

**U.S. Army Corps of Engineers
Omaha District**

**Draft Site-Specific Work Plan
Port Angeles Combat Range
FUDS Property No. F10WA0033**

**Site Inspections at Multiple Sites, NWO Region
Formerly Used Defense Sites
Military Munitions Response Program**

**Contract No. W912DY-04-D-0010
Delivery Order No. 003**

June 2008



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DRAFT

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Military Munitions Response Program

Submitted to:

U.S. Department of the Army
U.S. Army Corps of Engineers, Omaha District

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List of Acronyms and Abbreviations

°F	degrees Fahrenheit
AOC	area of concern
ASR	Archives Search Report
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CSM	Conceptual Site Model
DERP	Defense Environmental Restoration Program
DMM	discarded military munitions
DoD	Department of Defense
DQO	data quality objective
ER	Engineer Regulation
EPA	U.S. Environmental Protection Agency
FSP	Field Sampling Plan
FUDS	Formerly Used Defense Site
GPS	global positioning system
HRS	Hazard Ranking System
IDW	investigation-derived waste
IEP	Important Ecological Place
MC	munitions constituents
MD	munitions debris
MEC	munitions and explosives of concern
mm	millimeter
MMRP	Military Munitions Response Program
MRA	munitions response area
MRS	munitions response site
MRSP	Munitions Response Site Prioritization Protocol
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NDAI	No Department of Defense Action Indicated
NEODFC	Naval Explosives Ordnance Disposal Facility Center
NRCS	Natural Resources Conservation Service
NWO	Northwestern Division Omaha District
PACR	Port Angeles Combat Range
PETN	pentaerythritol tetranitrate
PUD	Public Utility District
QA/QC	Quality Assurance/Quality Control
QAPP	Quality Assurance Project Plan
ROE	right of entry
RI/FS	Remedial Investigation/Feasibility Study
SAP	Sampling and Analysis Plan
Shaw	Shaw Environmental, Inc.
SI	Site Inspection
SSHP	Site Safety and Health Plan
SSWP	Site-Specific Work Plan

Abbreviations and Acronyms (Cont.)

TPP	Technical Project Planning
U.S.	United States
USC	United States Code
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
UXO	unexploded ordnance
WDAHP	Washington Department of Archaeology and Historic Preservation
WDFW	Washington Department of Fish and Wildlife
WDNR	Washington Department of Natural Resources
WDOE	Washington Department of Ecology
Work Plan	<i>Final Type I Work Plan</i>

1.0 Introduction

This Site-Specific Work Plan (SSWP) presents the information necessary to conduct field activities associated with a Site Inspection (SI) planned at Port Angeles Combat Range (PACR). The SI field activities will consist of site reconnaissance for munitions and explosives of concern (MEC) and sampling and analysis of soil, sediment, and groundwater for munitions constituents (MC).

MEC are military munitions that may pose unique explosives safety risks, such as unexploded ordnance (UXO), discarded military munitions (DMM), or MC present in high enough concentrations to pose an explosive hazard. MC are any materials originating from UXO, DMM, or other military munitions, including explosive and nonexplosive materials, and emission, degradation, or breakdown elements of such ordnance or munitions (10 USC 2710(e)(3) and 10 USC 2710(e)(2)).

1.1 Project Authorization

The Department of Defense (DoD) has established the Military Munitions Response Program (MMRP) to address DoD sites suspected of containing MEC or MC. Under the MMRP, the U.S. Army Corps of Engineers (USACE) is conducting environmental response activities at Formerly Used Defense Sites (FUDS) for the Army, the DoD Executive Agent for the FUDS program.

Pursuant to USACE Engineer Regulation (ER) 200-3-1 (USACE, 2004a) and the *Management Guidance for the Defense Environmental Restoration Program* (DERP) (Office of the Deputy Under Secretary of Defense [Installations and Environment], September 2001), USACE is conducting FUDS response activities in accordance with the DERP statute (10 USC 2701 et seq.), the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) (42 USC 9601), Executive Orders 12580 and 13016, and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (40 CFR Part 300). As such, USACE is conducting remedial SIs, as set forth in the NCP, to evaluate hazardous substance releases or threatened releases from eligible FUDS.

While not all MEC/MC constitute CERCLA hazardous substances, pollutants, or contaminants, the DERP statute provides DoD the authority to respond to releases of MEC and MC, and DoD policy states that such responses shall be conducted in accordance with CERCLA and the NCP.

Shaw Environmental, Inc. (Shaw) is responsible for conducting SIs at FUDS in the northwest region managed by the USACE Northwestern Division Omaha District (NWO) Military Munitions Design Center. Shaw has prepared this SSWP for the USACE, under USACE Contract No. W912DY-04-D-0010, as a supplement to the *Final Type I Work Plan* (Work Plan; Shaw, 2006).

1.2 Site Name and Location

The PACR FUDS (FUDS Property Number F10WA0033) is located in Clallam County, Washington, approximately 7 miles southeast of Port Angeles Washington (Figure 1). The FUDS is located in Sections 5, 8, and 17 of Township 29 North, Range 5 West (Figure 2).

The FUDS is situated on land owned by the city of Port Angeles, Olympic National Park, and private landowners. The FUDS property boundary is shown on Figures 2 and 3. The area of the property once owned or leased by the DoD is listed as “1,600 (+/-) acres” in the *Archives Search Report* (ASR; USACE 1996). The *ASR Supplement* (USACE, 2004b) indicated the area of the FUDS as 2,567.87 acres, but listed the area of Range Complex No. 1 as 2,629 acres. The *Defense Environmental Programs Annual Report to Congress Fiscal Year 2007* (DoD, 2007) listed the FUDS area as 2,629 acres. Figure 3 presents the layout of the range and subranges on a 2006 aerial photograph.

1.3 Scope and Objectives

The primary objective of the MMRP SI is to determine whether a FUDS project warrants further response action under CERCLA or not. The SI collects the minimum amount of information necessary to make this determination, as well as it (i) determines the potential need for a removal action; (ii) collects or develops additional data, as appropriate, for Hazard Ranking System (HRS) scoring by the U.S. Environmental Protection Agency (EPA); and (iii) collects data, as appropriate, to characterize the release for effective and rapid initiation of the Remedial Investigation and Feasibility Study (RI/FS). An additional objective of the MMRP SI is to collect the additional data necessary to complete the Munitions Response Site Prioritization Protocol (MRSPP).

The scope of the SI reported herein is restricted to evaluation of the presence of MEC or MC related to historical use of the FUDS prior to transfer. Potential releases of hazardous, toxic, or radioactive wastes are not addressed within the current scope. The intent of the SI is to confirm the presence or absence of contamination from MEC and/or MC. The general approach for each SI is to conduct a records review and site reconnaissance in order to evaluate the presence or absence of MEC and to collect samples at locations where MC might be expected based on the conceptual site model (CSM) (Appendix A). The following decision rules are used to evaluate the results of the SI:

- Is No DoD Action Indicated (NDAI)? An NDAI recommendation may be made if:
 - There is no indication of MEC; and
 - MC does not exceed screening levels determined from Technical Project Planning (TPP).
- Is an RI/FS warranted? An RI/FS may be recommended if:
 - There is evidence of MEC hazard. MEC hazard may be indicated by direct observation of MEC during the SI, by indirect evidence (e.g., munitions debris [MD],

craters), or by a report of MEC being found in the past without record that the area was subsequently cleared; or

- MC exceeds screening levels determined from TPP.
- Is a removal action warranted? A removal action may be needed if:
 - High MEC hazard is identified. Shaw will immediately report any MEC findings so that USACE can determine the hazard in accordance with the MRSPP. An example of a high hazard would be finding sensitive MEC at the surface in a populated area with no barriers to restrict access; or
 - Elevated MC risk is identified. Identification of a complete exposure pathway (e.g., confirming MC concentrations above health-based risk standards in a water supply well) would trigger notification of affected stakeholders. Data would be presented at a second TPP meeting regarding the possible need for a removal action.

For purposes of applying these decision rules, USACE has provided guidance that evidence of MEC will generally be a basis of recommending RI/FS. Evidence of MEC may include confirmed presence of MEC from historical sources or SI field work, or presence of MD.

1.4 Site Inspection Process

The steps involved in conducting an SI include:

- Reviewing existing data,
- Following the TPP process,
- Preparing the SSWP,
- Conducting the SI field activities (site reconnaissance, media sampling, and analysis), and
- Preparing the SI Report.

The TPP process is one through which project objectives and data collection processes are identified, and site stakeholders are brought together to discuss goals and objectives. This process includes the following phases:

- Identification of the current project area,
- Determination of data needs,
- Development of data collection options, and
- Finalization of the data collection program.

A multi-disciplinary team of key stakeholders attended a TPP meeting(s) in order to participate in the process so SI activities can be conducted in a timely and efficient manner.

1.5 Munitions Response Site Prioritization Protocol

The DoD is required to assign a relative priority for each munitions response site (MRS) within a munitions response area (MRA). This process is to be completed for all DoD sites including FUDS, which are known or suspected of containing UXO, DMM, or MC.

Definitions:

Defense Sites – Locations that are or were owned by, leased to, or otherwise possessed or used by the DoD. The term does not include any operational range, operating storage, or manufacturing facility, or facility that is used for or was permitted for the treatment or disposal of military munitions (10 USC 2710(e)(1)).

Munitions Response Area – An MRA refers to any area on a Defense Site that is known or suspected to contain UXO, DMM, or MC. Examples are former ranges and munitions burial areas. An MRA can be comprised of one or more MRS (32 CFR 179.3).

Munitions Response Site – A discrete location within an MRA that is known to require a munitions response (e.g., remedial response) (32 CFR 179.3). MRSPP scoring is completed for each MRS.

1.6 TPP Summary

The TPP meeting for the PACR was held at the Port Angeles City Hall on February 14, 2008. Representatives from the USACE – Omaha Design Center and Seattle District, Washington Department of Ecology (WDOE), city of Port Angeles, Olympic National Park, Clallam County, and Shaw were in attendance. The EPA has an agreement that WDOE is the lead agency for FUDS work in Washington State and the EPA was not invited to the TPP meeting.

Shaw summarized the SI process, reviewed the site information, presented a summary of the site including potential MEC and MC, and the proposed approach for the SI addressing MEC and MC sampling. All parties were in agreement with the approach presented.

Specific discussions included:

Areas of Concern (AOCs): All parties were in agreement with the AOCs as shown in the presentation.

Stakeholders: Stakeholders include the city of Port Angeles, Olympic National Park, and Clallam County Public Utility District Number 1 (PUD No. 1). Local tribal nations may also be a stakeholder because of aboriginal land rights. Mike Nelson of the USACE Seattle District will contact the tribes to inquire about participation.

Concerns were expressed by the Clallam County representative that the Clallam County PUD No. 1 water intake is likely upstream of the FUDS but that we should inquire directly with the PUD. The Clallam County PUD No. 1 was contacted; it was noted that there are two water intakes on Morse Creek (Kitz, 2008). The upstream intake is within the northwest finger of the FUDS property at a point labeled as “Port Angeles Dam.” The second intake point is located approximately 1,200 feet downstream of the dam.

Screening Criteria: It was agreed by the WDOE that human health and ecological screening values consistent with those used for previous SIs conducted in Washington State (Fort Flagler

Military Reservation and Fort Townsend) are appropriate for this FUDS. The city of Port Angeles stated that they had no basis from which to comment on the screening criteria and look to WDOE for guidance.

An Olympic National Park representative questioned whether the screening criteria adequately address impacts to vegetation. It was indicated that no direct sampling of vegetation is completed. Following the meeting, Shaw inquired with its ecological risk assessor whether plant values were included in the development of the ecological screening values. The risk assessor indicated that when plant values were available for a particular compound they were used in the development of the screening values.

Sampling: The group questioned whether an adequate investigation could be conducted with the heavy vegetative cover found in a rain forest. It was explained that the visual reconnaissance and field sampling will follow established trails and paths and that these trails and paths are the most likely exposure points for human and wildlife exposure.

It was asked whether any special permits would be required from the Olympic National Park to collect soil samples. The Olympic National Park representative indicated that they would evaluate. This will be resolved during the request for right of entry (ROE) between the Olympic National Park and USACE Seattle District. No ROE request will be made to the Olympic National Park due to ongoing negotiations between the USACE Headquarters and the Department of Interior/National Park Service. Portions of the PACR located within the Olympic National Park are range buffer zones only, and any access request would be to collect background samples. Background sample locations have been selected from alternate locations off Olympic National Park property.

1.7 Decision Rules

The following proposed data quality objectives (DQOs) and decision rules will guide Shaw's technical approach at various stages of the SI as the specific AOC is evaluated:

Objective 1: Due to the historically documented presence of MEC, the PACR will be recommended for a RI/FS.

DQO No. 1 – Using trained UXO personnel and handheld magnetometers, a visual search of the PACR will be conducted to document current site conditions and for physical evidence of range activity to be used for collection of samples. The visual search will consist of a meandering path survey along trails and in accessible areas. The following decision rule will apply:

- If there is indication of an imminent MEC hazard, the site may be recommended for a removal action.

Objective 2: Determine if the site requires an additional investigation or can be recommended for NDAI based on the presence or absence of MC above screening values.

DQO No. 2 – Soil and sediment samples will be collected and analyzed. Analytical results will be compared to background values and, if exceeded, they will be compared to screening values for human health and ecological risk assessment. The following decision rules will apply:

- If sample results are less than background concentrations, the site will be recommended for NDAI relative to MC.
- If sample results exceed background concentrations, but do not exceed human health screening values the site will be recommended for NDAI relative to MC.
- If sample results exceed background concentrations and human health screening values, the site will be recommended for additional investigation.
- If sample results exceed background concentrations and ecological screening values but do not exceed human health screening values, additional evaluation of the data will be conducted in conjunction with the stakeholders to determine if additional investigation is warranted.

1.8 MEC Technical Approach

The technical approach is based on the Work Plan (Shaw, 2006), *Final TPP Memorandum* (Shaw, 2008), and the *Formerly Used Defense Sites, Military Munitions Response Program, Site Inspections, Program Management Plan* (USACE, 2005). In accordance with Section 3.1.1 of the Work Plan, the technical approach includes the following:

- Existing data will be used to document the presence or absence of MEC.
- A magnetometer-assisted site reconnaissance will supplement the existing data in an attempt to identify evidence of MEC and/or MD at the ground surface, under vegetative cover, or beneath the surface.

If MEC is found during SI field activities, the following excerpted procedures will be followed, per Interim Guidance Document 06-05 and Safety Advisory 06-2 (see Appendix B for complete document):

“a. (1) The property owner or individual granting rights of entry to the property will be notified of the hazard and advised to call the local emergency response authority (i.e., police, sheriff, or fire department). The individual will also be informed that if they do not call the local response authority within 1 hour, the individual who identified the UXO item will notify the local emergency response authority.

b. (2) The local response authority will decide how to respond to the reported incident, including deciding not to respond (e.g., if the local response authority is already aware of the hazards on the property). If the local response authority decides to respond, the individual who identified the item or his designee will mark the location of the item and provide accurate location information to the emergency response authority. The individual who identified the item or his designee will generally remain in the area until

the local response authority arrives, unless specifically indicated by the appropriate response authority that the individual may leave the area.”

“(c) Neither the U.S. Army Corps of Engineers personnel, nor their contractors have the authority to call EOD [Explosive Ordnance Disposal] to respond to an explosive hazard. This call is the responsibility of the local emergency response authority for FUDS properties and it must come through the proper chain of command on installations.”

1.9 SSWP Organization

This SSWP supplements the Work Plan (Shaw, 2006), which includes an Accident Prevention Plan and Site Safety and Health Plan (SSHP; in Appendix D), and a Sampling and Analysis Plan (SAP; in Appendix E) that includes both the USACE SAP and the Shaw SAP. The SAPs contain a Field Sampling Plan (FSP) and a Quality Assurance Project Plan (QAPP). The Work Plan, as amended by this SSWP, governs work that will be implemented during the SI at the FUDS. This SSWP provides additional information not available in the Work Plan, including site information (background information, summary of historical documents evaluated, and resulting data needs), a discussion of activities to be conducted prior to mobilizing to the field, a presentation of field data to be collected, and appendices with supporting documents. Specifically, this SSWP includes the following sections:

- Section 1.0 Introduction,
- Section 2.0 Site Information,
- Section 3.0 Pre-Field Activities,
- Section 4.0 Site Inspection Activities,
- Section 5.0 Investigation-Derived Waste,
- Section 6.0 Proposed Schedule,
- Section 7.0 References,
- Figures,
- Tables,
- Appendix A Conceptual Site Model,
- Appendix B USACE Interim Guidance Document 06-05 and Safety Advisory 06-2, and
- Appendix C Site Safety and Health Plan Addendum.

2.0 Site Information

Unless otherwise referenced, the following historical and physical setting information in Sections 2.1 and 2.2 is taken from the ASR (USACE, 1996) and the *ASR Supplement* (USACE, 2004b). This section provides a summary of site-specific information not available in the Work Plan, which was used to profile the site in development of the CSM.

2.1 Installation History

In early 1943, the 115th Cavalry Squadron (mechanized) requested that land be leased in the area of Port Angeles, Washington for use as a combat range. The range was intended to be used for tactical firing problems and short range known distance firing (200 to 300 yards). Through leases and use permits, approximately 1,600 acres were obtained within Sections 5, 8, and 17 within Township 29 North, Range 5 West for use as the PACR. The range was sited for use of 37 millimeter (mm) and 75mm ammunition and small arms. However, there are reports that mortars and land mines were also used at the FUDS. There were no buildings or improvements, other than a spotting tower. Troops were encamped at the Port Angeles Fair Grounds/ Conservation Corps Camp.

Records indicate that the range consisted of a single firing line, with firing occurring to the south into the hilly and mountainous terrain. All firing apparently occurred from a single firing line. Interviews with former residents of the area and enlisted personnel who used the range indicated that all firing was west of Deer Park Road. Firing occurred at direct stationary and moving targets (targets and tanks pulled across range using cables) and indirect firing using coordinates.

In April and May 1944, the range was declared excess and all leases and permits were canceled. There is no information to suggest that at the time of closing any attempt was made by the Army to perform any range clearance prior to returning to private ownership. In addition, there was no information to indicate that the Army attempted to disseminate the actual use of the former range in terms of potential hazards that could remain.

Two young boys were killed in August 1948, when a 37mm shell exploded while they were cutting some downed timber within the former range. The 37mm shell was embedded in a log they were sawing. Immediately after the death of the two boys, the Army initiated the dedudiving of the area expected to be contaminated. On May 7, 1949, a Certificate of Clearance was issued noting that approximately 775 acres had been cleared of dangerous/explosive material. Figure 5 shows the area of the accident and the 1948 range clearance.

Subsequent clearances of the PACR occurred in 1952, 1955, 1956, and 1957. At some point in the 1950s signs were posted warning the public of dangers from munitions and explosive materials at the site. In 1963, 652 acres were purchased by the Army to restrict and control access to contaminated property. The 652 acres were retained until 1968 when it was transferred to the city of Port Angeles and Mr. Raymond Diehl. Records indicated that the quitclaim deed

included a “surface use only” and indemnity clause. This area is currently included in parcel identification numbers 5, 11, and 25 through 31 (Figure 4).

2.2 Physical Setting

2.2.1 Access and Land Use

The site is located approximately 7 miles southeast of the city of Port Angeles in Clallam County. The site is accessed from US Highway 101 by turning south onto Dear Park Road and traveling approximately 5 miles. Current land use is primarily as a protected watershed for the city of Port Angeles, timber production, Olympic National Park, and private residences.

2.2.2 Topography and Climate

The PACR is located on the Olympic Peninsula of Washington State. The land is hilly and semi-mountainous. The northern portion of the FUDS contains areas of meadowland/grassland, but other areas are densely forested. Review of historical aerial photographs indicates that the areas of meadowland/grassland have been present since at least 1939. This portion was the area used for actual firing. The southern portion of the property is located within the Olympic National Park and is contained in the Buffer Zone. The minimum and maximum elevations of the PACR are approximately 700 feet in the north and 3,541 feet in the south at Round Mountain (Figure 2). Deep ravines associated with Morse and Surveyor Creeks are present at the site.

The FUDS consists of primarily second growth fir and alder with some cedar trees. Where forested, the site has very heavy undergrowth that makes traverse difficult. A general depiction of the area’s topography and vegetation, including surface elevations and prominent features is provided on Figures 2 and 3.

The PACR area is tempered by winds from the Pacific Ocean. Summers are warm but hot days are rare. In winter, temperatures are cool; however, freezing temperatures and snow are infrequent except in the mountains.

