sources in soil and groundwater and ingestion of shellfish from Ostrich Bay. OU 2 addresses the potential chemical impacts to marine sediments in Ostrich Bay and any associated ecological risks to the marine environment.

In 2000, OU 3 was added to address the concern that discarded military munitions (DMM) or material potentially posing an explosive hazard (MPPEH) might remain at JPHC/NHB and present a hazard to human health and the environment in both the marine and terrestrial environments. OU 3 includes MEC that may be present at JPHC-NHB or in Ostrich Bay. OU 3 was further subdivided to separate marine (OU 3M) and terrestrial (OU 3T) ordnance related actions at JPHC. In November 2004, OU 3T was further divided into OU 3T-JPHC and OU 3T-NHB. The NHB facility is designated as OU 3T-NHB, which is geographically defined as the upland areas and the shoreline down to the MHHW line at 12 feet above the mean lower low water (MLLW) line or 5.7 feet above sea level (National Geodetic Vertical Datum of 1929 [NGVD29]) (U.S. Navy 2010a).

2.2 HISTORY OF SITE INVESTIGATIONS, REMOVALS, AND REMEDIAL ACTIONS

Munitions clearance and response activities were conducted on an intermittent basis as part of operations across the entire former NAD facility and as part of Navy Explosive Ordnance Disposal (EOD) operations through 1998. Additional munitions response activities were completed by joint contractor/EOD operations between 1998 and 2004. These operations were implemented under CERCLA as part of a time-critical removal action (TCRA) for OU 1, through the OU 1 ROD, the OU 3T-NHB RI, and also as part of ongoing facility reconstruction operations.

The item of concern at this site is explosively configured DMM equivalent to a 20-mm or larger projectile. This item type is referred to herein at DMM HE. No DMM HE was found during the OU 3T-NHB RI.

2.2.1 Pre-Remedial Investigation and OU 1 ROD, 1981 to 2002

Pre-Remedial Investigation

Three reports of Explosive Ordnance Disposal Mobile Unit 11, Detachment Bangor (EOD MU 11 Det. Bangor) responses were found in the available historical record regarding terrestrial recovery at JPHC prior to 1998; none involved DMM HE (U.S. Navy 2002a). Other references to the discovery of DMM were found, but no substantiating information regarding dates, locations, types, or quantities was available (Foster Wheeler 2002e).

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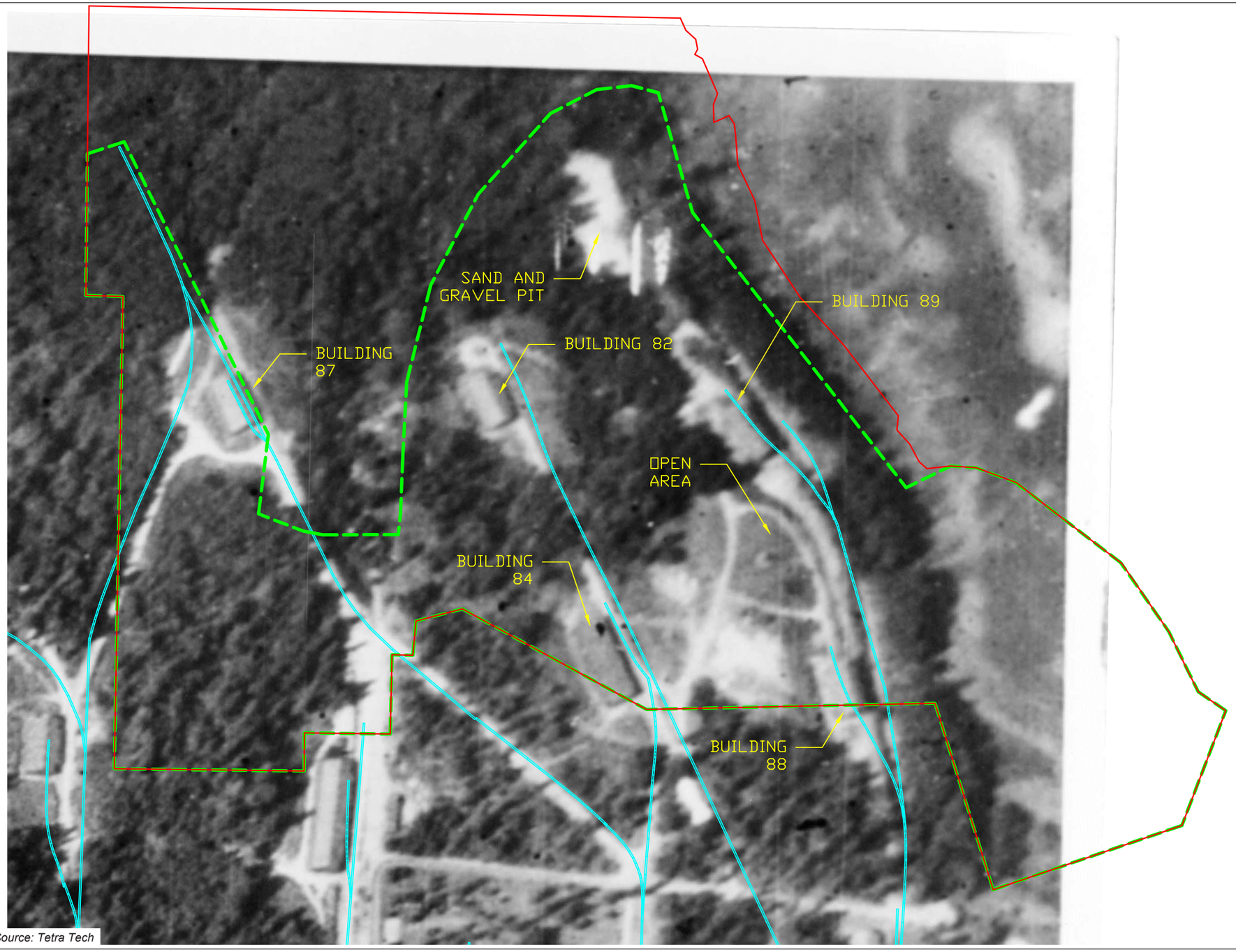

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SCALE IN FEET

LEGEND:

OU 3T NHB BOUNDARY

APPROXIMATE ALIGNMENT OF FORMER RAILROAD TRACKS

NHB DEVELOPED AREA

SOURCE: NARS, FRAME NO. 57, 1942

U.S. NAVY	Naval Hospital Bremerton OU 3T ROD	**Figure 2-1** **Existing Structures at** **NAD Puget Sound, 1942**

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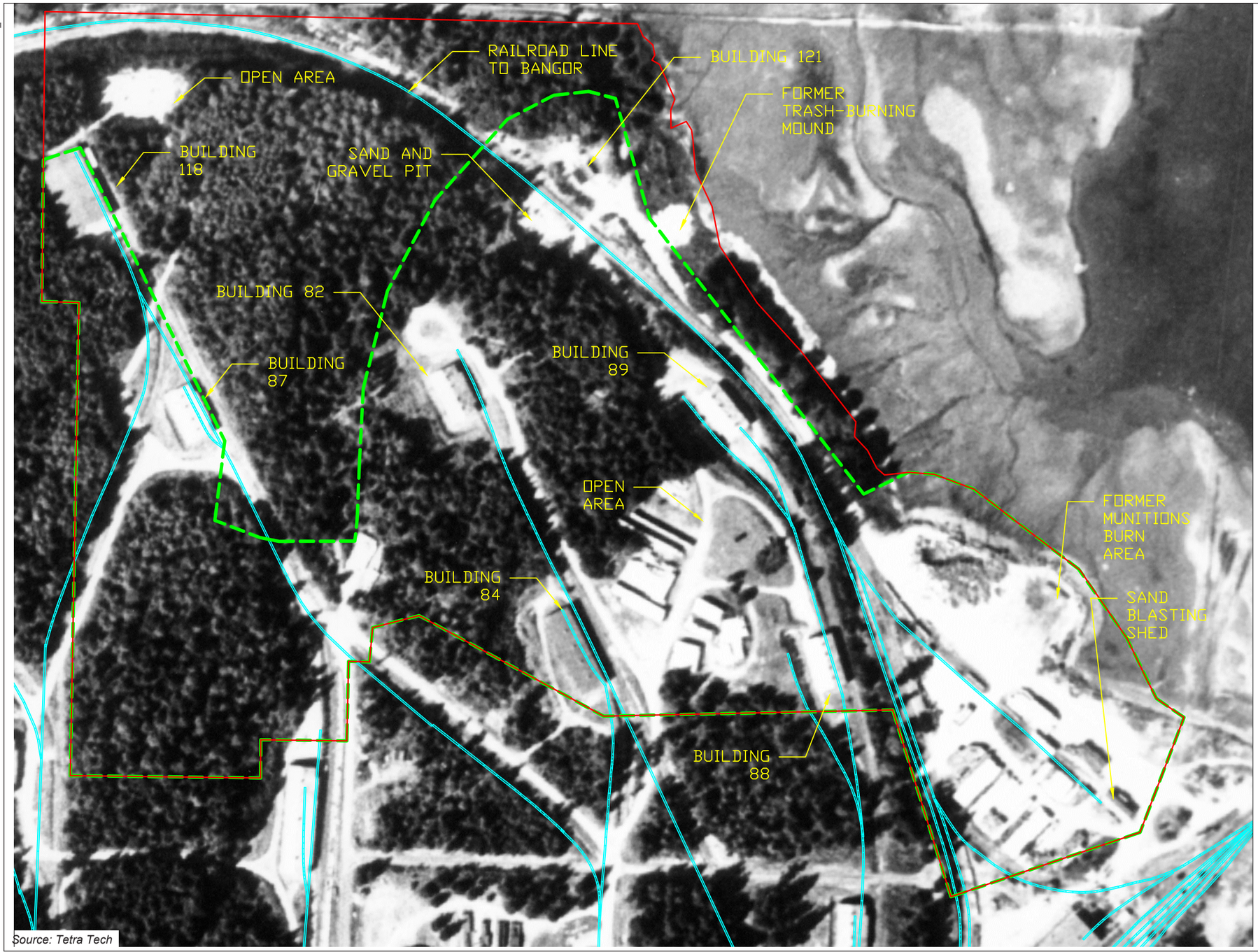

Source: Tetra Tech

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SCALE IN FEET

LEGEND:

OU 3T NHB BOUNDARY

APPROXIMATE ALIGNMENT OF FORMER RAILROAD TRACKS

NHB DEVELOPED AREA

SOURCE: USGS EROS, FRAME NO. 3-8, AUGUST 19, 1951

U.S. NAVY	Naval Hospital Bremerton OU 3T ROD	**Figure 2-2** **Existing Structures at** **NAD Puget Sound, 1951**

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Source: Tetra Tech

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SCALE IN FEET

LEGEND:

OU 3T NHB BOUNDARY

NHB DEVELOPED AREA

SOURCE: WALKER AND ASSOCIATES, AUGUST 21, 2003

U.S. NAVY	Naval Hospital Bremerton OU 3T ROD	**Figure 2-3** **Existing Structures at** **OU 3T-NHB, 2003**

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One DMM HE item was identified at the surface in 1995. In February 1995, two boxes were found in a wooded area 75 feet from the south wall of NHB. The exact location where these boxes were found is unknown. The items were identified as a World War II–vintage demolition kit and a flare kit. The demolition kit was a DMM HE item that contained 20 half-pound blocks of TNT, detonators, several feet of detonator cord, and plastic explosives. The materials were determined to be too unstable to be moved off site by EOD Bangor and were disposed of by on-site detonation (U.S. Navy 2002a).

A munitions investigation was conducted at JPHC as part of a shoreline and recreation area investigation between June 1998 and January 1999. This included a portion of NHB. The investigation included a surface clearance, geophysical survey to identify metallic anomalies that could represent DMM HE, and excavation of 290 test pits and 5 trenches in selected sub-grids. The test pits were advanced to investigate over 500 distinct mapped anomalies. No DMM HE items were found during this investigation.

In July 1998, a pre-RI surface sweep, electromagnetic survey, and intrusive investigation were performed along the NHB shoreline (including the helipad and the former munitions burn area) (U.S. Navy 2002c). Intrusive clearance operations were conducted in September and October of 1999. Only one DMM HE item (a 2.25-inch nose cone filled with smokeless powder) was recovered from grid 44, at the site of the ordnance burn area.

From 1998 to 2001, an electromagnetic survey and intrusive investigation were performed in the area bounded by Higbee Road and Boone Road (hospital main building, clinic area, and parking lots), the child-care center, and along the NHB recreation area and shoreline (including the helipad and former munitions burn area) (U.S. Navy 2002b, 2002c). Munitions clearance activities were then conducted in the vicinity of the clinic and hospital areas of NHB to 1 and 4 feet below grade (Figure 2-4). In November 1999, soils from the clinic excavation activities were stockpiled and screened for use as fill material at Elwood Point.

The hospital-related construction work was performed before the differentiation between OU 3T-NHB and OU 3T-JPHC had occurred. The northern portion of the recreation facility is on NHB property. A 40-mm MK 12 fuze (DMM HE) was recovered at the surface on February 24, 1999.

OU 1 ROD

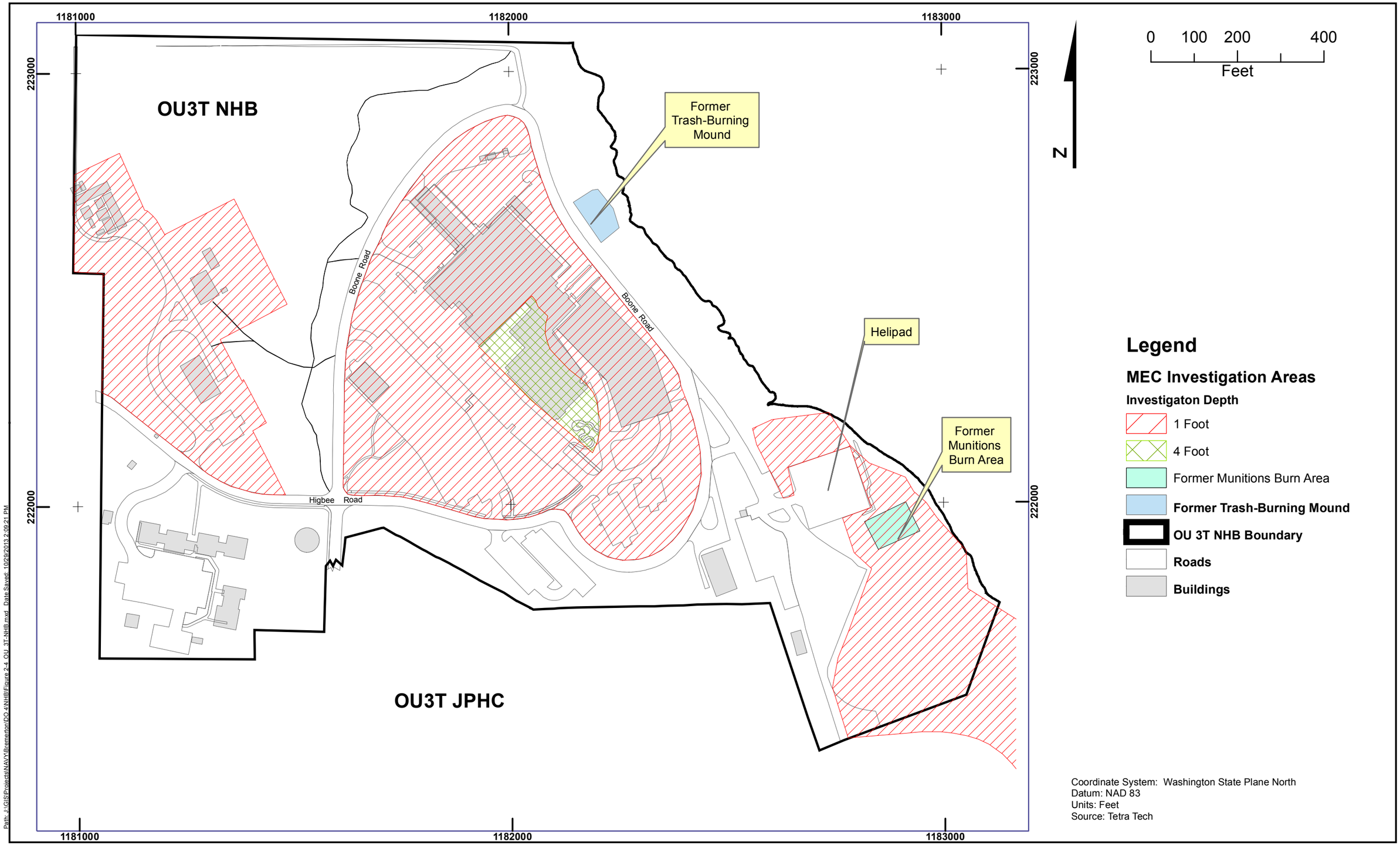
A ROD for OU 1 addressing chemical contamination at the JPHC/NHB site was executed in August 2000 (U.S. Navy, USEPA, and Ecology 2000). The OU 1 ROD was prepared to mitigate human health risk from terrestrial chemical impacts in soil and groundwater and ingestion of shellfish from Ostrich Bay. The selected remedy for impacted soils and groundwater at OU 1 included the following:

- Placement of a minimum 1-foot-thick soil cover over approximately 16 acres of the site, including the shoreline area of OU 1 (Figure 1-4), and 4 other small areas in the vicinity of grids 6, 8, 141, 143, and 235-236
- Installing shoreline protection features to limit erosion along approximately 2,700 feet of shoreline in the Elwood Point area
- Removal of creosote-treated pilings from Ostrich Bay and marine tissue monitoring
- Removal of the source of groundwater contamination and perform groundwater monitoring
- Land use controls (LUCs) to limit the future use of groundwater, maintain the soil cover, maintain shoreline protection features, control excavations, and limit residential development in areas remediated under the ROD
- Deed and land use restrictions in the event of transfer of the JPHC/NHB site

The remedial action for OU 1 soil was conducted from August 2000 to June 2002 (Foster Wheeler 2002a, 2002c, 2002d) and the Navy conducted a TCRA for munitions under OU 3 as part of the OU 1 remediation. The remediation activities started in the southern part of the shoreline at JPHC, outside of the OU 3T-NHB boundary and progressed northward. As the construction activities progressed, the shoreline protection system was installed first, followed by the munitions removal TCRA. The soil cover was placed following completion of the munitions removal activities.

The TCRA originally involved DMM clearance by excavating 1 foot of soil, mechanically screening the soil, and locally placing a geotextile indicator layer prior to backfilling the excavated area with screened soil or clean fill. The site, except areas designated for pavement, was then covered with a 4- to 6-inch layer of topsoil and sod.