The average maximum high at Port Angeles occurs in July and August at 68.4 degrees Fahrenheit (°F) and the minimum average low occurs in January at 34.0 °F. The average annual precipitation is 25.57 inches, which occurs primarily between October and April. Average total snowfall is 3.8 inches.

2.2.3 Surface Water

Three creeks transect the FUDS flowing from south to north: Surveyor Creek, Frog Creek, and Morse Creek (Figures 2 and 3). A wetland is present north of the site (not shown).

2.2.4 Geology and Hydrogeology

2.2.4.1 Bedrock Geology

Bedrock geology of the area is controlled by the converging of two tectonic plates (Juan de Fuca and North American plates). Underlying the PACR are accreted Tertiary sediments and pillow

basalt rocks that were once on the floor of the Pacific Ocean. During the Pleistocene Epoch, colder climates brought about glaciation over much of the Olympic Peninsula and Puget Lowland, leaving thick glacial outwash deposits over older rocks (Orr and Orr, 2002).

2.2.4.2 Overburden Soils

Overburden soils present at the PACR are Elwha gravelly sandy loam, Neilton very gravelly sandy loam, Puget silt loam, and Terbies very gravelly sandy loam (NRCS, 2007).

2.2.4.3 Hydrogeology

Shallow groundwater occurs in gravelly units within the glacial outwash deposits. Based on well logs, groundwater occurs in these units at a depth ranging from 50 to 120 feet. Groundwater flow is to the north from the highlands to the Strait of Juan de Fuca.

2.3 Population and Land Use

2.3.1 Nearby Population

The closest population center is the city of Port Angeles, Washington located approximately 7 miles to the northwest. The 2000 census population was 18,379 persons (U.S. Census, 2000). The population density is less than 100 persons per square mile. There are several residences within the FUDS boundary.

2.3.2 Land Use

Land use is primarily as a protected watershed for the city of Port Angeles, timber production, a National Park, and private residences. The site is accessible to the general public. Members of the public who attended the public information meeting indicated that the area is used for hiking and hunting. Fencing (condition unknown) and a few remaining signs warning of munitions hazards are still present.

2.3.3 Area Water Supply

Drinking water in the area is obtained from Clallam County PUD No. 1 and private water supply wells. Clallam County PUD No. 1 obtains water from Morse Creek at two water intake structures and from wells. The upstream structure is located at the location labeled as “Port Angeles Dam” on Figure 2 and the second intake is located approximately 1,200 feet downstream of the dam. The intake at “Port Angeles Dam” is within the PACR FUDS boundary. Some wells are located on private property within the FUDS. Figure 10 shows the locations of nearby wells.

2.4 Summary of Previous Investigations

The following describes range decontamination activities at the PACR. The information was summarized from the ASR (USACE, 1996):

- In April and May 1944, the range was declared excess. No information exists to indicate that any range cleanup was conducted at that time.

- In August 1948, two boys were killed when sawing some downed timber within the former range area. A live 37mm shell, embedded in the log they were sawing, exploded.
- Following the 1948 accident, a range clearance was conducted and, in May 1949, a Certificate of Clearance was issued noting that approximately 775 acres had been cleared of dangerous/explosive material.
- Subsequent clearances were completed in 1952, 1955, 1956, and 1957.
- In 1986, a Range Clearance Technology Assessment was completed for the PACR. The report concluded that “Additional mechanical clearance of the range is environmentally, technically, and economically unfeasible at this time or in the foreseeable future” (NEODFC, 1986).

Table 3 in the *Final TPP Memorandum* (Shaw, 2008) summarizes the results of the range clearances and MEC/munitions debris (MD) recovered during the clearance.

An Inventory Project Report (USACE, 1993) was prepared and issued in 1993. The report determined that the PACR was formerly used by the DoD and is eligible for DERP FUDS. It was also proposed that further evaluation of the site be completed to better determine the hazards posed by the presence of UXO.

An ASR (USACE, 1996) was prepared and issued in 1996 summarizing historical information and a site visit performed to confirm site conditions. The ASR identified six areas of interest:

- Area A – Direct Fire Impact Area,
- Area B – Indirect Fire Impact Area,
- Area C – Buffer Zone,
- Area D – Combat Training Area,
- Area E – All remaining land, and
- Area F – Impact/Buffer Area (additional acreage).

The ASR identified the likely munitions used at PACR.

An *ASR Supplement* (USACE, 2004b) identified one range and seven sub-ranges as follows:

- Range Complex No. 1,
 - Direct Fire Impact Area,
 - Direct Fire and Combat Training,
 - Indirect Fire Impact Area,
 - Buffer Zone,
 - Buffer Zone and Combat Training,
 - Combat Training Area, and
 - Impact/Buffer Area.

- No other investigations/removal actions have been conducted at PACR.

MEC was located and disposed of during the multiple range clearance activities that occurred in 1949 and in the 1950s.

2.5 Other Land Uses that May Have Contributed to Contamination

Available information indicates that portions within the PACR are being used for cattle grazing and timber harvesting. Other than occasional use of fertilizers and pesticides/insecticides, no other potential sources of contamination are known.

2.6 Munitions Information

The ASR (USACE, 1996) and *ASR Supplement* (USACE, 2004b) indicate that the following munitions were used at PACR: small arms (.30, .45, and .50 caliber), 37mm (target practice, high explosive, and armor piercing), 75mm (practice, high explosive, and white phosphorus smoke), 60mm mortar (high explosive and practice), 81mm mortar (high explosive, practice, and white phosphorus smoke), rifle grenade M9A1 anti-tank, 2.36-inch rockets (practice and high explosive anti-tank), and anti-personnel and anti-tank practice mines. The munitions quantities used are not known. None of these munitions are reported as containing perchlorate. Table 1 lists the probable munitions used and munitions constituents for PACR.

3.0 Pre-Field Activities

3.1 Coordination with State Historic Preservation Office

The Washington Department of Archaeology & Historic Preservation (WDAHP) has been contacted to determine if there are any historical or cultural sites located at the FUDS. The WDAHP recommended that consultation with nearby tribes and an archaeological survey be conducted (WDAHP, 2008). The USACE Seattle District will conduct an archaeological evaluation of the FUDS, which will be documented in the SI Report.

3.2 Coordination Regarding Natural Resources

The Washington Department of Fish and Wildlife (WDFW), Washington Department of Natural Resources (WDNR) Natural Heritage Program, and U.S. Fish and Wildlife Service (USFWS) were contacted to determine whether any threatened or endangered species are present at the FUDS. Database searches by the WDFW indicated that “priority wildlife heritage points” and occupied Marbled Murrelet sites are present on the FUDS (WDFW, 2008). In addition, priority anadromous and resident fish are present in the area. Inquiries on the USFWS website for Clallam County, Washington indicated that federally listed species may use the FUDS (USFWS, 2007). The WDNR indicated that there were no records for rare plants or high quality native ecosystems in the vicinity of the FUDS (2008). This information is general to the area and not site specific. The status of threatened or endangered species in the area of PACR is shown in the table below.

Listing	Status	Common Name	Scientific Name
State and Federal	Listed	Bull Trout	<i>Salvelinus confluentus</i>
State and Federal	Listed	Northern Spotted Owl	<i>Strix occidentalis caurina</i>
State and Federal	Listed	Marbled Murrelet	<i>Brachyramphus marmoratus</i>

There is a designated wetland within the FUDS.

The PACR does qualify as Important Ecological Places (IEPs) or Sensitive Environments as defined by USACE (2006) and EPA (1997).

3.3 Review of Historical Aerial Photographs

A review of current (2006) and historical (1939 and 1975) aerial photographs of the FUDS has been completed as part of preparation of this SSWP. The quality of the 1939 aerial photograph (ASR Plate K-1) is poor but does indicate that the area of the meadowland located in the northern portion of the FUDS was present before the area was used for the range. The area of the FUDS also appears to have been heavily logged for timber prior to use by the DoD. No evidence of range activity can be observed in the 1975 or 2006 aerial photos.

3.4 Coordination of Rights of Entry

Per Section 2.5.2 of the Work Plan (Shaw, 2006) and as the geographic USACE District office for the PACR, the Project Manager from the USACE Seattle District office is responsible for obtaining the ROEs for the property where the SI activities will be performed. Access to identified property is necessary for conducting field activities. Table 2 identifies the properties of interest and the status of the ROE, and Figure 4 shows the locations of the individual property parcels.

3.5 Equipment

A four-wheel drive vehicle will be necessary for access on unpaved roads, with the permission of the landowners. In areas where vehicles are not permitted, access will be on foot.

A hand-held fluxgate magnetometer (Schonstedt or equivalent) will be used to support the reconnaissance effort. A hand-held global positioning system (GPS) unit will be used for traverses and to document any surface remains, document the reconnaissance survey, and identify the location of MEC, if found. A digital camera will also be used.

3.6 Communications

The primary means of on-site communication will be cellular telephones or radios. A satellite phone will be carried as a backup form of communication. The two-person Field Team (and any other accompanying parties) will remain together throughout all aspects of the field activities.

3.7 Training and Briefing

Any additional training will be conducted on site during the Daily Tailgate Safety Briefing, to include awareness of endangered species, culturally sensitive areas, and anticipated ordnance types. In addition, emphasis will be placed on the known presence of biota at the site.

4.0 *Site Inspection Activities*

The SI activities proposed at the FUDS are site reconnaissance, and soil, sediment, and groundwater sampling. SI field activities will be conducted in accordance with the SSHP Addendum (Appendix C). The SSHP Addendum is a supplement to the program-wide Accident Prevention Plan and SSHP contained in the Work Plan (Shaw, 2006). SI field activities will be documented in the field logbook.

4.1 *Key Personnel*

This section identifies key project personnel and their specific roles and responsibilities for each SI activity conducted at the FUDS. Additionally, this section defines the responsibilities, authority, and the interrelationships of all personnel who manage, perform, and verify activities affecting quality, particularly for personnel who need the organizational freedom and authority to:

- Initiate action to prevent the occurrence of nonconformance,
- Identify and record any quality problems,
- Initiate, recommend, or provide solutions through designated channels,
- Verify the implementation of solutions, and
- Control further processing, delivery, or installation of non-conforming items until the deficiency or unsatisfactory condition has been corrected.

Project Manager – The Shaw Project Manager will have overall responsibility, authority, and accountability for the project. Mr. Peter Kelsall is the Project Manager. He will provide additional management or technical support when needed and will serve as the final reviewer on all technical documents produced for the project.

Chemical Quality Control Officer – The Shaw Chemical Quality Control Officer shall ensure that all chemistry-related objectives, including responsibilities for DQO definitions, sampling and analysis, project requirements for data documentation and validation, and final project reports are attained. Mr. Tim Roth will serve as the Chemical Quality Control Officer for this project.

Health and Safety Manager – The Shaw Health and Safety Manager is responsible for the development and implementation of the SSHP and SSHP Addendum for the SI. Mr. Dave Mummert will serve as the Health and Safety Manager for this project.

Technical Lead – The Shaw Technical Lead will oversee the technical aspects of the inspection activities. Mr. Dale Landon will serve as the Technical Lead for this site. Although his presence is not required, Mr. Landon may act as a team member during the field activities. He may also serve as an alternate Field Team Leader.

Field Team Leader – The Shaw Field Team Leader will be responsible for the management and execution of all field project activities in accordance with the approved Work Plan, as well as federal, state, and local laws and regulations. Mr. Dale Landon will serve as the Field Team Leader for this site. The Field Team Leader will function as the primary point of contact for the stakeholders and field personnel, and will document technical progress, needs, potential problems, and recommended solutions.

UXO Technician – The UXO Technician will be responsible for the UXO avoidance measures to be implemented during field activities. One of the following individuals will serve as the UXO Technician: David Watkins (1420), Rob Irons (1137), Jim Bayne (1212), Rueben Rhodes (0169), Ron Stanfield (1161), or Dave Van Deman (1057).

4.2 Field Reconnaissance

This section discusses the visual surface reconnaissance planned for the AOCs.

4.2.1 Objectives

A visual surface reconnaissance will be conducted along a meandering path through portions of the FUDS (Figure 5). The reconnaissance has three main objectives:

- Document general site conditions (field logbook, photographs, GPS waypoints) for each AOC, even if MEC has been documented from previous investigations or from SI reconnaissance;
- Identify and locate MEC, MD, and/or other evidence of range activities that may be present in order to test and verify the CSM (Appendix A) and to “ground truth” features seen on aerial photographs; and
- Optimize sample locations, biased to locations where MC is most likely to be present.

UXO avoidance will be conducted during all SI field activities. If suspected MEC is observed at any point during field activities, the field team will respond according to the requirements of the SSHP and SSHP Addendum (in Appendix C), and make appropriate notifications in accordance with USACE direction (Appendix B). The team leader will also contact the Shaw Project Manager and will coordinate with the Shaw Senior UXO Supervisor (Brian Hamilton) for assistance in identifying items. Reconnaissance for the purpose of determining the presence or absence of MEC will be terminated, and further reconnaissance will be limited to the minimum amount necessary to document site conditions and determine appropriate sample locations. If evidence of munitions activity is observed that is inconsistent with the CSM, notification will be made to USACE and WDOE, and a variance to this SSWP would be submitted to initiate appropriate changes to the SI approach.

4.2.1.1 Document General Site Conditions

The following conditions, if present, will be recorded in the field logbook and documented by digital photographs:

- Access limitations (fencing, gates, rivers, buildings, etc.);
- Land use (agriculture, development, buildings, campgrounds, dumping, etc.);
- Land disturbance (destruction of historic berms, excavation, fill, subsidence, etc.);
- Type and condition of vegetative cover and habitat (noting especially any distressed populations);
- Presence or potential presence of wildlife;
- Wetlands or other features that would qualify the site as an IEP;
- Soil conditions;
- Presence or absence of surface water (streams, ponds, etc.);
- Direction of surface water flow;
- Location and condition of groundwater wells;
- Evidence of use of surface water or groundwater for human consumption, stock watering, or irrigation;
- General physical setting and topography;
- Features such as residences, schools, or churches that were called out in the *TPP Memorandum*;
- Any activities that could result in contamination; and
- Photograph details (GPS waypoint, key features, direction, time, distance to key objects, etc.).

4.2.1.2 *Document Evidence of Military Activities*

Table 1 lists munitions and the associated MC used at Range Complex No. 1. The following conditions will be recorded in the field logbook and documented by digital photographs and GPS:

- Presence or absence of MEC, shell casings, bullets or bullet fragments, or other MD;
- Disposition of MEC and MD; and
- Location and physical description of range features such as firing points, berms, targets, observation posts, craters, foxholes, and historical military signs.

Based on USACE guidance, reconnaissance of this type will be limited to the identified former range areas, in the absence of evidence suggesting munitions-related activities in other portions of the FUDS.

4.2.1.3 *Sample Locations*

Reconnaissance will also be used to select optimal sample locations; i.e., samples will be biased to locations with evidence of former munitions activity, if observed. The following conditions

will be recorded in the field logbook (include text and sketches, when applicable) and documented by digital photographs:

- Rationale for selecting sample location (e.g., presence of MEC or MD, staining, distressed vegetation);
- Description of sample location (e.g. firing point, impact area, etc.);
- Soil conditions (as appropriate);
- Surface water or sediment conditions (as appropriate); and
- Description of the water source for groundwater samples (well details as available, location relative to AOC and other site features, depth to water, history of well installation, use of water).

Background sample locations will be selected in areas that do not appear to have been impacted by past site operations based on criteria such as similarity to soils within the AOC (soil samples), site accessibility, wind direction (soil samples), and groundwater flow direction (groundwater samples).

4.2.2 Reconnaissance Methods

The site reconnaissance will be performed by conducting a visual inspection of appropriate and accessible portions of the range by a field team of two or more persons, including a qualified UXO technician. The UXO technician will supplement the visual inspection with the use of a hand-held fluxgate magnetometer in areas where vegetation or soil cover may obscure potential ferrous objects. The path walked during the reconnaissance will be recorded using a hand-held GPS unit. Reconnaissance will not include detailed mapping; however, GPS waypoints and tracks will be presented on SI figures. The reconnaissance effort will be concentrated in the general vicinity of the firing point and target areas as well as limited reconnaissance in buffer areas.

The magnetometer will generally be used in areas where it would be difficult to see objects on the ground surface because of vegetation or other site conditions. The magnetometer may also be used around targets or in areas where subsurface MEC may reasonably be expected. The magnetometer might not be used in portions of the AOC if the ground surface is visible and there is no visual evidence indicating the presence of ferrous munitions-related objects, or in areas where interference from ferrous objects unrelated to munitions, such as buried utilities, are present.

4.2.3 Extent of Reconnaissance

Site reconnaissance will use available aerial photographs and a Geographic Information System base map developed from the ASR and other sources. Field crews will be provided both current and historical aerial photographs. Information shown on the reconnaissance base map will include AOC boundaries, property boundaries, information from reported MEC findings, range

clearance areas, topography, current roads, and buildings. One objective of reconnaissance is to “ground truth” features seen on aerial photographs (e.g., if targets are still visible, or if buildings have been removed or added).

The reconnaissance efforts will be focused on the AOCs and may be further concentrated in areas where MEC or MC is most likely to be found based on the CSM (e.g., firing targets). General site conditions will be documented throughout the AOC and as appropriate in other parts of the FUDS.

The reconnaissance effort will be concentrated in the area of the FUDS where the 1948 accident occurred and an area identified in the 1948 range clearance as an “area of high contamination” (Figure 5). Reconnaissance will also extend into selected other portions of the AOC. The anticipated total length of the meandering path is approximately 40,000 linear feet. Note that because of very heavy vegetative undergrowth, many areas may have limited access. Alternate routes may be walked when undergrowth prevents access.

4.3 Field Sampling

This SSWP details sampling to be conducted, by media, as discussed during the TPP meeting and documented in the *Final TPP Memorandum* (Shaw, 2008). The collection of soil, sediment, and groundwater samples are proposed for the AOCs. Sample location rationale is presented in Table 3.

In all instances, samples will be collected using clean, new, disposable sampling equipment, such as a spoon or scoop and bowl. Nondisposable tools, such as a spade, shovel, or trowel, may be used to remove vegetation, roots, and gravel prior to collection of the soil and sediment samples. Soil and sediment samples will be collected in accordance with this section and with the SAP/FSP Section 6.1 and Shaw Standard Operating Procedures T-FS-101 and T-FS-124 in Appendix E of the Work Plan (Shaw, 2006). Groundwater samples will be collected in accordance with Section 5.3.4 in Appendix E of the Work Plan. Sample designations and quality assurance/quality control (QA/QC) sample requirements are summarized in Table 4.

4.3.1 Soil Sampling

A total of eight soil samples are to be collected from Range Complex No. 1. One soil sample will be collected from the firing line to determine impacts from firing. One soil sample will be collected from the Combat Training Area Subrange. Two samples will be collected from each of the two impact areas (direct and indirect fire impact areas). One sample will be collected from the location of the Swagerty accident and one sample will be collected from the area of “heavy contamination” based on historical range clearance activities. The exact locations of the samples will be determined in the field following completion of the visual reconnaissance survey. The approximate locations of the soil samples are shown on Figure 6. All surface soil samples will be composite samples (7-point, wheel pattern with a 2-foot radius). Soil samples will be analyzed for explosives (including nitroglycerin and pentaerythritol tetranitrate [PETN]) and

metals of concern (chromium, copper, iron, lead, mercury, and nickel) plus metals aluminum, magnesium, manganese, and zinc. The additional metals may be used to conduct geochemical evaluation for determination of naturally occurring metals of concern concentrations. These samples are designed to assess the potential presence of MC associated with past activities involving the use of military munitions.

4.3.2 Sediment Sampling

One sediment sample will be collected from Surveyor Creek at a location downstream of the FUDS operational areas. This sediment sample will be used to determine if there has been a release of MC to surface water and sediment from the Range Complex No. 1 related to past range activities. The approximate location of the sediment sample is shown on Figure 6. The actual sampling location will be determined in the field based on results of the visual reconnaissance. The sediment sample will be a discrete sample. The analytical suite will be the same as for soils (i.e., explosives [including nitroglycerin and PETN] and metals of concern [chromium, copper, iron, lead, mercury, and nickel] plus metals aluminum, magnesium, manganese, and zinc).

4.3.3 Groundwater Sampling

One groundwater sample will be collected from a domestic water well located downgradient of the Range Complex No. 1. The groundwater sample will be collected from a point as close to the well head as possible and before any water treatment (softener). The approximate location of the groundwater sample is shown on Figure 6. The groundwater sample will be analyzed for the same constituents as for soils and sediment listed above.