After completion of the soil remediation activities in the southernmost 4 acres of the shore, a large-caliber Coast Guard round was found at the intersection of South Shore Road and Dowell Road, which is not within the OU 3T-NHB boundary. This caused a reassessment of the techniques used for munitions removal in order to avoid contacting large munitions. For the remaining 11.7 acres of the remediation area, previously obtained electromagnetic data were used to identify 2,475 metallic anomalies that were individually excavated to a depth of 2 feet (including the ball field on the NHB property). Following removal of these targets, heavy equipment was used to remove the uppermost 1 foot of soil. Placement of the geotextile, soil backfill, and topsoil was continued in this area as described above. During the OU 1



U.S. NAVY	OU 3T-NHB ROD	Figure 2-4 1998-1999 Investigation Areas

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ROD/TCRA activities, four DMM HE items were recovered outside of the OU 3T-NHB boundary: a projectile nose fuze, 40-mm projectile, 1-pounder projectile, and 5-inch projectile base fuze. In total, 4,589 other munitions-related items were also found, ranging from non-HE-containing DMM (e.g., small arms) to MPPEH scrap.

Also, to meet the requirements of the OU 1 ROD, in May and June 2002, Navy contractors removed soil containing polynuclear aromatic hydrocarbons to a depth of 2 feet over five 50- by 50-foot grids on the east side of several residential buildings on Haven Road (Figure 2-1). This location is the center of the former manufacturing area. A surface clearance of metallic items in the area was performed using hand-held magnetometers prior to the soil removal, and 143 subsurface metallic anomalies were identified after the surface clearance. No DMM or MPPEH item was encountered during the intrusive investigation of these 143 targets. The excavation was backfilled with clean soil, and sod was placed to restore the area to its initial condition.

Three DMM HE items were removed from OU 3T-NHB from 1981 to 2002. A World War II-vintage demolition kit was identified and destroyed at the OU3T-NHB in 1995. A 2.25-inch nose cone with smokeless powder residue (DMM HE) was identified and removed during 1998. A Mark 12 fuze (DMM HE) was recovered in the clinic expansion area in 1999 (Foster Wheeler 2002b). The locations of where these three items were found and removed are shown on Figure 2-5.

2.2.2 Preliminary Assessment/Site Investigation, 2001 to 2002

The PA/SI represented the first step in the CERCLA assessment and cleanup for munitions at OU 3T JPHC, including OU 3T-NHB. No field investigations for munitions items were conducted during the PA/SI (Foster Wheeler 2002e). The PA/SI report provides information concerning munitions-related operations at the former NAD Puget Sound. It also provides a description of the site-specific geographic information system- (GIS-) based munitions hazard assessment developed to determine the relative level of hazard associated with potential residual munitions-related items. The results of this munitions hazard assessment were later superseded by preliminary application of the MEC hazard assessment (MEC HA) included in Appendix A of the OU 3T JPHC Phase 2 RI work plan (TtEC 2007a), followed by the final evaluation using the MEC HA and data from Phase 2 of the RI (TtEC 2010a).

2.2.3 Construction Safety Oversight, 2003 to 2007

Construction safety oversight has been provided at NHB since November 2003. Over 1,440 hours (or 180 work-days) of construction safety oversight was provided resulting in the discovery of only one DMM HE item. The single DMM HE item was a Coast Guard 1-pounder casing with primer was found about 300 feet northwest of the hospital building at a depth of

about 6 inches at the same time an archeological investigation was being performed (October 2005) (U.S. Navy 2010a). The location of where this item was found and removed is shown on Figure 2-5.

2.2.4 Remedial Investigation/Feasibility Study, TCRA 2007 to 2009

Initial Remedial Investigation

A site-wide remedial investigation (RI) to evaluate the nature and extent of DMM HE and a TCRA of a former trash-burning mound were performed at the OU 3T-NHB from October 2007 to April 2009. The RI focused on identification and removal of explosively configured DMM equivalent to a 20-mm or larger projectile, which is referred to as DMM HE and is the item of concern at this site. No DMM HE item was found at NHB during the RI (U.S. Navy 2010a).

The focus of the RI was to determine the surface and subsurface locations and extent of DMM HE (explosively configured items 20 mm and larger) at OU 3T-NHB. The RI work plan (U.S. Navy 2007c) defined the area to be investigated at NHB as approximately 24 acres within the following:

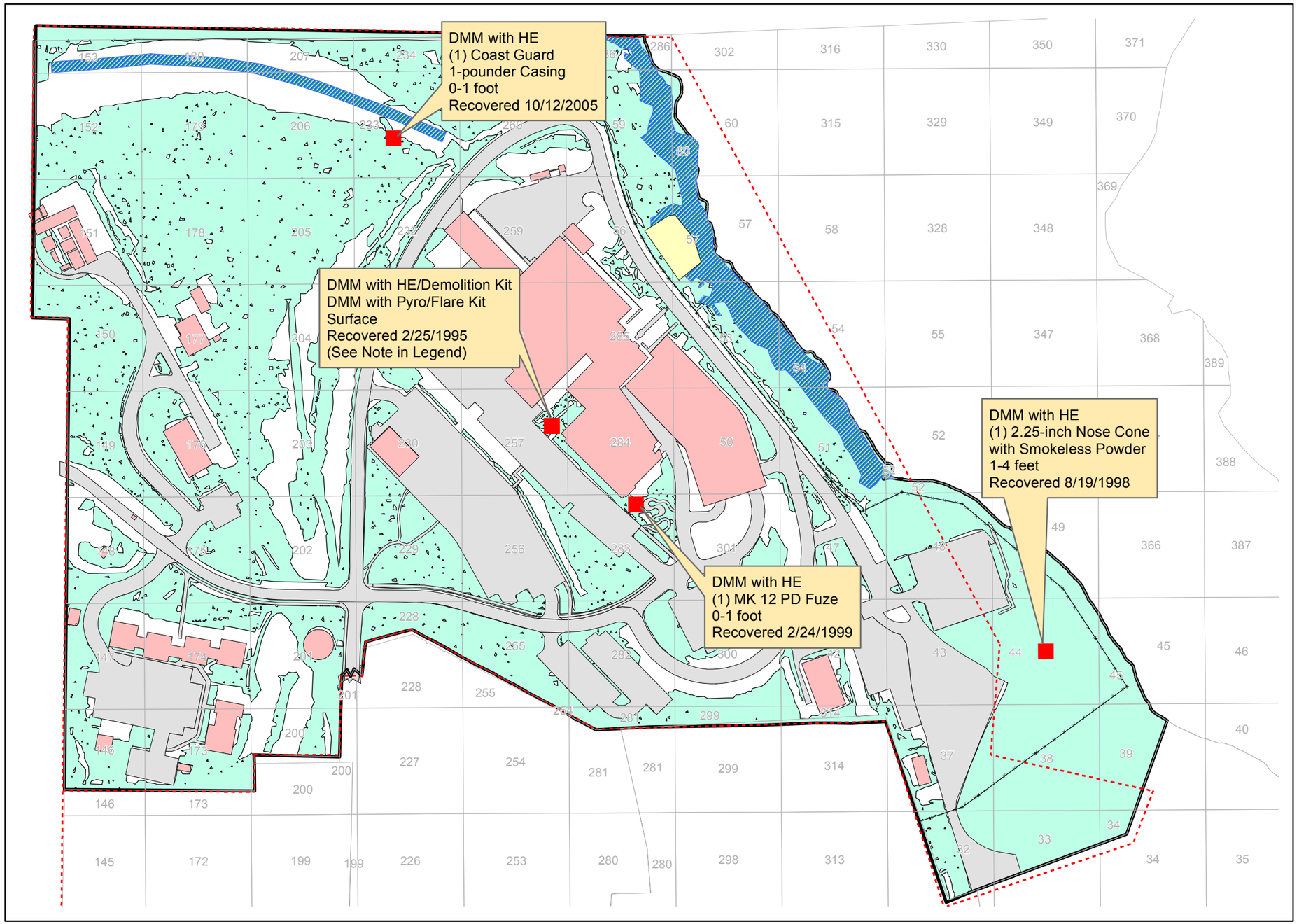
- Fifty feet on either side of present and historical roads, railways, and pathways, and in a 50-foot buffer around present and former building locations
- The developed area of the site surrounding the hospital and support buildings
- Three distinct open areas identified on historical aerial photographs as "suspect open areas" that might have been affected by NAD Puget Sound activities and could contain DMM

The areas at NHB that were investigated during the RI are shown on Figure 2-6.

The following areas were excluded from the RI: (1) portions of Elwood Point that were investigated and remediated as part of the 1999 to 2001 OU 1 ROD and TCRA, (2) the woodland area where slopes exceeded 30 degrees, and (3) areas under buildings and roadways because they were cleared as part of the construction.

The four principal activities performed during the RI were vegetation removal, surface clearance, geophysical investigation, and intrusive operations.

Figure 2-5 shows the locations of all DMM HE items found between 1995 and 2005.



0 100 200 400
Feet

N

Legend

- 2003 Land Survey
- NHB Fence
- 55 Grids
- Wetlands
- OU 3T NHB Boundary (48.8 acres)
- Buildings (4.1 acres)
- Roads (12.8 acres)
- Former Trash-Burning Mound
- Areas Excluded from Geophysical Data Collection (Slope Exceeds 30 Degrees; Wetland Areas (5.2 acres)
- Areas Investigated
- DMM-HE

Callouts

- Items found during other NHB Investigations

Note:
Demolition Kit consists of the following:
(20) 1/2-pound blocks of TNT
(5) Detonators
(1) Detonator Cord

Coordinate System: Washington State Plane North
Datum: NAD 83
Units: Feet
Source: Tetra Tech

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U.S. NAVY	OU 3T-NHB ROD	

Figure 2-5
DMM HE Finds at OU 3T-NHB

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Coordinate System: Washington State Plane North
Datum: NAD 83
Units: Feet
Source: Tetra Tech

Path: J:\GIS\Projects\NAVY\Bremerton\DO 4\NHB\Figure 2-6_OU_3T-NHB.mxd Date Saved: 10/30/2013 11:43:09 AM

U.S. NAVY	OU 3T-NHB ROD	**Figure 2-6** **OU 3T-NHB Remedial Investigation Area**

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Vegetation removal involved the hand removal of vegetation less than 4 to 6 inches in diameter from selected areas of NHB. The purpose of the vegetation removal was to increase site access, thereby increasing the area that could be subjected to the investigation activities. No root removal or other intrusive activity was performed. EOD personnel provided oversight during the vegetation removal. The vegetation removal excluded isolated ravine areas where slopes greater than 30 degrees would prohibit safe performance of the surface clearance or geophysical investigation.

Magnetometers were used to locate surficial (ground surface to 2 inches below grade) metallic items in areas at NHB where the geophysical survey was to be performed. Surface metallic waste, MEC, and MPPEH were removed to increase site safety and reduce electromagnetic interference during the geophysical investigation. The area cleared during this task was 100 percent of the NHB site that was not covered by roads or buildings, or approximately 30 acres. The surface clearance included the reconstructed shoreline/recreation areas and locations where the subsequent geophysical survey could not be performed because of the surface topography.

The surface clearance and subsequent geophysical investigation and intrusive operations (discussed below) used an extension of the OU 3T grid-based system to facilitate effective control and management of the data. The OU 3T grid was originally applied to most of the former NAD PS before OU 3T-NHB was established. Seventy-five grid squares were overlayed on OU 3T-NHB as an extension of the OU 3 T grid system to support the RI. Each new grid was typically 200 feet square except near property boundaries. The grid-based system enabled effective quality control during the RI by subdividing OU 3T-NHB into small uniform areas for the recognition and correction of potential issues related to data quality (U.S. Navy 2010a).

Time-domain electromagnetic (TDEM) geophysical equipment coupled with appropriate navigational equipment was used to survey the site. Two electromagnetic surveys were performed during the RI. The initial survey was performed over the areas identified in the RI work plan (TtEC 2007b). During this survey, 10,989 anomalies were mapped and 1,397 anomalies (12.7 percent) were selected for the intrusive investigation (Figure 2-6). The geophysical data collected in the field were processed and interpreted to determine the location, approximate size, and approximate depth of particular anomalies. The processing included merging the signals from the TDEM survey and positioning data, interpretation of select anomalies, and review and quality control by appropriate experienced staff.

This information from the survey was entered into a geographic information system database and mapping program.

Shortly after the vegetation removal and surface clearance activities began, a former trash-burning mound containing canisters of flashless pellets was located on the eastern shoreline of NHB. The mound location is shown on Figure 2-4. The presence of the canisters indicated that the mound could be a source of additional MPPEH or DMM items. The mound, which measured approximately 1,500 cubic yards, was identified on a 1951 plot plan as a former trash-burning area (U.S. Navy 2002a). Based on the discovery of the canisters and the former use of the mound, the Navy conducted a TCRA at the mound.

Time-Critical Removal Action

At first, seven weathered canisters containing what was initially identified as smokeless powder were found in the mound along the eastern shoreline outside the NHB security fence. They were transferred to EOD Bangor for proper disposal.

It was determined that a TCRA was needed to reduce the possibility of contact with DMM that could be remaining in the mound and because of the potential risk to human health, human welfare, and the environment. Work to remove the mound was performed in accordance with the TCRA mound removal work plan addendum (U.S. Navy 2008b).

From May 5 to June 23, 2008, the team removed a total of 346 canisters. The material in the canisters was identified as flashless pellets, a material manufactured and used during World War II to reduce the visible muzzle flash from ship-mounted guns.

The closure report for the TCRA mound removal at OU 3T-NHB was finalized in March 2010 (U.S. Navy 2010b). Given that the mound was no longer present and based on the information contained in that report, the Navy determined, and EPA concurred, that no further action related to the former trash-burning mound was necessary (U.S. Navy 2010a, 2010b).

Work for the RI resumed following completion of the TCRA. The TCRA area was included in the RI.

RI Resumed

After the soil mound was removed, an additional geophysical survey of the mound footprint was performed. In this survey, 159 anomalies were detected, 20 of them (12.6 percent) were excavated. Anomalies within each of the investigation grids were selected randomly for the investigation.

The dig teams proceeded through the grids, excavating and examining the selected targets in accordance with the approved standard operating procedures. Vallon or Schonstedt detectors were used to guide the excavations and perform real-time quality control to ensure that the

selected anomalies had been located and removed. The geophysicists also reviewed a portion of the dig results to ensure that the recovered items were consistent with the items identified by means of the geophysical mapping.

The excavations were performed in a 1.5-foot radius surrounding the target. They were dug to a maximum of 2 feet below ground surface for anomalies with a signal strength of 10 mV or less and to a maximum of 4 feet below ground surface for anomalies with a signal strength of 10 mV or more, or to a reasonable maximum depth based on site and safety constraints (e.g., buildings, roadways, and utilities) if an item matching the mV signal on the dig sheet was not uncovered. For targets located near subsurface obstructions such as underground utilities and building foundations, alternative targets were established. These alternative targets met the millivolt stratification requirement requested by the EPA.

No DMM HE item was identified within the fenced area of NHB during the RI.

A thorough evaluation of the potential hazard at the site was conducted during the RI using the EPA MEC HA methodology, which evaluates explosive hazard for sites. The MEC HA indicates a low potential for an explosive incident under current, and reasonably anticipated future land use (U.S Navy 2010a).

2.3 WETLAND DELINEATION AND CULTURAL PLANT SURVEY

A site-specific factor that affected the response action was the presence of Wetland C along the shoreline of OU 3T-NHB. In response to stakeholder input during preparation of the proposed plan, the Navy conducted a wetland delineation and plant survey of Wetland C at OU 3T-NHB (U.S. Navy 2011). The characterization included the following:

- Delineation and description of wetland C, including both tidal and nontidal wetlands
- Functions assessment of all wetlands
- Field and laboratory assessment of soils in the wetlands and buffers
- Plant assessment

The wetland delineation, functions assessment, and soils fieldwork were conducted over a 3-day period from May 31 to June 2, 2011. Site visits to the study area were made to mark and map the wetland boundaries using a global positioning system (GPS) unit, to perform extensive plot

sampling of uplands and wetlands, and to observe and measure functions indicators for the functions assessment.

An initial plant survey was conducted on May 27, 2011. A follow-up survey was conducted on June 20 after consultation with traditional plant experts from the Suquamish Tribe.

The wetlands were rated using the *Washington State Wetlands Rating System for Western Washington* (Ecology 2004). The Washington State Department of Ecology (Ecology) recognizes four categories of wetlands, which are designated as Categories I through IV:

- Category I wetlands are wetlands of exceptional value in terms of protecting water quality, storing flood and stormwater, and/or providing habitat for wildlife. These wetlands are of infrequent occurrence; often provide documented habitat for sensitive, threatened, or endangered species; and/or have other attributes that are very difficult or impossible to replace if altered.

- Category II wetlands are wetlands that are difficult, although not impossible, to replace; generally have little to no disturbance; and provide high levels of some functions. Category II wetlands also include estuarine wetlands less than 1 acre or greater than 1 acre but disturbed, and interdunal wetlands greater than 1 acre. Although Category II wetlands occur more commonly than Category I wetlands, they are deemed to warrant a relatively high level of protection.

- Category III wetlands generally provide a moderate level of functions, have been disturbed in some way, and are often less diverse or more isolated from other natural resources. Category III wetlands are regulated wetlands that do not contain the features or function levels of wetlands in Categories I, II, or IV. They occur more frequently, are less difficult to replace, and need a moderate level of protection compared to higher rated wetlands.

- Category IV wetlands do not meet the criteria for wetlands in Categories I, II, or III. These are wetlands that could be replaceable and, in some cases, can be improved from a functions standpoint. These wetlands may provide important functions and values and should be protected to some degree.

Vegetated tidal wetlands that cover more than 1 acre and are relatively undisturbed are rated as Category I. Other estuarine wetlands are rated as Category II.

The on-site portion of Wetland C covers approximately 1.8 acres. The wetland extends off site to the north. Wetland C contains both estuarine and freshwater wetlands. The boundary between

the two vegetated wetland types, as well as the lower boundary between the vegetated wetlands and the unvegetated mudflats, was located in the field and recorded with a GPS unit but was not marked in the field. The wetland/upland boundary was both marked in the field and recorded with a GPS unit. The extent of tidal versus freshwater wetlands is shown on Figure 1-2.

The 0.77-acre freshwater portion of Wetland C is a slope wetland according to the hydrogeomorphic classification system (Ecology 2004). It is classified as a palustrine, forested, seasonally saturated wetland, according to the Cowardin classification (Cowardin et al. 1979) used by the U.S. Fish and Wildlife Service for the National Wetlands Inventory. The freshwater portion of Wetland C is rated as a Category III wetland according to Ecology's rating system (Ecology 2004).

The 1.05-acre tidal portion of Wetland C is a tidal fringe wetland, according to the hydrogeomorphic classification system. It is classified as an estuarine, intertidal, emergent wetland, according to the Cowardin classification. The low marsh area is saltwater tidal, regularly flooded, whereas the high marsh is irregularly flooded. The tidal portion of Wetland C is rated as a Category I wetland, according to Ecology's rating system, which rates tidal wetlands according to special characteristics rather than wetland functions.

Thirty-seven plants known to be used by the Suquamish Tribe for medicine, food, tools, or weaving were found at the site. The Suquamish representatives indicated that all but one of the plants with traditional uses on the site would be harvested from above the ground (U.S. Navy 2011).

2.4 SUMMARY

Operations at the site at NAD Puget Sound from 1904 to 1959 had the potential for release of DMM HE as a result of unintended accidental spillage. The Navy has conducted an extensive amount of work at the site over almost 30 years of investigation and removal. The results confirm that there is a low potential for DMM HE at the site.

The RI was conducted over the entirety of OU 3T-NHB. During the surface clearance and intrusive investigation, no DMM HE was recovered. The former trash-burning mound was the only area identified during the RI as having high concentrations of discarded items (346 canisters with a total weight of over 27,000 pounds). The canisters were determined to be an oxidizer and not DMM HE.

Based on the results of the RI, there does not appear to be a clustering of DMM items in any one area, which indicates that there was no intentional, systematic disposal or burial of DMM HE at this site. Clusters of items do not appear to be in the vicinity of the sites of the buildings used

during the active life of NAD Puget Sound, along transportation corridors (i.e., the former railroad lines), or in the open areas identified from historical air photographs.

During the RI, 11,997 subsurface electromagnetic anomalies were identified and 1,417 were selected for excavation (12.7 percent). No DMM HE item was recovered.

The DMM HE incidence rate is calculated by dividing the number of subsurface DMM HE finds by the number of terrestrial anomalies investigated. The Navy/EPA project team established a value of 0.0002 as a low DMM HE incidence rate in the April 2006 Joint Resolution Statement. Two of the finds were surface finds and are not included into the calculation. Therefore 2 subsurface DMM HE items divided by 11,997 investigated terrestrial anomalies results in an incidence rate of 0.000167, which is less than the 0.0002 incidence rate. This indicates that there is a low DMM HE incidence rate. The MEC HA indicates that there is a low potential for an explosive incident under current and reasonably anticipated future land use. These metrics indicate that the site poses a low risk for DMM HE.

3.0 COMMUNITY PARTICIPATION

The Navy prepared a community relations plan in 1992 (U.S. Navy 1992) and updated the plan in 2008 (U.S. Navy 2008a). The plans were implemented to establish and promote community involvement in the CERCLA investigations and cleanup at JPHC. The members of the community surrounding the JPHC-NHB site have been kept informed about and had the opportunity to participate in the multiple stages of the investigations and cleanup process.

The RI/FS report and proposed plan for OU 3T-NHB were made available to the public in September 2010 and September 2013, respectively. They can be found in the Public Information Repository and the Administrative Record file maintained at the Sylvan Way Library and the Naval Facilities Engineering Command (NAVFAC) Northwest offices, respectively.

A notice of the availability of the proposed plan was published in the *Kitsap Sun* and *Peninsula Daily News* (newspapers) on September15, 2013. The published notice also announced the opening of the public comment period, which was from September 15 to October 15, 2013. The notice further announced an open house to discuss the proposed plan. The open house was held at the Hampton Inn, Bremerton Washington, on September 24, 2013. Navy and EPA representatives were available at the open house to address public questions, comments, and concerns. No community member attended the open house.

3.1 RESTORATION ADVISORY BOARD

The JPHC RAB was formed when the site was placed on the NPL in 1994. The RAB used to meet as needed and monitored the progress of environmental activities at JPHC, including NHB. Meetings were announced in the local newspapers at least one week before the event. The meetings were held in a place that is open and easily accessible to the public (a library or meeting room at JPHC Community Center). The agenda for the meeting typically included a review of the meeting minutes from the previous meeting, a synopsis of activities completed since the last meeting, a discussion of any issues brought forth by meeting attendees, and a preview of site-related activities scheduled for the next quarter or half year. Minutes of these meetings were then made available to interested parties at the information repositories. Community interest has decreased since 2008, and RAB meetings have not been convened since then. The primary means of community communication since then has been mailings, public announcements, and town hall meetings as needed.

3.2 TOWN MEETINGS

Town meetings were held for JPHC and NHB prior to the start of field activities, and as needed during performance of the RI. The meetings were open to all NHB residents and workers, as well as any interested members of the public. Flyers providing notification of the meetings were posted as well as issued to every residence at NHB. A Navy representative presented a brief detailing the sequential steps involved with the scheduled activities (U.S. Navy 2010a).

3.3 MUNITIONS AWARENESS MATERIALS

A visitor awareness program was instituted before the beginning of the OU 3T-NHB RI/FS fieldwork. The program includes posters placed in common areas (such as waiting rooms), as well as information flyers for visitors, patients, and workers that describe the work being performed.

The base command provides munitions awareness training for employees and residents of the Bachelor Enlisted Quarters (BEQ) at NHB. In addition, the NBK Bangor Housing Office provides notification to prospective residents of JPHC, nearly all of whom have access to NHB, regarding the potential presence of munitions at NHB. The notification explains the procedures to follow if suspicious materials are encountered. As part of the program, new residents are asked to sign a document acknowledging their awareness of the munitions history at JPHC and NHB and their understanding of the LUCs that are in place. A digital video disc (DVD) describing the site history and munitions is provided. A coloring book is also provided to residents for the purpose of educating children regarding potential site hazards. The Navy will continue to distribute these materials to new residents of JPHC-NHB and will update these materials as needed.

The munitions education awareness training program was enhanced in 2013 to be consistent with requirements in the OU 3T JPHC ROD (U.S. Navy 2011). The existing excavation permitting process for JPHC was reviewed and metrics identified to measure compliance with provisions of the ROD. The excavation permitting process is now auditable and provides documentation of compliance.

3.4 FACT SHEETS/NEWS ARTICLES/PRESS RELEASES

Six fact sheets related to JPHC/NHB were issued between April 1991 and November 2013. Four of the fact sheets were issued between April 1991 and September 1994.

Nine news articles were published relative to JPHC/NHB between July 1998 and September 2013. Six of these articles were published between July 1998 and June 2001. Seven articles were published in the *Kitsap Sun* and one article was published in the *News Tribune*.

One press release was issued by the Navy in 2008 about the discovery of empty shell casings at JPHC, which presented a notice to all JPHC residents and employees regarding the find and the potential for munitions at the site.

3.5 INFORMATION REPOSITORY

An information repository is available for document review by the public. Community members were encouraged to visit the repository and review any documentation of interest. The Navy has supplied hard copies of documents related to the cleanup efforts at JPHC/NHB to the Information Repository at the Kitsap Regional Library, Sylvan branch library at 1301 Sylvan Way in Bremerton. The public was able to review documents at this location.

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4.0 GOVERNMENT TO GOVERNMENT CONSULTATION

Pursuant to Secretary of Navy Instruction (SECNAVINST 11010.14A) and Navy Region Northwest Instruction, the Navy consulted with the Suquamish Tribe during the course of the RI/FS and specifically with respect to the proposed plan. The Suquamish supports the selected remedy.

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5.0 SCOPE AND ROLE OF OPERABLE UNIT 3 TERRESTRIAL

NAD Puget Sound was placed on the CERCLA NPL in 1994 and has been divided into five operable units (OU 1, OU 2, OU 3M, OU 3T-JPHC, and OU 3T-NHB) for the purpose of site investigations. In May 1995, OU 1 was established to address human health risk from terrestrial chemical impacts in soil and groundwater and ingestion of shellfish from Ostrich Bay. Concurrently, OU 2 was established to address potential chemical impacts on marine sediments in Ostrich Bay and any associated ecological risk to the marine environment. In 2000, OU 3 was added to address abandoned ordnance in both the marine and terrestrial environments. OU 3 includes MEC that may be present in the upland portions of JPHC and NHB or in the marine environment of Ostrich Bay. OU 3 was divided into two OUs. OU 3T encompasses the terrestrial portion of the JPHC and addresses potential environmental and human health exposure issues from potential DMM HE within the terrestrial portion of the former ammunition depot. OU 3M is the marine portion of JPHC and addresses potential environmental and human health exposure issues from potential DMM HE within the terrestrial portion of the former ammunition depot.

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6.0 SITE CHARACTERISTICS

OU 3T-NHB is located approximately 2 miles northwest of downtown Bremerton, Washington, along the western shore of Ostrich Bay. Its geographic position is longitude 122°41'28" and latitude 47°35'38". The site occupies approximately 50 acres on a hillside west of Ostrich Bay. The NHB property is greater than the extent of OU 3T-NHB and includes tidelands to a depth of 4 fathoms into Ostrich Bay. OU 3T-NHB comprises terrestrial uplands areas to the shoreline above MHHW. The portion of the NHB property between the MHHW line and 4 fathoms depth in Ostrich Bay is part of OU 3T-JPHC. The land surface elevations range from sea level to 140 feet above MSL. NHB consists of a hospital and support buildings. The site occupies the northern portion of the former NAD Puget Sound, an ammunition storage, assembly, and disassembly facility operated by the Navy from 1904 to 1959. Drinking water for NHB is supplied by the City of Bremerton public water system.

6.1 CONCEPTUAL SITE MODEL

The conceptual site model (CSM), which is graphically presented in Figure 6-1, focuses on the explosive hazards posed by munitions that are potentially present at the site in terms of the safety of residents, visitors, and workers. The CSM brings together environmental and human land use activities to illustrate the understanding of existing contaminant transport and exposure processes.

The item of concern at this site is explosively configured DMM equivalent to a 20-mm or larger projectile (DMM HE). The primary exposure pathways for potential DMM HE in soil are related to subsurface excavation. This excavation can be a result of construction for site development and infrastructure or building maintenance.

6.1.1 Primary Sources

The CSM is intended to encompass all potential past ordnance-related uses at the NHB site and the potential DMM HE exposure pathways associated with those uses. DMM was not disposed of at OU 3T-NHB. The primary release mechanisms were spillage and unintentional losses during the actions that occurred in the northern portion of the former NAD Puget Sound. The RI identified no evidence of intentional, systematic disposal or burial of DMM HE at OU 3T-NHB. An evaluation of production records and records of materials received at the depot indicates that the most common ordnance items at NAD Puget Sound included small-arms ammunition, 40-mm cartridges, 20-mm cartridges, 5-inch projectiles, 14-inch projectiles, and 14-inch bag charges.

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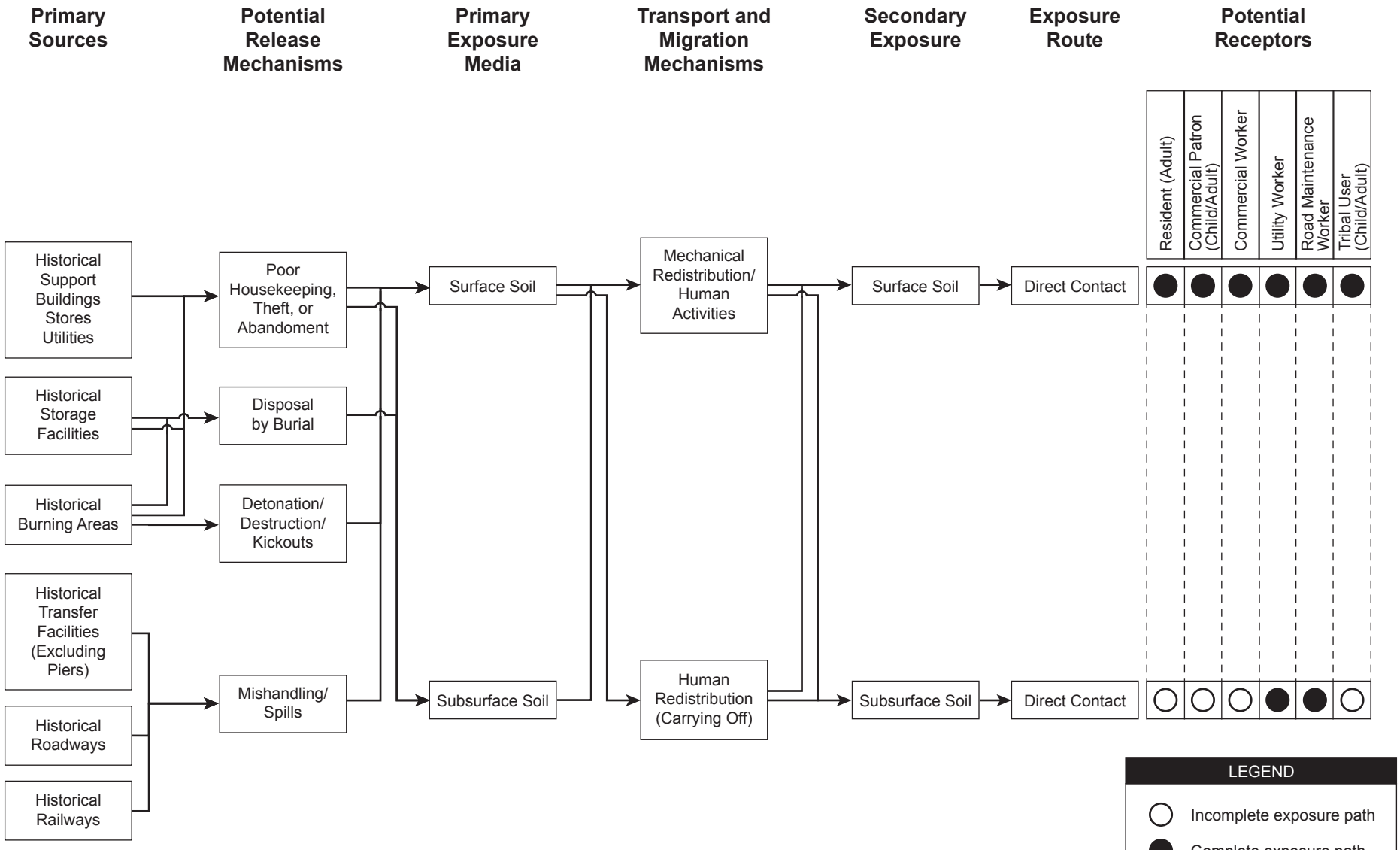

U.S. NAVY

Figure 6-1
Potential DMM HE Exposure Path Conceptual Site Model for OU 3T-NHB

Naval Hospital
Bremerton
OU 3T
ROD

6.1.2 Potential Release Mechanisms

The former trash-burning mound was the only area identified during the RI as having high concentrations of discarded items (346 canisters with a total weight of over 27,000 pounds). The canisters were determined to be an oxidizer and not DMM HE. DMM was not disposed of at the site. In the past, munitions may have been released from historical support and storage facilities as a result of spillage and unintentional losses. The available site information indicates no intentional, systematic burial or disposal of munitions within the boundaries of OU 3T-NHB. Two areas that were historically used to burn trash and munitions were identified within the OU 3T-NHB boundary. Historical transfer facilities and primary transport routes may have been the locations of mishandling or loss events in the upland area, but no definitive pattern of loss in such areas is evident based on an analysis of data gathered during past removal actions or RIs.

6.1.3 Potential Transport Mechanisms

Two DMM HE items identified at OU 3T-NHB were found at the surface. The other two DMM HE items were found at depths less than 4 feet. These two items were likely buried by naturally occurring processes or past site regrading. There is no evidence to indicate systematic, intentional burial of DMM.

Because the site grounds are currently maintained by professional groundskeepers, the potential for future migration of DMM HE items to the ground surface through soil erosion is very low. There is also a potential for shoreline erosion of near-shore beach deposits to expose buried DMM HE.

6.1.4 Potential Exposure Pathways

The DMM HE exposure pathways are typically incomplete for all the potential receptors. LUCs prohibit ground-disturbing activities at NHB, unless a dig permit is obtained prior to conducting any operation involving digging by residents, contractors, and visitors.

Construction and utility workers who regularly perform excavation activities are more likely to have complete exposure pathways to potential DMM HE in surface and subsurface soil. However, surface clearance of metallic items at NHB, implementation of munitions training for contractors, and the requirement that contractors obtain dig permits before conducting ground-disturbing activities have reduced the potential for complete exposure pathways to potential DMM HE in soil. Construction and utility workers also have the potential to work in areas where surface clearance and geophysical data collection have not been performed (e.g., under roadways and buildings). It has been determined that the potential to encounter munitions during utility maintenance in existing utility corridors is very low due to the level of past ground-disturbing activities. These ground disturbing activities resulted in removal of DMM items

found or determination that the area of action was clear of DMM items. Data gathered during the RI indicate a very low potential for encountering DMM in areas of the site that have been previously investigated. In addition, areas of the site that have not been investigated but have been previously disturbed through development (e.g., roads, buildings, etc.) also are believed to have a low potential for encounters with DMM.

6.1.5 Potential Receptors

The land use for the upland part of NHB is expected to continue as a naval hospital, and the wetland areas will continue to be federal property where the Navy may allow plant harvests.

Figure 6-1 identifies six categories of potential receptors at OU 3T-NHB and associated complete and incomplete exposure paths to potential DMM HE in soil.

Adult Residents

Residents at OU 3T-NHB are adults that are generally assigned temporary housing at the site. The BEQ houses Navy personnel associated with hospital operations. Adult residents are considered to have a complete exposure path for direct contact to potential DMM HE in surface soil. However, due to existing and proposed LUCs, adult residents do not have a complete exposure path to potential DM HE in subsurface soil.

Commercial Patrons

Commercial patrons are adult and child patients at the hospital and those accompanying patients. Commercial patrons are considered to have a complete exposure path for direct contact with potential DMM HE in surface soil. Due to existing and proposed LUCs, commercial patrons do not have a complete exposure path to potential DMM HE in subsurface soil.

Commercial Workers

Commercial workers are adults that work at the hospital as professional and support staff. Commercial workers are considered to have a complete exposure path to DMM HE in surface soil. Due to existing, and proposed LUCs, commercial workers do not have a complete exposure path to potential DMM HE in subsurface soil.

Utility and Road Maintenance

Utility and road maintenance workers are considered to be adults working under contract or are part of NBK Bremerton Public Works conducting a specific repair, upgrade, or new project at the site. These workers have the potential for subsurface digging in areas that have already been

disturbed, and therefore cleared of DMM HE at the site. They also have the potential for digging in areas that have not been previously disturbed. Utility and road maintenance workers are considered to have a complete exposure path to potential DMM HE in surface and subsurface soil.