4.3.4 Background Sampling

Ten background surface soil samples (plus one duplicate sample) will be collected from nearby areas outside the range impact area boundaries. The discrete samples locations will be determined in the field in areas that do not appear to have been impacted by past site operations. The soil background samples will be collected using the same procedures and analyzed for the metals of concern (chromium, copper, iron, lead, mercury, and nickel) plus metals aluminum, magnesium, manganese, and zinc. The additional metals may be used to conduct geochemical evaluation for determination of naturally occurring metals of concern concentrations. The results of the background sampling will be used for comparison to the results from the samples collected on the PACR. Proposed background sampling is summarized in Table 4.

Two background sediment samples (plus one duplicate sample) will be collected from Surveyor Creek at a location upstream of the impact areas. The samples will be analyzed for the metals listed above for the soil background samples, and the data will be used for comparison to the sediment sample collected downstream of the impact areas.

One background groundwater sample will be collected from a groundwater source located either up or cross gradient of the firing line and impact areas. The sample will be analyzed for the

metals listed above for the soil background sample and used for comparison to the groundwater sample collected downgradient of the firing line and impact areas. The well to be sampled will be determined following receipt of approved ROEs from landowners.

Analytical methods to be used are discussed in Section 4.4 Analytical Program below.

4.3.5 Quality Assurance/Quality Control Samples

Quality control samples, including field duplicates and matrix spike/matrix spike duplicate samples, will be collected as detailed in Table 4. The USACE NWO Military Munitions Design Center has directed that no quality assurance (field split) samples will be collected for the SI at this site.

4.3.6 Sample Preservation, Packaging, and Shipping

Sample preservation and packaging are provided in Shaw SAP/FSP Tables 4-1 and 4-2 in Appendix E of the Work Plan (Shaw, 2006). Sample shipment will follow the procedures specified in Section 4.0 of the Shaw SAP/FSP. Completed analysis request/chain-of-custody records will be secured and included with each shipment of coolers per Section 7.1.3 of the Shaw SAP/FSP. Samples will be shipped to the following laboratory:

GPL Laboratories, LLLP
7210A Corporate Court
Frederick, Maryland 21703
Phone: 301.694.5310
Fax: 301.620.0731
Attention: Sample Receiving/Virginia Zusman

4.4 Analytical Program

Definitive target analyses for samples collected from the PACR FUDS consist of the following list of analytical suites:

- Select metals aluminum, chromium, copper, iron, lead, magnesium, manganese, nickel, and zinc by EPA SW-846 Method 6020A;
- Mercury by EPA SW-846 Method 7471A; and
- Explosives (including nitroglycerin and PETN) by EPA SW-846 Method 8330 modified.

Soil samples that are possibly impacted by small arms fire will be passed through an ASTM International No. 10 (2mm) wire mesh sieve at the laboratory prior to analysis for lead in order to remove coarser particles and foreign objects, including large metallic lead fragments from bullets, which have a low degree of bio-availability (Interstate Technical and Regulatory Council, 2003).

Chemical data will be reported via a hard-copy data package and electronic format following the requirements described in the Shaw SAP/FSP Sections 7.1 and 7.2 (Appendix E) of the Work

Plan and applicable portions of the USACE QAPP (Shaw, 2006). These data deliverables will be validated in accordance to the requirements referenced in Section 8.2 of the Shaw SAP/FSP.

Chemical data will be reported via a hard-copy data package and electronic format following the requirements described in the Shaw SAP/FSP Sections 7.1 and 7.2 (Appendix E) of the Work Plan and applicable portions of the USACE QAPP (Shaw, 2006). These data deliverables will be validated in accordance to the requirements referenced in Section 8.2 of the Shaw SAP/FSP.

4.5 Background and Screening Values

Site-specific or regional data regarding background concentrations of metals in soil, sediment, and groundwater are not known to be available. Ten background surface soil samples will be collected from nearby areas outside the range impact area boundaries. A comparison of site sample data to background data will be necessary to distinguish a munitions-related release from ambient conditions resulting from naturally occurring or anthropogenic sources. Where the body of background data includes sufficient samples (i.e., soil), a background threshold comparison of site concentrations to the background 95th upper tolerance limit or 95th percentile, as appropriate, will be made (EPA, 1989, 1992a, 1994, and 2002). If one or more site samples exceed the background threshold, the following tests may also be applied:

- A nonparametric comparison of the central tendencies or medians of the site and background distributions, using the Wilcoxon rank sum test (EPA, 1994, 2002, and 2006; U.S. Navy, 2002 and 2003),
- A geochemical evaluation using correlation plots of trace element versus reference element concentrations (EPA, 1995; Myers and Thorbjornsen, 2004), for any element that fails either of the above two statistical tests.

Two background sediment samples will be collected from Surveyor Creek at a location upstream of the impact areas. The sample will be analyzed for the metals listed above for the soil background samples and the data will be used for comparison to the sediment sample collected downstream of the impact areas.

One background groundwater sample will be collected from a groundwater source located either up or cross gradient of the firing line and impact areas. The sample will be analyzed for the metals listed above for the soil background sample and used for comparison to the groundwater sample collected downgradient of the firing line and impact areas.

Where the body of background data is limited (in this case, sediment and groundwater), the site-to-background comparison will be conducted according to guidance for SI activities and HRS scoring (EPA, 1992b). Background concentrations for analytes are taken to be the maximum values observed in the limited background data set (EPA, 1995). A comparison is then made to determine if a hazardous substance in the media is “significantly above the background level” according to the HRS criteria (EPA, 1990, Table 2-3):

1. If the sample measurement is less than or equal to the sample quantitation limit, no observed release is established.
2. If the sample measurement is greater than or equal to the sample quantitation limit, then:
 - If the background concentration is not detected, an observed release is established when the sample equals or exceeds the sample quantitation limit.
 - If the background concentration equals or exceeds the detection limit, an observed release is established when the sample is three times or more above the background concentration.

Background threshold values, for comparison to site data per the above HRS criteria, are three times the maximum detected background concentration. For analytes not detected in background samples, the background threshold is the sample quantitation limit.

Site sample data that exceed background concentrations will be compared to appropriate human health and/or ecological screening criteria to determine if additional investigation should be recommended. Tables 5 through 8 list the screening criteria for this SI.

4.6 Site-Specific Information/Data

In addition to observations and data directly obtained from field activities discussed in Sections 4.2 and 4.3, site-specific information/data will be collected for the FUDS to supplement that found in the ASR and *ASR Supplement*. Initial information collected has been incorporated in the SSWP. This site information will be supplemented using research via Internet searches, requests from agency contacts (WDAHP, WDFW, WDNR, USFWS, etc.), and site contacts, if applicable. Site-specific information/data will include geology, climate, hydrogeology, federally and state-listed threatened and endangered species known to be or potentially be on site, sensitive habitats, wetlands, cultural and archeological resources, water resources, vegetation, waste disposal sites, and impact mitigation measures.

Further data collection will be conducted to complete the MRSPP scoring sheets and to collect the pertinent MC-related HRS scoring information. The primary information needed to complete the MRSPP scoring, such as hazard type (i.e., explosive or chemical) and accessibility, will come from historical site documents (*ASR*, *ASR Supplement*, etc.). To further supplement current on- and off-site information needed for receptor scoring, additional data will be collected on the current on- and off-site activities/structures, population density, CERCLA sites, Resource Conservation and Recovery Act sites, well locations, and water supply information.

5.0 *Investigation-Derived Waste*

Investigation-derived waste (IDW) will be managed in accordance with Work Plan Section 3.7 and Shaw SAP/FSP Section 9.0 in Appendix E of the Work Plan (Shaw, 2006). All IDW is presumed nonhazardous unless field observations indicate otherwise. The following types of IDW will be managed as specified in Appendix E of the Work Plan (Shaw, 2006):

- Personal protective equipment and disposable equipment (i.e., gloves, disposable sampling scoop): Bagged and routed to a municipal landfill;
- Excess surface soil, sediment, and groundwater: Returned to the source (i.e., ground surface); and
- Water used in cleaning of reusable equipment: Poured on ground surface.

6.0 *Proposed Schedule*

The proposed schedule for field activities and reporting is provided below. The timing of the field activities assumes there will be no delays because of inclement weather.

- Final SSWP Submitted July 2008.
- Field Work Begins August 2008.
- Draft SI Report Submitted November 2008.
- Draft SI Report Comments Due December 2008.
- Draft Final SI Report Submitted January 2009.
- Draft Final SI Report Comments Due February 2009.
- Second TPP Meeting February 2009.
- Final SI Report Submitted March 2009.

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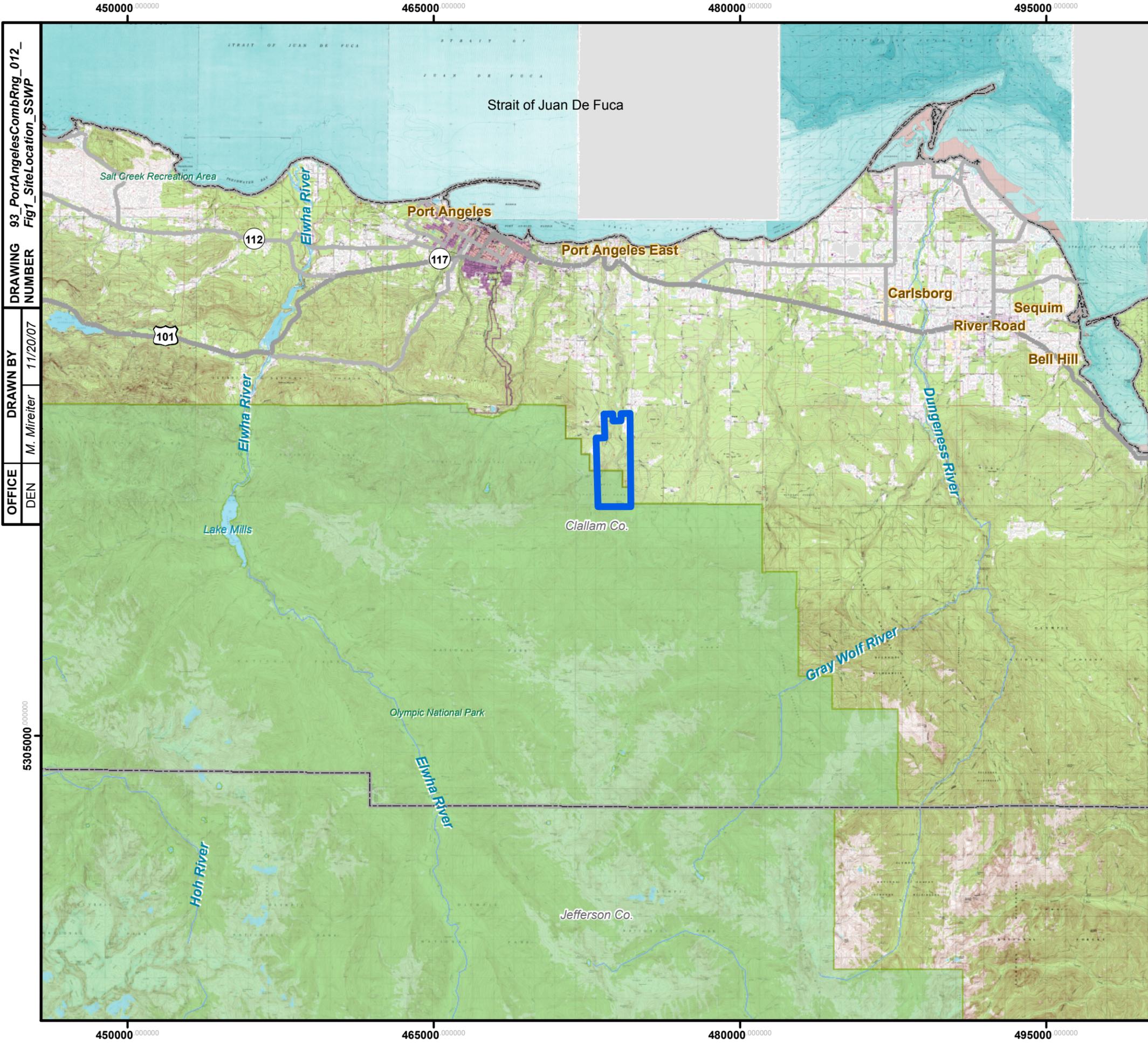
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Reservation (T9N, R10W, S9,15,16,21,22) and Port Angeles Combat Range (T29N, R5W, S5,8,17). January 7, 2008.

Figures



DRAWING NUMBER: 93_PortAngelesCombRng_012_Fig1_SiteLocation_SSWP
 DRAWN BY: M. Mireiter
 DATE: 11/20/07
 OFFICE: DEN

Legend

 Port Angeles Combat Range FUDS Property

NOTES:
 1) FUDS property boundary was obtained from a GIS dataset provided by the USACE.
 2) Topographic map (Clallam County) was obtained from the U.S. Department of Agriculture, Service Center Agencies, 1999.



REFERENCE/PROJECTION: NAD 83 UTM Zone 10N



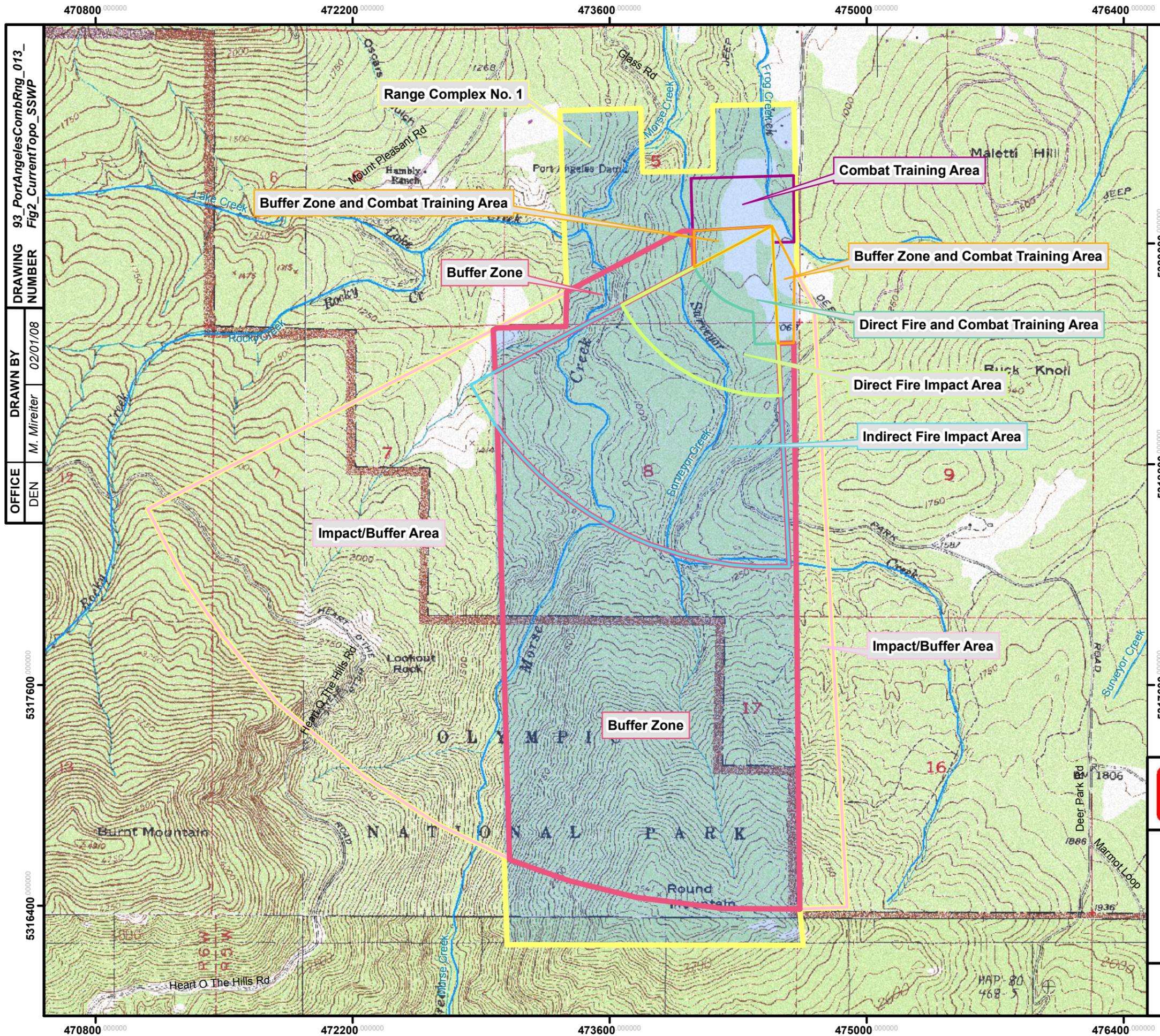
U.S. ARMY CORPS OF ENGINEERS
 OMAHA DESIGN CENTER

FIGURE 1

SITE LOCATION

PORT ANGELES COMBAT RANGE
 FUDS PROPERTY NUMBER F10WA0033





DRAWING 93_PorAngelesCombrng_013_ Fig2_CurrentTopo_SSWP
 NUMBER
 DRAWN BY M. Mireiter 02/01/08
 OFFICE DEN

Legend

- Port Angeles Combat Range FUDS Property
- Ranges in the MMRP Inventory**
- Range Complex No. 1
- Sub-Ranges in the MMRP Inventory**
- Direct Fire Impact Area
- Direct Fire and Combat Training Area
- Indirect Fire Impact Area
- Buffer Zone
- Buffer Zone and Combat Training Area
- Combat Training Area
- Impact/Buffer Area

NOTES:
 1) FUDS property and range boundaries were obtained from a GIS dataset provided by the USACE.
 2) Topographic map (Clallam County) was obtained from the U.S. Department of Agriculture, Service Center Agencies, 1999.

N

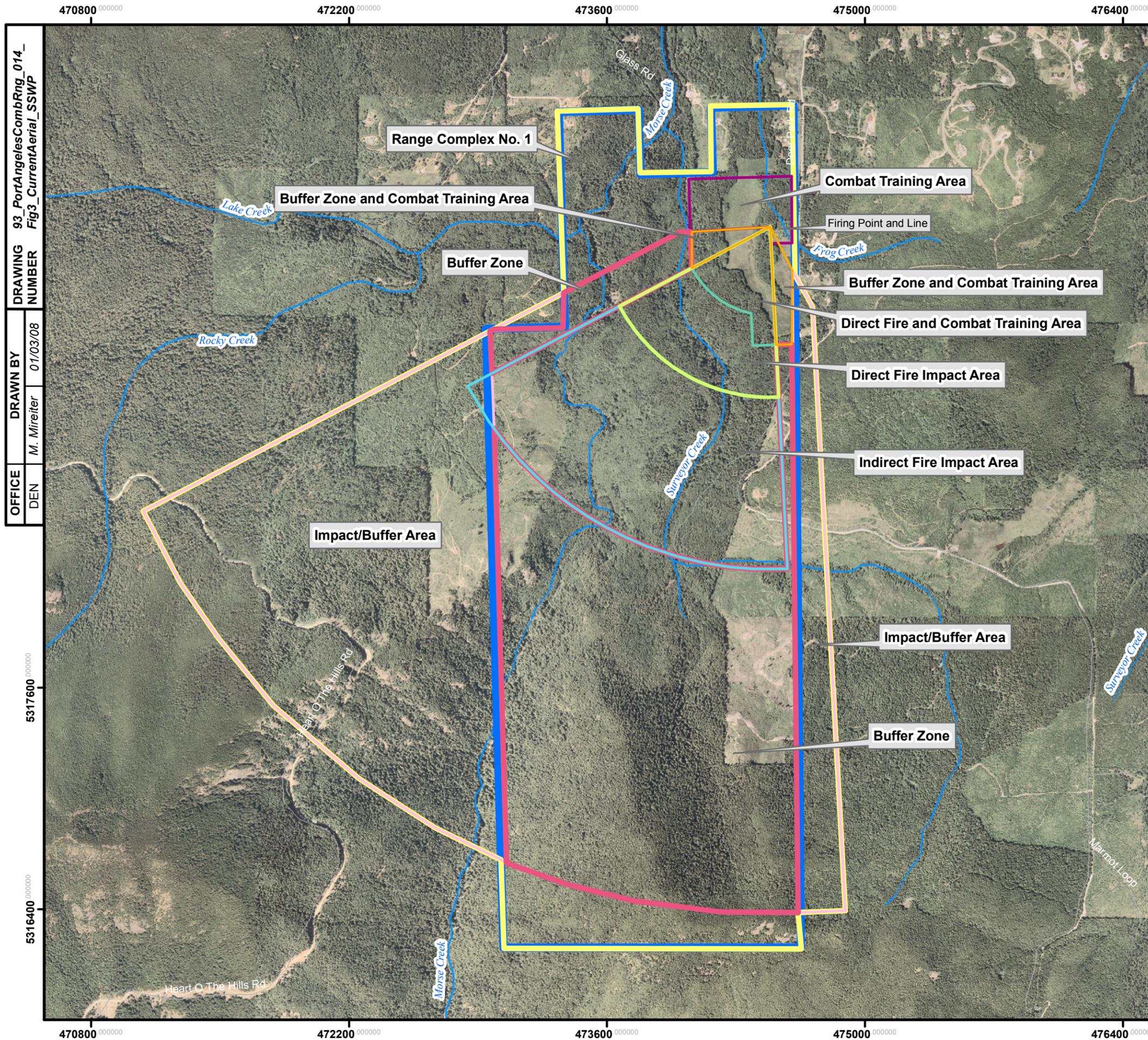
0 875 1,750 3,500 Feet

REFERENCE/PROJECTION: NAD 83 UTM Zone 10N

U.S. ARMY CORPS OF ENGINEERS
 OMAHA DESIGN CENTER

FIGURE 2
CURRENT TOPOGRAPHIC MAP
 PORT ANGELES COMBAT RANGE
 FUDS PROPERTY NUMBER F10WA0033

Shaw Environmental, Inc.



DRAWING NUMBER: 93_PorAngelesCombRng_014_Fig3_CurrentAerial_SSWP
 DRAWN BY: M. Mireiter
 DATE: 01/03/08
 OFFICE: DEN

Legend

- Port Angeles Combat Range FUDS Property
- Ranges in the MMRP Inventory**
- Range Complex No. 1
- Sub-Ranges in the MMRP Inventory**
- Direct Fire Impact Area
- Direct Fire and Combat Training Area
- Indirect Fire Impact Area
- Buffer Zone
- Buffer Zone and Combat Training Area
- Combat Training Area
- Impact/Buffer Area

NOTES:

- 1) FUDS property and range boundaries were obtained from a GIS dataset provided by the USACE.
- 2) Aerial photograph (Clallam County) was obtained from the U.S. Department of Agriculture, Service Center Agencies; photograph is from the USDA-APFO National Agricultural Inventory Project (NAIP), 2006.



0 875 1,750 3,500 Feet
 REFERENCE/PROJECTION: NAD 83 UTM Zone 10N

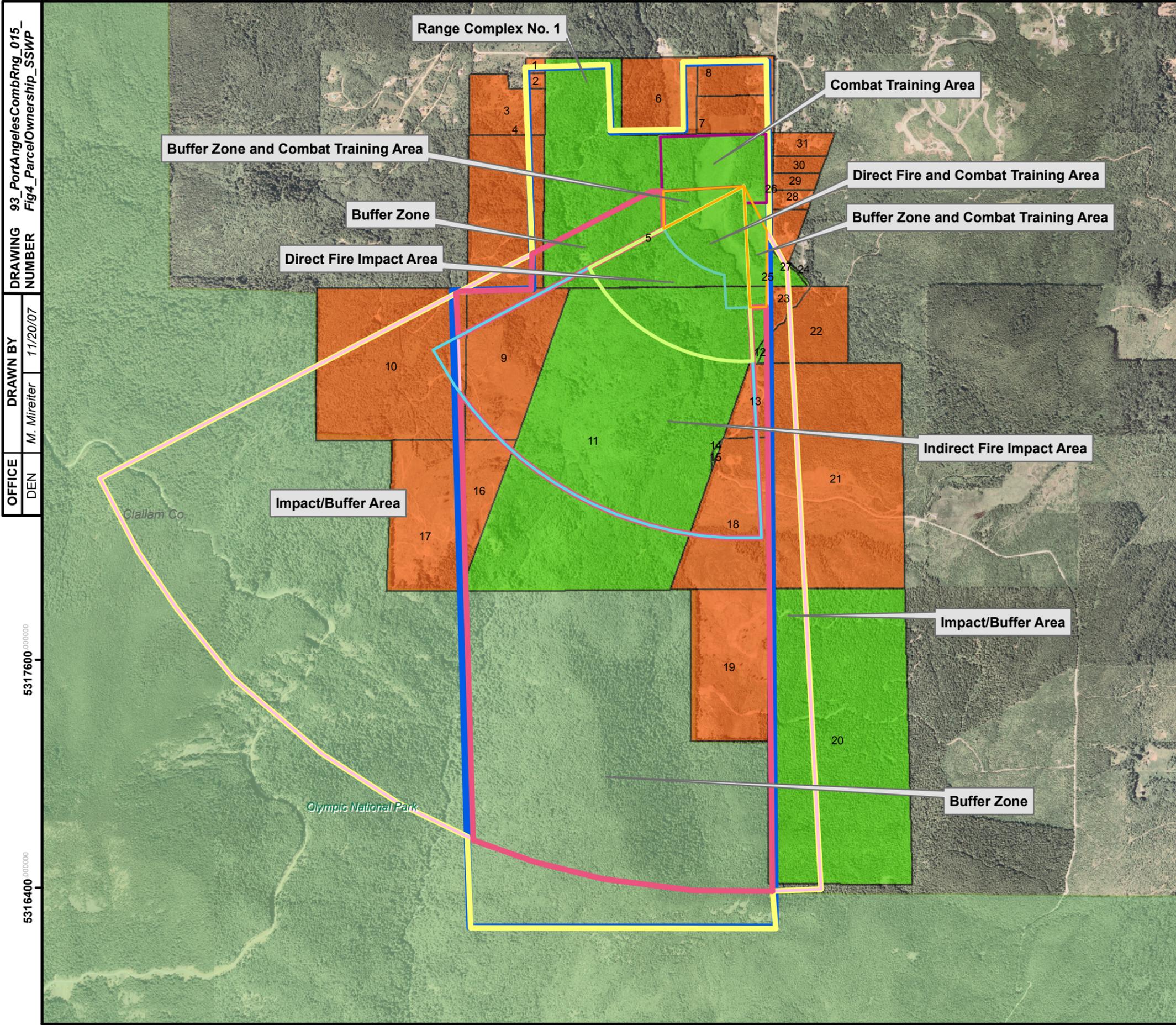
U.S. ARMY CORPS OF ENGINEERS
 OMAHA DESIGN CENTER

FIGURE 3
SITE LAYOUT AND
CURRENT AERIAL PHOTOGRAPH

PORT ANGELES COMBAT RANGE
 FUDS PROPERTY NUMBER F10WA0033

Shaw Environmental, Inc.

470800 000000 472200 000000 473600 000000 475000 000000 476400 000000



Legend

- Port Angeles Combat Range FUDS Property
- Olympic National Park
- Taxlot Parcel - Private
- Taxlot Parcel - Public
- 10 Parcel ID Number

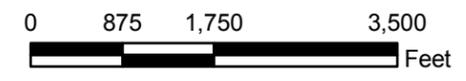
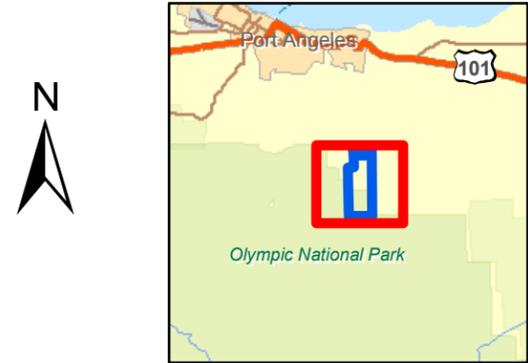
Ranges in the MMRP Inventory

- Range Complex No. 1

Sub-Ranges in the MMRP Inventory

- Direct Fire Impact Area
- Direct Fire and Combat Training Area
- Indirect Fire Impact Area
- Buffer Zone
- Buffer Zone and Combat Training Area
- Combat Training Area
- Impact/Buffer Area

NOTES:
 1) FUDS property and range boundaries were obtained from a GIS dataset provided by the USACE.
 2) Parcel data were obtained from Pacific County website.
 3) Aerial photograph (Clallam County) was obtained from the U.S. Department of Agriculture, Service Center Agencies; photograph is from the USDA-APFO National Agricultural Inventory Project (NAIP), 2006.



REFERENCE/PROJECTION: NAD 83 UTM Zone 10N

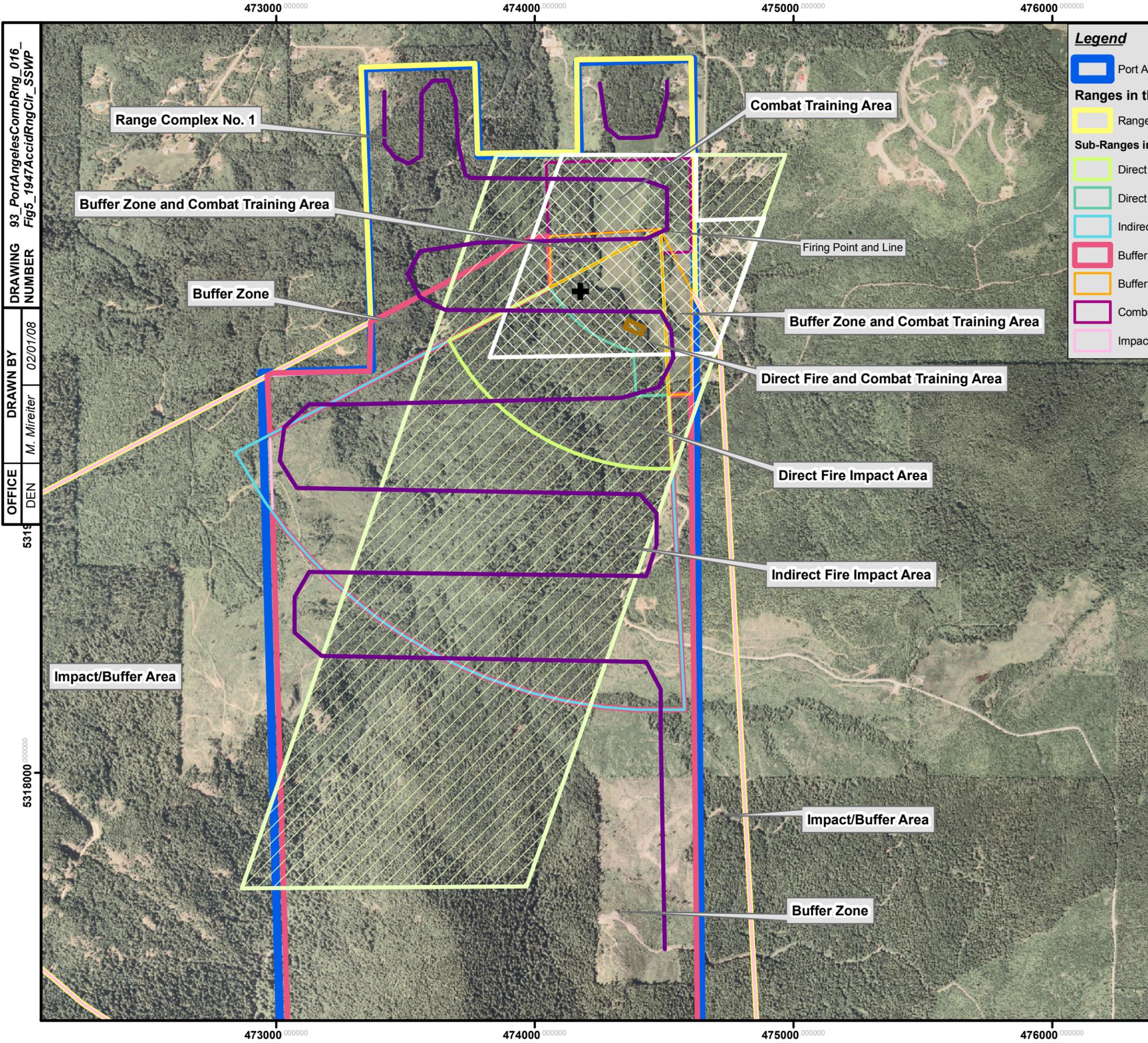
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 DRAWN BY: M. Mireiter
 DATE: 11/20/07
 OFFICE: DEN

U.S. ARMY CORPS OF ENGINEERS
 OMAHA DESIGN CENTER

FIGURE 4
PARCEL OWNERSHIP
 PORT ANGELES COMBAT RANGE
 FUDS PROPERTY NUMBER F10WA0033

Shaw Environmental, Inc.

470800 000000 472200 000000 473600 000000 475000 000000 476400 000000



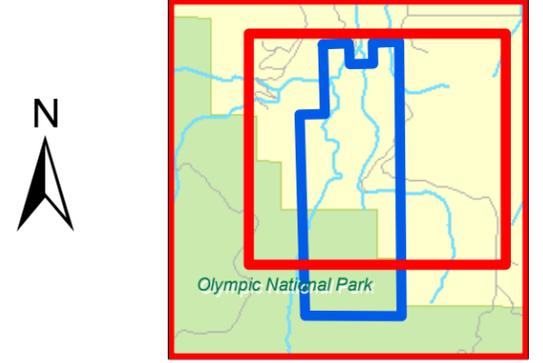
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 DRAWN BY: M. Mireiter
 OFFICE: DEN
 5318000
 5319000

Legend

- Port Angeles Combat Range FUDS Property
- Range Complex No. 1
- Direct Fire Impact Area
- Direct Fire and Combat Training Area
- Indirect Fire Impact Area
- Buffer Zone
- Buffer Zone and Combat Training Area
- Combat Training Area
- Impact/Buffer Area
- Proposed Reconnaissance Route
- Area of Greatest Contamination
- Area of Heavy Contamination
- Probable Limit of Contamination
- + Location of Swagerty Accident

NOTES:

- 1) FUDS property and range boundaries were obtained from a GIS dataset provided by the USACE.
- 2) Accident and clearance locations from ASR, Appendix L-3 (USACE, 1996).
- 3) Aerial photograph (Clallam County) was obtained from the U.S. Department of Agriculture, Service Center Agencies; photograph is from the USDA-APFO National Agricultural Inventory Project (NAIP), 2006.

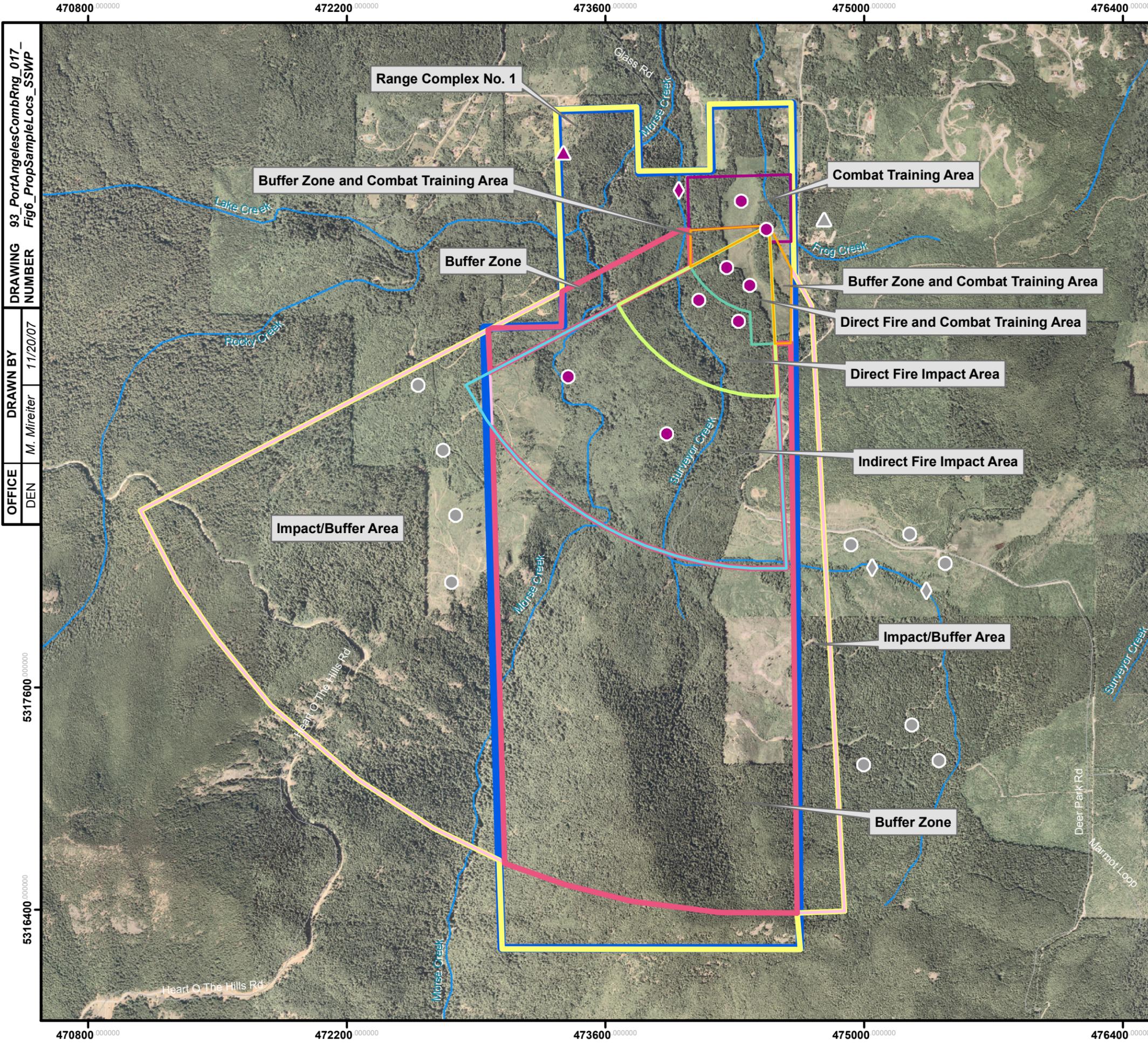


REFERENCE/PROJECTION: NAD 83 UTM Zone 10N

U.S. ARMY CORPS OF ENGINEERS
 OMAHA DESIGN CENTER

FIGURE 5
PROPOSED RECONNAISSANCE ROUTE

PORT ANGELES COMBAT RANGE
 FUDS PROPERTY NUMBER F10WA0033



470800 000000 472200 000000 473600 000000 475000 000000 476400 000000

5316400 000000 5317600 000000 5318800 000000 5320000 000000

DRAWING NUMBER: 93_PortAngelesCombRng_017_Fig6_PropSampleLocs_SSWP

DRAWN BY: M. Mireiter 11/20/07

OFFICE: DEN

Legend

- Port Angeles Combat Range FUDS Property
- Proposed Soil Sample Location
- Proposed Sediment Sample Location
- Proposed Groundwater Sample Location
- Proposed Background Soil Sample Location
- Proposed Background Sediment Sample Location
- Proposed Background Groundwater Sample Location

NOTES:

- 1) FUDS property and range boundaries were obtained from a GIS dataset provided by the USACE.
- 2) Aerial photograph (Clallam County) was obtained from the U.S. Department of Agriculture, Service Center Agencies; photograph is from the USDA-APFO National Agricultural Inventory Project (NAIP), 2006.

0 875 1,750 3,500 Feet

REFERENCE/PROJECTION: NAD 83 UTM Zone 10N

U.S. ARMY CORPS OF ENGINEERS
OMAHA DESIGN CENTER

FIGURE 6

PROPOSED SAMPLE LOCATIONS

PORT ANGELES COMBAT RANGE
FUDS PROPERTY NUMBER F10WA0033

Shaw Environmental, Inc.