Tribal User

Thirty-seven plant species found in the wetland and upland buffer areas are known to have Suquamish Tribe use. These uses may be medicinal, food, tools, or baskets and clothing. Suquamish representatives indicated that all but one of the plants with traditional uses would be harvested from above the ground. One plant would be harvested for its roots and would typically be dug up. Harvesting would require digging a few inches below the surface.

Suquamish Tribe members have expressed an interest in plant harvesting along the shoreline and uplands areas. Once base access has been requested and approved, these individuals would harvest plants. One plant species has the potential to be harvested for its roots, requiring digging to a maximum depth of approximately 6 inches. Since there has been 100 percent surface clearance, tribal users do not have a complete exposure path to potential DMM HE in surface soil. Surface clearance during the RI was conducted down to at least 6 inches. As a result, digging to 6 inches or less for plant harvest is considered to be within the cleared surface. Therefore, tribal users do not have a complete pathway to potential DMM HE in subsurface soil if they harvest the one plant of interest that requires a few inches of digging. However, current LUCs and those specified for the selected remedy (described in Section 12) will require MEC awareness education, which communicates potential hazards at the site and how to respond to a suspected MEC item, and an excavation permit.

6.2 PHYSICAL SETTING

Operable Unit 3T-NHB is located along the shore of Ostrich Bay. Operable Unit 3T-NHB is immediately adjacent to the tidelands of Ostrich Bay. The land surface elevations at NHB range from sea level to 140 feet above sea level.

Currently the NHB site consists of:

- OU 3T-NHB includes terrestrial uplands areas to the shoreline above MHHW
- 31.5 acres of the property occupied by the hospital, various support structures, and include 15.5 acres that are paved or used for buildings

- 6.5 acres consisting of parking lots, grassed fields, and the helipad on Elwood Point
- 12 acres, northern and northwestern portions, of the property that are undeveloped and heavily wooded
- 2.5-acre strip of land east of the hospital security fence containing portions of a very rare, protected wetland, which extends off the site to the north

Forty-four of the 50 acres are enclosed within a security fence. Access to this area is controlled by a manned gate. The remaining areas, situated outside the security fence, are under 24-hour surveillance by base security. All access to the fenced and unfenced portions of the site must be approved by base security.

Three wetlands have been identified at the NHB site (Figure 1-2). Wetland A is approximately 103 square feet in area. Wetland B is approximately 15,000 square feet in area and runs most of the length of the old rail bed. Wetland C is located along the northern half of the hospital's eastern shoreline and is part of a larger saltwater marsh that extends off site to the north along Ostrich Bay. This wetland is situated east of a 0.6-acre upland-wetland buffer area located adjacent to the NHB fence.

During 2011, the Navy conducted a characterization of Wetland C. The extent of Wetland C and the location of the boundary between saltwater and fresh water wetlands were identified during the 2011 characterization. The characterization also included a cultural plant survey where plants used by the Suquamish Tribe were identified. Wetland C contains both saltwater (estuarine) and freshwater wetlands. The saltwater portion of Wetland C is rated as a very rare Category I wetland within the Puget Sound lowland.

6.3 GEOLOGY

Soils at the site belong to the Alderwood series developed on recessional silty sand deposits. This soil layer, combined with fill, represents the uppermost geologic layer. The surface soils are underlain by Vashon recessional outwash deposits ranging from 5- to 30-feet thick. This is the uppermost water-bearing unit at the site and comprises silty sands and gravels deposited by glacial outwash. The underlying Vashon Till consists of a dense fine-grained, low-permeability matrix of silt with gravel and cobbles. The thickness of Vashon Till in the upland area ranges from 10 to 20 feet, and this unit is unknown in the lower areas of the site. The till is underlain by the Vashon advance outwash deposits, a silty fine-grained sand up to 250 feet thick. The depth to bedrock at JPHC is not known.

6.4 HYDROGEOLOGY

Surface water at JPHC occurs primarily as runoff from precipitation and lawn watering. Water that does not infiltrate the ground enters the storm sewer system and discharges to Ostrich Bay. Ostrich Bay is a navigable waterway and considered as Waters of the State of Washington.

A stream in the northwestern portion of the site flows north onto the adjacent NHB property. There are a number of seeps visible in the intertidal area at low tide. These seeps are representative of perched groundwater.

Drinking water for residents and visitors is provided by the City of Bremerton. Explosive hazards presented by potential MEC at OU 3T-NHB are not a contaminant of concern for groundwater. Chemical impacts from MEC were not identified at OU 3T-NHB. Future uses of groundwater are not anticipated to be affected by the current condition at OU 3T-NHB

It is anticipated that the site will continue to utilize existing the City of Bremerton public water system for drinking water in the future. The City of Bremerton water sources are the Union River Reservoir, approximately 5 miles southwest of JPHC, and groundwater from production wells located in the Bremerton area. All sources are managed in accordance with Washington State Department of Health, EPA regulations, and best management practices for water supply systems. The Bremerton water system serves about 55,000 people and the Bremerton Naval Complex. On average, the Bremerton water utility supplies about 8 million gallons each day.

6.5 ARCHAEOLOGICAL/CULTURAL RESOURCES, 2005 TO 2007

The Navy conducted three archaeological evaluations of the NHB site (AA/HRA 2005a, 2005b, 2005c). With the exception of a small area along the shoreline that could not be accessed because of water inundation and an area along the shoreline classified as a "high-probability" area for the presence of cultural resources, the conclusion of the analysis was that much of NHB could be reclassified as a "no-probability" area for hunter-fisher-gatherer resources. Associated with the site classification, separate archaeological resources protection plans (ARPPs) were prepared for no-probability areas (U.S. Navy 2007a) and low-, moderate-, and high-probability areas (U.S. Navy 2007b). The Suquamish Tribe and the Washington State Historical Preservation Office approved the classifications established by the evaluation and the ARPPs (U.S. Navy 2010a). To establish these classifications under Section 106, the Navy worked with the Suquamish Tribe using an existing Cooperative Agreement developed under a Memorandum of Agreement among the Tribe, Navy and U.S Army Corps of Engineers. In addition, the Navy also consulted the Washington State Historical Preservation Office.

A training program was implemented during the RI and TCRA for all Navy contractor and subcontractor employees to ensure that they were aware of the potential for encountering cultural resources. The training program was conducted in accordance with the ARPPs. No cultural resources were encountered during the RI or TCRA at OU 3T-NHB.

6.6 NATURE AND EXTENT OF DMM

The Navy has conducted an extensive amount of work at the site over almost 30 years of investigation and removal. The results confirm that there is a low potential for DMM HE at the site. As stated earlier, only four items of concern, DMM HE were found, during actions conducted prior to the RI.

The RI was conducted over the entirety of OU 3T NHB. During the surface clearance and intrusive investigation, no DMM HE was recovered. The former trash-burning mound was the only area identified during the RI as having high concentrations of discarded items (346 canisters with a total weight of over 27,000 pounds). The canisters were determined to be an oxidizer and not DMM HE.

During the RI, 11,997 subsurface electromagnetic anomalies were identified and 1,417 were selected for excavation (12.7 percent). No DMM HE items were identified during the RI. Based on results of the RI, there does not appear to be a clustering of DMM items in any one area which indicates that there was no intentional, systematic disposal or burial of DMM HE at this site. There do not appear to be clusters of items in the vicinity of the sites of the buildings used during the active life of NAD Puget Sound, along transportation corridors (i.e., the former railroad lines), or in the open areas identified from historic air photos.

The incidence, calculated by dividing the number of subsurface DMM HE finds by the number of terrestrial anomalies investigated equals 0.000167, which is less than the 0.0002 incidence rate established by the Navy/EPA project team as a low DMM HE incidence rate. This indicates that there is a low DMM HE incidence rate. The MEC HA indicates that there is a low potential for an explosive incident under current, and reasonably anticipated future land use. These metrics indicate that the site poses a low risk for DMM HE.

6.7 ACCESS LIMITATIONS

NHB is a secure naval hospital base, and civilian access is controlled. The site was fenced on the north, west, and south before 2005. To increase site security, the perimeter fence was extended along the east side of NHB in 2005. This fence encloses 44 acres of the 50-acre NHB.

7.0 CURRENT AND POTENTIAL FUTURE USES OF LAND AND RESOURCES

7.1 LAND USE AT OU 3T-NHB

OU 3T-NHB includes terrestrial upland areas to the shoreline above MHHW (Figure 7-1). It does not extend beyond the shoreline past the MHHW line and does not include intertidal areas of Ostrich Bay. To the west, north, and south, the OU boundary is coincident with the NHB property boundary. Private residences are present north of the OU boundary near the shoreline, and a wooded area is present north of the OU boundary offshore. Privately owned property is along the northern half of the western property boundary (Erlands Point Apartments). Jackson Park Elementary School is along the southern half of the western property boundary, and JPHC is located along the southern OU boundary. The land surface elevations range from sea level to 140 feet above MSL. The location of NHB is shown on Figure 1-1.

The primary land use at OU 3T-NHB is the 125-bed hospital, pharmacy, clinics, and support structures. The site also is the parent command for the deployable 500-bed Fleet Hospital Bremerton. Future land use at the site will continue as a naval hospital that supports the medical mission of the U.S. Department of Defense (DoD).

Within the 50 acres of NHB, 12 acres consist of a heavily wooded recreational area in the northern and northwestern portions of the property, and 6.5 acres are associated with parking lots, grassed fields, and the helipad on Elwood Point. The remaining 31.5 acres of the property are occupied by the hospital, various support structures, and associated grounds, and they include 15.5 acres of the site that are paved or occupied by buildings. The distribution of these land use areas at the NHB site are shown on Figure 7-1.

There are no family housing units or officer quarters at NHB. The only housing is provided by the BEQ, located in two buildings in the southwestern portion of NHB. These quarters offer dormitory-style housing for 98 single or geographically displaced married enlisted men and women while they are stationed at NHB.

The current and reasonably anticipated future land use for the Category I wetland area located east of the NHB fenced property is tribal plant harvests. Furthermore, the wetland will continue to be federal property where the Navy may allow tribal plant harvests. The remedial action objectives (RAOs) for OU 3T-NHB, management of the potential risk to human health from contact with an explosively configured DMM HE item, will allow access to the upland portion of the site as a hospital and access to the wetland areas for Suquamish tribal members to collect traditional plants. There are no prohibited land uses. Only administrative access requirements are required (e.g., excavation permits, MEC awareness training, or access requests).

Because of the site's historical use as an ammunition depot, the Navy has implemented a set of LUCs for the NHB site. The ongoing efforts to involve, inform, and educate NHB employees, site workers, residents, and the community includes community awareness materials and a mandatory construction safety orientation, including dig permits for all ground-disturbing activities.

There are no prohibited land uses at OU 3T-NHB.

7.2 ADJACENT/SURROUNDING LAND USES

The JPHC, which is located south of OU 3T-NHB, is a 232-acre parcel that has been a military housing development for over 45 years and is expected to remain as such into the future. East of OU 3T-NHB lies Ostrich Bay, which is within the Suquamish Tribe's usual and accustomed area and supports recreational use.

Portions of the northern, western, and southern areas of the former NAD Puget Sound have been transferred to the City of Bremerton for NAD Park, NAD Marine Park, and Jackson Park Elementary School; to the State of Washington for Route 3; and to private developers for the Erlands Point Apartments. Reasonably anticipated future land use at these locations is expected to remain the same into the future.

7.3 CURRENT LAND USE CONTROLS

LUCs are a combination of engineering and administrative controls that are intended to protect human health or minimize hazards. Engineering controls can be landfill caps, fences, and other physical barriers. Administrative controls can be legal controls, such as easements, restrictive covenants, and zoning ordinances, or site-specific procedures, such as special requirements for digging or accessing a site.

Current LUCs for NHB are as follows:

- A deed restriction upon transfer from federal ownership
- Emergency response using 911 for any discovery of DMM,
- A munitions education and awareness program
- Long-term MEC management by continuation of the dig permitting and munitions awareness process for any ground-disturbing activities, with an enhanced

education and munitions awareness training program for major ground-disturbing activities.

These LUCs were implemented to protect the potentially exposed populations, which include the following:

- Hospital workers and patients of and visitors to NHB (adults and children)
- BEQ residents
- Workers that come to NHB to perform excavation-related work (e.g., utility repairs requiring digging or trenching)
- Members of the Suquamish Tribe who may be using the wetland areas for collecting traditional plants

There are no prohibited land uses at OU 3T-NHB. The LUC boundary at OU 3T-NHB is the property boundary of NHB out to the MHHW line along the shore. Figure 7-1 shows the LUC boundary at OU 3T-NHB.

The Naval Ordnance Safety and Security Activity (NOSSA) has been granted oversight authority by Department of Defense Explosives Safety Board (DDESB) for all technical plans and policies associated with explosives safety and oversight of Navy ships and facilities. As such, NOSSA is responsible for determining the degree of hazard due to DMM HE at NHB. NOSSA has stated that within OU 3T-NHB there is a low probability of encountering DMM HE. NOSSA has reviewed the data from NHB and specified the following requirements for the NHB site:

- Maintain the current program requiring munitions education and awareness program for NHB public works personnel and their contractors during the excavation permitting process.
- Maintain the current munitions education and awareness program for NHB staff and BEQ residents.
- Remove the requirement that an EOD technician be on site whenever intrusive (i.e., ground-disturbing activities) are underway, but if a MEC or MPPEH item is discovered, notify on-call EOD technician support of the "find."

NBK Instruction 8020.1B (*Implementation of Land Use Controls (LUCs) Applicable to Explosives Safety Management for Jackson Park Housing Complex [JPHC])*, dated 21 September 2012, implements these LUCs for JPHC, including NHB.

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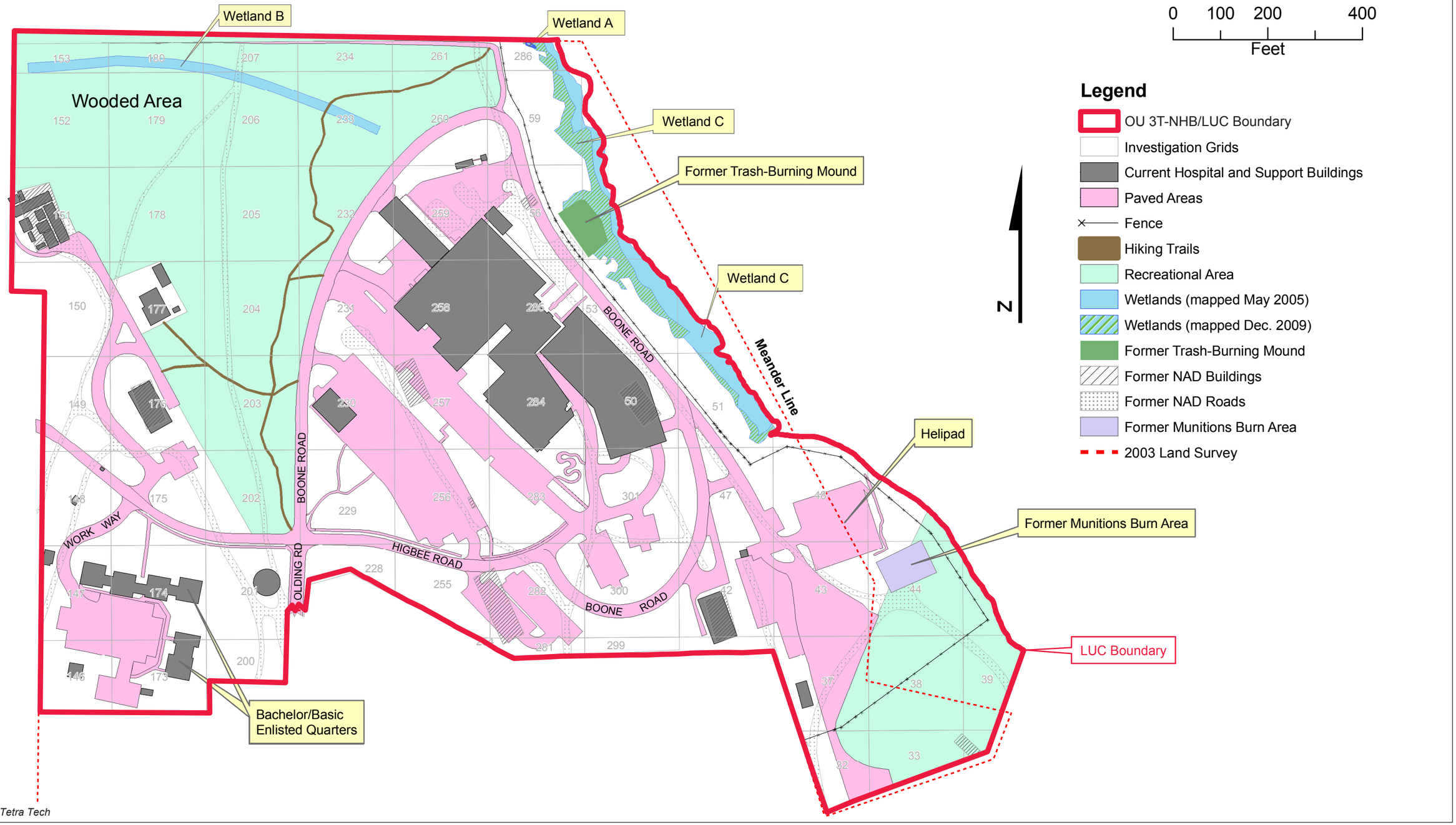

Source: Tetra Tech

U.S. NAVY	Naval Hospital Bremerton OU 3T ROD	**Figure 7-1** **Current Land Uses at OU 3T-NHB and LUC Boundary**

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8.0 SUMMARY OF SITE HAZARDS AND RISKS

8.1 HAZARDS AND RISKS

The exposure hazard and contaminant of concern addressed at OU 3T-NHB is the potential explosive hazard from DMM HE. DMM HE may be present as a result of the site's past history as NAD Puget Sound. Based on the MEC HA Analysis, NOSSA evaluation, and the recorded incident rate (number of subsurface DMM HE item locations divided by the number of investigated anomalies), there is a "low probability" for subsurface DMM HE exposure at OU 3T-NHB.

There is no regulatory standard that defines the acceptable quantitative minimum exposure level for DMM HE. The goal is to eliminate all potential contact with the DMM items; however, a variety of technical and practical factors make attaining such a goal with absolute certainty impossible. In the absence of a quantitative model for defining explosive hazards at the site, site hazards are described on a qualitative basis.

A qualitative evaluation of the finds data from 14 locations where magnetic anomalies were identified and investigated from 1995 to the present, combined with the investigation and removal of surficial items from 100 percent of the site, indicates that there appears to be no significant risk due to DMM HE at NHB, especially because DMM HE has been found at only four locations.

A quantitative evaluation of the potential hazard at the site was conducted using the MEC HA methodology (USEPA 2006) for determining munitions risk, which was developed by a task force chaired by the EPA and composed of representatives from the DoD, the Department of the Interior, the Association of State and Territorial Solid Waste Management Officials, and the Tribal Association for Solid Waste and Emergency Response. The MEC HA uses a series of numeric inputs associated with nine distinct severity input factors to categorize the risk at a particular site in terms of four distinct HA output categories.

The MEC HA was conducted during the development of the RI work plan (U.S. Navy 2007c) and resulted in a score of 575 (Output Category 3), which represents a low potential for an explosive incident under current use conditions. After the RI was completed, the MEC HA was reevaluated to gauge the probable benefit (decrease in residual risk) that resulted from the surface and subsurface clearance activities conducted at NHB.

The MEC HA evaluates the explosive hazard associated with surface and subsurface exposures strictly on the basis of whether a 100 percent clearance effort has been successfully performed. The surface clearance was completed for 100 percent of the accessible areas of the site; therefore, a decrease in risk was realized. The results of the intrusive investigation conducted during the RI at NHB demonstrate a "low probability" for subsurface DMM HE exposure at the site, with a

high degree of statistical confidence. 6055.09-STD, Chapter 12.4.3.2.1.1 (USDoD 2008) describes "low probability" as follows: "A 'low probability' determination may be assigned to those areas for which a search of available historical records and onsite investigation data indicate that, given the military or munitions-related activities that occurred at the site, the likelihood of encounter with MEC or Chemical Agent (CA), regardless of the CA configuration, is low."

It should be noted that, the MEC HA is not suited to consider the degree of confidence associated with statistically based DMM removal actions (i.e., the intrusive investigation). For this reason, the subsurface investigation conducted at NHB from 2008 to 2009 produced no change in the MEC HA score.

However, despite the lack of sensitivity to the subsurface clearance, the post-RI MEC HA output score for this site was reduced to 410 (Output Category 4). This score is lower than the pre-RI score (575) primarily because of the reduction in potential contact hours (U.S. Navy 2010a). The pre-RI contact hours were in the second to the highest category based on the potential for a worker or patient to encounter a surficial item. Post-RI encounters are limited to subsurface activities resulting in the reduction of the potential contact hours to the lowest hazard category. This reduced classification characterized NHB under "sites with a low potential for an explosive hazard condition under current and reasonably expected and appropriate future use conditions" (USDoD 2008).

Because the MEC HA was not designed to evaluate the potential risk reduction resulting from the subsurface clearance performed during the RI or to weigh the subjective value of the RI data, it provides a very conservative evaluation of the potential residual risk remaining at OU 3T-NHB. However, even with the above considerations, the MEC HA indicates that based on the post-RI conditions, the site scores in the lowest hazard category (U.S. Navy 2010a).

At sites where it has been determined that there is a low probability of an encounter with MEC (such as OU 3T-NHB), the DDESB allows the use of on-call construction support as a response action to any item suspected of being DMM encountered at that site. Given the low probability of an encounter with MEC at the NHB site, NOSSA concluded that on-call construction support may be removed from the dig permitting process (U.S. Navy 2010a). This is consistent with the process followed at JPHC, adjacent to NHB.

The TCRA at the former trash-burning mound along the shoreline of NHB was intended to reduce the likelihood of contact with DMM HE potentially present in the mound. As a result of the TCRA, the soil mound has been removed. In total, 1 DMM Pyro item, 6,613 MPPEH items, and 49,675 metallic items were removed from NHB along with 2,028 tons of nonhazardous mound soil. The potential risk to human health, human welfare, and the environment has been reduced. The potential for contact with DMM HE present in the mound along the shoreline has been eliminated.

8.2 BASIS FOR ACTION

Three DMM HE items were removed from the site, and one was blown in place prior to completion of the RI. Data from the RI and evaluation of the residual explosive risk at the site indicate there is a low explosive hazard remaining at NHB. No DMM HE item was found during the RI. The low probability of encountering DMM HE is based on the four pre-RI finds. This low probability is the basis for LUCs. The response action selected in this ROD, LUCs, is protective of human health and the environment.

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9.0 REMEDIAL ACTION OBJECTIVES

RAOs were developed for NHB to protect human health and the environment in consideration of the reasonably anticipated future land uses. The RAOs consider the contaminants and media of concern, exposure routes and receptors, and acceptable contaminant levels. In the case of DMM HE, there is no chemical "contaminant level" that is typically a basis of action or an RAO action objective at other CERCLA sites.

The RAO is based on the potential for exposure to explosive DMM HE and subsequent contact with DMM HE causing injury or mortality. The RAO for OU 3T NHB is the management of the potential risk to human health from contact with an explosively configured DMM HE item.

9.1 FUTURE LAND USES

The reasonably anticipated future land use for the upland part of NHB is expected to continue as a naval hospital, and the wetland areas will continue to be federal property where the Navy may allow tribal plant harvests.

9.2 CONTAMINANTS OF INTEREST

As agreed to by the project team during development of the RI work plans, the contaminant of interest is an explosively configured item (DMM items with HE) equivalent to a 20-mm projectile or larger.

For this ROD, the principal media of potential concern relative to explosives safety are the surface and subsurface soils. The exposure route of concern for the future site users is direct contact with DMM HE.

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10.0 DESCRIPTION OF ALTERNATIVES

This section presents the remedial alternatives that were evaluated in the OU 3T-NHB RI/FS (U.S. Navy 2010a). They were developed on the basis of the findings of the RI, the decision rules identified in the RI work plan, input provided to the project team by EPA, and the Suquamish Tribe, and comments submitted to the Navy by the general public.

10.1 ALTERNATIVE 1 – NO FURTHER ACTION FOR DMM BASED ON PREVIOUS INVESTIGATION AND REMOVAL ACTIONS

Alternative 1 provides a baseline against which to compare the performance and effectiveness of the other alternatives. The no further action (NFA) alternative is required by the CERCLA process. It assumes that no LUCs other than deed restrictions would be in effect and that no additional regulation-driven activities or steps would be taken to locate, remove, or dispose of any potential DMM, MPPEH, or non-munitions scrap. Under this alternative, the existing baseline LUCs for NHB (including the education/awareness programs and dig permitting process) would be discontinued.

10.2 ALTERNATIVE 2 – LAND USE CONTROLS AND LONG-TERM MANAGEMENT

Alternative 2 assumes that the NHB area would remain in its current land use, with no additional activities or steps taken to locate, remove, or dispose of any potential munitions. It assumes that the potential explosives hazard would be adequately controlled by the existing LUCs, which include deed restrictions if the property is transferred to another entity, implementation of the education/awareness program, long-term management (LTMgt) of the site through continued implementation of the existing dig permitting process that includes munitions-related awareness and education for utility workers and contractors. An enhanced munitions-related awareness and education training program for personnel supervising major ground-disturbing projects would also be provided.

In accordance with current NOSSA guidance, an on-call service is in place to support intrusive construction activities under the current set of LUCs. Based on past experience, the likelihood of an encounter with DMM during the course of activities associated with current and reasonably anticipated future land uses is low. In the event that potential DMM items are encountered, the need for additional explosive hazard management measures (e.g., on-site construction support for avoidance, geophysical investigation, etc.) would be evaluated as the situation warrants using established Navy procedures (e.g., the latest versions of NOSSA Instruction 8020.15 [U.S. Navy

2009b] and NAVSEA OP 5 [U.S. Navy 2009c]). It is assumed that the munitions awareness program and other LUCs would be continued for a 50-year period.

10.3 ALTERNATIVE 3 –LAND USE CONTROLS AND LONG-TERM MANAGEMENT DESCRIBED IN ALTERNATIVE 2 PLUS UXO OVERSIGHT FOR GROUND-DISTURBING ACTIVITIES PERFORMED AS MILCON PROJECTS IN UNDEVELOPED AREAS AT NHB

Alternative 3 includes maintenance of the existing LUCs and LTMgt program and procedures as described for Alternative 2. The LTMgt program for Alternative 3 adds on-site personnel with UXO technician training to provide oversight for ground-disturbing construction projects in currently undeveloped areas of NHB. The UXO technician oversight would apply to MILCON projects that exceed a current threshold value of $750,000. The UXO oversight would apply to land clearing, removal of roots and stumps (grubbing), and removal or grading of soils and any related ground-disturbing work. As part of the construction oversight work, anomalies that have been identified within a construction footprint would be excavated using the techniques that were used in the RI. Construction support would be provided in accordance with DoD 6055.09 STD, Chapter 12 (USDoD 2008).

Implementation of this alternative assumes that the existing geophysical data would be sufficient to identify the location and number of anomalies present in the area to be developed. The investigation and removal of detected anomalies would be performed using techniques implemented during the RI (U.S. Navy 2010a).

10.4 ALTERNATIVES 4A AND 4B – REMOVAL OF 100 PERCENT OF ANOMALY ITEMS IN ONE UPLAND GRID (GRID 233) PLUS LUCS AND LONG-TERM MANAGEMENT DESCRIBED IN ALTERNATIVES 2 OR 3

Under Alternative 4, 100 percent (73) of the anomalies remaining within a 200-foot-square grid centered on the former location of a Coast Guard 1-pounder casing recovered near the center of Grid 233 would be intrusively investigated by excavation and visual inspection. The 200-foot-square area to be investigated is shown on Figure 10-1. If a DMM HE item is discovered near the perimeter of the investigation area (i.e., within 25 feet of the perimeter), additional anomaly sites within a 100-foot-wide area adjacent to the 200-foot-square grid would be investigated. These additional investigation areas (step-out areas A, B, C, D, F, G, H, and I) are also shown on Figure 10-1.

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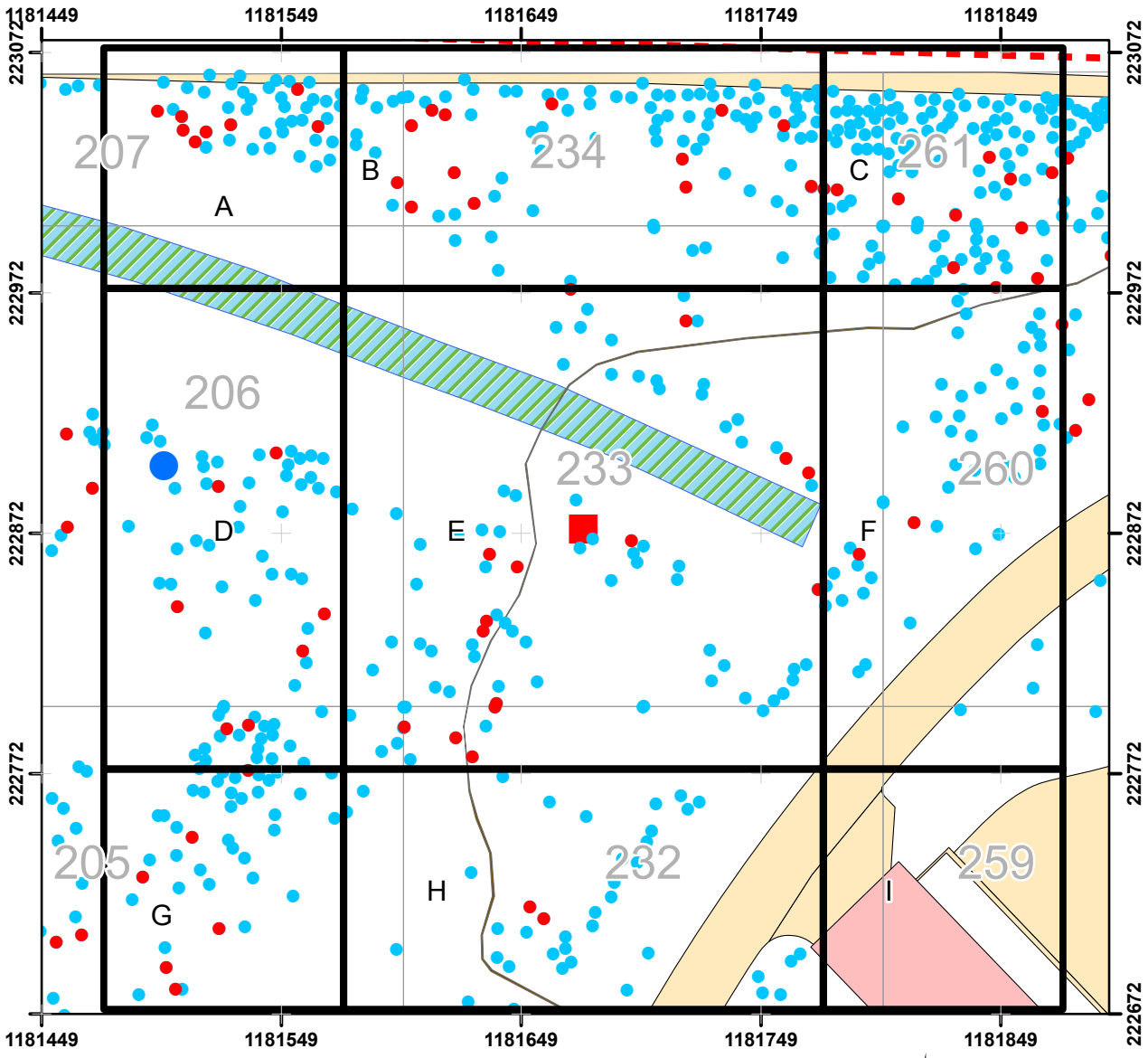

Zone	Total Number of Anomalies	Number of Anomalies Investigated
A	45	8
B	102	13
C	121	11
D	67	7
E	88	15
F	55	4
G	41	6
H	39	2
I	0	0

Legend

- 2003 Land Survey
- Investigated Anomalies
- Detected Anomalies
- DMM-SA
- DMM-PYRO
- DMM-HE
- Investigation Grids
- Buildings
- Roads
- Hiking Trails
- Wetlands
- Investigaton Grid and Stepouts

N

0 20 40 80
Feet

Source: Tetra Tech

U.S. NAVY	**Figure 10-1** **Area of DMM Clearance under Alternative 5**	Naval Hospital Bremerton OU 3T ROD

Grid 233 includes a portion of the former railroad grade, which has been identified as Wetland B. This area was not investigated in the RI, and there are no plans for an investigation if Alternative 4 is implemented, even if step-out areas are identified.

Alternative 4A combines the intrusive investigation with the LUCs and LTMgt identified for Alternative 2. Alternative 4B combines the intrusive investigation with the same LUCs and LTMgt identified for Alternative 3. Alternative 4 assumes that the munitions awareness program and other LUCs in Alternatives 2 or 3 would be continued for a 50-year period.

10.5 ALTERNATIVES 5A AND 5B – REMOVAL OF 100 PERCENT OF ACCESSIBLE ANOMALY ITEMS IN UPLANDS-WETLANDS BUFFER PLUS LUCS AND LONG-TERM MANAGEMENT DESCRIBED IN ALTERNATIVES 2 OR 3

Alternative 5 applies a treatment component to the uplands-wetlands buffer area east of the NHB security fence between the helipad and the northern NHB boundary. This 0.6-acre area is situated between the eastern NHB security fence and Wetlands A and C, which were determined to be contiguous during the wetland boundary survey in December 2009. The boundary of the uplands-wetlands buffer was shifted slightly based on the 2011 wetland delineation survey. The area of the uplands-wetlands buffer is shown on Figure 10-2.

The anomalies present in the uplands-wetlands buffer area would be removed by hand or mini-excavator during the implementation of Alternative 5. The goal would be 100 percent removal of remaining anomalies, which would require digging in 92 anomaly locations. However, the alternative would be implemented in a manner to avoid intrusive operations that could damage trees that are larger than 6 inches in diameter. The locations of the trees relative to the anomalies are shown on Figure 10-2.

A wetlands survey that complies with state/federal guidelines would be performed before this alternative is implemented, and a mitigation and restoration plan would be developed. No intrusive work would be performed in the wetlands; however, the anomaly removal operation would be conducted in a manner to remove nonnative vegetation from the uplands-wetlands buffer area and replant the affected areas with native vegetation to help improve the area as a wetland buffer.

In conjunction with the wetlands survey, the area would be assessed for archeological resources, and any areas in which archeological resources are noted would be excluded from the intrusive investigation.