Tables

**Table 1
Potential Munitions and Munitions Constituents
Port Angeles Combat Range, Washington**

Area of Concern	Munitions	Munitions Constituents
Range Complex No. 1	Small Arms (.30, .45, .50 caliber)	Lead; Propellant: single-base (nitrocellulose) or double-base (nitrocellulose and nitroglycerin); Tracer composition: strontium nitrate, polyvinyl chloride, strontium peroxide, magnesium powder.
	Shell 37 millimeter (mm)	M63 HE: Steel (chromium, copper, iron, nickel); Explosive – trinitrotoluene (TNT); Fuze M58 – lead azide, tetryl; Primer M23 – Black powder (sulfur, potassium nitrate, charcoal), primer mixture (mercury fulminate, potassium chlorate, antimony sulfide); Propellant – FNH powder (nitrocellulose, dibutylphthalate, dinitrotoluene, diphenylamine)
		M74 AP: Steel (chromium, copper, iron, nickel); Tracer – Tracer composition (strontium nitrate, polyvinyl chloride, strontium peroxide, magnesium powder); Primer M23 – primer mixture (mercury fulminate, potassium chlorate, antimony sulfide); Propellant – FNH powder (nitrocellulose, dibutylphthalate, dinitrotoluene, diphenylamine)
		M51 TP: Steel (chromium, copper, iron, nickel); Primer M23 – primer mixture (mercury fulminate, potassium chlorate, antimony sulfide); Propellant – FNH powder (nitrocellulose, dibutylphthalate, dinitrotoluene, diphenylamine)
	Shell 75mm	M48 HE: Steel (chromium, copper, iron, nickel); Explosive – TNT; Primer M32 – Black powder (sulfur, potassium nitrate, charcoal), primer mixture (mercury fulminate, potassium chlorate, antimony sulfide); Propellant – FNH powder (nitrocellulose, dibutylphthalate, dinitrotoluene, diphenylamine); Fuze M48 – Mercury fulminate, lead azide
		M64 WP: White phosphorus; Steel (chromium, copper, iron, nickel); Propellant – FNH powder (nitrocellulose, dibutylphthalate, dinitrotoluene, diphenylamine)
		M61 AP (practice): Steel (chromium, copper, iron, nickel); Propellant – FNH powder (nitrocellulose, dibutylphthalate, dinitrotoluene, diphenylamine); Tracer – Tracer composition: strontium nitrate, polyvinyl chloride, strontium peroxide, magnesium powder.

Table 1 (Cont.)

Area of Concern	Munitions	Munitions Constituents
Range Complex No. 1	Mortar 60mm	M49 HE: Steel (chromium, copper, iron, nickel); Explosive – TNT; Primer M32 - Black powder (sulfur, potassium nitrate, charcoal), primer mixture (mercury fulminate, potassium chlorate, antimony sulfide); Propellant - double-base powder (nitrocellulose and nitroglycerin); Ignition cartridge - double-base powder (nitrocellulose and nitroglycerin); Fuze M52– Mercury fulminate, lead azide, tetryl
	Mortar 81mm	M43A1 HE: Steel (chromium, copper, iron, nickel); Explosive – TNT; Primer M33 – Black powder (sulfur, potassium nitrate, charcoal), primer mixture (mercury fulminate, potassium chlorate, antimony sulfide); Propellant – double-base powder (nitrocellulose and nitroglycerin); Ignition cartridge – double-base powder (nitrocellulose and nitroglycerin); Fuze M52– Mercury fulminate, lead azide, tetryl
	Rifle Grenade	M44 Practice: Steel (chromium, copper, iron, nickel); spotting charge – Black powder (sulfur, potassium nitrate, charcoal)
	Mine AP	M57 WP: White phosphorus Steel (chromium, copper, iron, nickel); Propellant: double-base powder (nitrocellulose and nitroglycerin);
	Mine AT	M9A1: Steel (chromium, copper, iron, nickel); Pentolite – TNT and Pentaerythritol tetranitrate
	Rocket 2.36-inch Bazooka	M8 Practice: Steel (chromium, copper, iron, nickel); Fuze: M10A1 - Black powder (sulfur, potassium nitrate, charcoal) Spotting charge - Red phosphorus
		M1 practice: Steel (chromium, copper, iron, nickel); Fuze M1 - Black powder (sulfur, potassium nitrate, charcoal) Spotting charge - Red phosphorus
		M7 practice: Steel (chromium, copper, iron, nickel); Squib – Black powder (sulfur, potassium nitrate, charcoal) Propellant – double-base powder (nitrocellulose and nitroglycerin)
		M6 High Explosive Anti-tank: Steel (chromium, copper, iron, nickel); Explosive Pentolite – TNT and Pentaerythritol tetranitrate M7 powder

**Table 2
Rights of Entry Status
Port Angeles Combat Range**

Parcel¹	Landowner	Parcel ID	Date Signed by Landowner	Right of Entry Duration	Estimated Date to Contact Prior to Field Work
5, 11, 15, 25	City of Port Angeles	0529054400000000 0529081100000000 0529081100000000 0529043300750000	In process	9 months	1 week prior
12, 15, 25, 27	Clallam County	0529081101000000 0529081101000000 0529043301000000 0529054401000000	In process	9 months	1 week prior
20	Washington Department of Natural Resources	No parcel number listed	In process	9 months	1 week prior
No Parcel Number	Olympic National Park	No Parcel ID	Not requested	Not applicable	Not applicable
4 9 10 13 16 17 18 21	Manke Timber Company	0529053200000000 0529082100000000 0529071100000000 0529081400000000 0529083200000000 0529074100000000 0529084100000000 0529092205000000	In process	9 months	1 week prior
6 19	Green Crow Timber LLC	0529051300000000 0529071100000000	In process	9 months	1 week prior
22	Green Crow Corporation	0529092200000000	In process	9 months	1 week prior
1 2 3 7 8 23 27 28 29 30 31	Private owners	0529055000400000 0529055000600000 0529055000700000 0529051402000000 0529051400001000 0529092201000000 0529043300000000 0529043200200000 0529043200300000 0529043200420000 0529043200520000	In process	9 months	1 week prior

Table 3
Sample Location Rationale
Port Angeles Combat Range

Area of Concern	Sample Location	Sample Media	Sample Location Rationale
Range Complex No. 1	093A001	Surface Soil	Surface soil samples will be collected from the Firing Line, Combat Training Area Subrange, two samples from the direct fire impact area, and two samples from the indirect fire impact area. One sample will be collected from the location of the Swagerty accident and one sample will be collected from the area of "heavy contamination" based on historical range clearance activities. Sampling locations to be determined in the field based on the visual identification of the Area of Concern, the reconnaissance survey, and presence of MEC, munitions debris, or other indicators of potentially impacted soils.
	093A002		
	093A003		
	093A004		
	093A005		
	093A006		
	093A007		
	093A008		
	093A009	Sediment	Sediment sample to be collected from Surveyor Creek at a location downstream of the FUDS operational areas. Sampling location to be determined in the field based on the visual identification of the Area of Concern, the reconnaissance survey, and presence of MEC, munitions debris, or other indicators of potentially impacted soils.
	093A010	Groundwater	Groundwater sample will be collected from a well located down flow gradient from the FUDS operational areas. Well location to be identified following receipt of rights of entry from property owners and canvassing of property owners to determine if water well is present on the property.
Background	093A011	Surface Soil	Ten background surface soil samples will be collected in association with Range Complex No. 1. Actual sampling locations will be determined in the field based on visual observation that the area does not appear to be impacted by past site operations or human impacts.
	093A012		
	093A013		
	093A014		
	093A015		
	093A016		
	093A017		
	093A018		
	093A019		
	093A020		
	093A021	Sediment	Two background sediment samples will be collected from Surveyor Creek at a location upstream of the FUDS
	093A022		Sampling locations will be determined in the field based on visual observation that the area does not appear to be impacted by past site operations or human impacts.
	093A023	Groundwater	One background groundwater sample will be collected from a well located up or cross flow gradient from the FUDS operational areas. Well location to be identified following receipt of rights of entry from property owners and canvassing of property owners to determine if water well is present on the property.

Table 4
Sample Designations, Quality Assurance/Quality Control, and Analyses
Port Angeles Combat Range

Area of Concern	Sample Location	Sample Type	Sample Number	Sample Media	Quality Assurance/Quality Control Samples		Analysis/U.S. Environmental Protection Agency (EPA) Method
					Field Duplicate	MS/MSD	
Range Complex No. 1	093A001	Composite	NWO-093-0001	Soil		NWO-093-0009	Aluminum, chromium, copper, iron, lead, magnesium, manganese, nickel, and zinc by EPA SW-846 method 6020A Mercury by EPA SW-846 method 7471A Explosives (including nitroglycerin and PETN) by EPA SW-846 method 8330 (modified)
	093A002	Composite	NWO-093-0002	Soil			
	093A003	Composite	NWO-093-0003	Soil			
	093A004	Composite	NWO-093-0004	Soil			
	093A005	Composite	NWO-093-0005	Soil			
	093A006	Composite	NWO-093-0006	Soil			
	093A007	Composite	NWO-093-0007	Soil			
	093A008	Composite	NWO-093-0008	Soil			
	093A009	Discrete	NWO-093-1001	Sediment		NWO-093-1001-MS/MSD	
	093A010	Discrete	NWO-093-3001	Groundwater	NWO-093-3002		Aluminum, chromium, copper, iron, lead, magnesium, manganese, nickel, and zinc by EPA SW-846 method 6020A Mercury by EPA SW-846 method 7470A Explosives (including nitroglycerin and PETN) by EPA SW-846 method 8330 (modified)

MS/MSD denotes matrix spike/matrix spike duplicate.

Table 4 (Cont.)

Area of Concern	Sample Location	Sample Type	Sample Number	Sample Media	Quality Assurance/Quality Control Samples		Analysis/U.S. Environmental Protection Agency (EPA) Method
					Field Duplicate	MS/MSD	
Background	093A011	Composite	NWO-093-5001	Soil		NWO-093-5001-MS/MSD	Aluminum, chromium, copper, iron, lead, magnesium, manganese, nickel, and zinc by EPA SW-846 method 6020A Mercury by EPA SW-846 method 7471A
	093A012	Composite	NWO-093-5002	Soil			
	093A013	Composite	NWO-093-5003	Soil	NWO-093-5013		
	093A014	Composite	NWO-093-5004	Soil			
	093A015	Composite	NWO-093-5005	Soil			
	093A016	Composite	NWO-093-5006	Soil			
	093A017	Composite	NWO-093-5007	Soil			
	093A018	Composite	NWO-093-5008	Soil			
	093A019	Composite	NWO-093-5009	Soil			
	093A020	Composite	NWO-093-5010	Soil			
	093A021	Discrete	NWO-093-5011	Sediment			
	093A022	Discrete	NWO-093-5012	Sediment	NWO-093-5014		
	093A023	Discrete	NWO-093-6001	Groundwater		NWO-093-6001-MS/MSD	Aluminum, chromium, copper, iron, lead, magnesium, manganese, nickel, and zinc by EPA SW-846 method 6020A Mercury by EPA SW-846 method 7470A

MS/MSD denotes matrix spike/matrix spike duplicate.

PETN - pentaerythritol tetranitrate

Table 5
Human Health Soil and Sediment Screening Criteria and Selected Values for Potential Munitions Constituents
Port Angeles Combat Range, Washington

Analyte	USEPA Region 6 ^a		USEPA Region 9 ^b		Washington Department of Ecology - Soil Cleanup Levels ^c					Final Screening Value ⁱ (mg/kg)
	Residential MSSLs (mg/kg)	Industrial Outdoor Worker MSSLs (mg/kg)	Residential PRGs (mg/kg)	Industrial PRGs (mg/kg)	Method B Level - Unrestricted ^d (mg/kg)	Leaching - Phase 3 Model - Unrestricted ^e (mg/kg)	Method B Level - Industrial ^f (mg/kg)	Leaching - Phase 3 Model - Industrial ^g (mg/kg)	Natural Background Level ^h (mg/kg)	
Explosives										
Hexahydro-1,3,5-trinitro-1,3,5-triazine	4.4	17	4.4	16	NVA	NVA	NVA	NVA	NA	4.4
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	3,100	34,000	3,100	31,000	NVA	NVA	NVA	NVA	NA	3,100
2,4,6-Trinitrotoluene	16	64	16	57	NVA	NVA	NVA	NVA	NA	16
1,3,5-Trinitrobenzene	1,800	21,000	1,800	18,000	NVA	NVA	NVA	NVA	NA	1,800
1,3-Dinitrobenzene	6.1	68	6.1	62	NVA	NVA	NVA	NVA	NA	6.1
2,4-Dinitrotoluene ^j	0.72	2.8	0.72	2.5	NVA	NVA	NVA	NVA	NA	0.72
2,6-Dinitrotoluene ^j	0.72	2.8	0.72	2.5	NVA	NVA	NVA	NVA	NA	0.72
2-Amino-4,6-dinitrotoluene	NVA	NVA	12	120	NVA	NVA	NVA	NVA	NA	12
2-Nitrotoluene	2.8	14	0.88	2.2	NVA	NVA	NVA	NVA	NA	0.88
3-Nitrotoluene	1,600	23,000	730	1,000	NVA	NVA	NVA	NVA	NA	730
4-Amino-2,6-dinitrotoluene	NVA	NVA	12	120	NVA	NVA	NVA	NVA	NA	12
4-Nitrotoluene	40	200	12	30	NVA	NVA	NVA	NVA	NA	12
Nitrobenzene	20	110	20	100	NVA	NVA	NVA	NVA	NA	20
Nitroglycerin	6.1	68	35	120	NVA	NVA	NVA	NVA	NA	6.1
Methyl-2,4,6-trinitrophenylnitramine	240	2,700	610	6,200	NVA	NVA	NVA	NVA	NA	240
Pentaerythritol tetranitrate	No MSSL	No MSSL	NVA	NVA	NVA	NVA	NVA	NVA	NVA	0.5 ^k
Metals										
Chromium (Total)	210	500	210	500	NVA	NVA	NVA	NVA	48	210
Chromium (VI)	30	71	30	64	128	19	1,226	19	NVA	19
Copper	2,900	42,000	3,100	41,000	NVA	NVA	NVA	NVA	36	2,900
Iron	55,000	100,000	23,000	100,000	NVA	NVA	NVA	NVA	58,700	58,700
Lead	400	800	400	800	NVA	3,000	NVA	3,000	24	400
Mercury (Inorganic)	23	340	23	340	18	2.09	252	2.09	0.07	23

Table 5
Human Health Soil and Sediment Screening Criteria and Selected Values for Potential Munitions Constituents
Port Angeles Combat Range, Washington

Acronyms and Abbreviations:

CLARC = Cleanup Level and Risk Calculation

mg/kg = milligrams per kilogram

MSSL = Medium-Specific Screening Level

NA = not applicable, compound considered not present in natural soils

NVA = no value available

PRG = Preliminary Remediation Goal

USEPA = U.S. Environmental Protection Agency

WAC = Washington Administrative Code

Notes:

^a Region 6 Medium-Specific Screening Level (MSSL) table; December 2007. Values are based on residential and industrial outdoor worker exposure to single chemicals.

^b Region 9 Preliminary Remediation Goals (PRG) table; October 2004. Values are based on residential and industrial exposure to single chemicals.

^c Cleanup levels are established under the Model Toxics Control Act (MTCA) Cleanup Regulation. Chapter 173-340 WAC.

^d Values from Notes on Method A Cleanup Levels WAC 173-340-720, 740, and 745, Table 740-1, Table 5: Method B Calculations for Carcinogens for Soil Ingestion Plus Dermal Contact and Table 6: Method B Calculation for Soil Ingestion Plus Dermal Contact. Based on Unrestricted land use. From CLARC Notes updated on November 23, 2004.

^e Values from Notes on Method A Cleanup Levels WAC 173-340-720, 740, and 745, Table 740-1, Table 7: 3-Phase Model Assumptions and Results. Based on protection of groundwater. From CLARC Notes updated on November 23, 2004.

^f Values from Notes on Method A Cleanup Levels WAC 173-340-720, 740, and 745, Table 745-1, Table 5: Method C Industrial Calculations for Carcinogens for Soil Ingestion Plus Dermal Contact and Table 6: Method C Industrial Calculations for Carcinogens for Soil Ingestion Plus Dermal Contact. Based on industrial land use. From CLARC Notes updated on November 23, 2004.

^g Values from Notes on Method A Cleanup Levels WAC 173-340-720, 740, and 745, Table 745-1, Table 7: 3-Phase Model Assumptions and Results. Based on protection of groundwater. From CLARC Notes updated on November 23, 2004.

^h Values from "Natural Background Soil Metals Concentrations in Washington State", Publication #94-115, October 1994. Based on data for Puget Sound.

ⁱ Final Screening Value selected based on the lowest value listed for chemical between USEPA Region 9 PRG and Washington Department of Ecology – Soil Cleanup Levels.

^j Carcinogenic DNT mixture values used if more conservative than noncarcinogenic isomer-specific values.

^k Value is laboratory practical quantitation limit.

Table 6
Human Health Groundwater Screening Criteria and Selected Values for Potential Munitions Constituents
Port Angeles Combat Range, Washington

Analyte	Chemical Abbre-viation	CAS No.	USEPA Region 6 Tap Water MSSL ^b (µg/L)	USEPA Region 9 Tap Water PRG ^c (µg/L)	Federal Drinking Water Maximum Contaminant Level ^d (µg/L)	Washington Dept. of Ecology Method A Level ^e (µg/L)	Washington Dept. of Ecology Method B Level ^f (µg/L)	Natural Background Level ^g (µg/L)	Final Screening Value ^h (µg/L)
Hexahydro-1,3,5-trinitro-1,3,5-triazine	RDX	121-82-4	0.61	0.61	NVA	NVA	NVA	NVA	0.61
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	HMX	2691-41-0	1,800	1,800	NVA	NVA	NVA	NVA	1,800
2,4,6-Trinitrotoluene	2,4,6-TNT	118-96-7	2.2	2.2	NVA	NVA	NVA	NVA	2.2
1,3,5-Trinitrobenzene	1,3,5-TNB	99-35-4	1,100	1,100	NVA	NVA	NVA	NVA	1,100
1,3-Dinitrobenzene	1,3-DNB	99-65-0	3.7	3.6	NVA	NVA	NVA	NVA	3.6
2,4-Dinitrotoluene ^h	2,4-DNT	121-14-2	0.099	0.099	NVA	NVA	NVA	NVA	0.099
2,6-Dinitrotoluene ^h	2,6-DNT	606-20-2	0.099	0.099	NVA	NVA	NVA	NVA	0.099
2-Amino-4,6-dinitrotoluene	2-Am-DNT	35572-78-2	NVA	7.3	NVA	NVA	NVA	NVA	7.3
2-Nitrotoluene	2-NT	88-72-2	0.29	0.049	NVA	NVA	NVA	NVA	0.049
3-Nitrotoluene	3-NT	99-08-1	120	120	NVA	NVA	NVA	NVA	120
4-Amino-2,6-dinitrotoluene	4-Am-DNT	19406-51-0	NVA	7.3	NVA	NVA	NVA	NVA	7.3
4-Nitrotoluene	4-NT	99-99-0	4.2	0.66	NVA	NVA	NVA	NVA	0.66
Nitrobenzene	NB	98-05-3	3.4	3.4	NVA	NVA	NVA	NVA	3.4
Nitroglycerin	NG	55-63-0	3.7	4.8	NVA	NVA	NVA	NVA	3.7
Methyl-2,4,6-trinitrophenylnitramine	Tetryl	479-45-8	150	360	NVA	NVA	NVA	NVA	150
Pentaerythritol tetranitrate	PETN	78-11-5	No MSSL	NVA	NVA	NVA	NVA	NVA	0.5 ^k
Chromium (Total)	Cr	7440-47-3	NVA	NVA	100	50	NVA	NVA	50
Chromium VI	Cr	7440-47-3	110	110	NVA	NVA	48 (N)	NVA	48
Copper	Cu	7440-50-8	1,400	1,500	1,000 ⁱ	NVA	NVA	NVA	1,000
					1,300 ^j			NVA	
Iron	Fe	7439-89-6	26,000	11,000	300 ⁱ	NVA	NVA	NVA	300
Lead	Pb	7439-92-1	15	NVA	15 ^j	15	NVA	5	15
Mercury (Inorganic)	Hg	7439-97-6	11	11	2	2	4.8(N)	NVA	2
Nickel	Ni	7440-02-0	730	730	NVA	NVA	NVA	NVA	730

Table 6
Human Health Groundwater Screening Criteria and Selected Values for Potential Munitions Constituents
Port Angeles Combat Range, Washington

Acronyms and Abbreviations:

C = Value for carcinogen
CLARC = Cleanup Levels and Risk Calculations
MCL = Maximum Contaminant Level
MSSL = Medium-Specific Screening Level
N = Value for noncarcinogen
NVA = no value available
PRG = Preliminary Remediation Goal
µg/L = micrograms per liter
USEPA = U.S. Environmental Protection Agency
WAC = Washington Administrative Code

Notes:

- ^a If laboratory cannot meet these quantitation limits (QLs) with routine SW 846 methodology (as supported by MDLs that are no greater than 1/3 QL), laboratory's QL must be identified in laboratory submittal as failing to meet the QL. Some screening values cannot be obtained with routine methodology to the QL.
- ^b Region 6 Medium-Specific Screening Level (MSSL) table; December 2007. Values are based on tap water and represent exposure to a single chemical.
- ^c Region 9 Preliminary Remediation Goals (PRGs) table; October 2004. Values are based on tap water and represent exposure to a single chemical.
- ^d Drinking Water MCL from the 2004 Edition of Drinking Water Standards and Health Advisories, dated Winter 2004.
- ^e Values from Notes on the Development of Method A Cleanup Levels, WAC 173-340-720, 740, and 745. Table 720-1, Table 2: Summary of Information Used in Developing the Method A Ground Water Values in Table 720-1.
- ^f Values from Notes on the Development of Method A Cleanup Levels, WAC 173-340-720, Table 3: Drinking Water - Method B Calculations for Noncarcinogens and Table 4: Drinking Water - Method B for Carcinogens. CLARC Notes dated November 23, 2004.
- ^g Final Screening Value selected based on the lowest value listed for chemical between USEPA and Washington Department of Ecology Cleanup Levels.
- ^h Carcinogenic DNT mixture values used if more conservative than noncarcinogenic isomer-specific values.
- ⁱ Secondary MCL from the 2004 Edition of Drinking Water Standards and Health Advisories, dated Winter 2004.
- ^j Action level from the 2004 Edition of Drinking Water Standards and Health Advisories, dated Winter 2004.
- ^k Value is laboratory practical quantitation limit

Table 7
Ecological Soil Screening Criteria and Selected Values for Potential Munitions Constituents
Port Angeles Combat Range, Washington

Analyte	Proposed Benchmarks										Potential Bioaccumulative Constituent? ^h	Final Proposed Ecological Screening Value Soil ⁱ (mg/kg)
	Washington Department of Ecology Lowest Value for Plants/ Soil Biota/Wildlife ^a (mg/kg)	USEPA Region 5 ESLs ^b (2003) (mg/kg)	USEPA Region 7 ^c (mg/kg)	USEPA Region 8 ^d (mg/kg)	USEPA Region 10 ^e (mg/kg)	Other Values: Talmage et al. (1999) ^f or LANL (2005) ^g (mg/kg)						
Explosives												
1,3,5-Trinitrobenzene	NVA	0.376	0.376	EPA-R4	NVA		0.376	EPA-R4	6.6	LANL		0.376
1,3-Dinitrobenzene	NVA	0.655	0.655	EPA-R4	NVA		0.655	EPA-R4	0.073	LANL		0.655
2,4,6-Trinitrotoluene	NVA	NVA	NVA		NVA		NVA		6.4	LANL		6.4
2,4-Dinitrotoluene	NVA	1.28	1.28	EPA-R4	NVA		1.28	EPA-R4	0.52	LANL		1.28
2,6-Dinitrotoluene	NVA	0.0328	0.0328	EPA-R4	NVA		0.0328	EPA-R4	0.37	LANL		0.0328
2-Amino-4,6-Dinitrotoluene	NVA	NVA	NVA		NVA		NVA		2.1	LANL		2.1
2-Nitrotoluene	NVA	NVA	NVA		NVA		NVA		2.0	LANL		2.0
3-Nitrotoluene	NVA	NVA	NVA		NVA		NVA		2.4	LANL		2.4
4-Amino-2,6-Dinitrotoluene	NVA	NVA	NVA		NVA		NVA		0.73	LANL		0.73
4-Nitrotoluene	NVA	NVA	NVA		NVA		NVA		4.4	LANL		4.4
HMX	NVA	NVA	NVA		NVA		NVA		27	LANL		27
Nitrobenzene	40	1.31	1.31	EPA-R4	NVA		1.31	EPA-R4	2.2	LANL		40
Nitroglycerin	NVA	NVA	NVA		NVA		NVA		71	LANL		71
RDX	NVA	NVA	NVA		NVA		NVA		7.5	LANL		7.5
Pentaerythritol tetranitrate	NVA	NVA	NVA		NVA		NVA		8600	LANL		8600
Tetryl	NVA	NVA	NVA		NVA		NVA		0.99	LANL		0.99
Metals												
Chromium (total)	42	0.4	26	SSL	26	SSL	26	SSL	2.3	LANL	Yes	42
Copper	50	5.4	28	SSL	28	SSL	28	SSL	10	LANL	Yes	50
Iron	NVA	NVA	200	EPA-R4	NVA		200	EPA-R4	NVA			200
Lead	50	0.0537	11	SSL	11	SSL	11	SSL	14	LANL	Yes	50
Mercury	0.1	0.1	0.00051	ORNL	0.00051	ORNL	0.00051	ORNL	0.013	LANL	Yes	0.1
Nickel	30	13.6	38	SSL	38	SSL	38	SSL	20	LANL	Yes	30

Acronyms and Abbreviations:

EPA-R4 = USEPA Region 4
ESLs = Ecological Screening Levels
HMX = Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine
LANL = Los Alamos National Laboratory
mg/kg = milligrams per kilogram
NVA = No value available
ORNL = Oak Ridge National Laboratory Ecological PRGs (Efroymsen et al.)
RDX = Hexahydro-1,3,5-trinitro-1,3,5-triazine
SSL = USEPA Eco Soil Screening Levels
USEPA = U. S. Environmental Protection Agency

Table 7
Ecological Soil Screening Criteria and Selected Values for Potential Munitions Constituents
Port Angeles Combat Range, Washington

Notes:

^a Washington Department of Ecology, Toxics Cleanup Program, Table 749-3, Ecological Indicator Soil Concentrations for Protection of Terrestrial Plants and Animals. Developed under WAC 173-340-7493 (2)(a)(i).

^b Ecological Screening Levels (ESLs), USEPA Region V, August 2003.

^c USEPA Region 7: Catherine Wooster-Brown (Eco Risk Assessor) recommends the following hierarchy: USEPA EcoSSLs; ORNL Efrogmson values; USEPA Region 4 values; other published values

^d USEPA Region 8: Dale Hoff (Eco Risk Assessor) recommends the following hierarchy: USEPA SSLs; Dutch Intervention Values or ORNL Efrogmson values

^e USEPA Region 10: Joseph Goulet (Eco Risk Assessor) says Region 10 has no recommended hierarchy, therefore, values from the USEPA Region 7 approach were used

^f Talmage, S.S., D.M. Opresko, C.J. Maxwell, C.J.E. Welsh, F.M. Cretella, P.H. Reno, and F.B. Daniel, 1999, Nitroaromatic Munition Compounds: Environmental Effects and Screening Values, Rev. Environ. Contam. Toxicol.

^g Los Alamos National Laboratory (LANL), Eco Risk Database, Release 2.2, September 2005

^h Potential bioaccumulative constituents will be evaluated in more detail, as some screening values do not take into account bioaccumulation.

Potential bioaccumulative potential from: *Bioaccumulation and Interpretation for the Purposes of Sediment Quality Assessment: Status and Needs* (USEPA, 2000) and ODEQ EQSLVs (ODEQ, 2001).

ⁱ Final Screening Value selected using the following hierarchy:

1. State Value (Washington)
2. USEPA Region State Located In (USEPA Region 10)
3. Lower of Talmage et al. (1999) or LANL (2005) values.

Other References:

U.S. Environmental Protection Agency, 2007, *Guidance for Developing Ecological Soil Screening Levels (Eco-SSLs)*, Office of Solid Waste and Emergency Response, Website version last updated November 28, 2007: <http://www.epa.gov/ecotox/ecossl>.

U.S. Environmental Protection Agency, 2001, *Supplemental Guidance to RAGS: Region 4 Bulletins, Ecological Risk Assessment*. Originally published November 1995. Website version last updated November 30, 2001: <http://www.epa.gov/region4/waste/ots/ecolbul.htm>.

Efrogmson, R.A., Suter II, G.W., Sample, B.E. and Jones, D.S., 1997. Preliminary Remediation Goals for Ecological Endpoints. Lockheed Martin Energy Systems, Inc. (ORNL) ES/ER/TM-162/R2. Dutch Intervention Values:

Swartjes, F.A. 1999. *Risk-based Assessment of Soil and Groundwater Quality in the Netherlands: Standards and Remediation Urgency*. Risk Analysis 19(6): 1235-1249

The Netherlands Ministry of Housing, Spatial Planning and Environment's Circular on target values and intervention values for soil remediation http://www2.minvrom.nl/Docs/internationaal/S_I2000.pdf and Annex A: Target Values, Soil Remediation Intervention Values and Indicative Levels for Serious Contamination http://www2.minvrom.nl/Docs/internationaal/annexS_I2000.pdf were also consulted.

Table 8
Ecological Sediment Screening Criteria and Selected Values for Potential Munitions Constituents
Port Angeles Combat Range, Washington

Analyte	Proposed Benchmarks							Potential Bioaccumulative Constituent? ^g	Final Ecological Screening Value Sediment ^h (mg/kg)			
	Washington Department of Ecology Screening Level Values Freshwater ^a (mg/kg)	USEPA Region 5 Ecological Screening Levels ^b (mg/kg)	USEPA Region 7 ^c (mg/kg)	USEPA Region 8 ^d (mg/kg)	USEPA Region 10 ^e (mg/kg)	Other Ecological Screening Levels ^f (mg/kg)						
Explosives												
1,3,5-Trinitrobenzene	NVA	NVA	NVA	NVA	NVA	2.40E-02	TAL		2.40E-02			
1,3-Dinitrobenzene	NVA	8.61E-03	NVA	NVA	NVA	6.70E-02	TAL		6.70E-02			
2,4,6-Trinitrotoluene	NVA	NVA	NVA	NVA	NVA	9.20E-01	TAL		9.20E-01			
2,4-Dinitrotoluene	NVA	1.44E-03	NVA	NVA	NVA	2.90E-01	LANL		2.90E-01			
2,6-Dinitrotoluene	NVA	3.98E-03	NVA	NVA	NVA	1.90E+00	LANL		1.90E+00			
2-Amino-4,6,-Dintrotoluene	NVA	NVA	NVA	NVA	NVA	7.00E+00	LANL		7.00E+00			
2-Nitrotoluene	NVA	NVA	NVA	NVA	NVA	5.60E+00	LANL		5.60E+00			
3-Nitrotoluene	NVA	NVA	NVA	NVA	NVA	4.90E+00	LANL		4.90E+00			
4-Amino-2,6,-Dintrotoluene	NVA	NVA	NVA	NVA	NVA	1.90E+00	LANL		1.90E+00			
4-Nitrotoluene	NVA	NVA	NVA	NVA	NVA	1.00E+01	LANL		1.00E+01			
HMX	NVA	NVA	NVA	NVA	NVA	4.70E-02	TAL		4.70E-02			
Nitrobenzene	NVA	1.45E-01	NVA	NVA	NVA	3.20E+01	LANL		3.20E+01			
Nitroglycerin	NVA	NVA	NVA	NVA	NVA	1.70E+03	LANL		1.70E+03			
RDX	NVA	NVA	NVA	NVA	NVA	1.30E-01	TAL		1.30E-01			
Pentaerythritol tetranitrate	NVA	NVA	NVA	NVA	NVA	1.20E+05	LANL		1.20E+05			
Tetryl	NVA	NVA	NVA	NVA	NVA	1.00E+02	LANL		1.00E+02			
Metals/Inorganics												
Chromium	2.60E+02	4.34E+01	4.34E+01	MAC	4.34E+01	MAC	4.34E+01	MAC	5.60E+01	LANL	Yes	2.60E+02
Copper	3.90E+02	3.16E+01	3.16E+01	MAC	3.16E+01	MAC	3.16E+01	MAC	1.70E+01	LANL	Yes	3.90E+02
Iron	NVA	NVA	NVA		NVA		NVA		2.00E+04	LANL		2.00E+04
Lead	2.60E+02	3.58E+01	3.58E+01	MAC	3.58E+01	MAC	3.58E+01	MAC	2.70E+01	LANL	Yes	2.60E+02
Mercury	4.10E-01	1.74E-01	1.80E-01	MAC	1.80E-01	MAC	1.80E-01	MAC	1.80E-02	LANL	Yes	4.10E-01
Nickel	4.60E+02	2.27E+01	2.27E+01	MAC	2.27E+01	MAC	2.27E+01	MAC	3.90E+01	LANL	Yes	4.60E+02

Table 8
Ecological Sediment Screening Criteria and Selected Values for Potential Munitions Constituents
Port Angeles Combat Range, Washington

Acronyms and Abbreviations:

EPRGs = Oak Ridge National Laboratory Ecological PRGs
HMX = Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine
ISQGs = Canadian Interim Sediment Quality Guidelines
LANL = Los Alamos National Laboratory
MAC = MacDonald Consensus Values
mg/kg = milligram per kilogram
NVA = No Value Available
RDX = Hexahydro-1,3,5-trinitro-1,3,5-triazine
TAL = Talmage et al. (1999)
USEPA = U. S. Environmental Protection Agency

Notes:

^a Washington Department of Ecology, Creation and Analysis of Freshwater Sediment Quality Values in Washington State, July, 1997, Pub. No. 97-323a (Table 11).

^b Ecological Screening Levels (ESLs), USEPA Region V, August 2003.

^c USEPA Region 7: Catherine Wooster-Brown (Eco Risk Assessor) recommends the following hierarchy: MacDonald Consensus Values (MacDonald, 2000); ORNL Efroymsen values (ORNL, 1977

^d USEPA Region 8: Dale Hoff (Eco Risk Assessor) recommends the following hierarchy: MacDonald Consensus Values (MacDonald, 2000); Canadian ISQG values (CCME, 2003) or ORNL Efroymsen values (ORNL, 1977).

^e USEPA Region 10: Joseph Goulet (Eco Risk Assessor) says Region 10 has no recommended hierarchy, therefore, values from the USEPA Region 7 Approach were used.

^f Talmage, S.S., D.M. Opresko, C.J. Maxwell, C.J.E. Welsh, F.M. Cretella, P.H. Reno, and F.B. Daniel (TAL), 1999, *Nitroaromatic Munition Compounds: Environmental Effects and Screening Values*, Rev. Environ. Contam. Toxicol. or Los Alamos National Laboratory (LANL), Eco Risk Database, Release 2.2, September 2005; the Talmage [TAL] screening values assume 10% organic carbon in the sediment.

^g Potential bioaccumulative constituents will be evaluated in more detail, as some screening values do not take into account bioaccumulation. Potential bioaccumulative potential from: Bioaccumulation and Interpretation for the Purposes of Sediment Quality Assessment: Status and Needs (USEPA, 2000) and ODEQ EQSLVs (ODEQ, 2001).

^h Final Screening Value selected using the following hierarchy:

1. State Value (Washington)
2. USEPA Region State Located In (USEPA Region 10)
3. Lower of Talmage et al. [TAL] (1999) or LANL (2005) values.

Other References:

Efroymsen, R.A., et al., 1997, *Preliminary Remediation Goals* (EPRGs), ORNL, ES/ER/TM-162/R2,

Canadian Interim Sediment Quality Guidelines (ISQGs) Summary Table, CCME, December 2003.

MacDonald, D.D, C.G. Ingersoll and T.A. Berger, 2000, *Development and Evaluation of Consensus-Based Sediment Quality Criteria for Freshwater Ecosystems*, Archives of Environmental Contamination and Toxicology 39:20-31.

Appendix A
Conceptual Site Model

Conceptual Site Model – Range Complex No. 1

Overview

A site-specific conceptual site model (CSM) summarizes available site information and identifies relationships between exposure pathways and associated receptors. A CSM is used to determine the data types necessary to describe site conditions and quantify receptor exposure, and discusses the following information:

- Current site conditions and future land use.
- Potential munitions and explosives of concern (MEC) and munitions constituents (MC) sources (e.g., lead projectiles in an impact berm);
- Affected media.
- Governing fate and transport processes (e.g., surface water runoff and/or groundwater migration).
- Exposure media (i.e., media through which receptors could contact site-related MEC or MC).
- Routes of exposure (e.g., inhalation, incidental ingestion, and dermal contact).
- Potential human and/or representative ecological receptors at the exposure point. Receptors likely to be exposed to site MEC or MC are identified based on current and expected future land uses.

The CSM is evaluated for completeness and further developed as needed through Technical Project Planning (TPP) meetings and additional investigation.

The entire Port Angeles Combat Range (PACR) Formerly Used Defense Site (FUDS) is considered one area of concern (AOC) based on the presence of only one identified range – Range Complex No. 1.

Background

History of Use

Based on the *ASR Supplement* (U.S. Army Corps of Engineers [USACE], 2004), the entire FUDS property is one range, Range Complex No. 1, which contains seven subranges (Area A – Direct Fire Impact Area, Area B – Indirect Fire Impact Area, Area C – Buffer Zone, Area D – Combat Training Area, Area E – All remaining land, and Area F – Impact/Buffer Area (additional acreage)). Range Complex No. 1 was used between 1943 and 1944 for combat training of the 115th Cavalry Squadron (mechanized). The range was originally identified for training using 37 millimeter (mm) and 75mm ammunition and small arms. However, evidence from clearance activities indicate that 61mm and 81mm mortars and 2.25-inch rockets were also used at the range.

A table of organization and equipment provided in the ASR (USACE, 1996, Appendix F-8) indicates that armament for the 115th Cavalry Squadron included small arms (.30, .45, and .50 caliber hand, rifle, and machine guns), anti-tank rocket launcher, 60mm and 81mm mortars, and light tanks with armament. Although not listed in the inventory, an interview with a former member of the 115th Cavalry Squadron indicated that 75mm Howitzer Motor Carriage M8 Tank and M3 and M5 Light Tanks were fitted with 37mm weapons.

Both direct and indirect firing was conducted at fixed and moving targets (targets and tanks) to the south. Range clearance activities were performed in 1949, 1952, 1955, 1956, and 1957.

Munitions and Associated MC

Table 1 of the Site-Specific Work Plan (SSWP) lists the munitions and associated MC likely used at the AOC.

Previous MEC Finds

MEC and munitions debris (MD) finds are limited to those recovered during range clearance activities. MEC and MD that were recovered during the range clearance activities are noted in Table 3 of the *Final TPP Memorandum* (Shaw, 2008).

Previous MC Sample Results

There has been no previous sampling for MC at PACR.

Current and Future Land Use

The PACR is currently used for a protected watershed for the city of Port Angeles, for timber production, cattle grazing, hiking, hunting, and as private rural residences.

Barbed wire fencing, in an unknown condition, is present around the AOC. The condition of the fencing will be evaluated during field activities. The southern portion of the FUDS is within the Olympic National Park.

Future land use, based on Clallam County zoning (Gray, 2008), is as commercial forest and rural character conservation. Portions within the Olympic National Park will remain as a national park.

Ecological Receptors

Based on the presence of wetlands and streams and that the southern portion of the AOC is within the Olympic National Park, the AOC qualifies as an Important Ecological Place (IEP).

MEC Evaluation

The PACR is a former range used to train troops in the firing of anti-tank weapons. Shells (37mm and 75mm) and mortars (60mm and 81mm) were known to have been used at the range. Both practice and high explosives rounds with sensitive fuzes were used at the range. M9 rifle grenades and 2.36-inch rockets may also have been used, although no direct evidence exists for

their use. The ASR (USACE, 1996) speculated that infantry troops from Fort Lewis may have used the ranges as well as the 115th Cavalry. The risk for finding MEC is considered moderate based on reports from range clearance activities in the 1950s. Munitions with high explosives and sensitive fuzes were used at the range.

In 1948, two boys were killed when a 37mm round that was embedded in a log exploded. There have been no additional reports of MEC or MD being found by civilians (USACE, 1996).

MEC and MD have been previously found on the surface. Previous range clearance reports have recommended that the range use be restricted to “surface use only,” due to the subsurface MEC risk.

Much of the property is owned by the city of Port Angeles as part of a watershed. The Olympic National Park occupies the very southern portion of the FUDS. Other uses are for rural residences with limited farming and livestock use and timber production. There currently is a barbed wire fence in poor condition surrounding a portion of the property. However, for all practical purposes the range has uncontrolled access.

The range impact area has had limited disturbance since Department of Defense (DoD) use, as a result of ownership by the city of Port Angeles as a watershed. There are fewer than 100 persons per square mile in the vicinity of the site.

MC Pathway Evaluation

Overview of Site Characteristics

The PACR is located in a rural area approximately 7 miles south east of the city of Port Angeles, Washington. The majority of the site is heavily forested with dense underbrush. Portions of the site have open non-timbered areas. Morse Creek, Surveyor Creek, and Frog Creek traverse through the FUDS and are shown on Figure 3. Figure 3 shows the general layout of Range Complex No. 1. There was only one firing point at the FUDS. There are impact areas for direct firing and indirect firing targets.

Terrestrial Pathway

Sources of MC

Table 1 of the SSWP lists the MC associated with the munitions used at PACR. MC, if present, will be most likely found in the target areas when incomplete detonation may have occurred. Some MC, propellants or fuze residue may be found at the firing line. There have been no previous studies for MC at this site.