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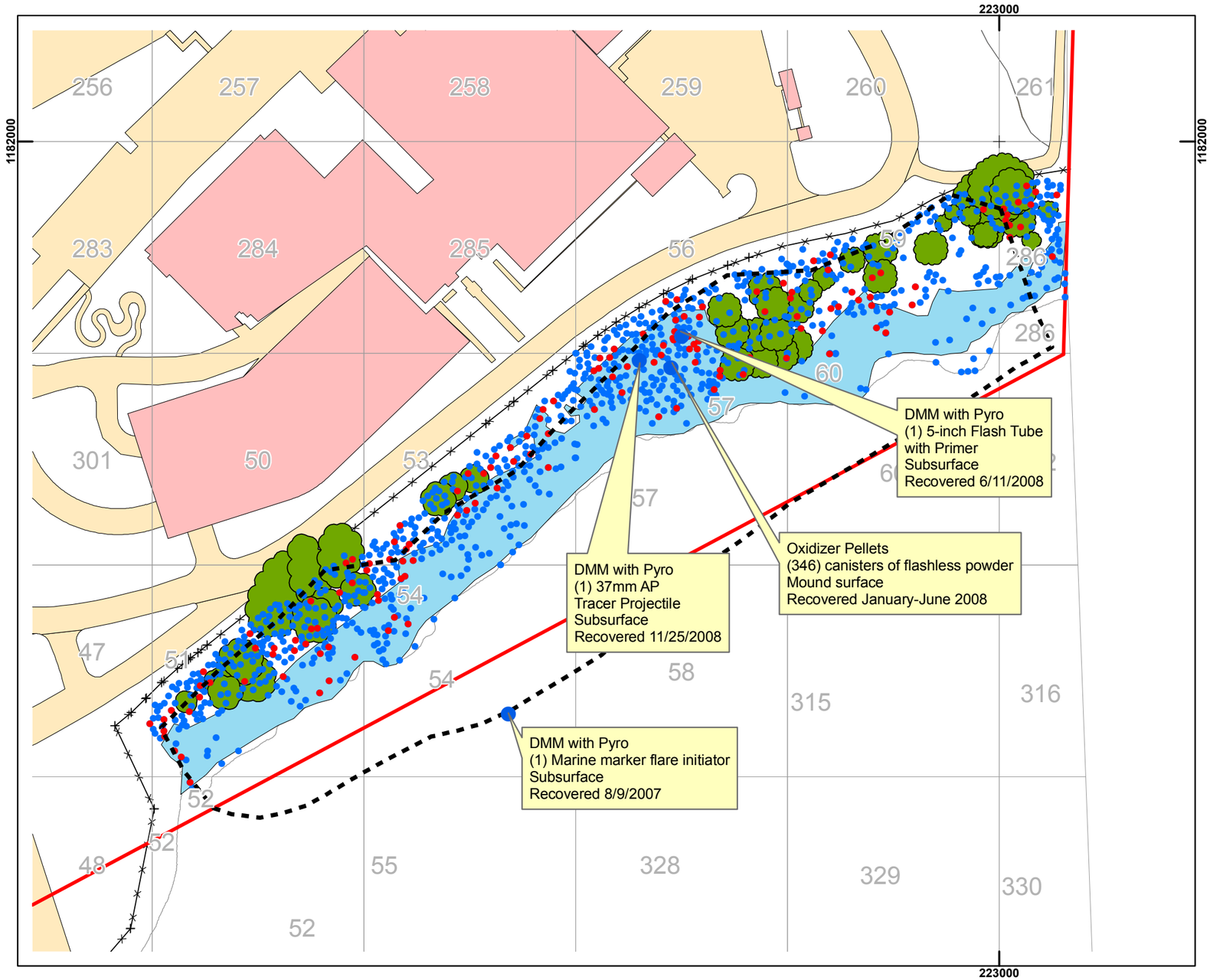

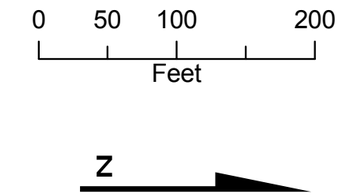

Legend

- 2003 Land Survey Meander Line
- DMM-PYRO
- Investigated Anomalies
- Detected Anomalies
- Trees
- Wetlands
- Investigation Grids
- Buildings
- Grids
- Roads
- Hiking Trails
- Fence
- Approximate boundary of high-probability zone for hunter-gatherer resources

Coordinate System: Washington State Plane North
Datum: NAD 83
Units: Feet

Source: Tetra Tech

U.S. NAVY	Naval Hospital Bremerton OU 3T ROD	**Figure 10-2** **Area of DMM Clearance Between the Security Fencing and Ostrich Bay**

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Alternative 5A combines the intrusive investigation with the LUCs and LTMgt identified for Alternative 2. Alternative 5B combines the intrusive investigation with the same LUCs and LTMgt identified for Alternative 3. Alternative 5 assumes that the munitions awareness program and other LUCs and LTMgt would be continued for a 50-year period.

10.6 ALTERNATIVES 6A AND 6B – REMOVAL OF 100 PERCENT OF ACCESSIBLE ANOMALY ITEMS IN UPLANDS-WETLANDS BUFFER, HAND REMOVAL OF ANOMALIES IN WETLANDS A AND C, PLUS LUCS AND LONG-TERM MANAGEMENT DESCRIBED IN ALTERNATIVES 2 OR 3

Alternative 6A consists of the hand removal of accessible anomalies in Wetlands A and C, the intrusive investigation and removal of accessible anomalies in the uplands-wetlands buffer as described for Alternative 5, and the LUCs and LTMgt identified for Alternative 2. Alternative 6B includes the intrusive components of 6A and the LUCs and LTMgt program identified for Alternative 3. Alternative 6 assumes that the munitions awareness program and other LUCs and LTMgt for Alternative 2 or 3 would be continued for a 50-year period.

The locations of mapped anomalies in the wetlands are shown on Figure 10-2. During the 2011 wetland delineation survey, 965 remaining anomalies were identified in the combined wetlands and uplands-wetlands buffer areas. Approximately 193 of these anomalies are within the tree root zones identified by the canopy drip line, making them inaccessible. Under Alternative 6, the intrusive investigations to remove 100 percent of the remaining anomalies (described for Alternative 5) would be performed by hand or with at track-mounted mini-excavator, as necessary. The maximum depth of the intrusive excavation would be 4 feet.

A wetlands identification and evaluation survey would be performed before Alternative 6 is implemented. The wetlands survey would include methods for mitigating the impacts of the hand excavation and a wetland restoration and enhancement plan. After the excavation work is completed, the wetlands would be restored by the replacement of soils in the excavations, and native wetland vegetation would be planted. The wetlands survey would also include an evaluation of excavation methods to be used during the investigation and an evaluation of the dewatering program on the wetlands.

In conjunction with the wetlands survey, the area would be assessed for archaeological resources, and any areas in which archaeological resources are noted would be excluded from the intrusive investigation.

Alternative 6 has the potential for substantial impacts on the estuarine wetland. If adverse effects on the wetlands cannot be avoided, measures to restore the wetlands would be required. Full restoration of a wetland generally takes many years, and complete restoration cannot be ensured. In addition, this area has a high likelihood for the presence of archaeological resources.

10.7 ALTERNATIVES 7A AND 7B –REMOVAL OF 100 PERCENT OF ACCESSIBLE ANOMALY ITEMS IN UPLANDS-WETLANDS BUFFER, MACHINE REMOVAL OF ANOMALIES IN WETLANDS A AND C, PLUS LUCS AND LONG-TERM MANAGEMENT DESCRIBED IN ALTERNATIVES 2 OR 3

Alternative 7 differs from Alternative 6 only in terms of the method to be used for the intrusive investigation within the wetlands. A barge-mounted full-size excavator (trackhoe on a swamp buggy) would be mobilized to the site for use in the intrusive investigation. Use of the swamp buggy would allow excavation without the constraints of the tidal cycle, eliminate the need for visual examination of the excavation by UXO technicians, and minimize the impacts of excavation slumping. This approach was successfully used in the intertidal investigation of OU 3T-JPHC.

The use of a trackhoe is expected to disturb a larger area during the investigation than the area that would be disturbed by hand (or mini-excavator) excavation techniques (Alternative 6). A wetlands identification and evaluation survey would be performed before Alternative 7 is implemented. The wetlands survey would include methods for mitigating the impacts of the trackhoe excavation and a wetlands restoration and enhancement plan.

A wetland archeological survey would also be performed before the intrusive investigation. As with Alternative 6, any areas in which archeological resources are identified would be excluded from the intrusive investigation.

After the excavation work is completed, the wetlands would be restored as described for Alternative 6. Full restoration of a wetland generally takes many years, and complete restoration cannot be ensured. In addition, this area has a high likelihood for the presence of archaeological resources.

Alternative 7A consists of the machine excavation of anomalies in the wetlands, the intrusive investigation and removal of accessible anomalies in the uplands-wetlands buffer as described for Alternative 5, and the LUCs and LTMgt identified for Alternative 2. Alternative 7B includes the LUCs and LTMgt program described for Alternative 3. Alternative 7 assumes that the munitions awareness program and other LUCs and LTMgt for Alternative 2 or 3 would be continued for a 50-year period.

11.0 COMPARATIVE EVALUATION OF ALTERNATIVES

The seven alternatives were subjected to a detailed evaluation in terms of nine NCP criteria (USEPA 1988), which are divided into three weighted areas: threshold criteria, balancing criteria, and modifying criteria. The threshold criteria relate directly to legal requirements:

- Overall protection of human health and the environment
- Compliance with ARARs

The alternatives must meet the threshold criteria in order to be selected.

The balancing criteria distinguish and measure differences between alternatives:

- Long-term effectiveness and permanence
- Reduction in toxicity, mobility, and volume
- Short-term effectiveness
- Implementability
- Cost

These five criteria were used to consider and scale the different strengths and weaknesses of the alternatives relative to one another. A graphical representation of the comparative evaluation of the seven alternatives using the threshold and balancing criteria is shown on Figure 11-1.

The modifying criteria are evaluated throughout the remedy selection process, but most directly through formal and informal comment periods:

- Acceptance by appropriate state agencies or agencies with jurisdiction over affected resources

- Community acceptance

No public comment on the proposed plan was received.

11.1 OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

This threshold criterion evaluates a remedial alternative's ability to provide adequate protection of human health and the environment and how potential explosives hazards are eliminated or reduced through treatment, engineering controls, or institutional controls. The overall protection

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	1 For MEC Based on Previous Investigation and Removal Actions	2 Land Use Controls and Long-Term MEG Management	3 UXO Oversight for Ground Disturbing MILCON Activities in Undeveloped Areas Plus Alternative 2	4A Removal of 100% Anomalies in Upland Grid 233 Plus Alternative 2	4B Removal of 100% Anomalies in Upland Grid 233 Plus Alternative 3	5A Removal of 100% Accessible Anomalies in Uplands-Wetlands Buffer Plus Alternative 2	5B Removal of 100% Accessible Anomalies in Uplands-Wetlands Buffer Plus Alternative 3	6A Hand Excavation of Remaining Anomalies in Wetlands A and C Plus Alternative 5A	6B Hand Excavation of Remaining Anomalies in Wetlands A and C Plus Alternative 5B	7A Machine Excavation of Remaining Anomalies in Wetlands A and C Plus Alternative 5A	7B Machine Excavation of Remaining Anomalies in Wetlands A and C Plus Alternative 5B
Overall Protection of Human Health & the Environment (a)	Adequate	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good
Compliance with ARARs	Good	Good	Good	Good	Good	Good	Good	Adequate	Adequate	Poor	Poor
Long-Term Effectiveness (b)	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good
Reduction of Toxicity, Mobility & Volume	Good	Good	Good	Good (c)	Good (c)	Good	Good	Good	Good	Good	Good
Short-Term Effectiveness	Superior	Superior	Good	Good	Good	Good (d)	Good (d)	Poor (e)	Poor (e)	Poor (e)	Poor (e)
Implementability (f)	Poor	Superior	Excellent	Excellent	Excellent	Good (d)	Good (d)	Poor (e,g)	Poor (e,g)	Poor (e,g)	Poor (e,g)
Total Cost	Superior	Superior	Adequate	Superior	Adequate	Superior	Adequate	Good	Poor	Good	Poor
Cost (present worth)	$0	$2,440,000	$9,440,000	$2,930,000	$9,930,000	$3,530,000	$10,530,000	$4,580,000	$11,580,000	$4,280,000	$11,280,000

Poor
Adequate
Good
Excellent
Superior

(a) Based on past removal actions and 100 percent surface clearance of accessible areas.

(b) Anomaly removals do not present a statistically significant reduction in risk, and there is a low incident rate of recovered DMM for past removal actions

(c) No removal action has been completed in the area where DMM was found (Grid 233)

(d) Based on low site-wide reduction in anomalies

(e) Based on low site-wide reduction in anomalies, high risk to worker safety, and short-term wetland damage

(f) Does not include shielding for associated removal alternatives

(g) Not implementable due to Executive Order 11990

U.S. NAVY

Figure 11-1
Comparative Evaluation of Alternatives

Naval Hospital
Bremerton
OU 3T
ROD

achieved by a proposed alternative is measured in terms of the alternative's short- and long-term effectiveness and compliance with ARARs in reducing unacceptable hazards associated with the site.

Because of the low risk indicated by the results of the RI and TCRAs, the low risk associated with the site based on the MEC HA, and the NOSSA determination of explosive safety, Alternative 1 was determined to achieve an adequate degree of protection of human health and the environment, and Alternatives 2 through 7 were determined to achieve a "good" degree of protection of human health and the environment.

Because the likelihood of encountering DMM items at the site is very low, even without further removal actions, Alternative 1 provides adequate protection of human health and the environment. However, Alternative 1 is not consistent with NOSSA's recommendation of continuing a program of munitions education and awareness.

Alternative 2, including deed restrictions, two-level education and awareness program, dig permitting process, and on-call UXO technician support is considered more protective of human health and the environment than Alternative 1. The continued use of the education and awareness program would provide a general level of awareness of the site's past history as NAD Puget Sound and more widespread knowledge about the proper procedures to follow in the unlikely event of an encounter with a potential DMM HE item. The permitting process for any digging provides specific requirements for contractor awareness training. To further increase the protectiveness of human health and the environment, an enhanced training program would be provided for personnel responsible for overseeing major construction that requires digging at NHB.

Because Alternative 2 is a component of Alternatives 3 through 7 (including the "A" and "B" variations), the Alternative 2 level of protectiveness becomes the standard of comparison. Alternative 2 is protective of human health and the environment based on the low potential DMM HE risk at the site. Given the low potential for DMM HE at the site, implementation of Alternatives 3 through 7 is not expected to result in a quantifiable reduction in the current low-risk conditions at the site. In addition, if digging is to be performed at the site and DMM HE is encountered, removal would be required under Alternative 2 by the LUCs described therein. Based on this evaluation, there is no difference in the overall protection of human health and the environment provided by Alternatives 2 through 7, and all of the alternatives provide "good" protection. This assessment for Alternatives 5 through 7 (A and B) assumes that full wetland function can be restored. Digging in wetlands can cause temporary to permanent loss of function. It is possible that the restoration required under Alternatives 5 through 7 would not be effective in fully restoring the wetland functions.

11.2 COMPLIANCE WITH ARARS

This threshold criterion is used to determine how each proposed alternative complies with applicable or relevant and appropriate federal and state statutory requirements (as defined in CERCLA Section 121), or whether a waiver is required and how it is justified. The assessment also addresses information from advisories, criteria, and guidance that the lead and support agencies designate as to be considereds (TBCs). Three classes of ARARs were addressed in the FS: chemical-specific, location-specific, and action-specific ARARs. The ARARs determined to be potentially applicable or applicable to OU 3T-NHB are summarized in Tables 11-1 through 11-3.

The success of any wetland mitigation decreases as the scale of excavation increases. Alternatives 2, 3, 6, and 7 have the potential to cause damage in the wetland. However, excavation under Alternatives 2 and 3 are likely to be targeted, occur during individual DMM HE identifications, and would be isolated. Excavation under Alternatives 6 and 7 would be at a much larger scale.

Chemical-Specific ARARs

Chemical-specific ARARs (Table 11-1) set health or risk-based concentrations in environmental media (i.e., soil, sediment, groundwater, and surface water) for specific hazardous substances, pollutants, or contaminants.

Chemical-specific ARARs for this decision are the following:

- Clean Water Act
- Water Pollution Control Act

No chemical release to the environment has been identified relative to munitions at OU 3T-NHB. There is the potential for chemical-specific ARARs to be applicable if a DMM HE item is identified at the site and that DMM HE item is breached or leaking, or requires blow in place to render the item safe. Under these circumstances, the chemical-specific ARARS would apply and the site would need to be cleaned up under the federal and state requirements specified in Table 11-1. Under this condition, all alternatives would be subject to chemical-specific ARARs and all alternatives would comply with ARARs.

Location-Specific ARARs

Location-specific ARARs are summarized in Table 11-2. Location-specific ARARs set restrictions on activities within geographic areas, such as wetlands, floodplains, and shorelines, and potential impacts to fish, wildlife, habitat, and cultural resources depending on the location

Table 11-1
Potential Chemical-Specific ARARs

ARAR	Citation	Description	Comment
Federal			
Clean Water Act	33 USC Section 314, 1251–1387; 40 CFR 100–149; 40 CFR 401 et seq.; 33 USC Section 304	The objective of the Clean Water Act is to restore and maintain the chemical, physical, and biological integrity of the nation's waters. Section 304 requires the attainment of water quality criteria where they are relevant based on the designated water use. Levels are provided for the protection of human health and aquatic life.	The Clean Water Act regulations most likely to apply to MEC response actions include migration of MEC-related contaminants (e.g., items broken open or leaking) in proximity to surface water, permitting for direct discharges into surface waters, standards for indirect discharges into surface waters, control of discharges of dredge and fill materials into surface waters, control of sediment migration from intertidal clearance operations, and stormwater management requirements.
State			
Water Pollution Control Act	Chapter 90.48 RCW; Surface Water Quality Standards (Chapter 173-201A WAC); Chapter 173-201A-070 (WAC)	Substances may not exceed specified standards for both fresh and marine waters for parameters such as inorganics, hydrocarbons, and toxic substances.	Applicable because the potential exists for MEC chemical releases to occur if a breached or leaking item is found, because the excavation of soil or intertidal sediment could increase turbidity or runoff, and heavy equipment could leak petroleum products, which could affect the water quality of Ostrich Bay or other surface water and groundwater.

Notes:
ARAR - applicable or relevant and appropriate requirement
CFR - Code of Federal Regulations
MEC - munitions and explosives of concern
RCW - Revised Code of Washington
USC - United States Code
WAC - Washington Administrative Code

Source: U.S. Navy 2010a

Table 11-2
Location-Specific ARARs

ARAR	Citation	Description	Comment
Federal			
Federal Water Pollution Control Act and Rivers and Harbors Act	40 CFR 320.1 et seq., 401, 404 et seq., 33 USC 1314; 320, 323, 40 CFR Part 230; Section 10 (33 USC 403); 33 CFR Parts 320, 322	Establishes criteria for evaluating effects on waters of the United States (including wetlands) and sets factors for considering mitigation measures. Applies to dredging, filling, and other alteration of the bed of navigable waters of the United States. Coverage for the activities that could affect waters of the United States will be sought under USACE Nationwide Permit 38, Cleanup of Hazardous and Toxic Waste.	Applicable during material stockpiling, placement of equipment, MEC detonation, and any site excavation work within streams, intertidal or tidal areas, and/or wetlands. Project activities will consider methods to lessen the impact on wetlands or navigable waterways to the maximum extent practicable using methods that involve the least disturbance of the ground and the least potential for suspension of sediment.
Coastal Zone Management Act	16 USC 1451–1464; 15 CFR 921–933	Requires that federal agency actions affecting the coastal zone be consistent to the maximum extent practical with the enforceable policies of Washington's approved coastal zone management program.	Navy actions must be consistent with the Washington State SMA (see state ARARs section) to the maximum extent practicable. This act applies to those lands extending landward for 200 feet in all directions as measured on a horizontal plane from the ordinary high water mark as defined in the Washington State SMA.
Endangered Species Act	16 USC 1531–1544; 50 CFR 17, 401–424, 450–453	Protects threatened and endangered species: Section 7 of the Endangered Species Act requires consultation with the U.S. Fish and Wildlife Service to identify the presence of protected species and critical habitat in the project area and measures to mitigate potential impacts on such species.	Applicable because threatened and endangered species have been identified in the project area. However, based on the biological evaluation (U.S. Navy 2007d), project activities are expected to have no adverse effect on threatened and endangered species, including protected species such as the bald eagle (known to be present). In addition, Chinook salmon or species less likely to be present, such as the bull trout, leatherback sea turtle, Steller

Table 11-2 (Continued)
Location-Specific ARARs

ARAR	Citation	Description	Comment
			sea lion, humpback whale, or killer whale, are also not likely to be affected. The Navy will conduct a biological assessment as required to determine the potential effect of the action on threatened and endangered species, consult with federal natural resource agencies as appropriate, and implement appropriate measures (if required) to reduce the likelihood of impact.
Fish and Wildlife Coordination Act	16 USC 661 et seq.	Prohibits water pollution from any substance that might affect fish, plant life, or bird life.	Applicable if activities occur that may affect essential fish and wildlife and their habitat if the shoreline is modified. Actions must prevent loss of and damage to wildlife resources.
Protection of Wetlands	Executive Order 11990	Requires consideration of effects on wetlands to minimize their destruction, loss, or degradation and preserve/enhance wetland values.	Applicable for material stockpiling, placement of equipment, MEC detonation, and any site excavation work that occurs within tidal areas and wetlands.
Magnuson-Stevens Fishery Conservation and Management Act (1996)	16 USC Section 1851 et seq.	Federal law that governs U.S. marine fisheries management. Under the provisions of this act, federal agencies must consult with the National Marine Fisheries Service before taking any action that adversely affects designated EFH. Adverse effects include any impacts that reduce the quality or quantity of EFH.	Applicable for activities that may affect fish habitat, including water quality, because Ostrich Bay is considered EFH for salmonids and groundfish (U.S. Navy 2007d). Activities will be managed to minimize adverse effects on fish, habitat, and water quality. The EFH consultation should be consolidated with existing environmental review procedures required by other statutes, such as the Endangered Species Act, when appropriate (50 CFR 600.920[f]).

Table 11-2 (Continued)
Location-Specific ARARs

ARAR	Citation	Description	Comment
Migratory Bird Treaty Act	16 USC 701–712	The Migratory Bird Treaty Act makes it unlawful to (or attempt to) pursue, hunt, take, capture, or kill any migratory bird, part, nest, egg, or product. All but a few bird species naturally occurring in the United States are protected under this act.	Applicable if excavation of DMM, detonation of DMM, brush clearing, or the movement of heavy equipment across the site may affect migratory birds or their habitat. Project activities will avoid harming any of these species. The Navy will coordinate with appropriate agencies as necessary and perform a biological assessment to determine any required mitigation measures if project activities are likely to affect these species.
Bald and Golden Eagle Protection Act	16 USC 668–668(d)	Requires project activities to protect and preserve eagle habitat found at NHB.	Applicable for activities that may affect bald and golden eagles or their habitat. Bald eagles have been observed using the trees in the shoreline area.
Marine Mammal Protection Act	16 USC 1361; 50 CFR 12	Under the provisions of the Marine Mammal Protection Act, it is unlawful for any person or federal agency to take (harass or kill) any marine mammal on the high seas, in U.S. waters, or on land under the jurisdiction of this act.	Applicable for activities conducted in marine waters, coastal zones, and aquatic areas that may affect marine mammals or their habitat. Based on prior biological evaluations, it is unlikely that killer or humpback whales, Steller sea lions, or leatherback turtles will be present, and there is no critical habitat designation for these species in or on the shorelines of Ostrich Bay. Therefore, project activities are not likely to result in a taking. If there is a sighting in the vicinity, the Navy will consult with appropriate agencies to ensure that appropriate mitigation measures are considered to comply with this act.

Table 11-2 (Continued)
Location-Specific ARARs

ARAR	Citation	Description	Comment
National Historic Preservation Act	16 USC 470(f), Section 106; 36 CFR Parts 60 and 63 and 800; 40 CFR 6.301	Comprehensive program to preserve cultural and historic resources. Section 106 of this act requires that federal agencies consider the effect of their actions on historic properties and consult with the SHPO, tribes, and other interested parties.	Applicable because historic and cultural resources have been identified in the NHB area. Several archaeological and cultural resource investigations at NHB have been performed with coordination through the SHPO and Suquamish Tribe (also see Section 6.5). The investigations identified protection strategies for these resources. The shoreline investigation areas are in "moderate" and "high" probability areas. The archaeological resources protection plans prepared for the remedial investigation will be consulted to ensure that excavations performed in the areas consider the appropriate mitigation, notification, or monitoring activities, and another Section 106 consultation will be performed for ground-disturbing activities associated with the selected remedy, as required.
State			
Shoreline Management Act	Chapter 90.58 RCW; Chapters 173-26, 173-22, and 173-27 WAC	Specifies the policies, standards, and limitations applicable to effects on coastal resources. The substantive requirements of this statute and implementing regulations are applicable to investigation activities along the shoreline (extending 200 feet landward). WAC 173-27-060(1) discusses the applicability of RCW Chapter 90.58 to federal lands and agencies within the coastal counties, including Kitsap County.	Applicable where work is within the coastal zone within 200 feet upland from the ordinary high water mark. Washington State manages its coastal zones through this act, and proposed actions must be consistent with its policies and goals and those of the locally approved coastal zone management programs, including the City of Bremerton Shoreline Master Program and Kitsap County Shoreline Management Master Program. Proposed actions must also be consistent with the Kitsap County shoreline designation maps (WAC 173-22-0636).

Table 11-2 (Continued)
Location-Specific ARARs

ARAR	Citation	Description	Comment
			Guidelines for local regulation of shoreline protection (WAC 173-16-060[17]) may be relevant and appropriate for activities related to the selected remedy.

Notes:
ARAR - applicable or relevant and appropriate requirement
CFR - Code of Federal Regulations
DMM - discarded military munitions
EFH - essential fish habitat
MEC - munitions and explosives of concern
NHB - Naval Hospital Bremerton
RCW – Revised Code of Washington
SHPO - State Historic Preservation Office
SMA - Shoreline Management Act
USACE - U.S. Army Corps of Engineers
USC - United States Code
WAC - Washington Administrative Code

Source: U.S. Navy 2010a

Table 11-3
Potential Action-Specific ARARs and TBCs

ARAR/TBC	Citation	Description	Comment
Federal			
Clean Air Act (ARAR)	40 CFR 51.40 et seq.	National Ambient Air Quality Standard for Particulate Matter.	Relevant and appropriate to detonation activities that may generate emissions of fine particulates (PM_{10}) or other activities that generate fugitive dust such as may occur during soil excavation activities. Relevant and appropriate to thermal flashing activities on Elwood Point.
	42 USC 1857–18571; 40 CFR 50-100; 40 CFR 131	The Clean Air Act regulates releases of specific substances into the air. Pursuant to this act, the U.S. Environmental Protection Agency has promulgated National Ambient Air Quality Standards (40 CFR 50), National Emission Standards for Hazardous Air Pollutants (40 CFR 61), and New Source Performance Standards (40 CFR 60, 63).	These standards apply to expected air releases resulting from MEC response actions, which use commercially available equipment to demilitarize explosives. If unstable material is encountered requiring on-site detonation for either Alternatives 2 or 3, a Level 1 or 2 emergency response action will be initiated in compliance with the requirements of Naval Sea Systems Command OP 5 (U.S. Navy 2008c) and applicable Navy EOD publications.
Department of Defense Ammunition and Explosives Safety Standards (TBC)	DoD 6055.9-STD	DoD standard issued under the DDESB, which establishes policies and procedures necessary to protect personnel from DoD ammunition, explosives, or chemical agents and contamination of real property currently or formerly owned, leased, or used by DoD.	A TBC for determining clearance depth using site-specific information, including site conditions and planned land use. The storage of munitions and siting of magazines is under authority of the DDESB. Use of these standards has been an integral part of planning remedial activities at NHB.

Table 11-3 (Continued)
Potential Action-Specific ARARs and TBCs

ARAR/TBC	Citation	Description	Comment
			A TBC for basic establishment of protection of personnel who live or work on the property, because it is DoD property (current or former). For example, a base procedure for calling 911 in the event that a suspicious item is encountered followed by the handling of the item by the appropriate emergency personnel, including EOD Bangor, as necessary.
Resource Conservation and Recovery Act, Subtitle C (ARAR)	42 USC 6921–6925; 40 CFR Parts 261–265 and 268	Requires the characterization of all wastes that meet the definition of a solid waste, including identification, accumulation (generators), manifesting, transport, treatment, and disposal requirements and land disposal restrictions. Wastes characterized as a hazardous waste are subject to stringent management standards under this regulation.	Applicable to the removal and management of DMM pursuant to RCRA and the storage of DMM on site subject to DDESB standards. Level 1 or 2 emergencies (unstable DMM items, DMM beyond the storage capacity of the on-site magazine, or items for which no IHCs and COEs have been received) will be handled by EOD Bangor under the provisions of the MMR and DDESB requirements, whereas items not considered Level 1 or 2 emergencies will be handled by the contractor and disposed of at a commercial facility in accordance with RCRA Subtitle C generator requirements and on-site DDESB storage requirements[a] in the interim (until transportation is initiated). A disposal plan will be developed with the work plans to detail how Levels 1 and 2 emergencies as well as DMM handling not considered an emergency will be managed, as has been done for other fieldwork.

Table 11-3 (Continued)
Potential Action-Specific ARARs and TBCs

ARAR/TBC	Citation	Description	Comment
Resource Conservation and Recovery Act, Management of Military Munitions (ARAR)	Military Munitions Rule (40 CFR 260 through 265 and 270)	This rule sets forth amendments to hazardous waste identification and management rules for military munitions (e.g., when a munition is a solid waste) and provides a definition and criteria for management of military munitions during explosive emergencies.	If suspected DMM items are encountered during construction oversight activities, EOD Bangor would be contacted to determine if a Level 1 or 2 emergency response action is required. If EOD determines that the response is not an emergency, the item will be managed under RCRA in accordance with MMR.
Resource Conservation and Recovery Act, Subtitle D (ARAR)	42 USC 6941–6949; 40 CFR Parts 275, 258	Requirements for management and disposal of solid wastes that are not RCRA hazardous waste.	Applicable to the management of debris and other solid wastes generated during project activities, including recyclable materials.
Hazardous Materials Transportation Act (ARAR)	49 USC 5101-5127; 49 CFR Parts 171–173, 177	Addresses the movement of hazardous materials on public highways, including the application of proper shipping descriptions, labels and markings, and placards and proper packaging and shipping papers to hazardous material shipments.	Applicable to the classification of hazardous materials and hazardous wastes generated on site and transported on public roads. Applicable to the training of on-site workers engaged in a hazardous material function.
Clean Water Act (ARAR)	40 CFR 401, et seq.	Establishes criteria and requirements for protecting stormwater discharges.	Applicable for the discharge of materials into stormwater associated with the disruption of the ground surface during excavation activities and the establishment of best management practices such as erosion control to prevent run-on and runoff.
State			
Transport of Hazardous Materials (ARAR)	Chapter 46.48 RCW; Chapter 446-50 WAC	The Washington State Patrol adopts by reference the federal Hazardous Materials Transportation Act regulations governing transportation of hazardous materials on public highways.	Applicable for any off-site transport of project wastes or hazardous materials on public highways.

Table 11-3 (Continued)
Potential Action-Specific ARARs and TBCs

ARAR/TBC	Citation	Description	Comment
Hazardous Waste Management Act (ARAR)	Chapter 70.105 RCW; Chapter 173-303 WAC	This statute and implementing regulations specify the requirements for identification, accumulation, manifesting, transport, treatment, storage, and disposal of dangerous waste (including state-only dangerous wastes).	The regulations apply if soil, sediment, or munitions excavated during the remediation exhibits characteristics or criteria of dangerous waste. WAC 173-303-578 specifically applies to military munitions. Applicable for the identification of potentially contaminated materials or soils and MEC as a potentially reactive (D003) or toxic (D008) hazardous waste. May be applicable to the stockpiling of contaminated materials and the detonation of MEC on site.
Solid Waste Management Act (ARAR)	Chapter 70.95 RCW; Chapter 173-351 WAC	Requirements for handling, siting, storage, and disposal of solid waste.	Applicable for excavated soil, shoreline debris, and munitions generated during remediation and disposed of or recycled.
Fugitive Dust Control Measures (ARAR)	Puget Sound Clean Air Agency Regulation I, Section 9.15	Precautions to minimize visible fugitive dust emissions.	Applicable to anomaly investigation and/or remedial actions that involve soil excavation. Also applicable to the thermal flashing of munitions-related debris performed on site using the thermal flashing unit.
Washington Clean Air Act (ARAR)	Chapter 70.94 RCW; Chapters 173-400 and 173-470 WAC	Ambient air quality standards for total suspended particulates and fine particulates (PM_{10}).	Relevant and appropriate for remedial activities that involve soil excavation.

[a]The Navy is currently evaluating the removal of the sited magazine on Elwood Point and is in the process of evaluating other storage possibilities that are compatible with the DDESB storage requirements**.**

Notes:
ARAR - applicable or relevant and appropriate requirement
CFR - Code of Federal Regulations
COE - Certificate of Equivalency

Table 11-3 (Continued)
Potential Action-Specific ARARs and TBCs

DDESB - Department of Defense Explosives Safety Board
DMM - discarded military munitions
DoD - U.S. Department of Defense
EOD - Explosive Ordnance Disposal
IHC - interim hazard classification
MEC - munitions and explosives of concern
MMR - Military Munitions Rule
NHB - Naval Hospital Bremerton
RCRA - Resource Conservation and Recovery Act
RCW - Revised Code of Washington
TBC - to be considered
USC - United States Code
WAC - Washington Administrative Code
Source: U.S. Navy 2010a

of the activity and the immediate environment. Location-specific ARARs for this decision relate primarily to work along the shoreline. Alternative 4 does not specify work along the shoreline. Alternatives 2 and 3 could involve work along the shoreline if a DMM HE item is identified under the LUC and or awareness programs. Alternatives 5, 6, and 7 involve work adjacent to or directly on the shoreline.
Location-specific ARARs (Table 11-2) that apply to work in coastal or shoreline environments are the following:

- Federal Water Pollution Control Act
- Rivers and Harbors Act
- Coastal Zone Management Act
- Fish and Wildlife Coordination Act
- Protection of Wetlands Executive Order 11990
- Magnuson-Stevens Fishery Conservation and Management Act
- Marine Mammal Protection Act
- Washington State Shoreline Management Act

Alternatives 2 through 5 comply with these shoreline-related ARARs.

Executive Order 11990 established the national policy of "no net loss" of wetlands. It also requires federal agencies to "show leadership in taking action to minimize the destruction, loss or degradation of wetlands" and to "preserve and enhance the natural and beneficial values of wetlands in carrying out the agency's responsibilities for (1) acquiring, managing, and disposing of federal lands and facilities, (2) providing federally undertaken, financed, or assisted construction and improvements, and (3) conducting federal activities and programs affecting land use, including but not limited to water and related land resources planning, regulating, and licensing activities."

In addition, the guidance documents for implementing Clean Water Act Section 404 and related Washington State laws (e.g., Wetland Mitigation in Washington State, Part 1: Agency Policies and Guidance, 2006) all require that impacts on both the area covered by wetlands and the functions of the wetlands be avoided or minimized before restoration (repair of the wetlands after the action) or compensatory mitigation for unavoidable impacts is considered.

The probability of compliance with these specific ARARs is controlled by the success of any mitigation measure to restore wetlands following excavation within the wetland area. Wetland restoration methods can never guarantee a return of full wetland function. Small, isolated excavation events within the wetlands would cause limited damage, and the probability of restoring wetland function would be higher than larger scale excavation events. Alternatives 2 and 3 would require only isolated excavation events within Wetland C and have a high

probability of complying with these two specific ARARs. Alternative 4 does not involve work within Wetland C and therefore complies with these ARARs. Alternative 5 involves work adjacent to the wetland and complies with these ARARs. Alternatives 6 and 7 would require numerous excavations throughout the entire Wetland C area and would cause large scale damage. Therefore, Alternatives 6 and 7 have a low probability of complying with these two specific ARARs. The need for an ARAR waiver will be dependent on the amount of damage caused to the Category 1 wetland and the success of the mitigation for any excavation conducted within the wetland.

Location-specific ARARs that apply to birds and cultural preservation are the following:

- Endangered Species Act
- Migratory Bird Treaty Act
- Bald and Golden Eagle Protection Act
- National Historic Preservation Act

All alternatives comply with these bird and cultural preservation ARARs.

Action-Specific ARARs and TBC

Potential action-specific ARARs set controls or restrictions on particular types of activities included in the selected remedial alternative. Table 11-3 identifies potential action-specific ARARs and the TBC.

The action-specific TBC is the DoD Ammunition and Explosives Safety Standard, and ARARs are the following:

- Clean Air Act
- RCRA, Subtitle C
- RCRA, Management of Military Munitions
- RCRA, Subtitle D
- Hazardous Materials Transportation Act
- Clean Water Act
- Washington State Transport of Hazardous
- Washington State Hazardous Waste Management Act
- Washington State Solid Waste Management Act
- Fugitive Dust Control Measures
- Washington State Clean Air Act

These ARARs and the TBC relate to excavation, transport, and management of hazardous waste, if found. All alternatives have the potential for excavation and/or hazardous waste management. If a DMM HE item identified under any of the alternatives is breached or leaking, or requires blow in place, there is the potential for hazardous waste. Alternatives 2 and 3 have the potential for excavation and or hazardous waste management if a DMM HE item and hazardous materials are identified under the LUCs specified for these alternatives. Alternatives 4 through 7 require excavation and also have the potential for hazardous waste management if DMM HE items and hazardous waste are identified during implementation.

Alternatives 2 through 7 comply with all action-specific ARARs.

11.3 LONG-TERM EFFECTIVENESS AND PERMANENCE

This balancing criterion addresses the results of a remedial action in terms of the residual explosives hazard after the remedial alternative has been implemented. The primary focus of this evaluation is to determine the effectiveness and permanence of the controls that may be required to manage the hazard posed by DMM items. The factors evaluated include the adequacy, suitability, capabilities, and limitations of current technologies and the long-term reliability and enforceability of management controls for providing continued protection from residual hazards. These controls also have to be maintained. The shorter the duration of time necessary for the implementation and maintenance of these controls, the better the score for the alternative. The effectiveness of all remedies under evaluation was based primarily on the low likelihood of an encounter with DMM items at the NHB site and the relative degree of explosive safety hazard posed in the event of such an encounter.

Because of the low potential for encountering a DMM HE item at the site, Alternatives 2 through 7 would not improve the long-term effectiveness or permanence of the selected remedy at the site. Alternatives 2 through 7 rely on LUCs, which would need to be maintained as long as the low probability for subsurface DMM HE exposure exists at NHB. NHB is expected to remain under the control of DoD and continue to be used as a naval hospital into the foreseeable future. The reliance on LUCs is expected to be effective in the long term, as long as the institutional controls are maintained.