Migration Pathway

Land surface may have been somewhat disturbed since DoD use. As described earlier, some logging activities may have occurred. There are no known tilling activities that may have occurred.

Much of the site has been and is currently being used as a watershed for the city of Port Angeles. Possible migration routes for MC are through overland transport via surface erosion into nearby surface water drainage.

Land Use and Access

Current land use is rural with livestock grazing. Portions of the site are protected as a watershed for the city of Port Angeles. Members of the public who attended the public information meeting indicated that the area is used for hiking and hunting.

The southern portion of the site is within the Olympic National Park. Future land use is likely to remain the same. Future land use, based on Clallam County zoning (Gray, 2008), is as commercial forest and rural character conservation.

There is unrestricted access to the site.

Human Receptors

Potential human receptors would be exposed through direct ingestion of the soil. The human exposure pathway is considered potentially complete.

Ecological Assessment

The Range Complex No. 1 is identified as an IEP because of its use as a watershed and portions being within a National Park. There have been no threatened or endangered species identified as specifically residing in the FUDS. However, transient use of the site is probable.

Surface Water/Sediment Pathway

Sources of MC

Soil impacted from metals and explosives may migrate to surface waters and sediment through soil erosion. There are no previous investigations for MC impacts to surface water/sediment.

Migration Pathway

Potential pathway is through the erosion of soils into Survivor and Frog creeks and into Morris Creek.

Surface Water/Sediment Use and Access

A portion of the surface water from Morris Creek is currently diverted for domestic water and irrigation purposes. Access to the three streams that traverse through the FUDS is unrestricted.

Human Receptors

Human ingestion of resident and migratory fish exposed to potential MC in the streams could occur. Determination of impacts will be assessed by comparing concentrations of select metals and explosives in sediments to background concentrations and human health screening values. The exposure pathway is potentially complete based on the presence of streams in the FUDS and the unrestricted access to the streams both on site and downgradient. Surface water conditions

will be assessed through the stream sediments, as the likely source of potential MC is from soil erosion into stream sediments.

Ecological Assessment

The presence of wetlands and streams within the FUDS and the southern portion of the FUDS is within the Olympic National Park and qualify the FUDS as an IEP. There are no known resident threatened and endangered species. However, migratory use of the FUDS by threatened and endangered species is probable.

Stream sediment sample analytical results will be first compared to background values. If background is exceeded, then comparison to ecological screening values will be performed. The ecological pathway is potentially complete based on the FUDS being an IEP.

Groundwater Pathway

Sources of MC

Soil impacted from metals and explosives may migrate to groundwater waters through infiltration. There are no previous investigations for MC impacts to groundwater.

Migration Pathway

MC may be leached from soil into groundwater, and then groundwater could be used for domestic use. Nearby wells may be located within the FUDS boundary. Depth to the producing aquifer is approximately 115 feet below ground surface.

Groundwater Use and Access

Private domestic wells are located downgradient of the firing line and impact areas within FUDS property.

Human Receptors

Residents in the area may use groundwater for domestic use. Results from groundwater sampling will be compared to groundwater human health screening values. The pathway to groundwater is considered potentially complete because of the relatively shallow occurrence of groundwater (approximately 115 feet below ground surface), and because wells are located on FUDS property and located downgradient of firing lines and impact areas.

Air Pathway

Sources of MC

Metals and explosives in soil may be a potential source for airborne exposure.

Migration Pathway

The potential for airborne migration of impacted soils is minimized by the presence of native grasses and vegetation present on the FUDS. This vegetation minimizes the likelihood of airborne entrainment of soils.

Human Receptors

Potential human receptors would be agricultural workers who till the soil and construction workers who disturb the soil. Exposure would be through entrainment of fine soil particles in air.

Because of the presence of native vegetation and current land (forested and watershed) use, the air pathway is considered incomplete for human receptors.

CSM Summary/Data Gaps

Evaluation of the CSM indicates the following known conditions or data gaps

CSM Section	Known	Unknown	Notes
MEC	MEC has been identified in previous range clearance operations		37mm high explosive rounds, munitions debris of M51 type fuzes, munitions debris from 81mm mortars
Terrestrial pathway – human receptors		X	Collect soil samples
Terrestrial pathway – ecological receptors		X	Collect soil samples
Sediment/Surface water pathway – human receptors		X	Evaluated through collection of sediment samples
Sediment/Surface water pathway – ecological receptors		X	Evaluated through collection of sediment samples
Groundwater pathway		X	Collect groundwater sample
Air pathway	X		Incomplete pathway

Appendix B
USACE Interim Guidance Document 06-05
and Safety Advisory 06-2



DEPARTMENT OF THE ARMY
HUNTSVILLE CENTER, CORPS OF ENGINEERS
P.O. BOX 1600
HUNTSVILLE, ALABAMA 35807-4301

REPLY TO
ATTENTION OF:

MAR 16 2006

CEHNC-OE-CX

MEMORANDUM FOR SEE DISTRIBUTION

SUBJECT: Procedure for Preliminary Assessment (PA) and Site Inspection (SI) Teams that Encounter Unexploded Ordnance (UXO) While Gathering Non-UXO Field Data, Military Munitions Center of Expertise (MM CX) Interim Guidance Document (IGD) 06-05

1. PURPOSE: This procedure describes the responsibilities of project teams during the preliminary assessment and site investigation phases should unexploded ordnance (UXO) be discovered.
2. APPLICABILITY: This guidance is applicable to the geographic military Districts, Military Munitions Response Program (MMRP) Design Centers, Major Subordinate Commands (MSCs), and designated Remedial Action Districts performing MMRP response actions.

3. REQUIREMENTS AND PROCEDURES:

a. During site visits to formerly used defense site (FUDS) properties to gather PA or SI information, in the rare instance that a UXO-qualified individual identifies an item that is an explosive hazard, the following actions will occur:

(1) The property owner or individual granting rights of entry to the property will be notified of the hazard and advised to call the local emergency response authority (i.e., police, sheriff, or fire department). The individual will also be informed that if they do not call the local response authority within 1 hour, the individual who identified the UXO item will notify the local emergency response authority.

(2) The local response authority will decide how to respond to the reported incident, including deciding not to respond (e.g., if the local response authority is already aware of the hazards on the property). If the local response authority decides to respond, the individual who identified the item or his designee will mark the location of the item and provide accurate location information to the emergency response authority. The individual who identified the item or his designee will generally remain in the area until the local response authority arrives, unless specifically indicated by the appropriate response authority that the individual may leave the area.

(3) During the SI, the state regulator may also be notified at their request.

MAR 1 6 2006

CEHNC-OE-CX

SUBJECT: Procedure for Preliminary Assessment (PA) and Site Inspection (SI) Teams that Encounter Unexploded Ordnance (UXO) While Gathering Non-UXO Field Data, Military Munitions Center of Expertise (MM CX) Interim Guidance Document (IGD) 06-05

b. During site visits to active installations or Base Realignment and Closure (BRAC) sites to gather PA or SI information, in the rare instance that a UXO-qualified individual identifies an item that is an explosive hazard, the following actions will occur:

(1) The installation point of contact (POC) or the BRAC coordinator will be notified of the hazard and requested to notify explosive ordnance disposal (EOD) through their channels.

(2) The installation/EOD will make the determination if they are going to respond to the incident. The installation/EOD may be aware of the hazards at the site and make the decision not to respond. If the installation/EOD decides to respond, the individual who identified the item or his designee will mark the location and provide accurate location information to the installation/EOD unit and will remain in the area unless the installation/EOD unit requests otherwise.

c. Neither the US Army Corps of Engineers personnel, nor their contractors have the authority to call EOD to respond to an explosive hazard. This call is the responsibility of the local emergency response authority for FUDS properties and it must come through the proper chain of command on installations.

d. AR 75-14 and AR 75-15 contain the information on how EOD responds to explosives hazards.

4. EFFECTIVE DATES: The requirements and procedures set forth in this interim guidance are effective immediately. They will remain in effect indefinitely, unless superseded by other policy or regulation.

5. POINT OF CONTACT: If you need additional information, please contact Mr. Brad McCowan at 256-895-1174.



CAROL A. YOUKEY, P.E.
Chief, Center of Expertise for Ordnance
and Explosives Directorate



DEPARTMENT OF THE ARMY
HUNTSVILLE CENTER, CORPS OF ENGINEERS
P.O. BOX 1600
HUNTSVILLE, ALABAMA 35807-4301

May 23, 2006

REPLY TO
ATTENTION OF:

OE Safety Division for Ordnance
and Explosives Directorate

Shaw Environmental
4171 Essen Lane
Baton Rouge, Louisiana 70809

Dear Sir/Madam:

This is Safety Advisory 06-2 – Munitions and Explosives of Concern (MEC) Safety During Site Inspections (SI), Pre-Work Plan Visits, Archive Search Reports (ASR) Investigations and Other Site Visits of a Non-Intrusive Nature.

Reference EP 75-1-1, EP 385-1-95a, and Interim Guidance Document (IGD), March 15, 2006.

The following procedures will be followed if an item is found that has an explosive hazard during the activities identified in the subject line:

- a. MEC items are not to be moved or disturbed during the above subject SI, Pre-Work Plan visits, ASR Investigations and other site visits of a non-intrusive nature.
- b. The locations of any discovered explosive hazardous items should be marked for accurate relocating purposes and the information provided to the designated Point of Contact (POC) and any emergency response authorities as may be required.
- c. During site visits to active Installations and/or Base Realignment and Closure (BRAC) sites the identified Installation POC or the BRAC coordinator should be notified of discovered MEC hazards. They then will request any appropriate emergency response action as deemed necessary through their channels if required.
- d. When a site visit is on a Formerly Utilized Defense Site, the property owner shall be notified in the event of finding any found explosive hazards along with the location of the explosive item(s) found, the property owner should then in turn notify their local emergency response authorities.

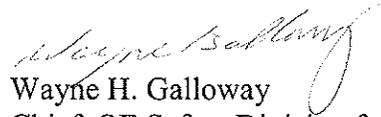
e. During these site visits all required MEC security requirements should be implemented as necessary and required. All team members are to be instructed in and made aware of any MEC security requirements.

f. All team members will be briefed on these procedures prior to any site investigations being performed and daily before any work begins.

This Safety Advisory is intended to serve as an explosives safety reminder.

Comments or questions about this Safety Advisory can be directed to the undersigned at (256) 895-1598/82.

Sincerely,



Wayne H. Galloway
Chief, OE Safety Division for
Ordnance and Explosives Directorate

Appendix C
Site Safety and Health Plan Addendum

ADDENDUM <u>WA-4</u> TO SITE SAFETY AND HEALTH PLAN (SSHP) REVIEWS AND APPROVAL US Army Corps of Engineers, Omaha District	This SSHP is a part of the Omaha District Safety Program. Please read and comply with USACE EM 385-1-1 and CENWO OM 385-1-1.	
Reviewer	Date	Signatures
Authored by: Dale Landon	5/28/08	Signature: 
Peer Review by: David Mummert, CIH	6/6/08	Signature: 
Quality Control Review (QCR) by: Dan McKellin	6/6/08	Signature: 
Project Manager Review by: Peter Kelsall	6/6/08	Signature: 
USACE Omaha District MM DC OE Safety Specialist Review: Chris Bryant		Signature:
USACE Omaha District MM DC Project Manager Approval: John Miller		Signature:

<p>ADDENDUM <u>WA-4</u> TO SITE SAFETY AND HEALTH PLAN (SSHP) TITLE PAGE US Army Corps of Engineers, Omaha District</p>	<p>This SSHP is a part of the Omaha District Safety Program. Please read and comply with USACE EM 385-1-1 and CENWO OM 385-1-1.</p>
<p>PROJECT NAME: FUDS SI – Port Angeles Combat Range</p>	
<p>PURPOSE OF ADDENDUM:</p> <p>This Addendum provides details specific to activities at this FUDS that were not provided in the approved Accident Prevention Plan and Site Safety and Health Plan included in the <i>Final Type I Work Plan, Site Inspections at Multiple Sites, NWO Region</i> (Shaw, 2006).</p>	
<p>DESCRIBE THE CHANGES EFFECTED BY THIS ADDENDUM:</p> <p>Site-specific supplemental information noted in following text.</p>	

SITE SAFETY AND HEALTH PLAN ADDENDUM

Site Name:	Port Angeles Combat Range
Site Location:	The former Port Angeles Combat Range is located near Port Angeles, WA, in Clallam County. The area of concern is the Range Complex No. 1.
Purpose of Visit:	Site Inspection to conduct site reconnaissance for munitions and explosive of concern (MEC) and to collect soil, sediment, and groundwater samples to evaluate the presence of explosives and metals.
Date(s) of Site Visit:	July 2008
Office:	Shaw Environmental, Inc., Richland, Washington office
Address:	1045 Jadwin Ave. Suite C Richland, WA 99352
Telephone:	509-943-6728

Date Prepared: May 28, 2008

Site inspection work at this FUDS will be conducted in accordance with the approved Accident Prevention Plan and Site Safety and Health Plan (SSHP) included in the *Final Type I Work Plan, Site Inspections at Multiple Sites, NWO Region* (Work Plan; Shaw, 2006). This Addendum provides details specific to activities at this FUDS that were not provided in the SSHP.

I. SITE DESCRIPTION AND PREVIOUS INVESTIGATIONS

(A site map is provided in the Site-Specific Work Plan.)

A. SITE DESCRIPTION:

- o Size: One Area of Concern (AOC) covering approximately 2,629 acres.
- o Present Usage (Check all that apply)

<input type="checkbox"/> Military	<input checked="" type="checkbox"/> Recreational	<input type="checkbox"/> Agricultural (primary use)
<input checked="" type="checkbox"/> Residential	<input type="checkbox"/> Commercial	<input type="checkbox"/> Landfill
<input checked="" type="checkbox"/> Natural Area	<input type="checkbox"/> Industrial	
<input checked="" type="checkbox"/> Other Specify: Forest Products, Watershed		

<input type="checkbox"/> Secured	<input type="checkbox"/> Active	<input type="checkbox"/> Unknown
<input checked="" type="checkbox"/> Unsecured	<input checked="" type="checkbox"/> Inactive	

B. PAST USES:

In early 1943, the 115th Cavalry Squadron (mechanized) requested that land be leased in the area of Port Angeles, Washington for use as a combat range. The range was intended to be used for tactical firing problems and short range known distance firing (200 to 300 yards). Through leases and use permits, approximately 1,600 acres were obtained within Sections 5, 8, and 17 within Township 29 North, Range 5 West for use as the Port Angeles Combat Range (PACR). The range was sited for use of 37 millimeter (mm) and 75mm ammunition and small arms. However, there are reports that mortars and land mines were also used at the FUDS. There were no buildings or improvements, other than a spotting tower. Troops were encamped at the Port Angeles Fair Grounds/Conservation Corps Camp.

Records indicate that the range consisted of a single firing line, with firing occurring to the south into the hilly and mountainous terrain. Interviews with former residents of the area and enlisted personnel who used the range indicated that all firing was west of Deer Park Road. Firing occurred at direct stationary and moving targets (targets and tanks pulled across range using cables) and indirect firing using coordinates.

In April and May 1944, the range was declared excess and all leases and permits were canceled. There is no information to suggest that at the time of closing any attempt was made by the Army to perform any range clearance prior to returning to private ownership. In addition, there was no information to indicate that the Army attempted to disseminate the actual use of the former range in terms of potential hazards that could remain.

Two young boys were killed in August 1948, when a 37mm shell exploded while they were cutting some downed timber within the former range. The 37mm shell was embedded in a log they were sawing. Immediately after the death of the two boys, the Army initiated the dedudiving of the area expected to be contaminated. On May 7, 1949, a Certificate of Clearance was issued noting that approximately 775 acres had been cleared of dangerous/explosive material.

Subsequent clearances of the PACR occurred in 1952, 1955, 1956, and 1957. At some point in the 1950s signs were posted warning the public of dangers from munitions and explosive materials at the site. In 1963, 652 acres were purchased by the Army to restrict and control access to contaminated property. The 652 acres were retained until 1968 when it was transferred to the city of Port Angeles and Mr. Raymond Diehl. Records indicated that the quitclaim deed included a “surface use only” and indemnity clause.

C. SURROUNDING POPULATION:

<input checked="" type="checkbox"/> Rural	<input checked="" type="checkbox"/> Residential	<input type="checkbox"/> Commercial
<input type="checkbox"/> Urban	<input type="checkbox"/> Industrial	
<input type="checkbox"/> Other Specify		

D. PREVIOUS SAMPLING/INVESTIGATION RESULTS:

The following describes range decontamination activities at the PACR. The information was summarized from the ASR (USACE, 1996):

- In April and May 1944, the range was declared excess. No information exists to indicate that any range cleanup was conducted at that time.
- In August 1948, two boys were killed when sawing some downed timber within the former range area. A live 37mm shell, embedded in the log they were sawing, exploded.
- Following the accident, a range clearance was conducted. In May 1949, a Certificate of Clearance was issued noting that approximately 775 acres had been cleared of dangerous/explosive material.
- Subsequent clearances were completed in 1952, 1955, 1956, and 1957.
- In 1986, a Range Clearance Technology Assessment was completed for the PACR. The report concluded that “Additional mechanical clearance of the range is environmentally, technically, and economically unfeasible at this time or in the foreseeable future” (NEODFC, 1986).

An ASR (USACE, 1996) was prepared and issued in 1996 summarizing historical information and performing a site visit to confirm site conditions. The ASR identified six areas of interest:

- Area A – Direct Fire Impact Area,
- Area B – Indirect Fire Impact Area,
- Area C – Buffer Zone,
- Area D – Combat Training Area,
- Area E – All remaining land, and
- Area F – Impact/Buffer Area (additional acreage).

(1) MEC ENCOUNTERED: MEC reported recovered during the range clearance activities include: 37mm (high explosive [HE], armor piercing [AP], and target practice [TP]) rounds and MD from 81mm mortars. Documented as being used on the range also included small arms, 75mm (HE, white phosphorus [WP], and AP), 60mm mortar (HE and practice), rifle grenade, antipersonnel and antitank mine, 2.36-inch bazooka rocket.

(2) SAMPLES: None collected

Chemical	Concentration	Media	Location
None.	None.	None.	None.

II. DESCRIPTION OF ON-SITE ACTIVITIES

<input checked="" type="checkbox"/> Walk Through	<input type="checkbox"/> Drive Through	<input type="checkbox"/> Fly Over
<input checked="" type="checkbox"/> On-Road	<input checked="" type="checkbox"/> Off-Road	<input checked="" type="checkbox"/> On-Path
<input checked="" type="checkbox"/> Off-Path		
<input type="checkbox"/> Other Specify		

Activities/Tasks to be Performed

Reconnaissance

A visual reconnaissance of the Range Complex will be conducted to identify evidence of MEC and/or range activities (presence of MEC or munitions debris and ground-scarring suggestive of impact areas). Suspect areas of interest, as indicated in the SSWP, will be inspected as part of the field reconnaissance. The reconnaissance team will locate, identify, and stake sampling locations within these areas. The density and type of MEC or munitions debris observed on the ground will be noted.

The following conditions at each planned sampling location will be documented or recorded in the field logbook and/or by digital photographs:

- Presence or absence of MEC, shell casings, bullets, or debris,
- Coordinates of staked sampling locations (using a hand-held global positioning system [GPS] unit),
- Access limitations,
- Vegetative cover,
- Soil conditions, and
- Other conditions encountered that impact sample collection.

The site reconnaissance will be performed by conducting a visual and geophysical inspection of the range. The geophysical inspection will be accomplished using a Schonstedt by the unexploded ordnance (UXO) technician. The path walked during the visual reconnaissance will be recorded using a hand-held GPS unit. Reconnaissance will not include detailed mapping. Touching or handling of MEC or munitions debris will not be allowed.

Sampling (Soil, Sediment, and Groundwater)

A total of eight soil samples are to be collected from Range Complex No. 1. One soil sample will be collected from the firing line to determine impacts from firing. One soil sample will be collected from the Combat Training Area Subrange. Two samples will be collected from each of the two impact areas (direct and indirect fire impact areas). One sample will be collected from the location of the Swagerty accident and one sample will be collected from the area of “heavy contamination” based on historical range clearance activities. The exact location of the samples will be determined in the field following completion of the visual reconnaissance survey.

One sediment sample will be collected from Surveyor Creek at a location downstream of the FUDS operational areas.

One groundwater sample will be collected from a domestic well source downgradient of the AOC. Water samples will be collected from taps; well sampling equipment such as pumps and generators will not be used.

In addition, 10 soil, 2 sediment, and 1 groundwater background samples will be collected from locations away from areas of former military activity.