Alternative 1 does not take additional steps to directly eliminate DMM, but given the low potential for encountering a DMM HE item, this alternative adequately addresses the site conditions. Alternative 2 also does not take additional steps to directly eliminate DMM. However, as with Alternative 1, some DMM may be discovered over time and reported through the 911 emergency response process.

Based on these considerations, all of the alternatives are considered effective in terms of long-term effectiveness and permanence. Alternatives 2 through 7 are expected to provide "good" long-term effectiveness by providing the education and awareness training plus the dig permitting process and MEC on-call support identified for Alternative 2. Under Alternatives 4 through 7, removal of the anomalies does not change this conclusion.

11.4 REDUCTION OF TOXICITY, MOBILITY, AND VOLUME THROUGH TREATMENT

The rating of an alternative's ability to reduce the toxicity, mobility, and volume of DMM HE relates to how much DMM HE that alternative removes, clears, and destroys. Under the education and awareness training and excavation notification requirements for all alternatives, removal would occur if any DMM HE item is encountered during activities at the that disturb the ground. For Alternatives 1, 2, and 3, removal would occur only during ground disturbing activities that are conducted for nonremedial purposes and DMM HE is encountered. So, over time, it is possible that removals will occur under Alternatives 1, 2, and 3. Alternatives 4 through 7 could result in additional removal of DMM HE as well. However, results of the RI suggest that there is a low possibility of finding remaining DMM HE at the site. This means that Alternatives 1 through 7 will likely not significantly reduce toxicity, mobility, and volume. As a result, all alternatives were considered to provide "good" reduction of toxicity, mobility, and volume.

11.5 SHORT-TERM EFFECTIVENESS

This balancing criterion addresses the effects of a proposed alternative on the public, the environment, and the remediation workers during its implementation and up until the time the RAOs have been met. Each proposed alternative is evaluated with respect to the degree to which the community and on-site workers are protected from explosives hazard during the remedial action and the nature and magnitude of ecological, socioeconomic, and cultural impacts associated with the implementation of the remedial alternative. In general, the explosives hazard is proportional to the type of DMM potentially present, the amount of removal or clearance that must be performed, the site conditions in which the work must be performed, and the level of awareness and recognition of the potential hazards.

The risk to the community during the response typically results from traffic congestion or the operation of construction equipment; a drain on community utilities, emergency services, and other infrastructure; impacts on air quality; increased noise; or the need to evacuate community members from an exclusion zone for DMM blow-in-place operations (items that need to be

blown up where they are found). Risks to the environment may take many different forms, depending on the site characteristics and the habitats being supported.

All of the alternatives provide an acceptable level of risk to the community. Daily activities of NHB staff may be temporarily affected by restricted access in exclusion zones and minor disturbances. However, controls, as required for the operation and movement of heavy equipment, would be implemented, and the disruption of hospital operations would be controlled through the use of blast protection. The latter should not require evacuation of the buildings unless there is an emergency. The community may also be exposed to an explosives hazard if DMM items are found (under any alternative). However, during the RI and TCRA, similar operations were conducted with minimal impact or explosive safety hazards to community members.

The short-term effectiveness of any of the alternatives relative to the explosives hazard at NHB may be approximately equal. Risks to construction workers and the community would be equal, because a response to the discovery of any DMM item would initially require an emergency response. There may be risks to remediation workers, the community, and the environment due encounters with DMM items during construction, implementation of clearance activities in the undeveloped areas of NHB, or anomaly removal in the areas specifically covered by Alternatives 4 through 7. However, experience has shown that these risks can be managed through project planning and careful project execution.

The alternatives that involve work within the wetlands or uplands-wetlands buffer are expected to result in short-term impacts on the environment. These impacts get worse going from Alternatives 5 through 7. The short-term impacts on Wetlands C would be greatest with Alternative 7, because more wetland surface area would be disturbed. Loss of wetlands habitat should be avoided and when adverse impacts are unavoidable, they must be minimized and repaired. There are methods to repair (restore) wetlands. However, there can be no guarantee that this rare and important wetland can be fully repaired if Alternatives 5, 6, or 7 are selected.

Because wetland restoration cannot replicate the original conditions of wetlands or restore the original ecological function, there may also be some long-term environmental effects. These effects are difficult to anticipate. In addition, disturbance of the rare (Category I) tidal wetlands may result in a net loss of Category I wetland status. This loss would contribute to the overall loss of these rare wetlands that currently exist in Washington State. The loss of Category I status is a potentially permanent condition that cannot be effectively mitigated.

Based on this evaluation, Alternatives 1 and 2 are considered “superior” in terms of short-term effectiveness; Alternatives 3, 4, and 5 are considered “good”; and Alternatives 6 and 7 are considered “poor.”

11.6 IMPLEMENTABILITY

This balancing criterion addresses the technical, administrative, and operational feasibility of implementing a proposed alternative:

- Technical feasibility considers potential construction and operational difficulties, the likely duration of the response, the practicality of the alternative, the ease of undertaking additional supplemental or corrective remedial actions in the future (if required), and the ability to monitor the effectiveness of that remedy.

- Administrative feasibility considers the type and practicality of the activities needed to coordinate with other agencies (e.g., state and local) in order to obtain the permits or approvals needed to implement the remedial action.

- Operational feasibility includes the availability of infrastructure services and materials required to implement the remedial action.

All of the alternatives with the exception of Alternative 1 are implementable. Although it is technically implementable, Alternative 1 was rated poor because it is not consistent with NOSSA's recommendation for a program of munitions education and awareness.

The Navy's explosive safety expert for OU 3T-NHB (NOSSA) has recommended that Alternative 2 be implemented at the site. This alternative includes education and awareness training plus dig permitting requirements that are already in place at NHB. Therefore, Alternative 2 was rated "superior" in terms of implementability. Alternative 3 requires UXO support, and Alternative 4 requires excavation in a wooded area. These requirements are more complex; therefore, Alternatives 3 and 4 were rated "excellent." Alternative 5 was rated "good" because it requires excavation only in the uplands-wetlands buffer area. However, the buffer area is in sensitive habitat that protects and supports functions in the adjacent wetland. Because of the importance of the buffer area to the adjacent wetland, mitigation would be required under the Coastal Zone Management Act. Alternatives 6 and 7 require excavation in both the uplands-wetlands buffer and wetland environment. Excavation in the wetland area would be much more difficult for workers conducting the remedy-required excavation. Excavation in the wetland would require dewatering of the excavation before anomaly removal. This is a significant complication, because there are no guarantees that dewatering will remove a sufficient amount of water to allow visual identification of the item causing the anomaly or its effective removal. There is also concern that dewatering the wetlands soils has the potential to result in permanent impacts on the wetlands. Specifically, excavation in the wetlands could result in drier conditions in the freshwater portion, resulting in changes in the types of vegetation that could be harvested by the Suquamish Tribe.

As previously discussed, wetland restoration cannot replicate the original conditions of the wetlands or restore their original ecological function. Therefore, implementation of Alternatives 6 and 7 would likely not be able to comply with Executive Order 11990. As a result, Alternatives 6 and 7 were rated "poor" in terms of implementability.

11.7 COST

This balancing criterion addresses the capital costs, annual operation and maintenance (O&M) costs associated with implementing the remedial alternative, and costs for preparing the 5-year reviews. These costs are combined and presented in Table 11-4 as a total present-worth format to facilitate the comparison alternatives. The table also shows the cost of the alternative allowing for a 2.8 percent annual inflation rate (future worth) based on the average consumer price index from 1999 to 2009. The present value column of the table shows the amount of money that would need to be set aside at the beginning of the remedy implementation to cover its cost over the full 50-year implementation period (USEPA 2000). The present value was calculated using the 30-year real discount rate (the rate at which money loses value over time) as of December 2009, which was 2.7 percent.

Table 11-4
Summary of Cost Breakdowns for Remedial Alternatives

Alternative	Capital Cost	O&M Cost	5-Year Review	Present Worth	Future Worth	Present Value
2	$0	$2,170,000	$270,000	$2,440,000	$5,270,000	$1,350,000
3	$6,350,000	$2,750,000	$340,000	$9,440,000	$22,340,000	$4,760,000
4A	$490,000	$2,170,000	$270,000	$2,930,000	$5,760,000	$1,840,000
4B	$6,840,000	$2,750,000	$340,000	$9,930,000	$22,830,000	$5,250,000
5A	$1,090,000	$2,170,000	$270,000	$3,530,000	$6,360,000	$2,440,000
5B	$7,440,000	$2,750,000	$340,000	$10,530,000	$23,430,000	$5,850,000
6A	$2,140,000	$2,170,000	$270,000	$4,580,000	$7,410,000	$3,490,000
6B	$8,490,000	$2,750,000	$340,000	$11,580,000	$24,480,000	$6,900,000
7A	$1,840,000	$2,170,000	$270,000	$4,280,000	$7,110,000	$3,190,000
7B	$8,190,000	$2,750,000	$340,000	$11,280,000	$24,180,000	$6,600,000

Note: O&M - operation and maintenance

Source: U.S. Navy 2010a

Capital costs consist of direct and indirect costs. Direct costs include expenditures for the equipment, labor, and material necessary to perform the removal action and are based on actual costs incurred over the past several years by the Navy. Indirect costs include expenditures for engineering, financial, and other services that are not part of the actual response activities and

services, but are required to complete the implementation of the remedial alternative. The capital costs assume that the anomaly investigation and removal activities included in Alternatives 4 through 7 will be performed within the next 2 years. The capital costs identified for Alternative 3 are based on the development of 20 percent of the wooded area west of the hospital at 10-year intervals, such that the entire wooded area is developed at the end of the 50-year period. Annual O&M costs are post-construction costs required to ensure the continued performance of the remedial action.

Alternatives 4A, 5A, 6A, and 7A include the costs of implementing Alternative 2. No capital cost is associated with Alternative 2.

Alternatives 4B, 5B, 6B, and 7B include the costs for implementing Alternative 3. The capital costs for Alternative 3 are based on development of 20 percent (one-fifth) of the wooded area west of the hospital at 10-year intervals so that the entire wooded area is developed at the end of the 50-year period.

The cost summaries for Alternatives 5 through 7 do not include wetland mitigation (restoration) costs. These costs are difficult to estimate and are likely to be substantial.

Alternative 2, which includes implementation of the existing LUCs and LTMgt of the NHB site, represents the lowest cost option. The highest cost option would be either Alternative 6B or Alternative 7B (Table 11-1).

11.8 AGENCY AND COMMUNITY ACCEPTANCE

The EPA approved the final Proposed Plan, and no community comment was received.

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12.0 SELECTED REMEDY

The results of the evaluation of the alternatives indicate that Land Use Controls and Long-Term Management (Alternative 2) is the highest ranking alternative because it achieves the same degree of protectiveness of human health and the environment as Alternatives 3 through 7 (A and B) at the lowest cost and the lowest risk to sensitive wetlands (see Figure 11-1).

12.1 RATIONALE FOR THE SELECTED REMEDY

Alternative 2 is the preferred alternative because it provides protection of human health and the environment and achieves the threshold and balancing criteria required for CERCLA at the lowest cost. The rationale for selection of Alternative 2 as the preferred alternative can be summarized as follows:

- No DMM HE items, the item of interest, were found during the RI.
- Alternative 2 preserves the ability of the Suquamish Tribe to access NHB and adjacent JPHC.
- Alternative 2 preserves the function and resources of all wetlands at OU 3T-NHB.
- Significant removal actions have already been completed.
- The explosive safety experts for OU 3T-NHB (NOSSA) determined that the site poses a low level threat.
- The number of overall DMM items found confirms NOSSA's determination that there is a low probability of munitions hazards at NHB.

12.2 DESCRIPTION OF THE SELECTED REMEDY

Alternative 2 assumes that the NHB area will remain in its current land use and that traditional plant harvests by the Suquamish Tribe may occur in future. It assumes that the potential explosives hazard will be adequately controlled by the use of the LUCs that include deed restrictions if the property is transferred to another entity, on-call support using the 911 system to report the discovery of a suspected DMM HE item, continued implementation of the munitions awareness and education program, and LTMgt of potential DMM HE at the NHB site. The LTMgt component of this alternative includes the following:

- Continued munitions-related awareness and education program for all personnel performing minor digging

- An enhanced munitions-related awareness and education training program for personnel supervising major digging projects

Because current and reasonably anticipated future land use remains a naval hospital, the existing DoD requirement to maintain emergency response via mutual aid agreements with Kitsap County Central Communications (CENCOM) via the 911 system will also remain in effect. CENCOM will direct the response to Navy Regional Dispatch and or public service response as indicated by the nature of the call and will include notification and response by Navy EOD personnel as required.

In accordance with current NOSSA guidance and past experience, the likelihood of an encounter with DMM during the course of activities associated with current and reasonably anticipated future land use at NHB is low. In the event that potential DMM items are encountered at a particular location, the need for additional explosives hazard management measures will be evaluated as the situation warrants using established Navy procedures (e.g., the latest versions of NOSSA Instruction 8020.15 [U.S. Navy 2009b] and NAVSEA OP 5 [U.S. Navy 2009c]).

There are no prohibited land uses at OU 3T-NHB. The LUC boundary at OU 3T-NHB is the property boundary of NHB out to the MHHW line along the shore. Figure 7-1 shows the LUC boundary at OU 3T-NHB.

The Navy is responsible for implementing, maintaining, reporting on, and enforcing the LUCs. This may be modified to include another party should the site-specific circumstances warrant it. Although the Navy may later transfer these procedural responsibilities to another party by contract, property transfer agreement, or through other means, the Navy shall retain ultimate responsibility for remedy integrity.

Within 90 days of ROD signature, a draft LUC management plan will be prepared for EPA review.

12.3 COST OF THE SELECTED REMEDY

Costs for the selected remedy were first presented in the RI/FS report (U.S. Navy 2010a). The costs are based on EPA FS costing guidance (USEPA 2000). Alternative 2 is estimated to have a present worth cost of $2,440,000 based on a 50-year period of performance. These costs include no capital cost, $2,170,000 in O&M costs for on-call EOD support over the 50-year period, and $270,000 for preparing the 5-year review reports.

Alternative 2 is estimated to have a future worth cost of $5,270,000 allowing for a 2.8 percent annual inflation rate based on the average of the consumer price index from 1999 to 2009. The present value for Alternative 2 is $1,350,000, which represents the amount of money that would need to be set aside at the beginning of the remedy implementation to cover its cost over the full 50-year implementation period (USEPA 2000).

12.4 EXPECTED OUTCOMES OF THE SELECTED REMEDY

The expected outcome is that the Navy will continue to effectively manage the low potential for exposure to a DMM HE item.

12.4.1 Function of the Land Use Controls Management Plan

Within 90 days of ROD signature, the Navy will prepare and submit to EPA for review and approval a LUC management plan that outlines the processes for implementing the LUCs described in Section 12.2 and inspection requirements. It will also include procedures for responding to the future discovery of suspected DMM HE items. Any DMM find or incident will be reported to the regulatory agencies as part of the annual and 5-year review reports, or as required by the LUC management plan to be prepared. The selected LUCs may be modified in the future, based on recommendations and conclusions in annual LUC inspection reports or the 5-year review process, with the approval of EPA .

12.4.2 Termination of LUCs

The LUCs shall remain in place as long as there is a potential explosive safety hazard from DMM HE. The LUCs may be terminated on the basis of a 5-year review, with EPA approval.

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13.0 STATUTORY DETERMINATIONS

Under CERCLA Section 121 and the NCP, the lead agency must select remedies that (1) are protective of human health and the environment, (2) comply with ARARs/TBCs, (3) are cost-effective, and (4) use permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. In addition, CERCLA includes a preference for remedies that use treatment that permanently and significantly reduces the volume, toxicity, or mobility of hazardous wastes as a principal element and a bias against off-site disposal of untreated wastes.

13.1 PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

This ROD addresses hazardous substances and pollutants or contaminants that may pose a threat to human health and welfare or the environment. There is a low probability that hazardous substances in the form of DMM HE may remain within the operable unit boundaries. However, continued implementation of existing LUCs, as specified in Alternative 2, is protective of human health and the environment, and the LTMgt component of the alternative meets NOSSA's recommendation for maintaining an education program at OU 3T-NHB (U.S. Navy 2010a).

13.2 COMPLIANCE WITH APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

The selected remedy complies with the applicable ARARs and TBC listed in Tables 11-1 through 11-3. No waiver of ARARs is required.

13.3 COST-EFFECTIVENESS

Alternative 2 was determined to achieve essentially the same degree of protectiveness of human health and the environment as Alternative 3 through 7 at the lowest cost.

13.4 USE OF PERMANENT SOLUTIONS AND ALTERNATIVE TREATMENT TECHNOLOGIES TO THE MAXIMUM EXTENT PRACTICABLE

Alternative 2 assumes that the NHB area will remain in its current land use with no additional activities or steps taken to locate, remove, or dispose of potential munitions. The low potential explosives hazard will be adequately controlled by the existing LUCs, which include (1) deed restrictions if the property is transferred to another entity, (2) implementation of the

education/awareness program, and (3) LTMgt of the site through continued implementation of the existing dig permitting process, which includes munitions related awareness and education for utility workers and contractors.

13.5 PREFERENCE FOR TREATMENT AS A PRINCIPAL ELEMENT

The extent to which an alternative reduces the toxicity, mobility, or volume of DMM HE is determined by how much DMM HE the alternative removes, clears, and destroys. The degree of reduction in toxicity, mobility, and volume of DMM HE for Alternative 2 depends on whether DMM HE is found once the alternative is implemented. DMM HE items are not expected to be found at the site. All suspected DMM HE items found at OU 3T-NHB will be addressed in accordance with the LUC management plan.

13.6 FIVE-YEAR REVIEW REQUIREMENTS

A 5-year review will be required because the low potential for DMM HE presence at the site. As a result, the effectiveness of the LUCs and LTMgt program will be evaluated as part of the 5-year review process to ensure that the final remedial actions for the NHB site remain protective. The LUCs shall remain in place as long as there is a potential explosive safety hazard from DMM HE. The LUCs may be terminated on the basis of a 5-year review, with EPA approval. Five-year reviews will continue until LUCs have been removed.

14.0 DOCUMENTATION OF SIGNIFICANT CHANGES FROM PREFERRED ALTERNATIVE OF PROPOSED PLAN

There was no significant change to the selected remedy presented in the Proposed Plan.

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15.0 RESPONSIVENESS SUMMARY

The Navy received no comment during the public comment period.

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