III. SITE PERSONNEL AND RESPONSIBILITIES

Name/Responsibility	Training					
	HAZWOPER 40-hour	8-hour HAZWOPER Refresher	Hazardous Waste Site Supervisor	First Aid	Cardiopulmonary Resuscitation	UXO Specialist
Dale Landon Field Team Leader/ Site Safety and Health Officer (SSHO)	X	X	X	X	X	
Field Sampler TBD	X	X		X	X	
UXO Technician David Watkins (1420) or Rob Irons (1137) or Jim Bayne (1212) or Rueben Rhodes (0169) or Ron Stanfield (1161) or Dave Van Deman (1057)	X	X		X	X	X

IV. HAZARD ANALYSIS

A. Safety and Health Hazards Anticipated:

<input checked="" type="checkbox"/> Heat Stress	<input checked="" type="checkbox"/> Cold Stress	<input checked="" type="checkbox"/> Tripping Hazard
<input type="checkbox"/> Noise	<input type="checkbox"/> Electrical	<input type="checkbox"/> Falling Objects
<input checked="" type="checkbox"/> Foot Hazard	<input checked="" type="checkbox"/> Biological	<input type="checkbox"/> Overhead Hazard
<input type="checkbox"/> Radiological	<input type="checkbox"/> Confined Space	<input type="checkbox"/> Water
<input checked="" type="checkbox"/> Explosive	<input type="checkbox"/> Climbing	<input type="checkbox"/> Flammable
<input type="checkbox"/> Other Specify		

B. Overall Hazard Evaluation:

<input type="checkbox"/> High	<input type="checkbox"/> Moderate	<input checked="" type="checkbox"/> Low	<input type="checkbox"/> Unknown
-------------------------------	-----------------------------------	-----------------------------------------	----------------------------------

JUSTIFICATION:

Historical documentation indicates 37mm and 75mm HE, AP, and practice rounds were the primary munitions used at the PACR. An incident in 1947 killed two young boys while they were harvesting timber. Five separate range clearances were performed during the 1940s and 1950s. Since the last range clearance (1957) there have been no reports of MEC. However, a “surface use only” recommendation was made following the final range clearance. Access to the range, though uncontrolled, is limited by the dense forest and undergrowth. There is potential for MEC to be present and undetected in the dense undergrowth. Travel during the SI field work will be limited to open areas and along easily traversed paths and trails. Travel into areas of heavy undergrowth will not be attempted.

V. SITE INSTRUCTIONS FOR MEC AVOIDANCE

See Section 4.3 of the SSHP for full scope of MEC avoidance requirements.

- a. DO NOT touch or move any ordnance items regardless of the marking or apparent condition.
- b. DO NOT visit an ordnance site if an electrical storm is occurring or approaching. If a storm approaches during a site visit, leave the site immediately and seek shelter.
- c. DO NOT use radio or cellular phones in the vicinity of suspect ordnance items.
- d. DO NOT walk across an area where the ground cannot be seen. If dead vegetation or dead animals are observed, leave the area immediately due to potential chemical agent contamination.
- e. DO NOT drive vehicles into suspected MEC areas; use clearly marked lanes.
- f. DO NOT carry matches, lighted cigarettes, lighters or other flame producing devices into a MEC site.
- g. DO NOT rely on color codes for positive identification of ordnance items or their contents.
- h. Only the on-site UXO Specialist is allowed to approach suspected ordnance items to take photographs, and prepare a full description (take notes of the markings or any other identifiers/features).
- i. The location of any ordnance items found during the site investigation should be clearly marked so it can be easily located and avoided.
- j. Always assume ordnance items contain a live charge until it can be determined otherwise.

Section 4.3 of the SSHP defines on-site MEC avoidance requirements for FUDS properties. In general, the purpose of MEC or anomaly avoidance during SI activities is to avoid any potential surface or subsurface anomalies. Intrusive anomaly investigation is not authorized during MEC avoidance operations. The reconnaissance and sampling field work shall include a minimum of two people, one of whom shall be a UXO technician. This team will be on-site during all sampling activities. Sampling personnel must be escorted at all times in areas potentially containing MEC until the UXO team has completed the access surveys and the cleared areas are marked. If anomalies or MEC are detected, the UXO team will halt escorted personnel in place, select a course around the item, and instruct escorted personnel to follow. If MEC is

encountered, Shaw will stop work in the vicinity and make notifications as outlined in the Work Plan. Shaw is not to conduct further investigation or removal of any MEC.

VI. SITE CONTROL AND COMMUNICATIONS

A. **SITE WORK ZONES:** UXO avoidance will be conducted in accordance with the SSHP and USACE EP 75-1-2 during all SI activities. Rigid demarcation of work zones, e.g., using barricades or caution tape, will generally not be required for this project. The Field Team Leader/SSHO, in consultation with the UXO Technician, will determine the boundary of an Exclusion Zone (EZ) to be established around a specific area of activity, appropriate to the potential hazards. The boundaries may be described by physical features, e.g., fences, tree lines, or topographic features, or may be defined by a radius around the center of activity. The EZ boundary will be verbally communicated to team members, who will maintain a watch to assure that only field team members are within the work zone. If a bystander or intruder approaches the EZ, the field team will cease work and ask the person to remain outside the area. A Contamination Reduction Zone (CRZ) will generally not be required because personnel decontamination is not anticipated. If required, a CRZ will be established in a manner similar to that described for the EZ. The support zone will consist of all portions of the site not defined as an EZ or CRZ.

B. COMMUNICATIONS:

(1) **ON-SITE:** Verbal communications will be used among team members to communicate to each other on-site. If this communication is not possible, the following hand signals will be used.

GRIP PARTNER'S WRIST OR BOTH HANDS AROUND WAIST – Leave the area immediately.

HAND GRIPPING NOSE – Unusual smell detected.

THUMBS UP – OK, I am alright or I understand.

THUMBS DOWN – No, negative.

(2) **OFF-SITE:** Off-site communications will be established at the site and may include an on-site cellular phone or the nearest public phone or private phone that may be readily accessed.

Cellular Phone: (509) 521-1437

Public/Private phone

TELEPHONE NUMBERS:	
1. MEDICAL FACILITY (Emergency Care): Olympic Medical Center, Port Angeles WA	(360) 417-7000
2. MEDICAL FACILITY (Non-Emergency Care): Occupational Medical Associates, Silverdale, WA	(360) 692-1848
3. FIRE DEPARTMENT: Port Angeles Fire Department	(360) 417-4655 or 911
4. POLICE DEPARTMENT: Clallam County Sheriffs Department	(360) 417-2459 or 911
5. POISON CONTROL CENTER:	(800) 222-1222
6. USACE MM DC PROJECT MANAGER: John Miller	(402) 995-2735 (office) (402) 350-3735 (cell)
7. USACE DISTRICT PROJECT MANAGER: Mike Nelson	(206) 764-3458 (office) (206) 390-9873 (cell)
8. USACE OE Safety: Chris Bryant	(402) 995-2279 (office) (402) 917-7476 (cell)
9. SHAW PROJECT MANAGER: Peter Kelsall	(720) 554-8178 (office) (303) 981-8435 (cell)
10. SHAW TECHNICAL LEAD: Dale Landon	(509) 946-2069 (office) (509) 521-1437 (cell)
11. SHAW FIELD LEADER: Dale Landon	(509) 946-2069 (office) (509) 521-1437 (cell)
12. SHAW SAMPLER: TBD	
13. SHAW OE SAFETY: Brian Hamilton	(303) 690-3117 (office) (303) 809-0416 (cell)
14. SHAW UXO TECHNICIANS: David Watkins (#1420), Rob Irons (#1137), Jim Bayne (#1212), Rueben Rhodes (#0169), Ron Stanfield (#1161), or Dave Van Deman (#1057) (Contact: Morey Engle)	(303) 690-3870 (720) 480-3204 (cell)
15. Shaw Helpdesk	(866) 299-3445
16. Shaw Health and Safety Manager David Mummert	(419) 425-6129 (office) (419) 348-1544 (cell)

(3) EMERGENCY SIGNALS: In the case of small groups, a verbal signal for emergencies shall suffice. The emergency signal for large groups should be incorporated at the discretion of the UXO Technician.

Verbal Nonverbal (Specify)

VII. EMERGENCY RESPONSE

(1) ACCIDENTS: Safety-related incidents and accidents will be immediately reported to the Shaw Project Manager, Shaw Health and Safety Manager, Shaw Helpdesk (if necessary), and the USACE Military Munitions Design Center (MM DC) Project Manager. Additional notifications within the USACE organization will be coordinated by the USACE MM DC Project Manager. Additional accident reporting responsibilities of Shaw personnel are described in Section 1.9 of the Accident Prevention Plan.

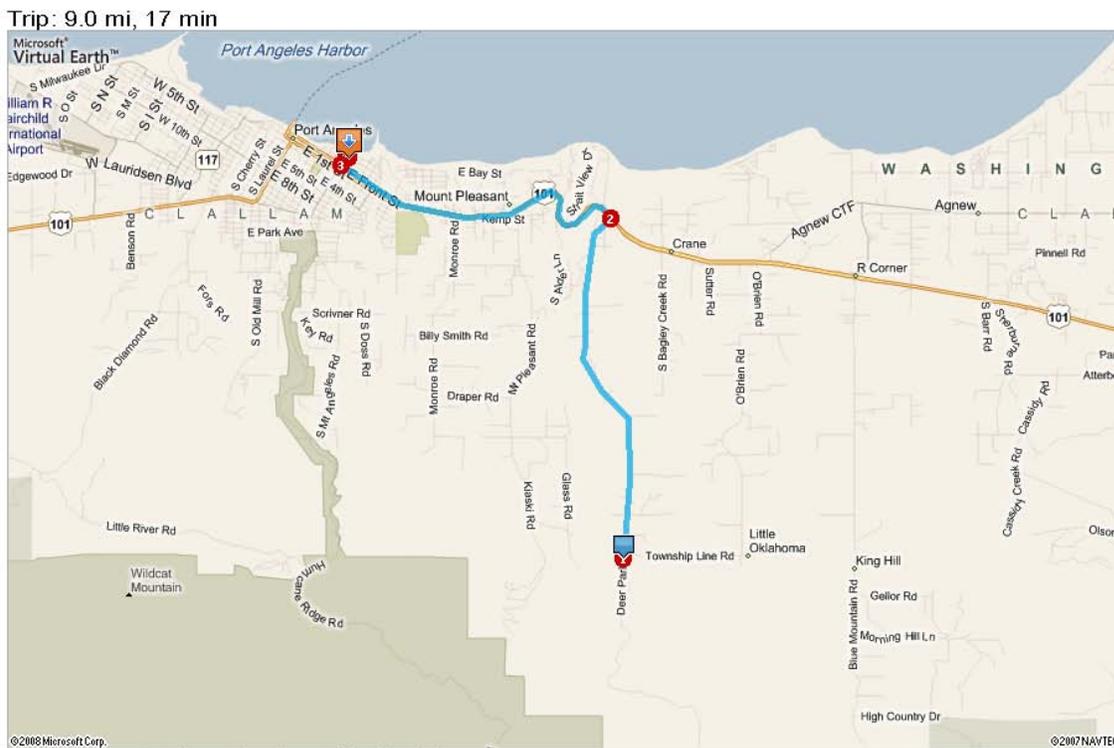
(2) DIRECTIONS TO THE NEAREST HOSPITAL/MEDICAL FACILITY:

Emergency medical care is available at Olympic Medical Center 939 Caroline St., Port Angeles, WA 98362.

Directions to Olympic Medical Center from Port Angeles Combat Range, WA (see Figure 1):

- Port Angeles Combat Range, take Deer Park Road North 4.6 miles.
- Turn left onto US-101 4.3 miles.
- Turn Right onto N Race St 0.1 mile.
- Turn right onto Caroline St.
- Arrive at Olympic Medical Center

Figure 1: Directions to Olympic Medical Center from Port Angeles Combat Range



(3) CLINIC FOR NON-EMERGENCY MEDICAL TREATMENT

In the event of a work-related, non-life threatening injury, the following occupational health clinic is approved by Health Resources for medical treatment of Shaw employees. Notifications per section VII. (1), above, and to Health Resources (800-350-4511) are required prior to transporting the employee to the clinic.

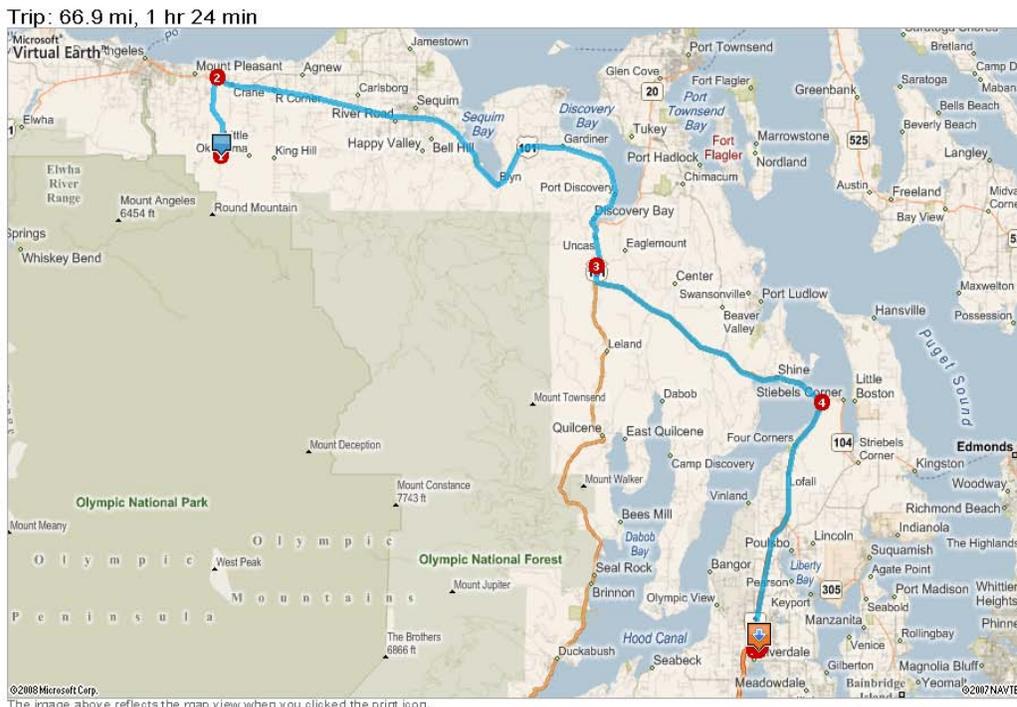
The clinic for non-emergency medical treatment is:

Occupational Medical Associates, 10513 Silverdale Way Northwest, Suite 101, Silverdale, WA 89383; Telephone number 360-692-1848.

Directions to Occupational Medical Associates in Silverdale, WA from Port Angeles Combat Range, WA (see Figure 2):

- From Port Angeles Combat Range, take Deer Park Road North 4.6 miles.
- Turn right onto US-101 31.4 miles.
- Bear right onto SR-104 East 15.7 miles.
- Turn right onto SR-3 14 miles.
- Take ramp right for WA-303 South toward Silverdale 0.3 miles
- Turn left onto Clear Creek Rd NW 0.2 miles
- Turn left onto NW Randall Way 0.4 miles
- Turn right onto Silverdale Way NW 0.2 miles.
- Arrive at Occupational Medical Associates, 10513 Silverdale Way NW

Figure 2: Directions to Occupational Medical Associates from Port Angeles Combat Range



VIII. PERSONAL PROTECTIVE EQUIPMENT

For field work to be performed at this site, Level D personal protective equipment (PPE) is required. Level D PPE requirements are defined in Section 5.1.5 of the SSHP (Shaw, 2006). In general, the use of hard hats is required on all USACE work sites, except on MEC-contaminated sites. At this FUDS, hard hats will only be worn if an overhead hazard is identified. If hard hats are worn, they will be securely fastened to the wearers head. Tyvek[®] coveralls and gloves will be worn if poisonous plants, ticks, or other biological hazards are observed in the work area.

Contingency: Evacuate site if higher level of protection is needed.

IX. DECONTAMINATION PROCEDURES

Decontamination procedures are not anticipated as Level D PPE is being used. If decontamination is deemed necessary, procedures defined in Section 7.0 of the SSHP in the Work Plan will be followed. Team members are cautioned not to walk, kneel, or sit on any surface with potential leaks, spills, or contamination.

X. TRAINING

All site personnel and visitors will have completed the minimum training required by EM 385-1-1 and 29 CFR 1910.120(e). The Shaw Field Team Leader will verify that all on-site personnel and visitors have completed the appropriate training prior to admitting the individuals on site. Additionally, the UXO Technician assigned to this field reconnaissance will inform personnel before entering, of any potential site specific hazards and MEC safety procedures.

XI. GENERAL

The number of persons visiting the site will be held to a minimum. The UXO Technician can supervise no more than six non-UXO qualified persons while on MEC sites performing intrusive or non-intrusive work per DDESB TP-18. The Field Team Leader (with concurrence from the Health and Safety Manager) may modify this SSHP Addendum if site conditions warrant. All changes to the SSHP require USACE review and concurrence before new procedures can be applied in the field.

XII. SEVERE WEATHER CONTINGENCY PLAN

Sudden changes in the weather, extreme weather conditions, and natural disasters can create a number of subsequent hazards. Inclement weather may cause poor working conditions including slip, trip and fall hazards to exist. Natural disasters can create many secondary hazards such as release of hazardous materials to the environment, structure failure, and fires.

Weather conditions will be monitored throughout the day by all field team members. Additionally, field personnel should be aware of/informed of daily weather forecasts. Local weather broadcasts and information from a severe weather alert radio will be monitored by the Field Team Leader, SSHO, or designee when the likelihood for severe weather exists. The

location of Tornado Shelters that may be located in the general area where field work is being performed will be identified. Severe weather may include:

- Tornadoes,
- Thunderstorms (lightning, rain, flash flooding),
- Hail, and
- High wind.

Generally, cellular telephone communication will be used to alert crews to threatening weather. The necessary precautions or response, as directed by the Field Team Leader, to implement the Severe Weather Contingency Plan include:

- Reconnaissance and sampling operations will be suspended when the potential for lightning occurs. Operations may resume 30 minutes after the last observed lightning strike.
- Tornado shelters will be designated prior to the first day of fieldwork.
- For most types of severe weather, personnel should take refuge in vehicles or inside a designated office.
- In the event of a tornado, personnel should take cover in a basement, ditch, culvert, open “igloo,” or interior room of a strong building. Personnel should be aware that ditches and culverts may fill up with water quickly and should only use these as shelters as a last resort.
- The Field Team Leader must decide what operations, if any, are safe to perform based on existing conditions and anticipated conditions.

Additional information will be developed and communicated to personnel before commencing new tasks or activities. It may be necessary to halt certain hazardous operations or stop work altogether to allow the weather situation to pass.

Routinely monitoring weather conditions and reports may help reduce the impact of severe weather and natural disasters. The best protection against most severe weather episodes and natural disasters is to avoid them. This means seeking shelter before the storm hits. If lightning is a threat, stay away from pipes and electrical equipment and watch for damage caused by nearby lightning strikes.

SAFETY BRIEFING CHECKLIST

SITE NAME: Port Angeles Combat Range	DATE/TIME: /
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GENERAL INFORMATION

(Check subjects discussed)

- PURPOSE OF VISIT
- IDENTIFY KEY SITE PERSONNEL
- TRAINING AND MEDICAL REQUIREMENTS

SPECIFIC INFORMATION

- SITE DESCRIPTION/PAST USES
- RESULTS OF PREVIOUS STUDIES
- POTENTIAL SITE HAZARDS
- MEC SAFETY PROCEDURES
- SITE SOPs
- SITE CONTROL AND COMMUNICATIONS
- EMERGENCY RESPONSE
 - LOCATION OF FIRST AID KIT
 - EMERGENCY PHONE NUMBERS AND LOCATION
 - LOCATION AND MAP TO NEAREST MEDICAL FACILITY
 - PPE AND DECONTAMINATION

Stress the following during the briefing: If hazardous conditions arise, stop work, evacuate the area, and notify the SSHO and Shaw PM immediately.

PLAN ACCEPTANCE FORM
SITE SAFETY AND HEALTH PLAN ADDENDUM
FOR

Site Name: Port Angeles Combat Range
Location: Port Angeles, Washington

I have read and agree to abide by the contents of the Site Safety and Health Plan and this Addendum and I have attended the Safety Briefing for the aforementioned site.

NAME (PRINTED)	OFFICE	SIGNATURE	DATE

Person presenting the safety briefing:

SIGNATURE

DATE